JANUARY . . . 1913

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"THE ELECTRICAL MAGAZINE FOR EVERYBODY"

MODERN ELECTRICS

"THE ELECTRICAL MAGAZINE FOR EVERYBODY"

Edited by H. Gernsback

Volume V JANUARY, 1913 No. 10

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Modern Electrics

VOL. V. JANUARY, 1913 No. 10

The Practical Electrician

A Popular Course in Electricity on the Construction of Electrical Apparatus and Experiments to be Conducted with them

By PROFESSOR W. WEILER, of the University of Esslingen, (Germany)
Translated by H. GERNSBACK

CHAPTER IV

(Continued)

109. Rapieff Sun Arc Lamp

WHEN this lamp first appeared it created quite a sensation on account of its novelty and simplicity, as well as the purity of its light.

The construction is almost ridiculously simple, while the light is very steady and having a reddish color is very pleasing to the eye; it does not hurt it as much as the bluish light of the regular arc. The light, however, is only thrown in one direction and this is one of the poor features of the lamp.

FIG. 172

From a block of marble a cone is turned as shown in our illustration. The size is about 4 inches high, measures 2 inches on the top, and 1.2 inches at the bottom. Parallel to its sides two holes are drilled as shown, which will take the carbons, but the end of the holes which terminate in a hemispherical cup are not quite drilled through in order that the carbons do not fall out, but rest on a smalled diameter hole. This is easily understood by studying the illustration. The two holes come together up to about 1/8 inch, and thus the carbons are fed down by gravity at the ratio in which they are consumed.

In order to start the arc it is of course necessary to first make connection between the two carbons, the same as in the Jablochkoff lamp. Once the lamp is started it burns evenly while the marble gives it the reddish tint. It is an ideal lamp for the experimenter who wishes to have a cheap arc lamp for experimental purposes and one that does not get out of order easily.

110. Shunt and Differential Lamps

In practice it is required of an arc lamp that each shall burn independently of others placed in the same circuit and it should be possible to connect them in multiple.

Two kinds of lamps are now used almost exclusively, namely, the shunt lamp and the differential lamp.

Fig. 173 shows the multiple lamp which is based on the following principle:

The electromagnet, *a*, starts its armature in such a manner that as soon as the current is closed the two carbons are separated from each other. The coil, B, connected in shunt, is wound with fine wire, the resistance being 40 to 100 times greater than the resistance of the arc itself.

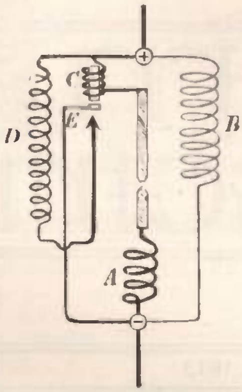


FIG. 173

This shunt is used to regulate the length of the arc. The electromagnet C pulls the armature E away from the terminal of the coil, D, wound with heavy wire as long as the lamp burns; as soon as the lamp is extinguished the current goes over D, which in other words replaces the lamp; thus, if there are more lamps in series with this lamp, all the others will not extinguish. It is, of course, self-understood that the coil, D, must have heavy enough wire so that it will not heat up to any great extent.

Fig. 174 shows the Krizik lamp constructed on the above principle. The two arms, P and N, carrying the carbons, are connected by means of a cord or belt which runs over the pulley, *b*. The upper parts of P and N are made of brass tubes in which we have the soft iron cores, *c* and *d*. These cores are shaped conically as shown in order that the magnetic effect of the coils on the cores for all positions is about the same. As long as there is no current in the lamps, the carbons are on top of each other, because the positive carbon, P, is a little heavier than the negative, N. As soon as the current is closed two circuits are open to the current, *i. e.*: the main part of the current flows over the part having the least resistance, *f*PN, around the electromagnet, C, and through the coil A, to the negative post. The magnet, C, now pulls its armature and the shunt D is disconnected from the circuit. Now the current is divided in A and B in the proportion of their resistances. If the arc is lengthened the current grows in B; the armature will be pulled in stronger and the arc shortened till its length becomes normal again.

As soon as the lamp extinguishes, C cannot pull up its armature any longer and the current flows through A, through the heavy wire to B, to the contact, E, and through the shunt which has the same resistance as the lamp itself, and from there finally to the next lamp.

THE DIFFERENTIAL LAMPS which again can be divided in a great many ingenious arrangements, are based on the following principle:

Fig. 175 shows the positive carbon which on account of its weight always tends to drop downward. The carbon support engages with a gear work as shown in our illustration, which in turn carries a wheel, A. Against the circumference of this wheel, a shoe, B, presses which is attached to the lever, C. This lever is connected with the iron core, K, which is surrounded by two coils. Through D the main current flows while the coil with a fine wire E, is in shunt. The negative carbon is carried on a piece of soft iron which at the same time is the armature of the negative electromagnet, F.

When no current flows through the lamp, the positive carbon rests upon the negative carbon; as soon as the circuit is closed F pulls on its armature and the arc is struck. If the arc becomes too long, the main current is weakened, while the shunt current increases, thus the wheel A becomes disengaged as the pressure of the lever C has been reduced and the result is that the positive carbon drops down a little. This, however, increases the main current again, the core K rises, B brakes the wheel and stops the downward movement of the + carbon. Thus the arc is always kept at its right length. In this lamp the voltage is about as follows:

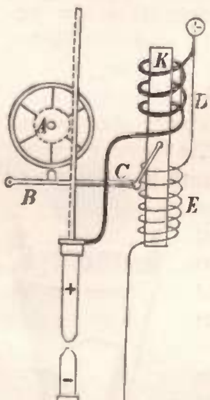


FIG. 175

At 1 ampere 32 volts.
" 2 amperes 34 volts.

At 3 amperes 35 volts.
" 4 amperes 36 volts.
" 6 amperes 38 volts.
" 8 amperes 40 volts.
" 10 amperes 42 volts.
" 12 amperes 44 volts.

Series lamps are used in circuits where nothing else but arc lamps are used; the differential lamp works very well in such a circuit. For multiple circuits and where arc lamps are used in connection with incandescent lamps, etc., the shunt lamp is preferred as it regulates itself to the prevailing tension.

In order to effect a slower consumption of the carbons, the Jandus lamp is enclosed air tight in a glass globe. This however, decreases the intensity of the light as the burning of the carbon now takes place in an atmosphere of carbon dioxide, while it is the oxygen of the air that gives the arc its greater brilliancy.

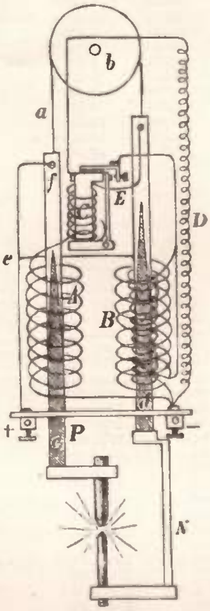


FIG. 174

CHAPTER V.

Conductors and Their Resistances

111. Materials

The material used, perhaps more than any other is copper, because of its cheapness and its greater conductivity. It has been proved by means of telegraph apparatus that electricity is propagated from 10 per cent. to 20 per cent. quicker in copper than in iron wires. In most apparatus it is used exclusively, but for long distances sometimes iron, steel, phosphor or silicon bronze are used in its place. In their order as far as the conductivity goes, the most important metals are grouped as follows:

Silver, copper, brass, iron, silicon bronze and German silver.

German silver is an alloy of 60 per cent. copper, 25 per cent. zinc and 15 per cent. nickel.

As a rule conductors are cylindrical, but in many instances they are used in strip form; in large dynamos the form is sometimes rectangular.

Insulation

In most apparatus the conductors are insulated by means of cotton or silk. This may be either a single, double, or even a triple layer of one of the two materials which may or may not be paraffined or else covered with rubber; very often this rubber itself is again covered with cotton.

Where there is a great deal of humidity it is often necessary to cover the insulated wire with a lead sheath which protects the wire thoroughly from all dampness.

Enamel Wire

Of late this wire has been introduced to a great extent and is used extensively in most every branch of the electrical industry, especially in all kinds of apparatus. The enamel is usually baked on the wire and makes an effective cover-

The table on the following page gives the number, diameter, weight, length and resistance of copper wire and is especially valuable to the experimenter as many different problems can be figured out in connection with the table.

112. The Resistance of the Human Body

This varies greatly and it depends all upon the metal by which connection is made with the body. If brass tubes are used as handles, and if the hands are moderately moist, the resistance is about 5,000 ohms.

If the hands are quite wet the resistance will fall to 2,700 ohms. If they are wetted with a solution of sal-ammoniac the resistance drops down to 1,570 ohms. With an alternating current of 11 volts, and while the hands are moist with sal-ammoniac solution the resistance is but 1,100 ohms. As a rule it may be said that the resistance of the human body is between 1,000 and 5,000 ohms. If a needle is stuck into the skin of each hand the resistance may drop to 100 ohms, as it is mainly the skin of the body which offers the high resistance, while the blood, muscles, nerves, etc., are good conductors.

In the nerves themselves the electric current travels at the rate of 33 to 60 yards a second; in the nerves of a frog only about 20 yards, and in free space, about 186,000 miles.

(To be continued.)

COPPER WIRE TABLE

Gauge.	Diameter.	Sectional Area.	Capacity.	Ohms.			Feet.		Pounds.	
B. & S. No.	In 1000ths.	In Circular Mils.	In Amp.	Per 1,000 Ft.	Per Mile.	Per Pound.	Per Pound.	Per Ohm.	Per 1,000 Ft.	Per O[hm]
0000	.460	211600.	312.	.04906	.25903	.000077	1.56122	20497.7	640.51	12987.
000	.40964	167805.	262.	.06186	.32664	.00012	1.9687	16255.27	507.95	8333.
00	.3648	133079.	220.	.07801	.41187	.00019	2.4824	12891.57	402.83	5203.
0	.32486	105534.	185.	.09831	.51909	.00031	3.1303	10223.08	319.45	3225.
1	.2893	83694.	156.	.12404	.65490	.00049	3.94714	8107.49	253.34	2041.
2	.25763	66373.	131.	.1563	.8258	.00078	4.97722	6429.58	200.91	1282.
3	.22942	52634.	110.	.19723	1.0414	.00125	6.2765	5098.61	159.32	800.
4	.20431	41743.	92.3	.24869	1.313	.00198	7.9141	4043.6	126.35	505.
5	.18194	33102.	77.6	.31361	1.655	.00314	9.97983	3206.61	100.20	318.
6	.16202	26251.	65.2	.39546	2.088	.00499	12.5847	2542.80	79.462	200.
7	.14428	20817.	54.8	.49871	2.633	.00792	15.8698	2015.51	63.013	126.
8	.12849	16510.	46.1	.6529	3.3	.0125	20.0007	1599.3	49.976	80.
9	.11443	13094.	38.7	.7892	4.1	.0197	25.229	1268.44	39.636	50.
10	.10189	10382.	32.5	.8441	4.4	.0270	31.8212	1055.66	31.426	37.
11	.090742	8234.	27.3	1.254	6.4	.0501	40.1902	797.649	24.924	20.
12	.080808	6530.	23.	1.580	8.3	.079	50.5906	632.555	19.766	12.
13	.071961	5178.	19.3	1.995	10.4	.127	63.7948	501.63	15.674	7.
14	.064084	4107.	16.2	2.504	13.2	.200	80.4415	397.822	12.435	5.
15	.057068	3257.	13.6	3.172	16.7	.320	101.4365	315.482	9.859	3.
16	.05082	2583.	11.5	4.001	23.	.512	127.12	250.184	7.819	1.
17	.045257	2048.	9.6	5.04	26.	.811	161.29	198.409	6.199	1.
18	.040303	·1624.	8.1	6.36	33.	1.29	203.374	157.35	4.916	.
19	.03589	1288.	....	8.25	43.	2.11	256.488	124.777	3.899	.
20	.031961	1021.	....	10.12	53.	3.27	323.399	98.9533	3.094	.
21	.028462	810.	....	12.76	68.	5.20	407.815	78.473	2.452	.
22	.025347	642.	....	16.25	85.	8.35	514.193	62.236	1.945	.
23	.022571	509.	....	20.30	108.	13.3	648.452	49.3504	1.542	.
24	.0201	404.	....	25.60	135.	20.9	817.688	39,1365	1.223	.
25	.0179	320.	....	32.2	170.	33.2	1031.038	31.0381	.0699	.
26	.01594	254.	....	40.7	214.	52.9	1300.180	24.6131	.7692	.
27	.014195	201.	....	51.3	270.	84.2	1639.49	19.5191	.6000	.
28	.014195	201.	....	64.8	343.	134.	2067.364	15.4793	.4837	.
29	.011257	[illegible]	....	81.6	432.	213.	2606.959	12,2854	.3835	.
30	.010025	100.5	....	103.	538.	338.	3287.084	9.7355	.3002	.
31	.008928	79.7	....	130.	685.	539.	4414.49	7.72143	.2415	.
32	.00795	63.	....	164.	865.	856.	5238.915	6.12243	.1913	.
33	.00708	50.1	....	206.	[illegible]	[illegible]	6590.41	4.85575	.1517	.
34	.006304	39.74	....	260.	[illegible]	[illegible]	8312.8	3.84966	.1204	.
35	.005614	31.5	....	328.	[illegible]	[illegible]	10481.77	3.05305	.0956	.
36	.005	25.	....	414.	[illegible]	[illegible]	13214.16	2.4217	.0757	.
37	.004453	19.8	....	523.	2765.	[illegible]	21013.25	1.52292	.04758	.
38	.003965	15.72	....	660.	3486.	[illegible]	26496.237	1.20777	.03755	.
39	.003531	12.47	....	832.	4395.	[illegible]	33420.63	0.97984	.02992	.
40	.003144	9.88	....	1049.	5542.	8742.	19659.97	1.92086	.06003	.

MUSICAL INSTRUMENTS PLAYED BY WIRELESS

A Chicago inventor named Raymond Phillips, is reported to have recently demonstrated a selective system of wireless control by which he controled the playing of three player pianos simultaneously.

RIPENING PEACHES UNDER ELECTRIC SPARKS

It is reported that an English inventor, T. Thorne Baker, of London, has perfected a process by which unripe peaches are ripened by being subjected to a high-tension electrical discharge directly onto the surface of the fruit.

It is said that after a few minutes of this treatment the ripening effect has penetrated almost to the stone, and the fruit is luscious and juicy.

SOME ELECTRICAL FACTS

Thirty million dollars are now inv[est]ed in electric autos.

The locks of the Panama Canal [will] be operated by electricity.

There are 2,000 electric motors [op]erating in the Hotel Astor, New Y[ork].

Austria-Hungary is building hy[dro]electric plants to cost more than $[...]000,000.

It was in 1752 that Ben Fran[klin] drew electricity from the clouds [with] a kite and string.

The electric motor for the sewing [ma]chine will take 30,000 stitches f[or a] cent's worth of current.

A little electric buffing motor is [now] used for polishing silver and other [ware] about the home.

There are 16 cables across the N[orth] Atlantic ocean.

New Electric Tubes

MANY obscure electric problems are often solved of late through the medium of some electric tube, used in observing. directly, certain phenomena which it would not be possible to observe otherwise. Some of the tubes thus devised are very ingenious and show to what pains the scientist will go when seeking an explanation of some known but poorly understood phenomenon

Fig. 1 shows a tube such as used in the demonstration of the direction of the positive light, or the negative glow light.

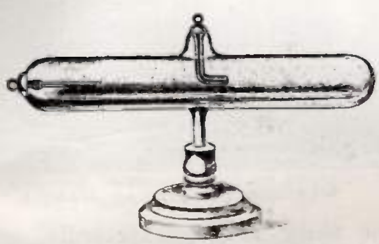


FIG. 1

If the middle electrode is negative, the blue light contained in the part of the tube which has no electrode, expands. If the same electrode is positive, the positive light bends around the electrode and takes its direction to the cathode.

Fig. 2 shows a new style deflection tube. A is the cathode, B the anode. If a connection is made between A and B but not at C, the wire in the center of the tube throws a narrow shadow. If C is connected with the cathode, the width of the shadow is increased quite a good deal.

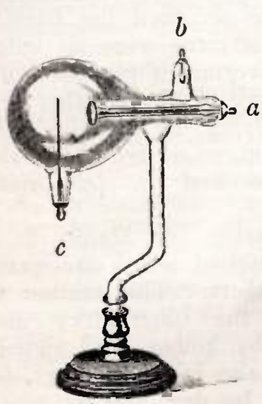


FIG. 2

Fig. 3 shows a vacuum tube invented by Perrin. This is used for the demonstration of the electrostatic deviation. K is the cathode; the sieve A is the anode, which is grounded. If the rod D is not charged the cathode rays passing through the sieve are parallel and straight. When charged negatively they tend to bend away from the rod D, while when charged positively they are bent *around* the rod also, but come together again above the rod.

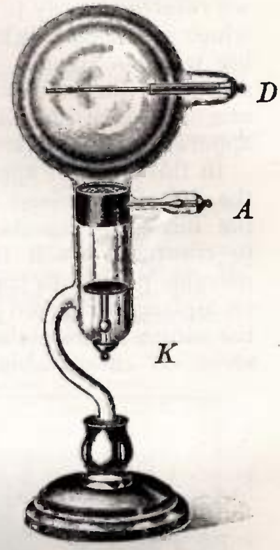


FIG. 3

A curious arrangement is shown in Fig. 4. There are two electric lamps connected together and mounted on a stand as shown. One of the lamps (Cathode) is connected with the negative pole of an induction coil and burns bright, while the lamp connected with the positive pole (Anode) stays dark. It is recommended that this tube be used in connection with a large spark coil on which a powerful primary current is used, such as by using an electrolytic interrupter. When alternating current is used with this arrangement, both lamps will glow.

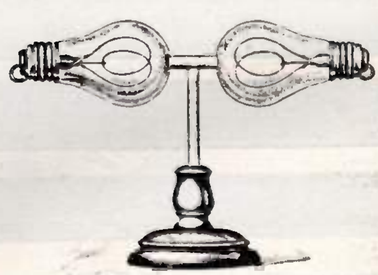


FIG. 4

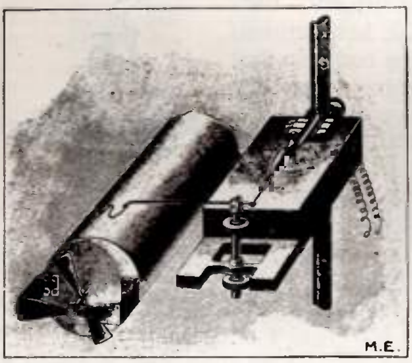
SELENIUM HYGROMETER

It has been discovered that the electrical resistance of selenium changes with moisture and the metal has been incorporated in a new hygrometer.

FROG-LEG WIRELESS

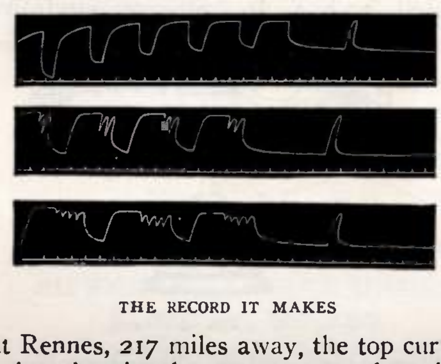
In our December issue, under the heading, "Getting Back to First Principles," we referred briefly to a French invention which utilizes a frog's muscle for recording wireless signals. Herewith we present two illustrations from *La Nature*, one of which shows one form of the apparatus employed.

In this form of apparatus the drum at the left is revolved by clockwork and the incoming signals cause the muscle to contract, which in turn causes the movable pointer to trace irregular curves on a piece of smoked paper wound about the drum. The other figure shows a series of curves obtained by means of



THE APPARATUS

the apparatus. These represent time signals sent out from the wireless station at the Eiffel Tower in Paris and received



THE RECORD IT MAKES

at Rennes, 217 miles away, the top curve being the signal sent at 10.45, the middle curve those at 10.47, and the lower curve those at 10.49 A. M.

MANILA'S WEATHER SIGNAL STATION

Manila has to keep pretty accurate tab on the weather, not only for the city's welfare, but for the safety of the entire archipelago, which numbers nearly half a hundred provinces. Typhoons

WEATHER STATION AT MANILA

come along very unexpectedly, and as the host is annoyed by the arrival of unexpected company, so the Philippine public becomes embarrassed when a strange typhoon comes howling along. The typhoon corresponds to our cyclone, except that it is usually fiercer and covers an area hundreds of miles greater than that covered by the cyclone.

The Catholic observatory at Manila keeps watch for typhoons, and the government's weather service is in charge of a learned priest, Father Jose Algue, S. J. When we occupied the islands Father Algue's services were so valuable that our government pleaded with him to take charge of the weather bureau. By complying, he forfeited his Spanish citizenship, so we are now making him an American by appropriate legislation.

The signal station for Manila is a stone tower on top of which are quarters for the keepers. This station is connected with the observatory and weather bureau by 'phone, and signals are displayed in the forms of flags, or by painted balls, by day, and by white and colored lights by night, denoting the attitude of the weather. The news of the approach of a storm is telegraphed to every town in the islands.—*Monroe Wooley.*

The Scientific Adventures of Mr. Fosdick

By Jacque Morgan

The Afro-American Cataphoretic Process Co., Limited

I

ALTHOUGH the experiment which Mr. Fosdick hoped would demonstrate the success of his undertaking scheme was a dismal failure, it resulted in bringing to the inventor's attention a hitherto undiscovered phenomenon of science that at once set him to thinking. It was a thing that promised untold millions.

A month had elapsed since the undertaking experiment, and Eben Stetzle, from the neck down, still remained as black as any native of the Congo. Mr. Fosdick learned this from his wife, and she had it from the enraged Mrs. Stetzle. Eben and Mr. Fosdick were strangers. The experiment of the plating bath had proven that a pigment such as graphite could be implanted by cataphoretic action into the cuticle, giving the skin the color of the pigment. In other words, he could turn a white man into a negro. He thought a long time over the commercial possibilities of this, but in the end he was forced to concede that there seemed small probability of making the business profitable—there seemed little demand for it. He pondered over this for weeks, and then the great thought came to him: *Why not reverse the process and make black men white?* The possibilities of the thing overpowered him. He dared not think of it—much.

Where to get the capital to exploit the idea bothered Mr. Fosdick for a week or more. Mr. Stetzle, his erstwhile faithful backer, was now his implacable enemy; Bill Hitchcock had not forgotten—nor forgiven—the menace to life and limb by Mr. Fosdick's electrified cats, and Mr. Snodgrass was, no doubt, still nursing his wrath over the incident of the Seidlitzmobile.

And yet the more Mr. Fosdick thought about it the more he became convinced that Hiram Snodgrass was the logical man to approach. Having built up a large fortune out of the manufacturing of patent jimcracks the president of the Ajax Manufacturing Company longed to identify his name with some truly great project of science. He was the prime mover in a half dozen uplift societies, and he frequently spoke upon the deplorable condition of the other half—giving voice freely, but no money. Yes, beyond a doubt, Mr. Snodgrass was the man.

II

"The prejudice against the negro is solely one of color," argued Mr. Fosdick. "He is entitled to our sympathy."

"Yes, yes," agreed Mr. Snodgrass, picking up the payroll and scrutinizing it to see where he could lop off a few dollars, "we will sympathize with him."

"It will take about a thousand dollars to equip a plant where our unfortunate brethren can be transformed," said Mr. Fosdick, after a long pause.

"Nothing doing," and Mr. Snodgrass whirled his desk chair around, giving Mr. Fosdick an excellent view of the presidential shoulders. The interview, so far as Mr. Snodgrass was concerned, was at an end.

Mr. Fosdick waited. Then he coughed.

"I tell you I've been stung once this week—two dollars—at a church fair. Everybody seems to think I'm made of money."

"But, Mr. Snodgrass," expostulated the inventor in a quiet, even voice, "this is not a charity affair—it's business. There's a fortune in it—even more, a million—or, I should say, to be more accurate, perhaps a hundred millions."

"What! Eh!" The desk chair swung about and the whisker-fringed countenance of Mr.

THE SECRET WAS TOO GOOD FOR JIM TO KEEP

Snodgrass again came into view. He was interested. "What's this about there being money in your scheme?"

"Do you know that there are about twenty million negroes in the United States? And do you know that each and every one of them would change the color of his skin? Suppose we get but five dollars apiece from them—that's a hundred millions the first crack out of the box. And that's not counting the millions and millions to be made in Hayti and Cuba and Africa. Think of it! I dare you!"

Mr. Snodgrass appeared dazed. He leaned back in his chair with eyes upon the ceiling, lost in the immensity of Mr. Fosdick's calculations.

"What is the cost of the operation?" he finally inquired.

Mr. Fosdick leaned forward earnestly. "Five and one-eighth cents apiece, if my figures are correct; provided we pay no more for current than ten cents a kilowatt hour."

"I'll furnish the current for half that," said Mr. Snodgrass, always with an eye for reducing expenses. "And that will lower the cost of production to something like two and a half cents." He sat up in his chair and gazed at the inventor with a sudden and solemn interest. "You'll need me in this, Fosdick. You are all right for the technical end, but you lack in business experience.

SUNDAY AFTERNOON THE FORTUNATE TWENTY STEPPED INTO THE BLEACHING VAT

See, I've cut the expense of manufacture right in half—without getting out of my chair."

Mr. Fosdick nodded earnestly.

"When can you show me a good sample?" inquired Mr. Snodgrass.

"By the end of the week. I've already spoke to Jim, the porter in the O K barber shop. And I think he has spoken of it to several of the waiters at the hotel. Perhaps I can show you a number."

"Very good," commented Mr. Snodgrass. "The process might work on one and not on another. To make sure you had better turn out ten or a dozen. If you can show me a good, clean, commercially white article I'll back you to the limit."

And ten minutes later Mr. Fosdick left the office of the Ajax Manufacturing Company with a check for a thousand dollars in his pocket, the same being for the expense c installing an experimental plant for the Afrc American Cataphoretic Process Compan: Limited.

III

The secret was too good for Jim to kee In a burst of confidence he told one of hi friends, a waiter at the Whiffleville Hote and the waiter confided in a number of hi brother lodge members. The news of "th second emancipation," as Jim called it, spreac and soon the tinshop began to take on th appearance of a Republican headquarters i Mississippi. The colored population of Whif fleville became insistent. Mr. Fosdick listene with some alarm to the clamor. He told then that they must select among them not ove twenty of their race for the experiment. Thi they did in the rear of the shop, the selectio being made by means of two cubes of bon which the contestants rolled upon the floor shouting at times with great fervor, "Com seben," or "Come 'leben!"

Sunday afternoon at precisely tw o'clock the fortunate twenty steppe into the bleaching vat. A gasolin engine and a low tension dynamo the kind used for plating purposes occupied a corner of the room. Th negative wire of the dynamo wa grounded upon the metal tank; th positive lead was split into twenty terminals, upon the end of each o which was a large sponge. A salin solution filled the tank up to the height of the men's mouths. They were instructed to rub themselves slowly with the sponges, the theory being that wherever the current was applied it would pass out of the surrounding cuticle, taking with it the dark pigment of the skin, which Mr. Fosdick said was nothing less than carbon. Mr. Fosdick busied himself at the dynamo; Mr. Snodgrass sat in a chair, watch in hand, and made calculations of the probable net cost and aggregate profits. It was a great lark for those in the vat. With the light-heartedness of their race they milled about in the tank, slapping each other with their sponges, and laughing as they speculated upon the joy that was soon to be theirs—of "passing for white."

Two hours passed, and Mr. Snodgrass began to complain about the expense. "Already," he said, "we have used up over a kilowatt apiece, and the process is not half over."

But Mr. Fosdick experienced an anxiety of another kind. He saw that the faces of some of the darkies had begun to take on a streaky appearance, and that their shoulders and arms where they had come into contact with the metal sides of the vat were white in spots. He began to worry.

"The current density is irregular," he muttered. "I do hope they will be patient."

But the negroes had begun to murmur among themselves. Mr. Fosdick pleaded with them to give the process time. They complied sullenly. It grew dark, and Mr. Fosdick silently removed the electric light bulbs and concealed them. A great fear began to steal over him. All was silence save for the occasional splash of the solution in the tank as the darkies moved about—a sinister sound that fell upon the ears of the panic-stricken inventor like that of crocodiles taking to water. It was uncanny.

An hour later Mr. Fosdick foolishly struck a match to see the time. And as he did so a large, broad-shouldered giant of a negro leaped angrily over the side of the tank. The flame of the match flickered but a moment, but that moment was enough. There was a roar of fright and rage from those in the tank, and then Mr. Fosdick and Mr. Snodgrass burst out of the door and started in mad flight down the deserted street. Once Mr. Snodgrass turned his head—only once. For many years afterwards the very thought of that sight threw him into convulsions

Eben Stetzle, returning from the barn where he had just put the cow to bed for the night, heard the uproar. In the van he saw the angular Mr. Fosdick a good twenty yards in front of the fat president of the Ajax Manufacturing Company. Both were running like possessed. And in hot pursuit followed a score of ghostly figures that caused the spectator to shriek in terror. Black and white they were—ringed like zebras and spotted like hyenas. In the pale moonlight they appeared as so many demons. Mrs. Stetzle found Eben

A LARGE BROAD-SHOULDERED GIANT OF A NEGRO LEAPED ANGRILY OVER THE SIDE OF THE TANK

lying upon the threshold. He regained consciousness two days later.

It was well that the train was just pulling out as Mr. Fosdick and Mr. Snodgrass reached the station. The conductor and the brakeman assisted the exhausted men to seats.

BLACK AND WHITE THEY WERE—RINGED LIKE ZEBRAS AND SPOTTED LIKE HYENAS

"Where?" inquired the conductor, pulling out his cash-fare book.

It was a quarter of an hour before Mr. Snodgrass could recover breath enough to reply.

"Rio de Janeiro," he said.

NEW WIRELESS TELEPHONE

It is reported from Rome, Italy, that a young Italian, Riccardo Moretti, has perfected a system of wireless telephony which has worked admirably between the military wireless telegraph station at Rome and Tripoli, voices being perfectly clear and easily recognized. Signor Moretti's device consists of a generator of continuous electric oscillations, working with a microphone, which he has developed to use in his own system. With the apparatus he has made such a successful demonstration before the Ministers of War and the Navy that the latter decided to install at once a complete radio-telephonic system between Rome and Lybia.

The Telephone Receiver

By H. G. Johnson

I will endeavor to give readers of *Modern Electrics* an account of the development of the telephone receiver, also to try and explain its theory and action; and by so doing try and answer the many queries that continually appear in this and other magazines relative to that most useful instrument. The receiver has been developed by telephone engineers and was available in an improved condition (that has not been altered for some years) for the use of wireless operators but it would appear from the recent patents that have been filed. that the wireless experts, in turn, are trying to improve it. Any advance that may be made, will be welcomed by telephone engineers quite as cordially as by wireless engineers. One of the earliest receivers consisted of a soft iron rod with a number of turns of wire round one end, an iron diaphragm was so placed and clamped round the edge that it was free to vibrate near the end of the iron rod. Two such instruments were connected in series with the addition of a battery. When the experimenter spoke into, or at the diaphragm at one end, his words were reproduced at the other end. The next stage was the substitution of a permanent bar magnet for the soft iron core. The instruments were connected as before but the battery was left out. Up to this point the receiver was used as a transmitter also, but other devices were used and from then up to the present day inventors have endeavored to improve the receiver for the purpose its very simple name implies. The next change was the use of a permanent magnet shaped like a long U with two coils of wire connected in series. This was again altered, the two coils or bobbins being wound on soft iron pole pieces which in turn were mounted on a horseshoe permanent magnet, and it is this last type that has lasted through many years of telephonic progress. In the early days of telephone development most of the results were obtained experimentally rather than by any set rules. The reason that the first instrument worked was: A magnetic field was created by means of the battery and the coils of wire on the iron cores, and the diaphragm was inserted in the magnetic field, but not touching the pole piece, it also concentrated the lines of force at one particular place in the field. Now when the voice waves impinged upon the diaphragm, and caused it to vibrate, it caused a slight variation of the magnetic field and a current was set up which caused the other instrument to respond. As a receiver has been calculated to act in response to a current of 6×10^{-13} ampere, or 0.000,000,000,000,6 amperes (W. H. Preece, 1887), you can quite understand that speech would be obtainable. The next result was due to the same reasons, but the current was set up by the varying of the permanent magnet instead of an electro magnet. We will now leave this ancient but honored history and try and explain, from the present day point of view, why the permanent magnet and soft iron pole pieces were retained, and also why the resistance of the winding varies: The receiver has to respond to very minute currents, so it is very necessary to have this portion of the circuit as perfect as possible. The winding was placed on soft iron pole pieces because iron has the property of varying and recovering under magnetic influence to a much greater degree than any other material, and the softer the iron and the greater its figure of permeability, the better it is for telephone requirements (and, of course, for wireless also). But even the best commercial iron requires energy to magnetize it so the permanent magnet is introduced to energize it by induction (or really to take care of the core losses) and by this arrangement we have an instrument that is ready to respond to the slightest variation due to an outside source of current. Now we come to the winding. This is purely a question of current and voltage, seeing that we have taken care of the core losses by means of the permanent magnet. It is unfortunate that some other name could not have been used to represent the value of a receiver instead of referring to its ohmic resistance. because it is active ampere turns that are required, and the greater the number of turns (in practice)

(*Continued on page* 1029)

Along the Great White Way

AS IT APPEARS AT NIGHT Photo O. J. Gude Co., New York.

The Jap-A-Lac sign, erected by the O. J. Gude Co. for the Glidden Varnish Company, of Cleveland, Ohio, while not as large as some of the signs shown in our previous issues, is one of the most attractive to be seen along Broadway.

The sign itself is 38½ feet high by 41 feet long. The figure is 27½ feet high; the arm, 17 feet long; the brush, 3 feet long, and the can is 12 feet high. The letters in Jap-A-Lac are 15 feet high at the ends and gradually decrease in height to 8 feet at the centre.

The action of the sign is that of the young woman painting the word "Jap-

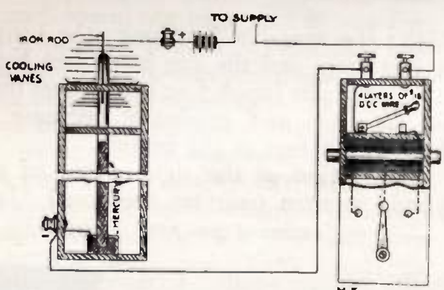
(*Continued on page* 1039)

THE SIGN BY DAYLIGHT Photo O. J. Gude Co., New York.

A Simple Mercury Arc Lamp or Rectifier

By Paul Horton

THE mercury arc is the most efficient of all electric lights, possibly with the exception of the flaming arc, consuming 0.3 watt per candle. It differs from all other lamps of the incandescent type, in that the incandescent body is a column of mercury vapor instead of carbon or a solid metal. Essentially, this lamp consists of an exhausted tube about 40 inches long, having a positive electrode of iron or platinum at the top of the tube, while the negative electrode consists of a quantity of mercury. Under a potential sufficient to break down the resistance of the vapor a long mercury vapor arc is formed which reaches from terminal to terminal, and fills up the whole interior of the tube. A very brilliant light is emitted, which, lacking in



red days, gives a greenish hue to anybody or object viewed by its light.

This lamp is rapidly finding commercial use in photography, and is used in central stations and private residences to convert A. C. into D. C. for use in arc lamps and charging automobile storage batteries. However, this use will be taken up and amplified farther on. In commercial practice very intricate machinery is necessary to produce a perfect lamp of this type. Hence this fact, coupled with the mistaken idea, held by most amateurs, that complex glass working is necessary in the construction, would seem to debar experiment in this particular line, but the fact is that any experimenter may build one with little or no trouble, and at very small expense; and the object of this article is to point out the method of procedure. However, let us review the principle involved, that we may proceed more intelligently construction.

Let a glass tube about 40 inches which has been sealed at one e completely filled with mercury, th closed with the thumb and inverte the bottom immersed in a dish co ing mercury. When the thumb moved from the end of the tube, th cury will fall down from the uppe of the tube in spite of the fact t doing so it will leave a vacuum it. Its upper surface will be abo inches above the mercury in the dis pending upon the air pressure an density of the liquid. However, th parently empty space, or "Torrice vacuum, is not exactly empty, bu tains a small amount of evaporated cury, or mercury vapor. And it i property that we will utilize in bu a practical lamp.

In the first stage of the construct will be necessary to procure a baro tube from any good chemical s house. This will be a thick-walled tube having a ¼-inch bore, abo inches long, and open at both ends. heat the tube thoroughly from e end, to expel any possible traces of ture. Regulate your Bunsen burn as to produce a smoky flame; this complished by cutting off the air su and then coat about 3 inches of on of the tube with a thick layer of Heat the tube further in the blue until the walls begin to soften, the troduce about 3 inches of a thoro sandpapered iron rod about 1-16 in diameter into the tube and heat i hottest flame until the walls fall tog thus sealing the wires securely in the In cooling, extreme care must be cised to prevent the glass cracking should be annealed in the sooty flam about ten minutes.

The next step is the constructio the support, which is built up of any able (preferably hard) wood. The suitable dimensions are 6 inches wi 30 inches high. The top piece and dle brace should each have a hole b exactly in the center the size of the tube, and are then laid aside. Bore a round hole, with an extension bit, exactly in the center of the base on the upper side. The diameter must be suitable to fit a small glass dish, which should measure 2 inches deep by 2 inches wide. The hole is to prevent the dish slipping. The tube is now ready to be filled with mercury. Take a quantity of mercury and place it in an iron or glass vessel and heat until the mercury boils. (Precaution) If an iron vessel is used it must be scrupulously clean and not coated with tin or zinc, as amalgams of these metals are not suitable for use as a rectifier. If a glass dish or porcelain is used, caution must be used in the boiling and measures must be taken for catching the mercury if the dish should break. The boiling is to free the metal from any occluded gases. Heat the tube again, and while warm fill completely with the mercury, taking every precaution to exclude any air bubbles in the mass of the mercury or clinging to the walls. Placing the thumb over the end, invert in the above-mentioned dish, in which some mercury has been placed. Now, holding the tube in one hand, place the middle brace in position by slipping down over the tube, and fasten.

The top piece may be temporarily fastened in place. The lamp should appear now as shown in the illustration.

If a current of electricity is now passed through the arc a vigorous heating of the iron electrode will take place. This would cause no trouble if iron and glass expanded at the same rate, but since they do not, it would cause the glass to break. If platinum is used for the seal-in the trouble will be eliminated, but the most feasible plan I know of is the use of radiating vanes. These are arranged as shown in the drawing, the ones upon the iron rod being soldered to it. Upon the vanes being arranged, the top pieces of the support may be permanently fastened. A potential being impressed upon the electrodes produces no effect until a high potential spark is passed from a ¼-inch spark coil. This is one of the various modes of starting these lamps, the other methods being tipping until the electrodes meet or by the use of a "booster" coil. In operation, the mercury is volatilized and condenses upon the walls of the tube.

An alternating current will not work this lamp, as it would be extinguished between reversals of the current, unless a suitable inductance coil is used. A coil of this type is shown in the lower part of the drawing, and consists of a laminated iron core 9 inches by 2½ inches in dimensions, wound with 5 layers of No. 18 DCC copper wire. Three steps are provided, for adjustment is desirable, as the lamp will rectify better at different temperatures with different inductances in circuit.

To use this as a rectifier, simply connect the storage battery or other apparatus in series in the circuit. The lamp chokes back half the alternations, by virtue of a peculiar anode resistance which it possesses. That is, the current passes easier from the iron to the mercury than vice-versa. The sum total of the unidirectional impulses have the properties of a direct current. However, if it is used to operate an arc light, such as is the case in many of the recent installations, the arc will emit a peculiar humming noise. This is not objectionable for use out of doors. This apparatus will be found much cheaper than an ordinary aluminum, lead converter in operation expenses.

THE TELEPHONE RECEIVER

(*Continued from page* 1026)

means higher resistance. In telephone work the current flowing is large and the voltage small. In wireless work the voltage is much greater and the current is much smaller (of course I am speaking comparatively) hence the wireless receiver is usually of a higher resistance due to the larger number of turns. There is a most important point for wireless amateurs to note, especially in connection with rewound receivers. The depth of the winding should bear a definite relation to the cross section of the iron core; otherwise the winding beyond a certain point ceases to be active ampere turns and becomes mere unnecessary resistance because the turns are not only some distance from the core, but are also so large compared with the inner turns that their effect is lost. The depth of the winding at no point should exceed twice the cross section of the iron. That is to say if the iron is ⅛ inch across, the depth of wire from the iron to the outside turn at any point must not be greater than ¼ inch.

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EDITORIAL

DURING the past few weeks we have received a good many communications from persons scattered all over the country, and from their communications it would seem that quite a few are becoming anxious about the future of wireless. A great many think that on account of recent legislation a damper will be put on the art, while quite a few others would like to know if wireless is simply a fad, doomed to extinction the same as the bicycle boom and its collapse a few years ago. To all these questions we can only answer positively and with the firmest conviction that wireless has not even been started as compared with what it will be in the very immediate future.

There is no other means of communication that is as desirable as wireless to-day. It will solve a multitude of economical conditions as soon as it gets into full swing.

It is not alone the wireless telegraph so much that is wanted or that is needed to be improved upon, as the wireless telephone. We have often spoken about this and we wish to emphasize it again that as soon as a practical, flexible, "foolproof" wireless telephone is invented which will be a commercial possibility, our every-day life, especially in the country and on the farms, will be changed similar as city life was changed with the introduction of the telephone; the quick and efficient communication by means of the spoken word has become an absolute necessity. When the wireless telephone has been perfected and as soon as the science of precise tuning has been evolved, the wireless telephone will be the strongest competitor of the wire telephone, without doubt. This is especially true in this country with its vast distances and in mountainous regions, where the cost of line building, compared with the small traffic that this usually carries over same, is often prohibitive.

As far as wireless telegraphy goes, the greatest desired improvement is that of very sharp tuning which will be required as soon as a great many hundreds or thousands of stations will be working simultaneously together. The demand for precise tuning, to-day, is already very acute. What is furthermore wanted is the multiplex wireless, *i. e.*, a system by means of which ten or more messages can be sent or received simultaneously, without effecting the various messages. Some good work has been done already in this directoin, but much is left to be improved upon as yet.

From the foregoing it will be seen that the art of wireless in general is at about the same stage of development as electricity was in the time of Faraday. So let us not become discouraged, and let us remember that before we can walk we must have learned to creep. As yet wireless is in the creeping stage.

Michael Faraday

MICHAEL FARADAY was born September 22, 1791, at Newington Butts, near London. His father was a blacksmith. Young Faraday when quite young began to learn the trade of bookbinding at which calling he worked until he was about twenty-two years old. He studied here with the greatest interest all books which fell into his hands, but especially physical and chemical works which were his favorites. These books, perhaps, wakened his interest in electricity.

Later he heard of the great invention of Sir Humphry Davy and came across a paper which Davy had lectured on his arc light before the Royal Institution of London. Faraday immediately wrote a few essays on same.

MICHAEL FARADAY

When brought to Davy's attention (1813) the latter at once employed Faraday as an assistant in his laboratory. He now threw himself with great energy into the study of physics and chemistry and after a short while became Davy's secretary.

In the year 1827 he was made professor of chemistry of the Royal Institution in London and from the year 1829 to 1842 he was also employed as teacher in the Academy in Woolwich. He died August 25, 1867, at Hampton Court.

Faraday, to whom we are indebted for the electromagnetic induction and a great many other far-reaching electrical inventions, was one of the greatest scientists who has ever been produced. As far as his original inventions go, his genius has never been surpassed by any living scientist.

It must be remembered that practically all the most important electrical inventions which to-day are necessary to our life, are directly due to Faraday's invention. Telegraphy, telephony, all regulating mechanicisms, the electric dynamos, etc., are all due to Faraday's work.

The discovery of electromagnetic induction was not due to luck or hazard, but had been prepared for years; already Ampère's theory seemed to point its way. However, Ampère, notwithstanding his great keenness in deduction was not able to devise the proper means. Faraday himself, as early as the year 1825 tried to produce a device to produce a current in a conductor, which was not connected to any source of current, but only in 1831 was he able to find the looked for effect. The form in which the effect was found was altogether different from what the scientists had thought or expected.

He found that in the moment where a circuit was closed in one wire, another momentary current of opposite direction would also be produced in a neighboring wire. This, however, was sufficient for Faraday to deduce all the more important induction problems within a very short time. Even the induction due to the terrestrial magnetism did not remain hidden from his keen insight in electrical matters.

The Wireless Amateur and the Wireless Law

By C. A. LeQuesne, Jr.

Part Two

How to Make Your Station Conform to the Law

THE law says:—(a) Your transmitting wave must be pure; (b) it must be sharply tuned; (c) your transmitter input must not be more than 1 kilowatt, or if you are within five nautical miles of a government radio station, ½ kilowatt; (d) your wave length must not exceed 200 metres.

Condition (a) makes it impossible to continue the use of an ordinary spark gap for the reason that when using this type of gap it is practically impossible to radiate a pure wave. The reasons for this are set forth in the author's article on the Quenched Spark System in the February issue of this magazine. Condition (b) renders the use of the ordinary helix practically impossible for the reason that the coupling between the condenser and the aerial circuits is too close and sharp tuning is practically impossible under these conditions. With the plain spark gap and the helix out of the way the amateur is left his choice of either the rotary or quenched gap, and, for coupling the condenser and aerial circuits, the oscillation transformer. A good quenched spark gap was described in the February, 1912, issue of this magazine and several types of rotary spark gaps have been described from time to time. The rotary gap is to be preferred to the quenched gap, for the reason that clear musical sparks may be obtained when using a transformer fed from the ordinary 60 cycle or 125 cycle lighting circuits, while the quenched gap requires high frequency alternating current supply to the transformer in order to produce a clear tone. It will sometimes produce a high pitched tone when the current supply is of low frequency, but usually the tone of the spark is mushy and does not carry well.

The rotary gap used in connection with an induction coil fed with battery current will not produce a high pitched musical spark under any condition, unless the interruptions of the primary current are rapid enough to produce a musical spark as in the case of motor driven or electrolytic interrupters; and, where the coil is fed by battery current, or 110-volt current through an electrolytic interrupter, the stationary electrodes of the spark gap should be wide enough to bridge the distance between two of the moving electrodes if the gap is of the wheel type; or if the gap is of the type sold by the Marconi Company to amateurs and experimenters the revolving electrodes should be wide enough to bridge the distance between two of the electrodes on the fixed plate. This precaution is necessary for the reason that the rise in voltage in the secondary of an induction coil is practically instantaneous and the voltage immediately decreases again with equal rapidity, so that if the electrodes of the gap are not within sparking distance when this rise in voltage occurs, there will be no spark. This leads to a ragged and irregular spark at the gap, which is hard to read and does not carry well.

If a motor driven interrupter is used, and is mounted on the same shaft as the revolving gap, and the two so arranged that the fixed and revolving electrodes of the gap are always in line at the instant the interruption of the primary circuit occurs, the gap becomes a synchronous gap and the above precautions as to the width of the electrodes need not be taken, and the electrodes may be of the ordinary size. In either case the gap may well consist of the two fixed electrodes and a solid wheel or ring of conducting material (the wheel or ring being thoroughly insulated from the motor shaft), as the tone of the spark is determined, not by the number of points on the gap, but by the number of interruptions per second of the primary current.

The use of quenched gaps with spark coils is recommended.

A good form of oscillation transformer was shown in the Supplement to the June, 1912, issue of this magazine and will be used in the calculations herewith.

Referring to the article on Limited Wave Lengths in the March and June issues of this magazine, we find that the product of the inductance in henries and the capacity in farads for an oscillating circuit having lumped capacity and inductance and a wave length of 200 metres must be 0.00000000000001125.

Assuming that a spark frequency of 1,000 per second, which gives a tone like that of the Telefunken sending set, is to be used, the capacity of the sending condenser, for use with a transformer, should be as shown in the Table I, which also shows the amount of inductance and the corresponding number of turns in the primary coil of the oscillation transformer.

Using spark coils with ordinary spring vibrators, and operated on battery current, it will be impossible to obtain a high pitched sending spark and the condenser capacity should be as shown in the Table IV, which also shows the amount of inductance and the number of turns to be used in the primary coil of the oscillation transformer. Where the coil is used with a high speed motor driven interrupter or an electrolytic interrupter capable of giving a high musical tone to the spark, the condenser sizes must be decreased, the inductance in the primary of the oscillation transformer being correspondingly increased as explained later.

Where spark coils are to be used in connection with an electrolytic interrupter on 110-volt current, the spark frequency cannot be determined in advance and the proper condenser capacity must be determined by trial, that is, the condenser, the spark gap, a hot wire ammeter, and one or two turns of the primary coil of the oscillation transformer should be connected in series and the secondary terminals of the spark coil connected to the terminals of the condenser, then the number of plates in the condenser should be varied until the maximum reading of the meter is obtained with the coil in operation, after which the amount of inductance to be used in the primary oscillation circuit, for a wave length of 200 metres, may be found by dividing the product of the inductance and capacity given above by the capacity of your sending condenser. The condenser capacity in farads may be calculated from the formula:

$$C = \frac{2{,}248 \times K \times A}{t \times 10{,}000{,}000{,}000{,}000{,}000}$$

Where C is the capacity in farads, K is the inductivity of the dielectric (3 for ordinary glass), A is the total active area of dielectric in square inches, and *t* is the thickness of dielectric in inches. When the amount of inductance necessary has been computed, the proper number of turns of the primary coil of the oscillation transformer to be included in the circuit may be found from Tables II and III. The inductance of either coil of the oscillation transformer, by turns, beginning with either the outside or the inside turn, is shown in Table II, and by single turns, beginning with the outside turn, in Table III.

Up to this point we can determine in advance just about what adjustment of the apparatus we should make in order to keep our wave length down to 200 metres. When it comes to tuning the aerial circuit we find that it is practically impossible to calculate the number of turns to be used in the secondary coil of the oscillation transformer for the reason that except in very few instances we cannot calculate with any degree of accuracy the capacity of the aerial.

In order to properly couple the condenser and the aerial circuits when using a wave length of 200 metres, it is necessary that the natural wave length of the aerial should be about 150 metres, the extra fifty metres being made up by connecting a portion of the secondary coil of the oscillation transformer in series with the aerial and ground lead, and the aerial must not have an effective length of more than 125 feet as explained in the article on limited wave lengths in the March issue of this magazine.

In most cases an aerial of this length, while sufficient for sending purposes, would be entirely too small for doing good work at receiving over very long distances, and most amateurs like to do good work in this direction. Then, again, there are a number of amateurs who already have aerials much bigger than this and who would be very much disappointed to have to cut them down to these proportions.

From time to time articles have appeared in this magazine recommending the use of a duplex aerial, which is nothing more nor less than two aerials, a large one for receiving and a small one for sending. This combination would be ideal were it not for the fact that in nearly every case the large receiving aerial absorbs a large proportion of the energy sent out by the small sending aerial and, in addition, if the large aerial is grounded through an anchor gap in its ground lead and used as a break in system, without an aerial switch, it will radiate waves of its own natural wave length which would be set up by the energy in the smaller aerial. These secondary waves, while they might not be powerful enough to carry any great distance, might still be powerful enough to cause interference with nearby commercial or government radio stations, and get you into trouble.

There is another method of complying with the law which permits of the use of a large receiving aerial, and does not require the use of a second small sending aerial. This method consists in the insertion of a high tension glass plate condenser of suitable capacity in the aerial lead between the secondary of the oscillation transformer and the aerial switch. If the amateur uses a break-in system without an aerial switch and receives through the secondary of the oscillation transformer, it is only necessary to install a single pole switch to short circuit this condenser while receiving and to open the switch when sending. It will be noted that near the bottom of form 762 is the question, "Is series condenser used in the antenna for transmitting?" This condenser is the one just mentioned.

Of course, it is generally admitted that an aerial operated on a wave length below its natural wave length, is not as efficient as it would be if sending out its natural wave or one longer than that, it is also admitted that there are certain losses in the condenser which further reduce the efficiency of the transmitting set, but it is the writer's opinion that even taking these losses into consideration the final results would be better than if the duplex aerial were used.

Size of the Series Condenser

In nearly every case this must be found by experiment. If the capacity and the inductance of any aerial can be calculated in advance the size of the series condenser can also be calculated; but unfortunately this is not the case except in a very few instances.

Let us consider an aerial whose capacity and inductance we can figure and determine the size of an appropriate condenser to bring its wave length down to the proper limits. Let us assume that the aerial is of the inverted L type, is 300 feet long, consists of four No. 12 wires spaced five feet apart, 80 feet high, with four wires similarly spaced in the vertical part, and that the aerial is supported on wooden poles on a wooden pier over a body of salt water, with no high buildings or other obstructions anywhere near. The approximate capacity of this aerial would be 1193 mmfd. (millions of a microfarad), its inductance, about 51.1 microhenries, and its wave length, about 465 metres. In order to operate this aerial on a wave length of 200 metres it is first necessary to bring its natural wave length down to 150 metres as explained above; and the product of the inductance in henries and capacity in farads, for this wave length would be 0.000000000000006325. As it is already equal to 0.000000000000061 or nearly ten times this value, it will be necessary to reduce the capacity of the aerial to 129.3 mmfd. or 0.0000000001293 fd. This can be done by inserting in the aerial lead a small glass plate condenser as already mentioned, as it is known that the combined capacity of two condensers in series, (and the capacity of the aerial may be considered as a condenser), is less than that of the smaller of the two capacities. The combined capacity

$$C = \frac{1}{\frac{1}{C_1} + \frac{1}{C_2}}$$

where C_1 and C_2 are the capacities of the two condensers in series. Now by a transposition of the terms of this formula we find that

$$C_2 = \frac{CC_1}{C_1 - C}$$

where C_2 is the capacity of the series condenser; C, the desired combined capacity; and C_1 the present capacity of the aerial. Now substituting the values given above in this formula we have

$$C_2 = \frac{1193 \times 129.3}{1193 - 129.3}$$

which equals 145 mmfd. or 0.000145 mfd.

Now assuming the glass to be used in this condenser is 0.1 inch thick and having a value of 3 for the inductivity, we find by substituting these values in the formula:

$$A = \frac{C \times t \times 10{,}000{,}000{,}000}{2248\,K}$$

$$= \frac{0.000145 \times 0.1 \times 10{,}000{,}000{,}000}{2248 \times 3}$$

which equals 21.5 square inches. It is seen therefore that a series condenser consisting of a sheet of glass 0.1 inch thick, with tinfoil sheets on both sides approximately 4½ inches by 4¾ inches would reduce the wave length of this big aerial to 150 metres; and it can then be brought up to 200 metres by connecting a portion of the secondary coil of the oscillation transformer in series with this condenser and the aerial.

The aerial just considered is pretty large, in fact, it is larger than most amateur aerials. If your aerial is smaller than this the condenser may be larger; or if your aerial is larger, the condenser must be smaller. In nearly every instance the size of this condenser will have to be found by experiment, for the reasons already mentioned, the process of finding the size being somewhat as follows: first adjust the condenser circuit to a wave length of 200 metres or less as already explained, then having connected the hot wire ammeter in the aerial lead, insert in the aerial lead a series condenser which you think would be of the proper size, then try to tune the aerial circuit to this same wave length by varying the number of turns in the secondary of the oscillation transformer until the hot wire ammeter shows a maximum reading. It is best to begin with one turn in the oscillation transformer secondary and if you find that the reading of the ammeter increases as you increase the number of turns, the condenser is not too large, and if you find that you reach the maximum reading just before you have added all the turns of the secondary you may assume that the condenser is of the proper size. If, on the other hand, the reading increases right up to the point where you get in all of the secondary of the oscillation transformer the condenser may possibly be too small and a slight increase in its size should then be made and the process tried again until the proper size of the condenser is finally reached. However, should you find by beginning with one turn the increase of the turns produces a decrease in the reading of the ammeter, the series condenser is too large and should be reduced in size. As just mentioned the proper size for the condenser is such that the maximum reading of the ammeter is obtained when all or not quite all of the secondary turns of the oscillation transformer are connected in the aerial circuit.

Changing Your Wave Length

So far, so good, but if every amateur uses a wave length of 200 metres no one will be able to tune out an unwanted amateur station without tuning them all out. This means that a number of us will have to use still lower wave lengths. Say we let the fellows who have the transformer sets and large aerials use the 200-metre wave length and those having spark coil sets use shorter wave lengths. In fact, every one of us should be prepared to use various wave lengths at times in order to get through interference.

This is a comparatively simple matter. Most of us won't care what the exact length of our wave is, so long as it is below the limit, so we should, after adjusting the apparatus for 200 metres, go about it as follows: First place the hot wire ammeter in the aerial lead. Second, decrease the inductance in the primary coil of the oscillation transformer by a whole turn, if we have a spark coil set, or by using the next smaller turn if we use a transformer. Third, slowly decrease the inductance of the secondary of the oscillation transformer until the ammeter shows a maximum reading. We are now tuned to a slightly shorter wave length than 200 metres. The process should be repeated several times with still smaller amounts of inductance in the primary of the oscillation circuit, *careful record being made of the adjustment of the primary and secondary,* either in the form of a table, or they may be marked right on the ribbons of the oscillation transformer itself. Then if at any time we find we can't get our message through on the wave length we are then using, we can, by consulting our records, quickly shift the clips on the primary and secondary and go ahead on the new wave length.

Getting the Most Out of Your Set

When you have determined the size of your sending condenser, and the proper amount of inductance in the primary of the oscillation transformer, hook them up with the transformer or spark coil and the spark gap. Care should be taken that the leads are of heavy stranded wire, not less than ⅛ inch in diameter, or copper or brass ribbon such as is used on the oscillation transformer. The leads connecting the condenser, spark gap and primary of the oscillation transformer must be as short as possible. This doesn't mean that the condenser may be on the floor, the spark gap on the table, and the oscillation transformer screwed up against the wall somewhere between the table top and the ceiling, but they should be placed so close together that the *total length of the leads connecting these three pieces of apparatus is not more than twenty to twenty-two inches.* This amount is sufficient and has been allowed for in the tables. *If you use more than this your wave length will be over 200 metres.*

After you have adjusted the inductance in the primary and secondary to the point where you secure a maximum reading on the hot wire ammeter in the aerial circuit, adjust the distance between the fixed and moving electrodes of the spark gap, if you use a rotary gap, until you get the maximum reading possible on the hot wire meter. If you use a quenched gap, vary the number of individual gaps in series until the maximum reading is secured.

Now a word or two concerning transformer voltages. You will notice that in Table I, the condenser has the same capacity for all three transformers, but the voltage to which the condenser is charged is higher as the power of the transformer is increased. This peculiar condition is due to the 200-metre wave length restriction. Ordinarily the condensers would each be charged to about 5,000 volts, and the size of the condenser increased with the increase in the transformer size. An increase in the capacity would necessitate a decrease in the amount of inductance in the primary of the oscillation transformer; but an efficient transfer of energy from the condenser circuit to the aerial circuit through the oscillation transformer cannot be had if the primary coil contains much less than one whole active turn, and one of the larger turns at that. Therefore we have to use the same capacity in each condenser and raise the voltage to which it is charged.

In order that a musical note may be had at the spark it is necessary that the condenser charge and discharge a number of times during each alternation of the supply current and to do this it is necessary that the transformer secondary be wound for a voltage about double that to which the condenser is to be charged. Therefore when buying your transformer be sure you get one whose secondary is wound for the voltage given in the table, and don't let anyone sell you a transformer unless he will guarantee it to deliver this voltage when connected to an alternating current circuit such as you have to supply your power.

Table I

Adjustment of Apparatus in Condenser Circuit When Transformers Are Used.

Wave length, 200 m. Spark Frequency, 1,000 per sec.

K.W.	Voltage for which secondary should be wound.	Condenser.			Oscillation Transformer.	
		Discharge voltage.	No. of plates.	Capacity, microfarads.	Inductance, microhenries.	No. of turns.
1/4	15000	7000	19	0.01	0.625*	0.9**
1/2	20000	10000	38	0.01	0.625*	0.9**
1	25000 to 30000	14000	38	0.01	0.625*	0.9**

To convert microfarads to farads, or microhenries to henries divide by 1,000,000.

The 1/4 Kw. condenser consists of one unit of 19 plates of glass (ordinary window) 8 x 10 x 1/16 inches between 20 tinfoil sheets 6 x 8 inches.

The 1/2 Kw. and 1Kw. condensers each consist of two units in series, each unit being 19 plates of glass (ordinary window) 10 x 14 x 1/16 inches, between 20 sheets of tinfoil 8 x 12 inches.

*An allowance of about 0.5 microhenry has been made for the inductance of the leads connecting condenser, spark gap, and primary of oscillation transformer. The total length of these leads should not be more than 20 or 22 inches, and their diameter, if of wire, not less than 1/8 inch. Copper ribbon 1/2" by 1/32 inch is to be preferred.

** Outside turn. Equally good if not better results would probably be had by using, instead, all of the second turn from the outside.

Table II

Inductance in Microhenries of Either Coil of Oscillation Transformer,—by Turns.

No. of turns.	Inductance. Beginning with inside turn.	Inductance. Beginning with outside turn.
1	0.225	0.722
2	1.225	2.4
3	1.776	4.5
4	3.115	6.72
5	4.870	8.8
6	7.1	11.0
7	9.75	12.05
8	13.15	13.15

Table III

Inductance in Microhenries of Either Coil Oscillation Transformer,—by Single Turns, Beginning with Outside Turn.

Turn.	Inductance.
1st	0.772
2nd	0.661
3rd	0.576
4th	0.504
5th	0.432
6th	0.363
7th	0.282
8th	0.225

Table IV

Adjustment of Apparatus in Condenser Circuit When Spark Coils with Spring Vibrators Are Used.

Wave length, 200 m.

Spark Length.	Condenser.		Oscillation Transformer.	
	No. Plates.	Cap. Mfd.	Inductance, Mhy.	No. Turns.
1/2"	3	0.002	13.4*	8**
1"	6	0.004	6.45*	3.9**
1 1/2"	9	0.006	4.13*	2.8**
2"	12	0.008	2.97*	2.5**

To convert microfarads to farads, or microhenries to henries, divide by 1,000,000.

These condensers are each one unit. The plates are common window glass 8 x 10 x 1/16 inches between tinfoil sheets 6 x 8 inches.

*An allowance of about 0.5 microhenry has been made for the inductance of the leads connecting condenser, spark gap, and primary of oscillation transformer. The total length of these leads should not be more than 20 or 22 inches, and their diameter, if of wire, not less than 1/8 inch. Copper ribbon 1/2" by 1/32 inch is to be preferred.

**Counting from outer end of coil.

Measurement of High Frequency Currents and Resistance

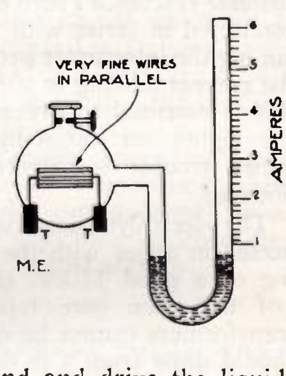
By Stanley E. Hyde

According to Ohm's law, the resistance of a conductor will vary directly as its length and inversely as its cross sectional area, but this law holds only for conductors carrying steady or direct currents, therefore the high frequency resistance of a conductor may be a great deal different from its resistance when traversed by steady or slowly alternating currents. This difference in resistance will depend on the frequency of the currents and the area of the conductors. Thus a large wire will have a resistance many times greater for high frequency currents than for direct current, this being due to the concentration of the current on the outside of the conductor, and is called a skin effect, the explanation being that the alternating current sets up an alternating field which it confines the current to the surface of the wire. But, on the other hand, if a small wire is used, about No. 36, the difference in resistance for the same amount of current, either high frequency or direct, is practically nil. Coils and windings used in radio-telegraphy should, for this reason, be composed of stranded conductors made up of very many fine insulated copper wires.

As there is no convenient way for measuring high frequency resistance, coils constructed in the above fashion can be measured on a Wheatstone bridge and the resistance thus found will differ very slightly from the true high frequency resistance.

In measuring high frequency currents the ordinary hot wire ammeter is of no use for the reason that it is operated on the shunt principle, *i e.,* the greater part of the current passes through the shunt, which is generally a large copper wire or strip, and only a very small part passes through the fine wire of the instrument. As explained above, a thick wire has a much higher resistance for high frequency currents than for low frequency or steady currents, therefore as the shunt consists of a large wire its resistance would vary with the frequency. Thus it can be readily seen that such an instrument is not suitable for the measurement of high frequency current where the actual current in amperes is desired.

An instrument known as the Reiss thermo-galvanometer is, however, a suitable device for the measurement of high frequency currents and is shown in the illustration. Between two terminals are soldered a number of very fine wires in parallel, the whole being inclosed in a glass bulb, and the connecting terminals, T, brought out from the sides through the glass. Fused to the bulb is a U-shaped tube containing a colored liquid to make it visible. Now, if a direct current is passed through the fine wires in parallel they will be heated and in turn heat the surrounding air, which will expand and drive the liquid up the tube. By passing different currents through the wires and noting the height the liquid rises for given currents this instrument can be calibrated, and as the fine wires in parallel have the same resistance for steady and high frequency currents it can be used for accurate measurements of the latter.



TO PERFECT SIGNALS FOR ARMY AVIATORS

It is reported from Washington, that a system of signals is being perfected for indicating instantly the effect of artillery fire as observed by army aviators. Wireless communication will be depended upon primarily, but a system of flag signals will also be perfected for use should the wireless fail.

Electrolytic Interrupters and How To Use Them

By H. Winfield Secor

Electrolytic interrupters are widely used for operating X-ray spark coils and wireless coils, etc., but do not always give the best of satisfaction, and just why this is so is explained briefly below.

It has been found in practise, and several authorities, including Dr. J. A. Fleming, in his excellent work, "The Principles of Electric Wave Telegraphy," state that the self-inductance (not resistance), of the circuit connected in series with these interrupters is not always sufficient to properly operate same, and if *no inductance* is included in the circuit the interrupter *will not work at all*. This is quite an important matter, and is frequently lost sight of by the user of such apparatus. Besides increasing the working qualities of the interrupter, and adjustable reactance (such as a choke coil), connected in series with the circuit containing the interrupter permits of limiting the current passing in such a circuit, and this is essential to prevent flickering of the lights on house-lighting circuits, which trouble is oftentimes very pronounced.

The electrolytic interrupter when connected in series with the primary winding of a good ½-kw. transformer coil (of the open core type; closed core transformers cannot be operated by it), should draw from 5 to 6 amperes. The circuit voltage may be from 50 to 110 volts, A. C. or D. C. The A. C. frequency should not be lower than 50 cycles, and better 60 cycles. The solution for the interrupter is composed of 5 parts pure water and 1 part of pure sulphuric acid. In mixing these ingredients, the acid should always be poured into the water, and not vice-versa, as otherwise the solution is liable to be forcibly ejected from the containing vessel. The frequency of the interrupter varies with the amount of inductance and voltage of the circuit, and sometimes reaches a value as high as 7,000 interruptions per second, as compared to two or three hundred per second, obtained from ordinary spring vibrators.

In cases where the interrupter fails to work satisfactorily, or passes too much current, a choke coil is generally the solution of the problem. Such a coil is easily made for ordinary purposes, by using a soft iron wire core 8 inches long by 1 inch in diameter, the weight being about 1.33 pounds. This core should be insulated with three layers of Empire cloth or shellacked paper. Over the insulated core is wound 3 layers of No. 12 B. & S. gauge enameled or D. C. C. copper magnet wire (about 2 pounds is required); leading taps off from each layer so that the self-inductance in circuit may be varied by connecting to one or more layers, as required. It is best to arrange the iron wire core to be moved in and out of the coil, which gives a very wide range of reactance adjustment. When the electrolytic interrupter is employed the spark coil vibrator should be cut out by screwing up the contact screw tight; or short circuiting the vibrator with a piece of copper wire.

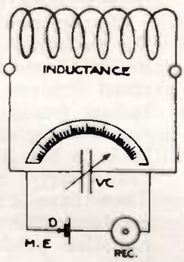
Another easily remedied trouble with electrolytic interrupters is that of heating, the solution often becoming very hot, especially where X-ray coils are operated steadily for long periods. The remedy for this trouble is to form a cooling worm out of thin lead pipe, having an inside diameter of ¼ to ⅜ inch, and the worm may have 4 to 6 convolutions. This pipe worm should just fit nicely into the interrupter jar, so as not to interfere with the working parts. Cold water is circulated through the worm by attaching one end of it to an ordinary spigot by means of a piece of rubber tubing, and the other end of the worm is connected with a piece of rubber tubing to a sink.

An easier way, but not as effective, is to place the interrupter jar within a larger vessel, and circulating cold water through same. This outer vessel is probably best composed of metal, as it is then an easy matter to provide a waste outlet by soldering a small piece of brass pipe into the side of the vessel, near the bottom. The water is fed into the top of the container, and thus a steady circulation of cool water is maintained about the interrupter jar.

[NOTE—*In making the water connections to the cooling worm, rubber tubing should always be used. This is necessary in order to insulate the interrupter and the lighting circuit from ground. The cooling water must be pure.*]

Wave Meters

With the advent of the new wireless law pertaining to private stations rigid enforcement will probably be used where the wave length is concerned, so that interference will be at a minimum with government and commercial stations. It is easy enough to say that wave length = $59.6\sqrt{CL}$, e. i. (wave length in meters equals 59.6 times the square root of the product of capacity in micro-farads and the inductance in centimeters) but to *do* it is another thing. Of course, this only refers to private installations; of such owners probably not one in a hundred would have the necessary sensitive laboratory apparatus to make these measurements with, so it is up to the government to supply water meters to private stations either by the owner securing one from the wireless inspectors or in any other way the secretary of commerce and labor may see fit.



A wave meter consists essentially of an inductance and a capacity, either or both of which are variable, the frequencies or wave lengths corresponding to the various positions of the pointer on the condenser scale, or, if the inductance is variable, on the scale of the inductance; having been predetermined and either plotted as a curve or arranged in tabular form. In commercial forms it is usual to have a fixed inductance and a variable condenser such as is used in ordinary receiving circuits only having a much larger capacity. A special means must be also provided to denote when resonance is obtained. In the figure is shown a diagram of a convenient form of portable wave meter made by the Marconi Company. It consists of a rectangular coil of wire, mounted in the lid of the carrying case, the terminals of which are connected to a variable condenser and across the same terminals are connected a crystal of carborundum and a telephone in series. In measuring the wave length of a transmitter the sending key is closed and the condenser of the wave meter adjusted till the signal is heard at a maximum in the head telephones; the wave length is then read from the table or curve which is on the lid of the box, which gives the wave lengths corresponding to every degree of the condenser scale.—*Stanley E. Hyde.*

A CORRECTION

We are in receipt of a letter from Miss Mabelle Kelso, who was mentioned in our November, 1912, issue as having lost her position through the intervention of the Department of Commerce and Labor. Miss Kelso states that she was removed as operator, not by the steamship company, as stated, but by the Marconi Co., who assumed control of the wireless equipment on the ship when all the United Wireless Co. stations passed into the control of the Marconi Co. Miss Kelso, however, states that she is still in the employ of the Marconi Co.

We take this opportunity of retracting the misstatements concerning Miss Kelso and tender our apologies to all concerned for any inconvenience they may have been caused thereby.

ALONG THE GREAT WHITE WAY

(*Continued from page* 1027)

A-Lac," the letters appearing as her arm with the brush swings across from left to right, after which the wording "Makes old things new" is flashed on. Then everything is switched off and the operation repeated indefinitely.

The sign is located on the roof of a building on Broadway, between 35th and 36th streets. It is directly opposite the building occupied by the *New York Herald,* one corner of which can be seen at the right of the daylight photograph, and it is visible diagonally across Herald square to all traffic on Broadway, Sixth avenue and 34th street, including the Sixth avenue elevated road and six different surface car lines.

We present two photographs of this sign, one showing it as it appears in the day-time and the other as it appears in action at night.

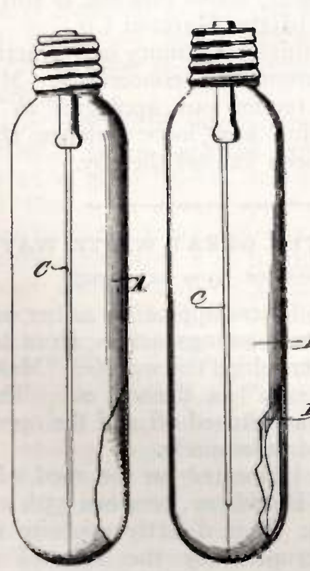
PATENT NO. 1,043,008, FOR PRODUCTION OF LIGHT, HAS BEEN GRANTED TO SAMUEL O. HOFFMAN, OF SAN FRANCISCO, CALIFORNIA.

The present invention is one of great originality; the name of the patent is termed "Production of Light."

There are many things of which our everyday philosophy is ignorant of, and the present invention shows how deep study will bring about new effects by old means.

We quote herewith an extract from this highly interesting patent which should be procured by everyone interested in electric lighting:

Fig. 3. Fig. 1



"Light consists of waves in the ether of certain lengths, capable of affecting the retina. Waves of greater length, called infra-red waves, are non-luminous. Both the luminous and infra-red waves upon absorption by a body are converted into heat. Aside from their physiological effects, the only difference between the luminous and infra-red waves is the longer wave length of the latter.

Practically all of the present systems of lighting depend upon the radiation of incandescent bodies. The radiation of such a body consists of waves of all lengths, only a small portion of which are luminous, most of the energy being in the longer non-luminous infra-red waves. The wave length carrying the maximum energy decreases as the temperature is raised, according to the Wien displacement law, and the higher the temperature the larger the proportion of luminous radiation present. At the highest possible operating temperature, only about 1%-5% of the radiation is of useful wave length (luminous); the balance being infra-red waves and non-luminous, so-called heat waves. Thus at least 95% of the energy used to keep the body incandescent is radiated as long non-luminous waves (heat) and so wasted.

My invention consists simply in separating the radiation of the incandescent body into the luminous and non-luminous portions, the small luminous percentage being allowed to radiate freely, while the non-luminous waves, representing most of the energy, are directed back to the incandescent body and used regeneratively, none being allowed to escape. Thus there is no loss of heat except that representing the small proportion of luminous radiation produced, and the energy required to keep the body at the necessary temperature is equivalent to the light produced, and not to the total radiation at that temperature, resuling in an enormous increase in efficiency.

Of course the simplest way of accomplishing this is to use a substance which transmits the luminous waves and reflects the non-luminous. I have found that a film of metallic silver, thin enough to be transparent, reflects a large proportion of the infra-red waves. Fig. 3 shows a lamp making use of this fact. A filament C is placed as nearly as possible along the axis of the cylindrical tube A, on the inside of which is deposited a thin film of silver. The lamp is otherwise similar to the ordinary incandescent electric lamp. The combined radiation from the filament strikes the inner metallic film normally, the infra-red waves are reflected back to the filament, while the light passes through. It is apparent that no energy can escape except in the form of light, and therefore, no wasteful heat is produced.

While I have only shown two methods of practising my invention, it is possible to make use of any means whatsoever by which the luminous waves can be separated from the non-luminous; the essence of my invention being the fact that the non-luminous radiation is directed back to the source without loss and used regeneratively. For instance with respect to the first method described, there are a large number of substances known to physicists which have the property of selective reflection. I have mentioned silver simply because I have actually and successfully tried it."

From the foregoing it will appear that Mr. Hoffman has made a far reaching discovery. We have as yet no information how this works out in practice, but we stand ready to believe that what Mr. Hoffman claims, is feasible and we shall shortly bring more information about this interesting invention.

PATENT NO. 1,042,778, FOR RECEIVER FOR ELECTROMAGNETIC WAVES, HAS BEEN GRANTED TO REGINALD A. FESSENDEN, OF WASHINGTON, DISTRICT OF COLUMBIA.

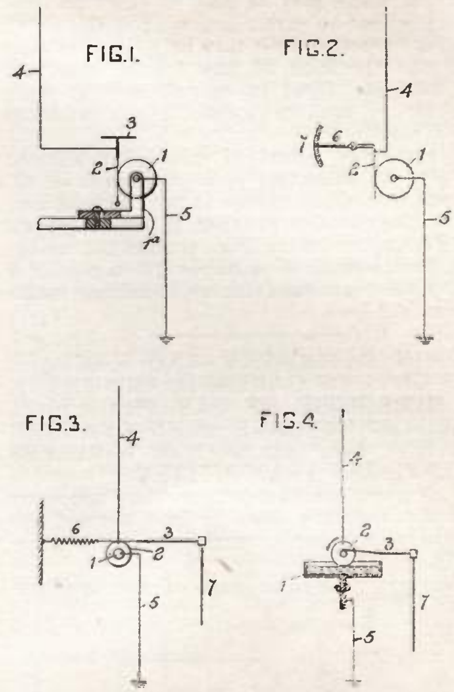
This invention, a new one of the well-known wireless inventor, relates to receivers for wireless signaling and more particularly to a new type of receiver in which the waves are caused to produce directly mechanical effects instead of to produce direct electrical effects such as changing the conductivity or continuity of a local circuit, and to securing the necessary persistence of effect.

More particularly still it relates to a new type of receiver in which the waves are caused to act directly upon moving bodies in tractional or frictional relation to vary such relation. The specific factor of frictional effect which is varied directly by the electro-magnetic waves is that known technically as the amount of friction.

We quote herewith an extract from the specification of this interesting and novel patent:

"My invention therefore involves at least two conductors, one of them preferably a solid, arranged to develop frictional or other tractional stress with or without contact of the parts, transmitting or tending to transmit motion; the modification of such stress by the electro-magnetic wave and finally the utilization of the change of stress directly or indirectly to produce a signal or indication. While the bodies between which the frictional stress is developed may be normally at rest and the change of stress be utilized, as by movement of one or both of them, to produce the desired indication or signal I prefer to develop said stress between relatively moving bodies between which there is a tractional effect causing one of them to tend to move the other, such tendency being opposed and partially counterbalanced by stress in the opposite direction. In such an arrangement friction causes tendency to movement of one of the bodies in the direction of the other in proportion to the amount of the friction and the counterbalancing force acting in the opposite direction. Any variation in friction by the action of the electro-magnetic waves, whether increase or decrease, will unbalance the normally balanced forces and cause bodily movement of the normally balanced member either in the direction of the frictional stress or in the direction of the counterbalancing force according as the effect of the electro-magnetic waves is to decrease or increase the total amount of friction. In most cases I prefer to arrange matters so that the total amount of friction will be increased by affecting an increase in the value of the factor known as the co-efficient of friction, or the pressure of the magnetic friction.

In Fig. 1 I have shown the frictional stress as developed between a rotating wheel 1, which may be driven by clockwork or by an induction or other motor and a body 2 resting against 1 and tending to follow the direction of movement of the latter, but restrained



and counterbalanced in such movement by the diaphragm 3 with which it is connected. This diaphragm is preferably very thin and correspondingly delicate.

The rotating wheel 1 may be made of silver, nickel, 10 per cent. bismuth-gold alloy or other suitable material and the body 2 may be a piece of thin gold leaf, though I do not confine myself to this particular material as amalgamated copper foil may be used especially when amalgamated copper is used for the wheel. This receiver is operatively connected in any desired receiving circuit, as for example, by connecting the body 2 to the vertical 4 and the wheel to the ground connection 5.

In operation the wheel 1 is rotated and the body 2 resting against its periphery is pulled or pushed as the case may be in the direction of movement of the wheel to an extent depending upon the co-efficient of friction of the surfaces of the bodies and the pressure with which one is forced against the other. This pressure may be suitably adjusted by gravity, as by shifting the position of the wheel support 1^a, or by magnetism or in any other suitable way.

The telephone diaphragm 3 by reason of its connection with the body 2 will be displaced by an average amount depending upon the pull or push exerted by the wheel upon the latter and the amount of the counterbalancing force, the latter being determined in this case by the elastic reaction of said diaphragm 3. With the parts in this normal condition the incidence of the electro-magnetic waves will change the amount of friction between the body 2 and the wheel 1, thus leaving the body 2 unbalanced as against the pull of the elastic diaphragm 3. This will cause a sudden change in the position of the diaphragm which may be used to effect an indication either by direct action upon the air to produce a sound or it may be utilized to control the operation of any desired apparatus or medium. Used to operate directly upon the air to produce sound, it has produced good results.

Many other forms of mechanism adapted to give an indication upon movement in response to a slight change in push or pull may be employed. For instance, a form is shown in Fig. 2 similar to Fig. 1 with the exception that instead of a diaphragm a pointer 6 and scale 7 are used for an indicating mechanism."

JOHN P. McCARTY AND KENDALL DOUGLAS, OF OAKLAND, AND FRANK P. HERRGUTH, OF SAN FRANCISCO, CALIFORNIA, HAVE BEEN GRANTED PATENT NO. 1,044,798, FOR WIRELESS TELEPHONE TRANSMITTER.

This invention relates to wireless telephony and the inventors claim to have devised improved means for transmitting speach wirelessly.

We quote herewith part of the specification:

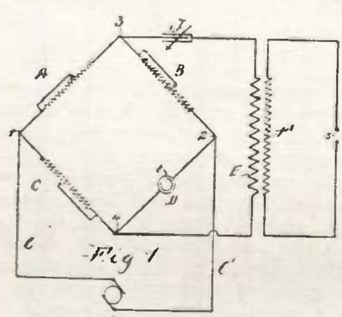


Fig 1

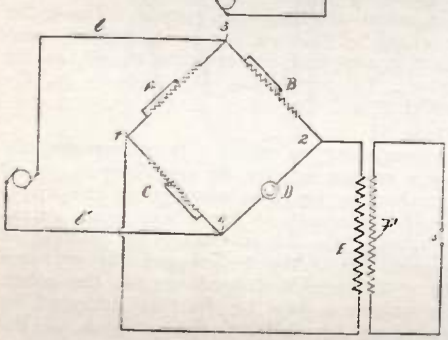


Fig 2

"In general terms our invention consists in combining with an ordinary telephone transmitter, a Wheatstone bridge, a source of power, and a high tension transformer having a spark gap.

Referring to the drawings, Figure 1 shows the four arms A, B, C, D, of a Wheatstone bridge. The resistances in all the three arms A, B, and C are adjustable and non-inductive. The arm D contains a telephone transmitter *t*. A source of constant current is applied between the points 1 and 2; and from the points 3 and 4 leads 1 and 1′ pass to the primary E of a transformer, the secondary F of which is connected with a spark gap *s*. In the circuit of the transformer primary, a condenser J is connected, said condenser being of the ordinary adjustable type. The bridge arms are then adjusted in any desired ratio relatively to the normal resistance of transmitter *t*, so that ordinarily the potential difference between 3 and 4 is zero. Varying the resistance of arm D by vibrating the diaphragm of the transmitter causes potential differences to appear between 3 and 4, which come in waves corresponding with the vibrations of the diaphragm; and these potential differences may be made very great or very small by properly adjusting the bridge arm ratios. The potential difference waves between 3 and 4 transmit wave currents through the primary circuit of E, and these currents in turn produce sparks across the points at *s*, which are transmitted through the surrounding media and received by ordinary wireless telephone apparatus.

Fig. 2 shows a view of our device having a continuous metallic primary circuit, without a condenser therein. Under some conditions the use of a condenser in this circuit would be contraindicated, and we wish it to be understood that the condenser may be dispensed with when expedient."

This is quite an interesting patent and while we do not know how well it will work out in practice, the invention sounds good and seems plausible. We, perhaps, will print more about it in a future issue.

PATENT NO. 1,043,117 FOR APPARATUS FOR PRODUCING RAPID ELECTRIC OSCILLATIONS, HAS BEEN GRANTED TO EGBERT VON LEPEL, OF BERLIN, GERMANY.

This shows the well-known invention of Von Lepel, who really is the inventor of the quenched spark gap. This patent has been in the patent office since August 4, 1908, and has only been patented just now. We do not know the reasons for such a long delay in the patent office, but it seems that the examiners in the patent office could not be convinced at once that the invention showed far reaching improvements over other spark gaps, which it really does.

We have discussed the quenched spark gap a number of times in this magazine, but we will nevertheless give a condensed description of this important patent.

Mr. Von Lepel in his specification states that in his improved electrodes their distance apart is to be taken very small as compared with their active surface. It is also to be equal at all points of same. Therefore the electrodes are appropriately formed by two disks A and B (Fig. 1) or by two cones A and B (Fig. 2), one being in the other, or by two concentric spherical surfaces or other suitable arrangement of opposing surfaces.

The electrodes may consist of steel, copper, brass and other metals, the positive electrode also of carbon. The space between the electrodes may be filled with air. Filling this space with other gases or liquid insulators has not been found particularly efficacious. In case of small powers, it is not necessary to

Fig 1 Fig 2 Fig 3

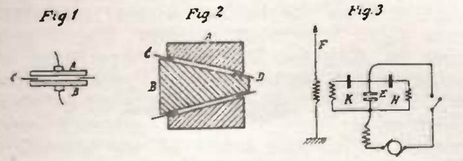
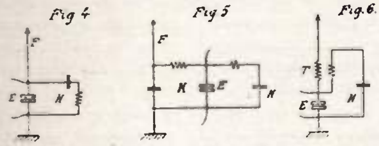


Fig 4 Fig 5 Fig 6.



cool the electrodes. The form of discharge seems to be between the electric arc and the electric spark. The distance between the electrodes may be taken so small as to be broken down at the working voltage, so that the generator starts up without bringing the electrodes into contact with each other. This is still possible at a voltage of 220 volts, the distance of the electrodes being then equal to fractions of one millimeter. Therefore, telegraphing according to the invention is operated in the same manner as ordinary telegraphy, that is, by establishing and interrupting the working current. For the same reason, the apparatus is able to work with an interrupted direct current or alternating current, unless the oscillations are used for telephoning.

When the apparatus is working, the discharge must be prevented from coming to the edges of the electrodes as they then turn into a long and ineffectual electric arc. For this purpose, a strip C (Fig. 1) or a pair of strips C, D (Fig. 2) of an insulating material, particularly paper, is brought between the electrodes in such a manner that it limits a parallel part of the surface of the electrodes, and projects out of the edges of the electrodes, said strip or strips being gradually used up.

It has been found that the output drawn from the oscillatory circuit becomes greater and can be easily brought up to one kilowatt, or more, if a second oscillatory circuit (auxiliary circuit) is connected in parallel, no power being drawn from the latter one. The natural vibration of the latter circuit may be equal to that of the working circuit or a harmonic of same, or it may have any other relation. It is, however, advantageous to have the electric magnitude of the auxiliary circuit a multiple of that of the working circuit, the resulting period of the vibration depending on the electric constants of both circuits. In Fig. 3, E is the source of oscillations, K is the working circuit from which oscillatory power is drawn by coupling it with an aerial wire or antenna F, and H is the auxiliary circuit. In Fig. 4 the aerial wire itself forms the working circuit. According to the connection represented by Fig. 5, the aerial wire is connected to a condenser. Numerous similar connections are still possible.

An effect particularly favorable is produced, if the working circuit is inductively coupled with the auxiliary circuit. Such an arrangement for exciting the aerial wire is shown in Fig. 6, in which T is the transformer serving for coupling, the manner of acting being different according to the direction of winding of the transformer coils.

CARL EMIL EGNER, OF STOCKHOLM, AND JOHAN GUNNAR HOLMSTROM, OF SALTSJOSTORANGEN, SWEDEN, HAVE BEEN GRANTED PATENT NO. 1,042,772, FOR CARBON GRAIN CELLS OF TELEPHONE TRANSMITTERS.

The present invention relates to a new telephone transmitter by the well-known inventors who perhaps are the only constructors so far who devised a satisfactory high amperage telephone transmitter that can be used to advantage for long distance work as well as in wireless telephony.

The present invention supplements the one which we discussed some time ago in *Modern Electrics.*

The inventors in their present invention seek to vibrate the diaphragm and the carbon

Fig. 1. Fig. 2.

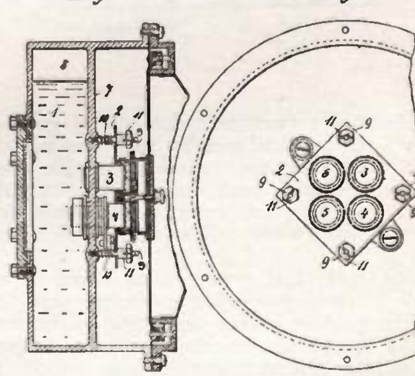


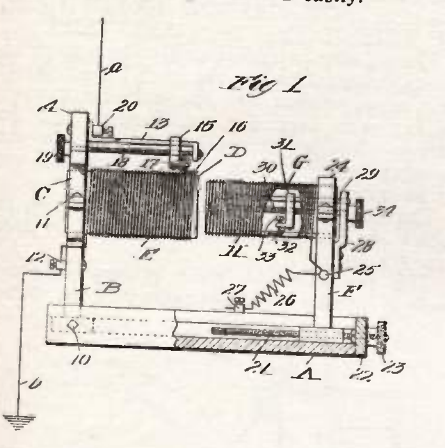
Fig. 3.

grains themselves, while the parts 3, 4, 5 and 6 are cooled by the liquid 1. Adjusting screws 11 hold the vibrating body containing the grains, and the inventors have laid special stress to the arrangement as shown in Fig. 3

which makes it impossible for the grains to fall out. An asbestos ring 12 encloses the carbon grains in cells, while two felt washers 13 and 14 separated by another washer 17 are arranged in such a manner that it is almost impossible for the grains to work loose. At the same time the cooled plugs 3, 4, 5 and 6 can move back and forward in the rings 13 and 14.

WILLIAM E. D. STOKES, JR., OF NEW YORK, N. Y., AND GEORGE W. DAVIS, OF GALILEE, N. J., HAVE BEEN GRANTED PATENT NO. 1,043,272, FOR TUNING DEVICE FOR WIRELESS TELEGRAPHY AND TELEPHONY.

This invention relates to a new loose coupler and our illustration shows how all the adjustments are made by means of thumb nuts as illustrated in 19, 34 and 23. Instead of sliding the standard F back and forward by hand the knob 23 is turned, which turns the threaded rod 21; thus the standard F is moved back and forward easily.



While this arrangement looks very good it has the great disadvantage that the adjustments cannot be made quickly enough, even if a very coarse pitch thread is used. At least it is not quick enough, we think, for ordinary use, when quick tuning is necessary.

Aside from this arrangement there is, of course, nothing new shown, except that the many metal rods introduced inside of the secondary, do not tend to improve the sensitiveness of the apparatus considerably.

PATENT NO. 1,042,205, FOR SYSTEM OF DUPLEX WIRELESS TRANSMISSION, HAS BEEN GRANTED TO LEE DE FOREST, OF NEW YORK, N. Y.

The present invention relates to a system of duplex wireless transmission by the well-known inventor and the object of the invention is to provide a system of wireless transmission, whether telegraphic or telephonic, and wherein messages may be received and transmitted simultaneously.

A further object of the invention is to provide a balanced system of wireless transmission wherein the effects of irregularities due to the action of the oscillator are eliminated.

A further object of the invention is to provide a differentially balanced system of wireless transmission with the attendant advantages of simultaneous reception and transmission of electro-magnetic wave signals.

We quote from the patent specification as follows:

"Referring to the accompanying drawings, and to the various views and reference signs appearing thereon: Fig. 1 is a view in diagram illustrating one form of arrangement embodying the principles of my invention. Fig. 2 is a similar view illustrating modified arrangements embraced within the scope of my invention. Fig. 3 are wave diagrams illustrating the action of the arrangements shown in Figs. 1 and 2. Fig. 4 is a view similar to Figs. 1 and 2, showing another form of transmitter and arranged in accordance with the principles of my invention. Fig. 5 are wave diagrams illustrating the action of the arrangements shown in Fig. 4. Fig. 6 is a diagram similar to Figs. 1, 2 and 4, showing still another arrangement embraced within the broad scope of my invention. Fig. 7 is a detail view showing means which are simple and efficient for simultaneously, and to the same or reciprocal degree, varying the mutual inductance of certain of the parts in attaining a balanced condition and relation of of circuits in accordance with the principles of my invention.

The same part is designated by the same reference sign wherever it occurs throughout the several views.

Various systems for simultaneously receiving and transmitting electro-magnetic wave signals have heretofore been proposed, but none, so far as I am aware, have proven successful in practical operation on account of latent defects in the systems or other causes. For instance, it has been proposed to base such a system on a definite relation and physical separation through a definite distance of the receiving and transmitting antennæ, the receiving antenna being located in a plane midway between and in the planes of two transmitting antennæ. Such an arrangement is commercially impractical, however, since its utility is confined to the receipt of signals transmitted from a fixed point, and, moreover, require a distance of separation of the order of one-half a wave length, which is very seldom possible.

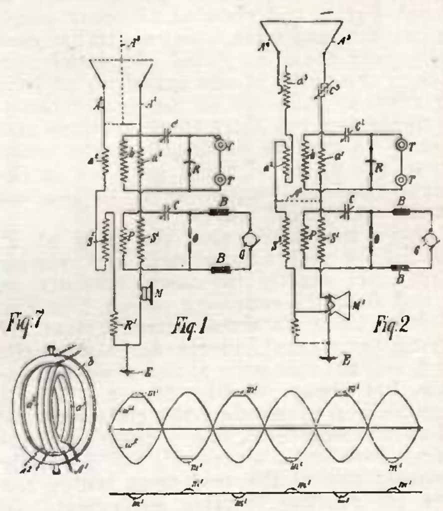
Again, in wireless systems generally, more or less irregularities due to the action of the oscillator are encountered, which disturb the signals transmitted and impair the efficiency of the receiver. This is especially true in the case of the wireless or radio telephone, the noises and other sounds produced by the arc or other form of oscillator, impressing their effect and influence on the transmitted electro-magnetic waves, and being reproduced at the distant receiving station, they more or less seriously interfere with the receipt of the message.

It is among the special purposes of my present invention to provide a system of wireless transmission and reception of electro-magnetic waves in which the above and other objections and difficulties are avoided and eliminated; wherein signals may be simultaneously transmitted and received without the necessity of employing switches to vary the circuit connections; wherein a differential balance of circuits is maintained; wherein the antenna and the transmitting and receiving systems are preferably coupled up in series, the antenna serving as the connecting link between the transmitter and receiver; wherein any special relation or physical separation of the antenna is unnecessary; and wherein other features of improvement are embodied, and other advantageous results are obtained.

Referring to the drawings, and particularly to Fig. 1, reference sign A^1 and A^2 designate antennæ or aerial conductors, which, as is common in the art, may consist of one or several wires. These may be independent of each other, or, and as indicated by the dotted line A^3, they may be different legs of the same loop antenna. These conductors are both grounded, as, for instance, at E.

Associated with both aerial conductors by any suitable method of coupling is an oscillating circuit for the generation of electromagnetic waves. In practice, and as shown, though in this respect my invention, as broadly defined in the claims, is not to be limited or restricted, the oscillating circuit includes one or other form of oscillator, O, a condenser C, and an inductance coil P. The oscillator may be of any desired form such as is employed in this art for the purpose. I have found an arc oscillator to be best adapted for the purpose, the arc being supplied with current from any suitable source, preferably a source of direct current, as, for instance, a direct current generator indicated at G. This arrangement which I have selected to illustrate the principles of my invention results in the production of a practically continuous train of electro-magnetic waves, and I have found such a system best adapted for my purposes. The leads of the current source may contain choke coils B in the usual way. The inductance coil P, in the oscillating circuit, in accordance with the principles of my invention as embodied in the arrangement shown in Fig. 1, is coupled inductively with coils S^1, S^2, oppositely wound with respect to each other, and respectively arranged in the aerial conductor systems A^1, A^2. The coils S^1, S^2 and P should be so relatively proportioned, wound and arranged, as to enable the same inductive effect to be created in each of the coils S^1, S^2, by coil P, but in opposite phase relation. By this arrangement the oscillations of the oscillating circuit produce exactly equal electro-magnetic vibrations in each of the aerial conductor systems, but of opposite phase, or phases of one hundred and eighty degrees apart. Also associated with both aerial conductors by any suitable method of coupling is a receiving circuit. In practice, and as shown, though in this respect my invention, as broadly defined in the claims, is not to be limited or restricted, the receiving circuit includes an inductance coil b, a variable condenser, C^1, and a receiver, which, in the exemplification I have selected for illustration purposes, comprises an ordinary head telephone T. And connected across this circuit is a detector R, which may be of any suitable or well known type, such as an audion, a perikon, or other construction well known in the art. The coil b is, in this form of my invention, associated inductively with coils a^1, a^2, and in such relation as to be influenced in exactly the manner and to the same degree by both of said coils a^1, a^2. When the aerial conductors A^1, A^2, are arranged in parallel, that is, to act in unison, then the received oscillations, to be detected in the receiving circuit, cause the coils a^1, a^2, to act additively, as contradistinguished from differentially, upon the coil b, that is, the received oscillations act in the same phase relation, provided the aerial conductors are not too widely separated, and hence an amplified effect is produced in the receiving circuit.

The transmitting device may be of any suitable form such as is common in wireless systems. In the particular arrangement shown, to which, however, my invention as



defined in the claims is not to be limited, I employ a microphone transmitter indicated at M for wireless telephoning. The transmitter is preferably arranged in series in one of the aerial conductor systems, as, for instance, the aerial conductor A^1, and preferably in the earth connection thereof. In the other aerial conductor system I place a resistance, R^1, adjusted to approximately the average resistance of the microphone or other transmitter M.

From the foregoing description it will be seen that I provide an exceedingly simple system of wireless communication wherein a differentially balanced circuit relation is maintained, thereby enabling electro-magnetic wave signals to be simultaneously transmitted and received at the same station and without the employment of switches to cut in or out either the transmitting or receiving apparatus according to whether messages are being sent or received.

In Fig. 3 I have graphically illustrated the action of the system. In transmitting, for instance, telephonically, the emitted magnetic waves radiating from the aerial conductor system A^1, A^2, are illustrated by the curves w^1 and w^2 respectively. It will be observed that these curves are exactly alike in amplitude and period, but are in opposite phase relation, and hence, in ordinary circumstances, when no signal is being sent out, they neutralize each other. If, now, the transmitter is operated, as in the case of telephoning, by speaking into the microphone M, the oscillations generated in the aerial conductor system A^1 are modified by the microphone in accordance with the sonorous vibrations accompanying the sounds to be transmitted, and these modifications are impressed upon the electro-magnetic waves radiated from the conductor A^1, while those radiated from conductor A^2, remain unaffected by the transmitter. The modifications thus impressed upon the waves radiated from conductor A^1 are in the nature of amplifying or cutting off of the peaks of the waves as indicated at m^1, m^2, Fig. 3, and since at all other points the two radiated wave trains neutralize each other, only these amplified or cut off portions of the peaks of one set of waves have any effect or influence on the distant receiving apparatus, but since these portions correspond to and are produced by the sound waves, the effect of these portions in the distant receiving apparatus is to produce exactly such sound waves.

I have mentioned that the coils a^1, a^2, should have such arrangement and relation as to exert exactly the same influence on the coil b of the receiving circuit. In Fig. 7 I have shown a simple arrangement for varying the mutual inductance between the coil b and the two coils a^1 and a^2 simultaneously, but always to like degree. This is accomplished by winding the coils b and a^1 and a^2 into ring form, one of the rings containing both coils a^1 and a^2, and pivotally mounting one of the said rings within the other for relative rotative movement. In this manner, by simply adjusting the relative angular positions of the ring coils I am enabled to vary simultaneously and to always the same degree the mutual inductance between the coil b and the coils a^1, a^2.

Any suitable, well known or convenient means, familiar to those skilled in the art, may be employed to prevent the proximity of the transmitting apparatus to the receiving apparatus at the same station therewith from unduly influencing or affecting said receiving apparatus, through inductive action.

In Fig. 2 I have shown a slightly different arrangement embodying the principles of my invention, and wherein a loop receiving antenna is employed, the two legs A^3, A^4 thereof being spaced far apart, but close together as compared with a quarter wave length. In this arrangement the receiving circuit including the coil b, variable condenser C^1, detector R and receiver T, remain the same as above described. The coils a^1, a^2 of the aerial conductor system A^3, A^4, however, which are associated inductively with the coil b, are wound in opposite directions with respect to each other, instead of being wound in the same direction as in Fig. 1, thereby establishing a differential relation. The transmitting system including the coil P, condenser C, oscillator O, choke coils B, and generator or other source of current G, remains the same as in the arrangement of Fig. 1, while the coils S^1 and S^2 which are inductively associated with the coil P, are wound in the same direction with respect to each other and with respect to coil P, instead of in reverse directions with respect to each other as shown in Fig. 1. Instead of arranging the microphone in the circuit of one of the aerials and a fixed resistance in the other, as in Fig. 1, I may employ in the arrangement of Fig. 2 a double or multiple microphone M^1, arranged to impress equal effects or modifications upon the generated or radiated waves in both the conductor systems A^3, A^4.

In receiving signals from a distant station with the arrangement shown in Fig. 2, the coils a^1, a^2 would act differentially upon the receiving coil b. In order to avoid this I change or vary the phase relation of the oscillations set up in the two legs of the loop antenna circuit. This result may be attained by arranging an adjustable inductance a^3 in one or the other of the aerial conductor systems A^3, A^4, or a variable condenser, indicated at C^3, may be inserted in one or the other of said conductor systems or an inductance may be inserted in one and a condenser in the other, or other suitable expedient may be employed. If desired, the conductor A^4 may be connected in series with the coil S^1, as indicated in dotted lines at A^5.

In the arrangements shown in Fig. 2, the irregularities due to the action of the oscillator will not be eliminated in the effects produced thereby in the distant receiving station. The same action as above described with reference to Fig. 1 and as graphically illustrated in Fig. 3, takes place in the arrangement illustrated in Fig. 2."

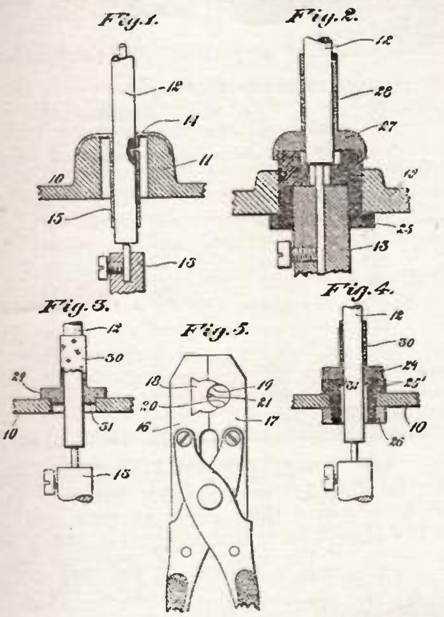
The foregoing is quite a novel idea and while we do not have any information how well it actually works in practice, we think that the patent is worth the earnest study of students interested in wireless telephony and telegraphy.

PATENT NO. 1,041,728 FOR MEANS FOR PREVENTING THEFT OF CURRENT FROM ELECTRIC METERS, HAS BEEN GRANTED TO CHARLES F. BERTIG, OF WINSTED, CONN.

This invention relates to means for preventing theft of current from electric meters.

An electric meter as is well known involves a casing in which is inclosed the meter mechanism and lead wires extend into this casing and are electrically connected therein with the meter mechanism, it being customary to connect the inner terminals of said wires with binding posts and the wires at and around such connection are bared or stripped of their insulation. It is a common thing especially in some sections to introduce wires into the meter casing and to bring these wires into contact with the lead wires where they are thus bared and in this way divert the current away from the meter mechanism, and along the wires thus wrongfully passed into the casing.

In this invention the inventor proposes to provide simple and effective means for preventing the passing of wire into the casing from a point outside of the same and the inventor claims that he can prevent positively the theft of current.



The inventor provides each lead wire with a barrier which may be of any suitable kind but which preferably covers fully the opening through which the wires extend. In Fig. 1 such a barrier is shown by 14.

The inventor also designed a new tool as shown in Fig. 5 by which the metal part, 14, is perforated and the sharp ends press into the wire at a number of points thereby making it an impossibility to pass a wire alongside of the other wire.

Other details will be clear by referring to the illustration.

A curious thing about this invention is that the inventor has actually designed a tool that can be used to great advantage to actually steal current. We refer to his special plier as shown in Fig. 5. If an individual desiring to rob the light company of current, gets two of these pliers and solders a wire on each of the pliers it becomes ridiculously simple to tap the line, simply by pressing the sharp prong, 21, which can easily be made long and sharp enough, around the lead wire and the plier can be easily taken off at any time and the little hole left in the wire will be so small as to be hardly noticeable.

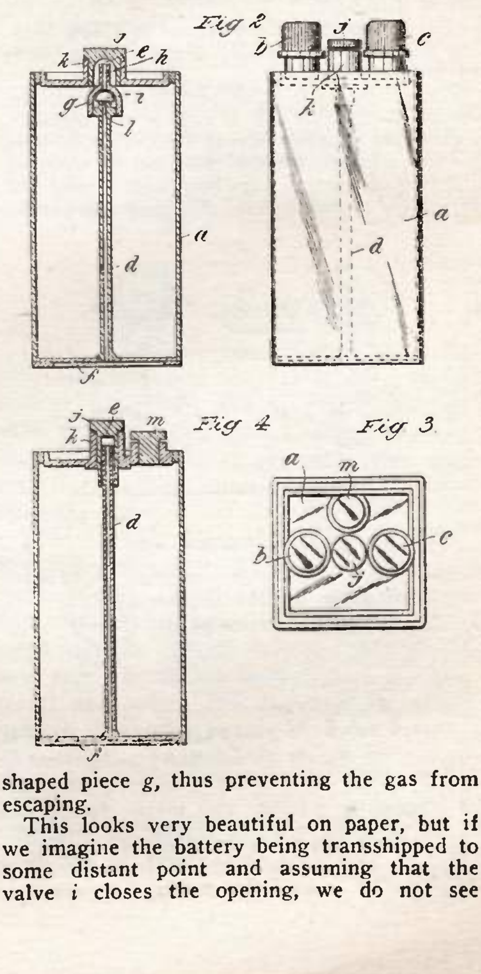
We respectfully submit this idea to Mr. Bertig.

PATENT NO. 1,043,535, FOR SECONDARY STORAGE BATTERY, HAS BEEN GRANTED TO ORLANDO OLDHAM, OF DENTON, NEAR MANCHESTER, ENGLAND.

This invention relates to a new storage battery and the inventor tries to overcome the old trouble of acid splashing, even when the battery is turned upside down in an ordinary manner.

It will be seen the vent tube *d* does not come out in the cover of the battery, but goes to the bottom, therefore clearing away the gases in such a manner that they cannot possibly reach the terminals of the battery itself. In Fig. 1, is shown the arrangement where the gas goes to the top compartment *e*, thence to the opening *g* in the dome shaped part *g*. Here it passes the valve *i* through a small hole at *l* and escapes through *d* to the bottom. A similar arrangement is shown in Fig. 4.

The inventor claims when he turns the battery upside down the valve *i* as shown in Fig. 1 will close the opening in the dome



shaped piece *g*, thus preventing the gas from escaping.

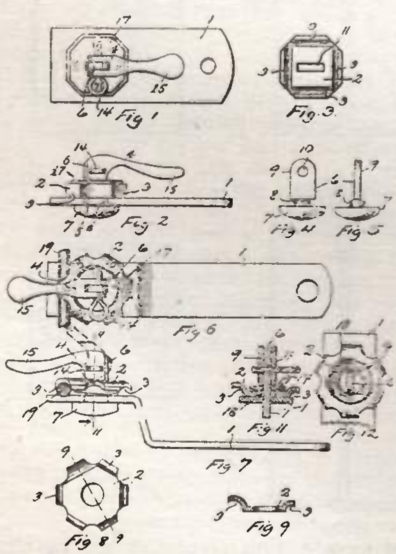
This looks very beautiful on paper, but if we imagine the battery being transshipped to some distant point and assuming that the valve *i* closes the opening, we do not see where the gas could escape, as the only opening h, would be closed.

A battery even when not in use will always give off a considerable amount of gas which many people have found out to their dismay by trying to close up a storage battery air tight. The usual result is that the battery is blown to pieces after thirty or forty hours. This is what surely would happen to such a device as described in the present patent and for that reason this invention does not show any distinct improvement upon other battery vents. Also it would appear that if this battery is laid on its side, the acid would surely flow out through the tube D. This, however, is not the worst part of this invention, but the greatest weakness is found in the tube D perforating the bottom of the jar. This is a very ticklish undertaking in a storage battery and if the jar is made of hard rubber or even celluloid, we do not believe that such a jar will be a commercial possibility, for sooner or later the bottom at the point where the tube goes through will leak and for this reason we do not think the present patent is of much use although theoretically it looks good.

PATENT NO. 1,044,717, FOR A BINDING POST HAS BEEN GRANTED TO PETER E. WIBERG, OF GLEN RIDGE, NEW JERSEY.

The present invention relates to a new binding post and is intended for clamping wires of different diameter.

As will be seen from our illustrations, the invention consists of a supporting member, a clamping member having a plurality of wire grooves adapted for the reception of wires of different diameters together, with means for adjustably mounting said clamping member on

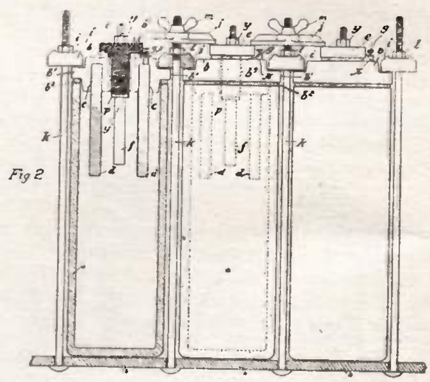


the supporting member and means for locking the clamping member against the inserted wire and supporting the member in any adjusted position.

From our illustration we hardly think it necessary to add a further description. It will be seen that this post is nothing but a clamp actuated by the lever 15 which secures the wire 19. While the device is satisfactory for a certain class of work, such as, for instance, large wiring on switchboards, etc., we think the post itself is rather cumbersome and not very pleasing to the eye. It also has the bad feature that small wires cannot be clamped easily and it is therefore not a good all around post, but can only be used for some special and specific purposes.

WILLIAM HERBERT LOWE, OF BRONDESBURY, ENGLAND, HAS BEEN GRANTED PATENT NO. 1,044,549, FOR AN ELECTRIC BATTERY.

This invention is termed an "electric bat-



tery," but in reality it is only an improvement on a cover for a primary battery. The idea is to get a tight cover so that acid or the like cannot be spilled easily. The clamp M, by means of the rods K, clamps the cover B^1 down on the jars A, and this really constitutes the entire invention.

The rubber packing B^2 is inserted between the cover and the cell, which makes the battery water as well as air tight. The cover B^1 is preferably of lead according to the inventor.

How the fumes and gases can escape from this battery, is not apparent to us.

MORSE CODE FOR NAVY SIGNAL

Washington, D. C.—Secretary of the Navy Meyer has directed that the international Morse code of signaling be adopted immediately throughout the naval service, replacing the Meyer code. The Meyer code will be discontinued altogether as soon as the signal forces of the ships and the shore stations shall become sufficiently proficient in the international Morse.

The Morse code will be applied to the wireless, wigwag, occulting light, sound signals and Ardois and Very methods of signaling.

International Wireless Signal Code

By Stanley E. Hyde

When the Radio-Telegraphic Conference met in Berlin in 1906 it decided that the International Bureau should be instructed to make a list of abbreviations that could be used between stations of different countries. The list is shown below. In the use of these abbreviations, the signal employed must be repeated three times, followed by the signal ..--.. The French equivalents are also added.

R A—What station is corresponding?
Quelle est la station en correspondance?

R B—At what distance are you from my station?
A quelle distance vous trouvez-vous de ma station?

R C—What is your wave length in metres?
Quelle est votre longueur d'onde en mètres?

R D—How many words have you to transmit to me?
Combien de mots avez-vous à me transmettre?

R E—How are you receiving?
Comment recevez-vous?

R F—I am receiving badly.
Je reçois mal.

R G—Send me ...— twenty times to regulate my apparatus.
Transmettez-moi vingt fois ...— pour régler mes appareils.

R H—Are you being interfered with?
Etes-vous troublé?

R J—I am being interfered with.
Je suis troublé.

R K—Atmospherics are very strong.
Les atmosphériques sont trés fortes.

R L—Tell me the wire charge to ....
Indiquez-moi la taxe à percevoir pour transmission par fil à ......

R M—Engaged with public correspondence. The ship is requested not to interfere.
Correspondance publique est engagée. Priére au navire de ne pas troubler.

R N—Stop transmitting.
Cessez-votre transmission.

R Q—Transmit more slowly.
Transmettez plus lentement.

R S—Increase your power.
Augmentez votre énergie.

R T—Diminish your power.
Diminuez votre énergie.

R U—Repeat everything.
Répétez tout.

R V—From .... to .... Repeat from such to such a word.
Répétez de .... à ....

R W—.... from .... Repeat .... words from ....
Répétez .... mots à partir de ....

R X—Your turn is No. ....
Votre tour est numéro ....

R Y—General call to all stations.

R Z—Nothing more.
Rien de plus.

S A—I have nothing for you.
Je n'ai rien pour vous.

S B—Everything in order.
Tout est en ordre.

S C—Wait. I will call you as soon as I have finished.
Attention. Je vous appellerai dès que j'aurai fini.

S D—You can transmit faster.
Vous pouvez transmettre plus vite.

S E—I am occupied with another station.
Je suis occupé avec une autre station.

If other abbreviations are needed they will continue with the letter (S).

A USE FOR STATIC

Have you ever been listening in at your wireless set, not far from a large station, and been able to tell that they were going to send by hearing a distinct click just before they started? Did you ever stop to think what caused that click? Perhaps not.

When the atmosphere is heavily charged with electricity all aerials in that vicinity will, if grounded, silently conduct the current to earth. But should a small gap be placed between the aerial and earth a charge will collect on the aerial and when the potential is great enough discharge across the gap setting up oscillations similar to those set up by the condenser and spark gap of any wireless set.

The click you heard was caused by the spark which took place as the blades of the aerial switch left the socket when the operator pulled down the switch for sending.

To use this atmospheric electricity, or static, for sending it is only necessary to place a minute spark gap in series with the ground lead and a sending key. Open the key contacts fairly wide so that no current can pass until the key is closed.

Of course, this arrangement can only be used on a fairly large aerial and while the atmosphere is well charged.

Static discharges heard in the telephones are probably often caused by just such arrangements as the above.

Tin roofs may be connected to the earth through a poor ground connection, such as the rain spout, and sparks take place between the joints.

The leaves of trees are said to collect electrical charges which suddenly rush to earth.

Aerial circuits which are grounded through a small gap, such as used in the Marconi break circuits, may be another cause.

Unused telephone and telegraph lines may also be another source of static rumblings through discharges passing across the minute lightning arrester gaps.

Perhaps in the near future steps will be taken to have all large surfaces in the vicinity of wireless stations permanently grounded, and thus lessen this interference.—*Thomas Appleby.*

HOW AMATEURS ARE TREATED IN CANADA

The American Government has at last passed a law governing amateur installations. Previous issues of this magazine contain the particulars which need not be repeated here. In short, they are few, simple, fair to all, and very lenient as compared with those across the line.

The Canadian Government regards the amateur in a very different manner. His restrictions are numerous, and he is not recognized unless he has paid his license fee, which is, at the present time, one dollar. In obtaining a license he submits himself to many petty rules and regulations, several of which are nothing less than the proverbial "red-tape." After the license comes a "declaration of secrecy," which must be filled out. The notary's charge for this is usually a dollar.

Now let us consider the amateurs' treatment previous to 1912, when licenses were not granted. Any amateur, wishing the protection of the law, had to apply to the Superintendent of the Government Wireless for permission. In answer to his application came a lengthy form requiring a detailed account of his station, to whom he had intentions of speaking, the object of the installation, and numerous other questions along the same line. Upon return of the blanks permission to install and operate the station was granted. It restricted the wave-length to fifty meters and the power absorbed by the primary of the transmitter to ¼ kw. On hearing the signal STP from a commercial or ship station he was required to suspend operations until advice came to cancel the signal. Referring to this signal, I may say that from 1909 to 1912 there was not one operator on the trans-Atlantic liners which dock at Montreal who was aware that such a signal existed, nor was the operator at the Marconi station any wiser.

We shall now take up the terms of a Canadian Amateur License. (1) He is not to establish, install or operate any wireless station except that which comes under his license. (2) The apparatus must be used solely for experimental purposes. (3) The power absorbed by the primary of the coil or transformer must not exceed ½ kw. (4) His wave-length must not exceed fifty meters. (5) His apparatus must not interfere with the operation of any station in Canada or ship station in Canadian or neighboring waters. (6) The Minister of the Naval Service may at any time cancel his license; this cancelation comes into force one calendar month after notification. (7) He must stop all transmitting if he perceives by his instruments that ship stations are operating and not start again until the signalling has ceased. (8) If an amateur station is found to interfere with the operation of commercial stations, the license may be at any time cancelled. (At the present time there is receiving apparatus in Canadian Marconi stations, by means of which it is absolutely impossible to tell the difference between a 200 and a 600 meter wave. I refer particularly to the 5 kw.

(*Continued on page* 1061)

New Wireless Clubs

POWER CITY WIRELESS ASSOCIATION

The Power City Wireless Association was formed Friday, October 18, 1912. The following officers were elected for a term of siv months: Ray F. Yates, president; J. Dobbie, vice-president; P. Downey, secretary, and Elmer E. Cornell, treasurer.

The club was organized to further the interests of amateur wireless in Niagara Falls. It has obtained a room in the Y. M. C. A. building, and at present has fifteen members.

CANTABRIDGA WIRELESS CLUB

This club was formed for the benefit of those in the club and the amateurs of this vicinity. Any question pertaining to wireless will be gladly answered if return postage is enclosed. We would like to communicate with other clubs, either by wireless or otherwise. The club call is CWA. The officers are: Alexis Moller, president and chief operator; Otis Angell, vice-president; Harold La Versa, secretary, 351 Harvard street, Cambridge, Mass. Weekly meetings are held Wednesday evenings, at eight o'clock. Amateurs are invited to attend. In the near future we hope to have Dr. Pierce and other wireless authorities to speak to the members. There are no dues.

ST. PAUL WIRELESS CLUB

At a recent meeting the following officers were elected: E. C. Estes, president; W. P. Husby, vice-president; L. R. Moore, secretary; T. J. Taylor, treasurer; D. T. Stetson, consulting engineer.

WIRELESS ASSOCIATION OF GREATER FORT SMITH

This club has recently been instituted in the city of Greater Fort Smith, Arkansas. The club is composed entirely of amateurs, but is progressing very rapidly. At a recent election the following officers were elected for the ensuing six months: John W. Howell, Jr., president; George Smith, vice-president; Francis N. Kimball, 118 Greenwood Road, secretary; Wallace Dowd, treasurer; Lawrence Forby, chief operator; Warren Pitts, assistant operator; C. H. Gaffin, supervisor. The club meets on alternate Tuesdays. All wireless enthusiasts in the vicinity of Fort Smith are requested to write to the secretary for information regarding membership, and visitors are welcome to regular meetings. Plans are now under way for a central station powerful enough to communicate with all stations in western Arkansas and Eastern Oklahoma.

BOISE RADIO CLUB.

The Boise Radio Club has been organized in place of the Boise Wireless Association, which broke up some time ago. The officers, at present, are: Earl Eby, president; Carl Eichelberger, secretary and treasurer, 715 North Ninth Street, Boise, Idaho; Earl Grant, station inspector.

LONG DISTANCE WIRELESS LOG

RECORD LOG.

STATION—S.S. MARIPOSA.

Communicated with	Date	Time	Wave length	Distance	Strength signal	Atmospherics	Remarks
San Juan....	10/13/12	1045P	600	2200	faint	nil	
S.S. Korea...	10/26/12	130P	350	1800	clear	bad	opr. sick
Cape Blanco.	11/ 2/12	452A	1800	3000	loud	faint	
S.S. Queen...	11/ 4/12	940P	400	950	faint	fine	S O S
Key West....	11/15/12	1115P	2000	3900	clear, faint	bad	

I am sending you a copy of a long distance log that is kept up by all "progressive" commercial operators. One reason that such logs are kept is that when the ship owners or captains make a kick these logs are shown them to remind them what the wireless can do.—*Stanley E. Hyde.*

Wireless Club Directory

Until further notice we will publish here from time to time a list of wireless clubs. These notices are inserted free upon receipt of proper information. Notices of the organization of all new clubs, as well as any changes of officers, etc., should be sent to us promptly.

Allegheny County (Pa.) Wireless Association—Leetsdale, Pa.

Alpha Wireless Association—Box 57, Valparaiso, Ind.

Amateur Experimental Association—Spokane, Wash.

Amateur Wireless Association of New Bedford—84 Dunbar Street, New Bedford, Mass.

Amateur Wireless Association of Schenectady—405 Lenox Road, Schenectady, N. Y.

Amateur Wireless Club of Geneva—448 Castle Street, Geneva, N. Y.

Amateur Wireless Telegraphy Club of California—Box 55, Capitola, Cal.

Arkansas Wireless Association—Little Rock, Ark.

Atlanta Wireless Association—159 Capitol Avenue, Atlanta, Ga.

Berkshire Wireless Club—18 Dean Street, Adams, Mass.

Boise Radio Club—715 North 9th St., Boise, Idaho.

Boys' Experimental Club—Box 214, Virginia, Minn.

Bridgeton Wireless Club—275 Bank Street, Bridgeton, N. J.

Bronx Wireless Association—500 East 165th Street, Bronx, N. Y.

Brooklyn Wireless Club—131 Ryerson Street, Brooklyn, N. Y.

B. W. T. A. Wireless Department—Scarsdale, N. Y.

Canadian Central Wireless Club—P. O. Box 1115, Winnipeg, Manitoba, Canada.

Cantabridga Wireless Club—351 Harvard St., Cambridge, Mass.

Cardinal Wireless Club—South Division High School, Milwaukee, Wis.

Chicago Wireless Association—4418 South Wabash Avenue, Chicago, Ill.

Cincinnati Wireless Signal Club—1839 Hopkins Street, Cincinnati, Ohio.

Colorado Wireless Association—1545 Milwaukee Street, Denver, Colo.

Danvers Wireless Association — Franklin Street, Danvers, Mass.

De Kalb Radio-Transmission Club—205 Augusta Avenue, De Kalb, Ill.

Dorchester Wireless Association—22 Harvard Street, Dorchester, Mass.

East Buffalo Wireless Club—701 Walden Avenue, Buffalo, N. Y.

East Glenville M. E. Wireless Association—634 East 124th Street, Cleveland, Ohio.

East Tennessee Wireless Association—723 North Third Avenue, Knoxville, Tenn.

Electric St. Louis Wireless Club—2008 Allen Avenue, St. Louis, Mo.

Ever Ready Wireless Club—167 East 71st Street, New York, N. Y.

Experimental Club of Cincinnati—1214 Jackson Street, Cincinnati, Ohio.

Fargo Wireless Association—518 Ninth Street, Fargo, N. D.

Flushing Wireless Association—24 Madison Avenue, Flushing, N. Y.

Frontier Wireless Club—1034 Elmwood Avenue, Buffalo, N. Y.

Fruitvale Wireless Club—2510 Fruitvale Avenue, Chicago, Ill.

The Germantown Wireless Club—5801 Germantown Avenue, Germantown, Pa.

Gramercy Wireless Club—311 East 23d Street, New York, N. Y.

Granby High School Electricity Club, Granby, Mass.

Greater Boston Wireless Association—41 Lawrence Street, Wakefield, Mass.

Guilford County (N. C.) Wireless Association—Greensboro, N. C.

Hamlin Wireless Association—2729 Noble Avenue, Chicago, Ill.

Hannibal Amateur Wireless Club—1306 Hill Street, Hannibal, Mo.

Haverhill Wireless Association—Haverhill, Mass.

Harriman Wireless Association—801 Clinton Street, Harriman, Tenn.

Hartford Wireless Association—320 Wethersfield Avenue, Hartford, Conn.

Independence Wireless Association—214 South 6th Street, Independence, Kas.

Italian-American Wireless Experimental Club—146 Bleecker Street, New York, N. Y.

Inter-Mountain Wireless Association—219 5th Street, Salt Lake City, Utah.

Killington Radio Club—36 Lincoln Avenue, Rutland, Vt.

Knights of Wireless—1271 East 35th Street, Flatbush, Brooklyn, N. Y.

Lexington Wireless Club—517 Throop Avenue, Brooklyn, N. Y.

Long Beach Radio Research Club—Long Beach, Cal.

Madisonville Wireless Club—5609 Tompkins Avenue, Madisonville, Ohio.

Manchester Radio Club—759 Pine Street, Manchester, N. H.

Metropolis Wireless Association—181 West 63d Street, New York, N. Y.

Mowa Wireless Club—331 Pacific Street, Brooklyn, N. Y.

New England Wireless Association, Inc.—[illegible] Milk Street, Room 99, Boston, Mass.

New Haven Wireless Association—27 Vernon Street, New Haven, Conn.

North Jersey Wireless Association—Hawthorne, N. J.

Oakland Wireless Club—916 Chester Street, Oakland, Cal.

Oklahoma State Wireless Association—Box [illegible], Muskogee, Okla.

Oregon State Wireless Association—Lents, Oregon.

Pacific Radio Communicating Association—[illegible]9 Washington Street, Vancouver, Wash.

Pacific States Wireless Association — 288 Wilcox Avenue, Los Angeles, Cal.

Pacific Wireless Club of Oregon—405 East Market Street, Portland, Ore.

Plaza Wireless Club—156 East 66th Street, New York, N. Y.

Power City Wireless Association—Niagara Falls, N. Y.

Progressive Wireless Club—Seattle, Wash.

Progressive Wireless Club — Poplar Bluff, Missouri.

Ranger Nautical Signal and Wireless Club —Nautical Training School, State House, Boston, Mass.

Rochester Wireless Association—Rochester, N. Y.

Rockland County Radio Wireless Association—54 Catherine Street, Nyack, N. Y.

Roslindale Wireless Association—962 South Street, Roslindale, Mass.

Sacramento Wireless Signal Club—2119 H Street, Sacramento, Cal.

St. Paul Wireless Club—1911 Ashland Ave., St. Paul, Minn.

Santa Cruz Wireless Association—184 Walnut Avenue, Santa Cruz, Cal.

Southern Wireless Association—1435 Henry Clay Avenue, New Orleans, La.

Springfield Wireless Association—323 King Street, Springfield, Mass.

Spring Hill Amateur Wireless Association —2 Benton Road, Somerville, Mass.

Sullivan Wireless Association—Sullivan, Ill.

Technical Wireless Association—1206 East Capitol Street, Washington, D. C.

Texas Wireless Association — 1212 Prairie Avenue, Houston, Texas.

Toledo Wireless Club—1024 Erie Street, Toledo, Ohio.

Tri-County Wireless Association — Greenfield, Ohio.

Tri-State Wireless Association — Memphis, Tenn.

United Wireless Relay Club — 102 High Street, Passaic, N. J.

Waterbury Wireless Association—26 Linden Street, Waterbury, Conn.

Waynesburg College Wireless Club — Waynesburg College, Pa.

Welcome Wireless Association—185 Chauncey Street, Brooklyn, N. Y.

Westchester Wireless Association—37 West Main Street, Tarrytown, N. Y.

Western Division High School Wireless Association—Milwaukee, Wis.

Wildwood Wireless Association—110 East Pine Avenue, Wildwood, N. J.

Wireless and Electrical Association—Lindsborg, Kans.

Wireless Association of Atlantic City—Atlantic City, N J.

Wireless Association of Buffalo, N. Y.—142 Dorchester Place, Buffalo, N. Y.

Wireless Association of Canada—189 Harvard Avenue, Notre Dame de Grace, Montreal, Quebec, Canada.

Wireless Association of Central California —860 Callish Street, Fresno, Cal.

Wireless Association of Easton, Pa.—123 North Main Street, Phillipsburg, N. J.

Wireless Association of Greater Fort Smith —Greater Fort Smith, Ark.

Wireless Association of Illinois—303 North 8th Street, Marshall, Ill.

Wireless Association of Milwaukee — 824 Nineteenth Avenue, Milwaukee, Wis.

Wireless Association of Montana — 309 South Ohio Street, Butte, Mont.

Wireless Association of New Orleans — 2022 State Street, New Orleans, La.

Wireless Association of Pennsylvania—Odd Fellows' Temple, Philadelphia, Pa.

Wireless Association of Savannah—303 Price Street, Savannah, Ga.

Wireless Association of Southern California—935 Denver Avenue, Los Angeles, Cal.

Wireless Association of Woodbury — 28 Penn Street, Woodbury, N. J.

Wireless Club of Baltimore — 728 North Monroe Street, Baltimore, Md.

Wireless Society of Springfield—P. O. Box 562, Springfield, Mass.

Wireless Telegraph & Telephone Association of U. S.—Boys' Club, 161 Avenue A, New York, N. Y.

Young Edison Society—Rogers, Ark.

Y. M. C. A. Wireless Club—211 West Fourth Street, Williamsport, Pa.

Zanesville Wireless Association—105 South Seventh Avenue, Zanesville, Ohio.

WIRELESS FOR LIGHTHOUSES

It is reported that some of the lighthouses along our coast are to be equipped with wireless apparatus to supplement the flash signals from the light. This would be especially useful when the fog is thick enough to obscure the light. This wireless equipment will also serve to keep the attendants informed of what is going on in the outside world.

PIFFLED NUMBER

The Wireless Screech

OUR MOTTO . . —— . . . . . —— .

THE ETHER: JAMMY

No. 23$\frac{33}{23}$ | 9 & 10 CEMBER | Price Gratis

The Wireless Screech

An exaggerated restrospect of timely as well as of untimely happenings and un-happenings, in the world of wireless.

Mohammed Ulysses Socrates Fips,
Editor.

Subscription price in the entire Universe, 150 ethersplashes.

Single copies, Gratis.

Forms are close and stuffy and are ventilated at 6 A. M. (central time) daily.

The Editor cannot be held responsible for publishing any dope in the *"Screech."* Most of the M.S. received cannot be deciphered by him, and when the printer gets through with it and has the magazine set up, it is usually too late to "can" certain contaminated dope.

No M.S. containing jokes, semi-jokes, or near-jokes, will be accepted. If they are especially good, however, we will keep them, and credit ourselves with them.

Address all dope, M.S., vegetables and fish to

Fips,
Fips Bldg., Fipfth floor, Fips ave., corner Fips street, Fipthpif, N. Y.

Idiotorial

WELL, well, say, you, look hoo's here!! Right you are. To tell the truth I was kinder shaky myself when the boss comes down a few days ago, and says:

"Fips, my boy," says he, "I have here letters from 639½ enthusiastic screechers, all of whom want you to come back. They say they can't live without the screech and you. They say that your contemporary, the Hon. *"Modern Electrics,"* is like a soup without salt, since the screech is out of it. One boob from Kobosh, Okla., even goes as far and says, that the Hon. contemporary is a misnomer and should be renamed: *"Modern Elec,"* because he argues that since we left your *"trics"* out, the paper has gone to the seeds!

"Well, Fips, my boy, they're right, dead right, your country is calling you. They want you, want you bad. Truth is they are crazy about you. The monthly "Screech" is the jam on their bread, except when the ether is jammed. You are the most popular screecher in the Universe, and deep in your heart you know it. Your health is fine now and since they've shaved your head bald you are not liable to get indigestion

THE EDITOR.

of the hair soon again. So cheer up and do your duty."

To tell the truth, I felt elated when I heard these inspiring words. Those 639½ screechers certainly spoke for the majority, and I told the boss I would try my best to (re-)serve my country and the screech-fraternity at large till the cows came home. Thus you see I am back on the job.

There was, however, one thing that troubled me considerably for several days after the interview with the boss. I finally picked up enough courage and went to his sanctum.

"Boss," said I, kind'a scary, "you said the other day that you received letters from 639½ screeches petitioning me to come back. Would it not be an imposition upon your good graces to tell me who that "½" screecher was?"

The boss, with deep disgust reflected in his left uppermost eye, took a long contemplative puff of his fat cigar, spat through the open window directly on the silk hat of a pedestrian, and shouted:

"Why, you boneheaded, rattlebrained, simp-faced, shrimp of a boob, that letter came from a football player and he is a ½back! Now back out before I halve you!!

TRY THIS ON YOUR PIANO.

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Advice on Patents

PERPETUAL MOTION ROLLER SKATES.

Jonathan Pumpernickle, Kishkish, Wis., writes:

Q. I have invented a set of roller skates in which the left one has a small dynamo, while the right one a small motor. Now I figure out that when rolling on the skates the dynamo will generate enough current to drive the motor which in turn will drive the roller skates. Therefore, once started, you could roll on indefinitely. Can I get a patent on it?

A. Your invention is of such a tremendous, far reaching importance that we decided not to print it, so that nobody will get wise to it. (*Notice to Printer: Please don't print this query.*) Get it patented at once, don't lose a second's time. Have it patented in all countries of the world, also on the north pole (an American possession) so that no one will make the skates and sell them to the Esquimos. The device is very practical and can, of course, also be used on horses and mules, etc. The surplus power of the dynamo can also be used to illuminate a headlight in front, and a tail light on the rear of the wearer on which the police will probably insist.

GET-THE-HOOK TROLLEY WIRE.

[illegible] Adolphus Skeemkind, [illegible], Cal., asks:

Q. Recently in front of our house the trolley wire snapped and fell to the ground. Two people were almost killed when trying to pick it up, and a horse went up in smoke as he stepped on the wire. This started me thinking real hard and this is what I invented as the result of my profound study of the problem: Why not place hard rubber insulated steel hooks, about six to eight inches long, all along the trolley wire—about three or four feet apart from each other. These hooks when attached right will not interfere with the trolley, as they will stick up vertically. Then when the wire falls to the ground, anyone can pick it up without danger of getting shocked to death.

A. The idea is certainly *very* original. You will surely get a patent on it. While the stockholders of the trolley line would probably object to such a scheme, likewise the linemen and the birds, you should not be influenced by such a trifle. All new inventions seem crazy at first till you get the people to think your way. Go to it, Adolphus.

A TELEPHONE CLOCK.

[illegible] Alva Whiffleheimer, Coco[illegible], Mo., writes:

Q. I have made a great invention. I worked out a clock combined with a phonograph which is placed at the telephone "central." Every hour, as well as half hour, the phonograph speaks the time into the central transmitter and an electromagnet lifts the hook off from the subscriber's phone. A loud speaking transmitter, very sensitive is used at "Central." Thus the subscriber at the other end gets the time accurately every half hour. I think it will be a great boon to humanity. Do you think I can get a patent?

A. [illegible], your invention sure is a [illegible]. It's just what we have been waiting for. Most assuredly you will get a patent, there's no doubt to that. Of course you must tell the subscribers, in case your invention becomes introduced, not to use the phone around the full as well as the half hours. Thus by consulting their clocks or watches they can easily time themselves. If they didn't do that the following might happen. (Conversation between two subscribers): A. "Duckie, you will surely not forget to call Sunday will you? You know I will be waiting so-o-o impatiently for you."

B. "Why certainly, 'lovie.' I will be there like a duck. I'll probably get there by.....——"

(The Central phonograph clock): **"Twelve, thirty!!"**

We would advise you also to work out an electromagnetic "coockoo" which could be easily placed inside of the telephone standard. If this coockoo would open his little door every 30 minutes, stick his head out and speak his time, we think that people would soon grow fond of it. Besides it would then not be necessary to use the electromagnet to lift the receiver off the hook. We give you the idea (very valuable) gratis and wish you luck.

Q 2. I also invented an automatic aerial which only works when it rains. I took some thin rope and soaked it in sal ammoniac, then I dried the rope, and made it into a regular four strand aerial. It is evident that as long as it does not rain, the aerial cannot work, as the rope in its dry state is a good insulator. As soon as it rains the aerial becomes as efficient as if the strands were of metal, on account of the electrolyte being formed in the rope. Don't you think it is a splendid idea, and don't you think I should get a patent on it?

A 2. Alva, you over-exerted yourself. The idea is brilliant. By all means get a patent. If possible, get two on it. Be on the safe side. To increase the capacity of the aerial, it would be a fine idea to plant grass seeds on the rope. After a few rains, you will have a nice lawn on the aerial.

WIRELESS CLUB.

"I wish to form a Wireless Club. Please tell me how to go about it.

"Respectfully yours,

"Hector Demosthenes Schweineleber."

The best wireless clubs are made as follows: Yank out a stout corner post which supports the chicken netting or the wire of the fence of your father's chicken or other yard. Take out the nails and carefully remove all the wire. With a hatchet and ordinary wood working tools, shape the club to required size. Paint it and your wireless club is ready for use.

PASSING THE GOOD WORD AROUND.

There was a girl named Margaretta,
So sweet not a youth could forgetta.
They would sit 'neath the moon
With Margie and spoon
And petta and petta and petta.

—*Houston Post.*

There was a young lady named Golda;
"I love you!" the fellows all tolda.
They'd come every night
And turn down the light
And holda and holda holda.

—*Detroit News.*

There was a young girl named Louisa,
A charming and beautiful tisa.
Her swain, lucky chap!
Used to call—such a snap!—
And squisa and squisa and squisa.

—*Boston Transcript.*

There was a young girl named Melissa
Whose beau would go mad if he'd missa.
And he wouldn't feel right
Till he'd hug her so-o-o tight
And kissa and kissa and kissa.

"Fips," Sr.

There was a young maiden named Guilta
Who lived in the house that Jack builta.
But she lost her dough
So dear Jack laid lough
And jilta and jilta and jilta.

"Fips," Sr.

THE ELECTRICAL GUY.

I am the Guy who put the Guy in the Geissler Tubes.

I am the Guy who put the Cop in Copper Wire.

I am the Guy who put the Dye in Dynamo.

I am the Guy who put the Hide in Hydrometer.

I am the Guy who put the Pie in Pyrites.

I am the Guy who put the Lie in Leyden Jar.

I am the Guy who put Silly in Silicon.

I am the Guy who put Perry in Perikon.

I am the Guy who put the Cell in Selenium.

I am the Guy who put the Trance in Transformer.

I am the Guy who put Naughty in Aueronautical.

I am the Guy who put the Bat in Battery.

I am the Guy who put Why in Wireless.

I am the Guy who put the Sock in Sockets.

I am the Guy who put the Bus in Buzzer.

I am the Guy who put the Car in Carborundum.

I am the Guy who put Edith in the Editor.

Revision of All Wireless Calls

We reprint herewith, by permission of the Department of Commerce and Labor, their general letter on the System of Call Letters. This letter covers the subject thoroughly, we think, and it is hoped that it answers, beforehand, any questions you may have concerning this matter.

DEPARTMENT OF COMMERCE AND LABOR
OFFICE OF THE SECRETARY
WASHINGTON

Radio Service

October 25, 1912.

BUREAU OF NAVIGATION
General Letter No. 35

System of Call Letters

The following system of awarding distinctive calls to licensed stations of the several classes, ship and land, will be followed and the calls will be included in the licenses by the Department of Commerce and Labor.

The list of radio stations to be published by the Department of Commerce and Labor will not be ready for issue probably before the spring, as it is desired to make it complete, and the examination and licensing of stations may not be finished in time for an earlier issue.

The calls of ship stations and coast stations open to public service will be sent, as soon after December 13, 1912, as practicable, to the International Bureau of the Telegraphic Union, at Berne, Switzerland, for publication in the International list.

The Bureau of Navigation will issue from time to time multigraphed lists of call letters so far as they may assist commerce and navigation.

Ship Stations and Coast Stations Open To Public Service

The Berlin Radiotelegraphic Convention (service Regulation IV, 2) provides that each ship station and coast station open to public service shall have call letters formed of a group of three letters, which shall be distinguishable from one another.

The series of three-letter calls beginning with N and W respectively (with a few temporary exceptions), and the series KOA to KZZ inclusive, have been assigned to the United States, and application has been made for 156 additional calls. The number is limited, and three-letter calls will be reserved for ship and coast public service stations, (which usually communicate with stations under foreign flags). The calls will be allotted by the Bureau of Navigation, Department of Commerce and Labor.

The call letters assigned to American ship stations on July 1, 1912, by the Bureau of Navigation, beginning with K for ships on the Atlantic and W for ships on the Pacific, will be retained as far as practicable in the issue of licenses, but some changes on Atlantic and Gulf ships will be necessary. Commercial coast stations open to public service will be assigned three-letter calls beginning with W.

The series beginning with N is reserved for Government stations, ship and land, and will be arranged by the Departments concerned and then forwarded to the Secretary of Commerce and Labor.

Amateur Stations

The call letters for amateur stations will be awarded by radio inspectors, each for his own district respectively, according to the following system:

(a) The call will consist of three items: number of radio district, followed by two letters of the alphabet. Thus, the call of all amateur stations in New England (which comprises the first district) will be the figure "one" in Continental Morse, followed by two letters; in California (in the sixth district) the figure "six" followed by two letters; in South Carolina the figure "four" followed by two letters; in Missouri the figure "nine" followed by two letters, etc., etc. (The territory of each district is shown in Regulations Governing Radio Communication, pages 3-4.) The letters X, Y, Z must not be used as the first of the two letters. (See Special Classes of Stations.)

(b) The three items, a given figure first, followed by two letters of the alphabet, thus may be combined in 598 different calls which will probably suffice for the amateur sending stations in most districts for some time to come.

(c) Radio inspectors will insert amateur station calls in station licenses according to this system, and will keep a permanent chart, of 598 squares, lettered with the alphabet from left to right, and from top to bottom, (A to W), inserting in the appropriate square the serial license number of the station to which the call letters were awarded. Within these limitations, radio inspectors will use their discretion in the award of calls, avoiding, of course, duplications.

(d) When a station is abandoned and the license canceled, or if a license shall be forfeited for violation of law, the call assigned to it may be allotted to another station.

(e) If the entire 598 calls have been exhausted, radio inspectors will issue additional calls, consisting of the figure of the district followed by three letters. From such combinations should be excluded the combinations SOS and PRB. all three-letter combinations beginning with QR or QS, all combinations involving the repetition of the same letter three times, three-letter combinations beginning with K, N, W, X, Y, Z, and other combinations, which, for various reasons, international, national, local or individual, may be objectionable. With such exclusions, over 10,000 calls will remain for each district.

Limited Commercial Stations

Calls for limited commercial land stations will be allotted by the Bureau of Navigation in a special manner to indicate, if practical, the different radio districts over which such stations usually radiate messages, as well as to identify the stations.

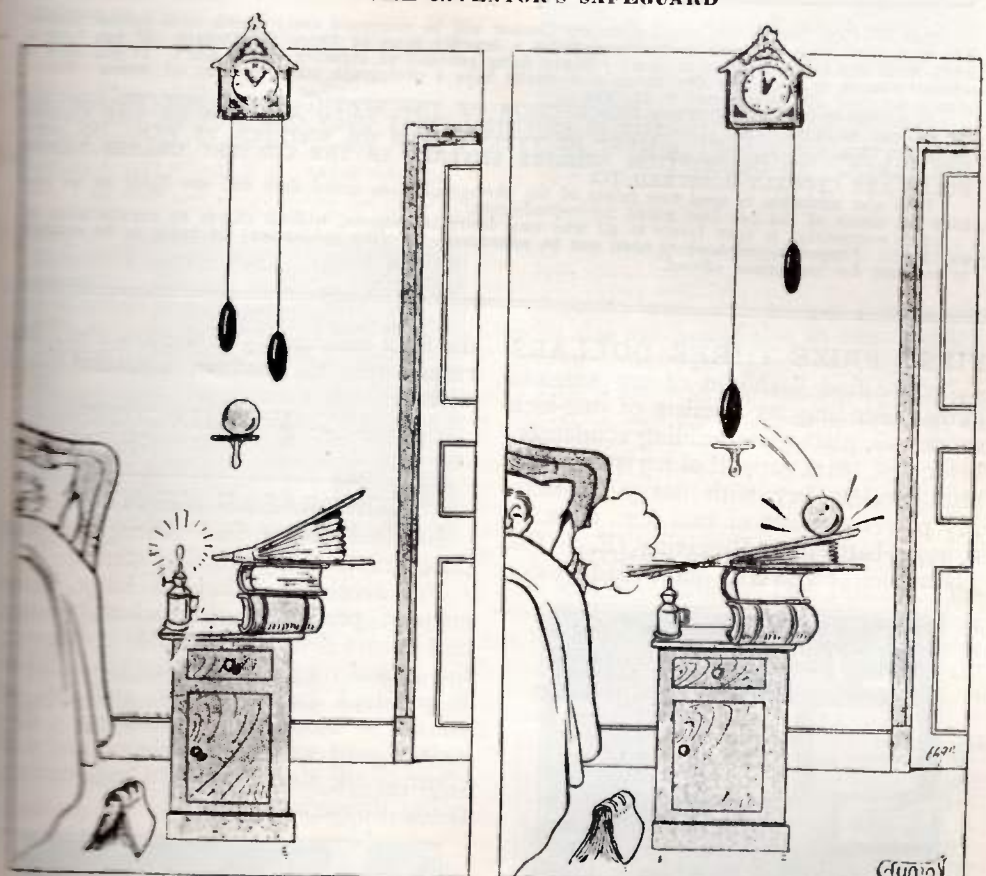
Special Classes of Stations

Calls for special classes of stations, such as experiment stations for the development

(*Continued on page* 1080)

Flying Sparks

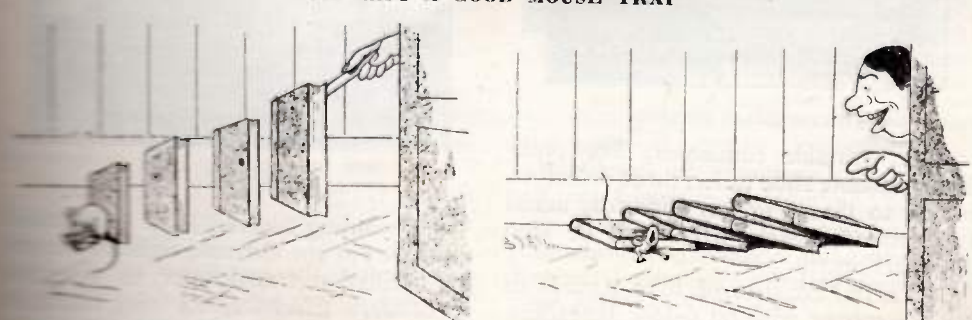
THE INVENTOR'S SAFEGUARD



Mr. [illegible], the inventor, always falls asleep while reading in bed——

And how he uses his clock to extinguish the lamp at 1 A. M.

AT LAST A GOOD MOUSE TRAP



Having the advantage of costing nothing——

And never getting out of order! —*Pêle-Mêle.*

helix, a 2-inch spark coil, a high tension key, and a heavy 2-kw. spark gap.

My aerial is 60 feet high, 150 feet long and consists of four wires.

I have been very successful with it. I

POUX AERIAL

have picked up M. C. C. (Cape Cod), N. A. R. (Key West), and also stations on the Great Lakes.

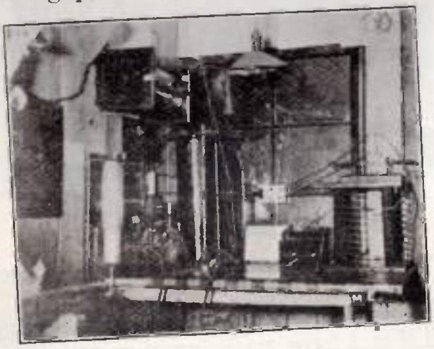
My call is N. J. P. I am at my station from 9 to 12 P. M.

NOEL POUX,
Pennsylvania.

HONORABLE MENTION

Herewith is a photo of my wireless outfit:

The sending set consists of a 2-inch coil run on an 8-volt storage battery, spark gap, on top of helix, which is of



HOWARD STATION

long wave length, glass plate condenser, wireless key with large silver contacts.

My receiving outfit consists of two tuning coils, double and single slide (a switch throws them in circuit, so as to use either as tuner or loading coil), one fixed and two variable condensers, and silicon, galena, and ferron detectors.

My aerial is 65 feet high at each end and 84 feet long. It is composed of 6 copper wires, No. 14 B. & S. gauge on 8-foot spreaders.

With this outfit I have obtained excellent results, hearing over land as far west as Port Huron, Mich., and south to N. A. R.

JACK HOWARD, New York.

HONORABLE MENTION

I have never seen a picture of a laboratory printed in *Modern Electrics*, so I took one of my outfit, and here it is.

My laboratory equipment consists of several hundred chemicals and quite an extensive list of apparatus for testing and experimenting. I have been some

LATHROP LABORATORY

years in collecting the outfit shown.

The apparatus marked X is home-made. The two interesting pieces being the Bunsen burner on the right, of original design and make, and the air tank, with the large gauge, made from an old fire extinguisher.

The two large tanks in the front marked OX and HY contain, respectively, oxygen and hydrogen at over 250 pounds pressure. These tanks are connected to an oxy-hydrogen blowpipe shown on the table. I used this intense heat for reduction tests and welding where an electric arc cannot readily be employed.

Also shown in the foreground are several hydrometers, two thermometers, two gas testing batteries, several graduates, beakers, test tubes, retorts, etc.

I connected the gas and water pipes

to the room myself, also the electric wiring, which is made to carry several times more current than I ever pull. I often blow 50-ampere fuses.

I do lots of photographic work and derive an untold amount of pleasure from my layout.

GEO. W. LATHROP,
Connecticut.

HOW AMATEURS ARE TREATED IN CANADA

(*Continued from page* 1050)

Marconi station at Montreal. This being the case, it is very easy for an amateur to "jam" a station of a similar type and thus lose his license if complained of by the operator at the station.) (9) Then there is a clause relating to the secrecy of intercepted messages. (10) Stations at reasonable times shall be open for government inspection. (11) The licensed apparatus must not interfere with the operation of telegraph lines. (12) Upon the Minister's approval the license may be assigned or sublet. (13) If necessary, as might be in the case of war, the Minister may take possession of the licensed apparatus in the name of the King, and use it as may seem fit. Authorized persons may enter the station and remove or operate the apparatus. (14) As a concluding clause, the breach, non-observance or non-performance of any of the rules and regulations may result in the permanent loss of the license.—*A Canadian Amateur.*

FROM WOODLAND, CAL., TO VICTORIA, B. C., BY WIRELESS

Recently G. C. Elwood, a Woodland, Cal., amateur, succeeded in talking with the British Government wireless station at Victoria, B. C. The night was favorable for such work and Mr. Elwood sent out V S D, and was answered by the British Columbia man. This distance, of about 700 miles, is phenomenal for a transformer of 615 watts, such as Mr. Elwood is using.

AN ELECTRIC PROPELLED BOAT.

Through the completion and operating of a small vessel, named the "Electric Arc" in England, many important points proving the superiority of the electric propulsion of vessels have been discovered.

The "Electric Arc" is an English vessel, at the present time being used for coastal service. It has been passed by the government inspectors as a 50 passenger vessel. The length of the boat is 50 feet between perpendiculars, the beam 12 feet, depth 7 feet 4 inches, and the maximum draft 4 feet 6 inches. The speed is about 8 1-3 miles per hour.

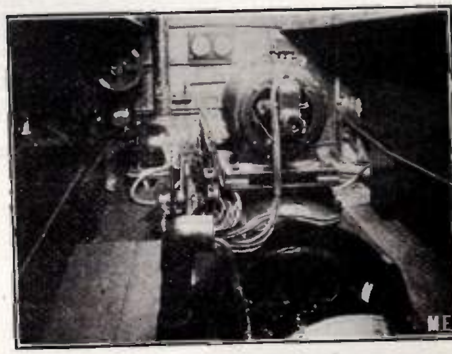


FIG. I

In Fig. 1, we have a view of the engine room. Here will be seen the alternating current motor which is directly connected to the shaft and propeller. This motor has no brushes or slip rings, and is of the type known as the "Multiple wound Machine," in which there are in the present instance two independent windings. The current is alternating, three phase, and the motor is of the simplest type. It is absolutely normal in mechanical construction, and of the type already perfected in sizes of thousands of horse-power. The novelty of the invention consists only in the arrangement of the stationary conductors, and the method of supplying them with current.

The first combination of the generator and the motor windings gives a speed of 7.25 knots, and the second combination, two-thirds of full speed, or about 5 knots. The speed of the motor is controlled by means of two simple switches. One of these switches controls the excitation of the generator field, and in this manner the amount of current generated is am-

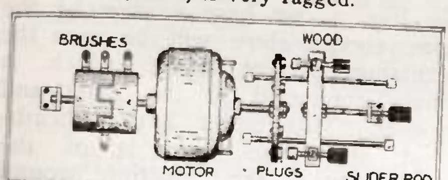
(*Continued on page* 1114)

This department has been started with the idea to encourage the experimenter to bring out new ideas. Every reader is welcome to contribute to this department, and new ideas will be welcomed by the Editors. WHEN SENDING IN CONTRIBUTIONS IT IS NECESSARY THAT ONLY ONE SIDE OF THE SHEET IS USED. SKETCH MUST INVARIABLY BE ON A SEPARATE SHEET NOT IN THE TEXT. The description must be as short as possible. Good sketches are not required, as our art department will work out rough sketches submitted by contributors. IT IS THEREFORE NOT NECESSARY FOR CONTRIBUTORS TO SPEND MUCH TIME IN SKETCHING VARIOUS IDEAS. When sending contributions enclose return postage if manuscript is to be returned if not used. ALL CONTRIBUTIONS APPEARING IN THIS DEPARTMENT ARE PAID FOR ON PUBLICATION.

FIRST PRIZE TWO DOLLARS

A METHOD OF USING THE ROTARY SPARK GAP WITH AN ORDINARY SPARK COIL

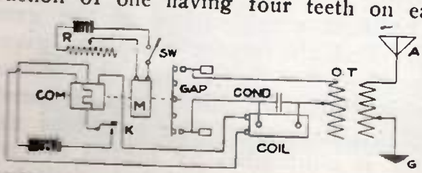
Many amateurs who have taken the trouble to introduce the rotary gap into their stations, have found that, instead of giving the desired pure toned spark, the spark, unless the circuits are finely adjusted, is very ragged.



M E FIG 1

An alternator giving a 500-cycle current is generally used with the synchronous type of revolving gap. This alone prohibits the use of this type. This causes the amateur to install the non-synchronous type, which is very unsatisfactory and is very troublesome when used in connection with a spark coil run by batteries.

The author, after glancing through Mr. Mertz's article in the May, 1912, issue, saw the way clear to using the synchronous type. The article describes a so-called "mechanical converter." I immediately started the construction of one having four teeth on each



M E FIG. 2

side making eight reversals of current in one revolution. The diameter of the commutator was two inches. The gap proper was made after the "Inwesco" type, and had eight plugs around the outside of a fibre disc 3½" in diameter. A motor was secured and a new shaft 6" long was put in it. Fig. 1 illustrates the construction. The action is easily understood. Every time a pair of plugs are in front of the fixed electrodes a reversal of current occurs at the commutator. The result is exactly the same as if an alternator were used. The higher the speed of the motor the higher pitched the spark. The vibrator is screwed up tight. The brushes must be pressed against the commutator with considerable tension as the commutator at a high speed throws them out and no current is secured. The motor should be powerful and speedy. A rheostat is used to regulate the speed. This was first tested on a one-inch coil, a condenser made of 4 sheets of glass 8 x 10 is sufficient. The surface of the foil is 6 x 8 per sheet, 3 sheets being used. The spark gap should be as small as possible. The author had considerable trouble in adjusting the arrangement, but in the end he was more than amply repaid.

Care should be taken that the gap be fixed on the shaft so that the plugs are in line with the fixed electrodes when the brushes on the commutator pass from one segment to the other so that the spark will jump at each reversal of the current by the converter.

The connections are shown in Fig. 2.

Contributed by

CHARLES S. BALLANTINE.

Note.—This is a very good idea and should work equally well with a quenched gap if properly adjusted.—Ed.

SECOND PRIZE ONE DOLLAR

USEFUL HINTS ON THE CONSTRUCTION OF WIRELESS APPARATUS

The edges of the space, bared for contact with the slider, on a tuning coil or loose coupler generally look very ragged, if the wire used is silk or cotton insulated. A very neat way of overcoming this is to cement two pieces of imitation leather over the ragged ends of the insulation, as shown in Fig. 1. Shellac is the best thing to use in fastening them, as it is a better insulator than ordinary glue.

A slider making especially good contact with its rod is shown in Fig. 2. Slits cut in the sides and top of the square tubing form tongues, which, when bent in, make excellent contact with the slider-rod.

About the best kind of slider handle is shown in Fig. 3. This obviates many of the difficulties experienced with the ordinary kind. The handle can be cut from a piece of hard fibre, or even wood. If desired, it can be cast from sealing wax in a wood or plaster mould. The sealing wax must be very liquid when being cast, and the mould hot and wet, or great trouble will be experienced.

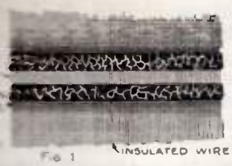


Fig 1

The usual rod or rods for supporting the secondary coil on a loose coupler are often bothersome, and make handling of the switch more or less difficult. A method is shown in Fig. 4 doing away with the rod and its attendant difficulties. On the outside of the secondary tube at the far end are glued two blocks, as shown at A and B. These slide over a wooden guide rail, glued in the inside of the primary tube, as at B. The wooden rail continues beyond the primary tube, where it is then supported by another wider strip. The guide rail also serves to guide the square coil end of the secondary, through a slot in the latter, cut as shown. A stop can be placed at the end of the guide rail if desired. Connection to the secondary is made by means of flexible leads. This system, as will be easily seen, allows plenty of room for the switch. Another advantage is that there is much less probability of sticking than in the usual system.

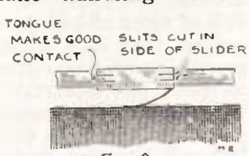


Fig 2

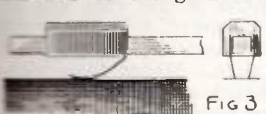


Fig 3

Varnish over mahogany stain appears much better than does wax. This fact seems to be neglected by many amateurs of my acquaintance, although the much neater appearance of the varnish more than makes up for the little extra trouble in finishing.

Hard rubber bases for instruments are usually very expensive, but are used in preference to wood, because there is not at all so much current wasted in leakage, on account of its better insulating qualities. A base that has most of the advantages of solid hard rubber and is much less expensive, is shown in Fig. 5. As will be seen, it consists of a wooden base covered with hard rubber, about ⅛ inch thick. The parts of the instrument itself are attached to the hard rubber top, and recesses are made in the wood so that none of the connected parts touch any of it. No leakage, therefore, ensues, and the cost of the base is greatly lowered.

Fig 4A

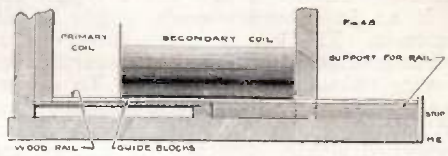


Fig 4B

The range of the point on the mineral of an ordinary galena detector is generally very small, unless the cup be loose upon a metal plate. The latter is, however, undesirable for several reasons. A simple method of increasing the range is shown in the illustration in Fig. 6. The binding-post carrying the screw to which is fitted the fine wire point, is attached to the base in a special manner. The attaching screw is made of such a length that when screwed tightly all the way into the binding-post there is left a certain amount of up and down play to the latter. This play is taken up by a piece of bent spring sheet brass, as illustrated, to which is attached the connection for the regular binding-post. The post can now be rotated without danger of loosening it from the base, as is usually the case. This motion, of course, increases the range of the point on the crystal.

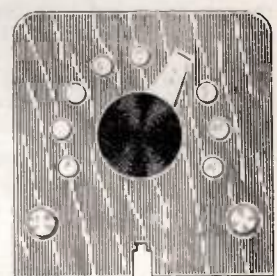


FIG 4C

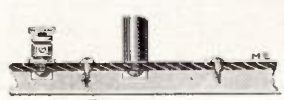


Fig 5

A very good point for galena detectors is made by straightening out the spiral spring on a discarded voltmeter of the d'Arsonval type. It is very elastic, being phosphor-bronze, and therefore holds its adjustment admirably. If desired the end can be cut, with a sharp pair of shears, into a point, increasing the sensitiveness of the detector.


Fig 6

Contributed by

P. MERTZ.

A MAGNETIC OIL BREAK KEY

This key is an improvement upon the oil break key described in the July issue of this magazine, and if the writer's experience with the above-mentioned key was a typical one it is an improvement much sought by all amateurs. The key is an excellent one as far as mechanical operation is concerned, but is very unhandy to manipulate. To obviate this unhandiness all that is necessary, if you have already constructed a key after the above-mentioned article, is to add the magnet and iron armature.

The case is constructed of brass tubing 2½ inches in diameter and 2¾ inches high, and having a bottom soldered in. The hard rubber top is cut to the shape shown, having a lip projecting all around to rest upon the edge of the cup. The iron tube is passed through the hard rubber disc and a hard fibre disc is fixed on the remaining end. The space between the two is wound with No. 22 D. C. C. wire and leads brought out to separate binding posts.

The iron tube has a ring set on the top, and the bottom is forced inward until a passage remains just large enough to accommodate the copper rod, which must pass through easily.

This rod has an iron disc soldered or screwed on its upper end, which serves as the

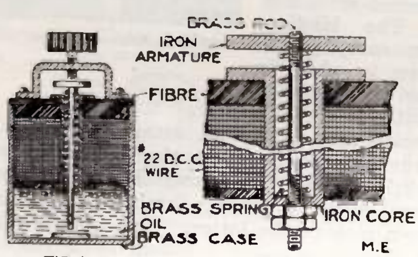


FIG. 1 FIG. 2

armature to be attracted downward by the force of the magnet, thus completing the circuit. A light brass spring is coiled inside the iron cylinder, which forces the plunger upwards after each attraction. To prevent the armature from being forced up too far it is necessary to provide the thumbscrew adjustment shown in Fig. 1 or at B, Fig. 2, where a nut and locknut threaded on the plunger is shown for adjustment. Either may be used. The arrangement shown in Fig. 1 I have used as the basis for a break in system.

In use the magnet coil, Morse key and several dry cells are connected in series, while the copper rod, or plunger, and the brass container are connected in series with the transformer and interrupter as is usual. After a little experiment to get the spring to the right tension and the armature at the best distance it will be impossible to beat the key with the Morse instrument. Its action will be snappy and quick and the amateur only handles the light Morse key. There is also no danger of getting shocked.

Contributed by

PAUL HORTON.

REVERSING RHEOSTAT

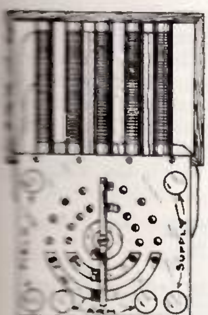
All reversing switches have one common defect, *i. e.*, the reverse current has the same intensity as it had before being reversed. Now this is very injurious to a motor, especially a high speed machine such as a spark gap motor. The simple combination of rheostat and reversing switch shown below eliminates the trouble above noted and at the same time the operation of the switch combines the control of the intensity of the current with its reversal and without the usual manipulation of levers innumerable. Its construction is very simple and is as follows: First obtain the necessary hard wood to construct a frame 6 inches by 8 inches by ¾ inch in size outside dimensions. This is to hold the resistance coils, five in number. The dimensions given above may be varied greatly. The resistance coils are wound upon wooden cores covered with asbestos. The cores should be about ⅜ inch in diameter and just long enough to fit snugly in the frame. They are to be wound full of German silver or other resistance wire spaced 1/32 inch apart and of a size large enough to accommodate the current you wish to use. The size may be obtained from any wire table. The supports are then nailed in place and the coils connected in series. The last coil has two leads, one from the center and is the first coil to be thrown in circuit, or out, as the case may be.

Now to the switch proper. Obtain a sheet of copper large enough to cut out a 1¼-inch disc with a ½-inch hole in the center. This disc is now mounted in the center of the panel which has been prepared beforehand. Next cut out two semi-circular copper pieces having diameters such that they will fit one within the other with a space of ¼ inch between. The dimensions in this case will be, outer strip, outside diameter, 5 inches, width ¼ inch; inside strip, outside diameter 4½ inches and ¼ inch wide. Mount these rings ¼ inch apart and in such a position that their centers, if they were solid circles, will be in the center of the 1¼-inch disc, and fasten them down with small screws or brads and bring out a connection from each to a separate binding post.

The arm should, for efficiency sake, be made from hard fibre, but wood will be a very acceptable substitute if low voltage currents are to be used. This arm is about 5¼ inches long and of any suitable thickness, about ½ inch, and has a ⅛-inch hole bored exactly in the center to accommodate the support or pivot. The contact brushes are made from sheet copper and are bent into an L and may be of any width suitable.

The brush marked 1 is to be connected to brush, 3, through a concealed wire, which may be run under the arm and held in place by a brad or staple. The brush, 2, is connected to the center pivot through a suitable sliding contact. The two remaining brushes are to be simply connected together or made in one piece, as shown in Fig. 1, and then bent.

The contact points are made of binding posts taken from the carbons of worn out dry cells and are mounted head up in the board in such a position as to fill out the cirches partly formed by the copper pieces. The contacts in the inner row are simply connected together and to the binding post indicated in Fig. 2, which is a back view of the panel. The row is connected together best by copper strip. A copper ring may be used instead of the inner row of contacts if desired. The outer set is connected to the resistance coils in the manner shown, connecting seven of the contacts and leaving one unconnected. This is the off position for the arm. The two wires running to the inner of the three discs and to the pivot, Fig. 2, are the only two in which the current is reversed. In the two marked "Field" the current is varied in intensity but not in direction. Thus it is seen that this instrument may be used as a rheostat or as a reversing switch or as



COPPER CONTACT
FIG. 1

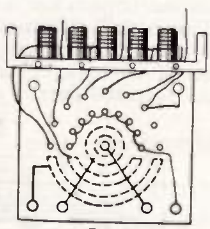


FIG. 2 M.E.

a combination of the two. In operation it is seen that if the arm is revolved in the direction shown by the arrow the current will be intensified at the moment of reversal, and this one may be applied to those simple electrical parlor illusions. If revolved in the opposite direction the current is reduced at reversal and may be gradually brought up to its former intensity.

Contributed by

PAUL HORTON.

LOADING COIL

Here are directions and drawings for making a simple but efficient loading coil. First procure four camera film spools, the longer the better, and two pieces of wood 4" x 4" x ½" thick. Screw these to the film spools and you have your core, which may now be stained and varnished. The film spools may


FILM SPOOLS
M.E. FIG. 1

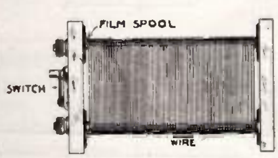


FIG 2

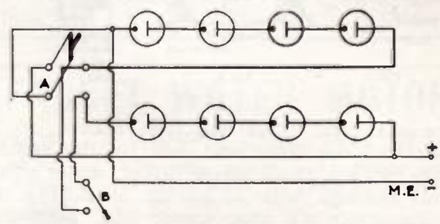
be covered with empire cloth for better insulation if desired. Now wind the core with enough enameled wire to cover it evenly for one layer, and bring out the ends and connect to the binding posts on the top. The windings of wire should be shellacked to keep them firm, and a switch should be mounted on top and shunted across the binding posts. If the switch is closed, the wave length remains the same as with a simple tuning coil, while open, the wave length is increased in proportion to the amount of wire in the loading coil.

Contributed by

H. B. ABBOTT, JR.

BATTERY CONNECTION SCHEME

Herewith find drawing for battery connections. There is, to my thinking, no explanation necessary, except that when switch B is



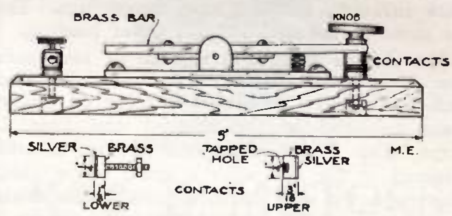
in and A out the cells are connected in series, and when A is in and B out the cells are connected in series multiple.

Contributed by

CHAS. HUPPERT.

WIRELESS KEY

Enclosed find drawings for a wireless telegraph key which has given good results. The base is of walnut, measuring 5½ by 3 by ½ inches. Get an old telephone ringer move-



ment and break off the rod which carries the tapper. Rivet to the armature a piece of brass bar 3 by 5/16 by ⅛ inches. In the end of the bar bore a 3/16-inch hole. The contacts are made by drilling a hole into the end of a ¼-inch brass rod which has been cut down to a length of ⅛ inch. A small piece of silver sheet is fastened to the end of this piece. The hole is tapped 6/32. The other contact is made in the same way, except that the brass piece is 3/16 inch long. It is tapped 8/32. The movement is fastened to the base with screws. The lower contact is fitted with a piece of threaded brass rod and is screwed to the base. If the brass is lacquered and the base shellacked the instrument may be made to look very neat.

Contributed by

MANFORD L. EATON.

BATTERY METER

Enclosed please find description and drawing of a volt-ammeter which would be all right for 30 amperes and 6 volts.

The case is a ring of fairly heavy brass, made so the crystal will go inside. The cover is made with a ring soldered around the edge.

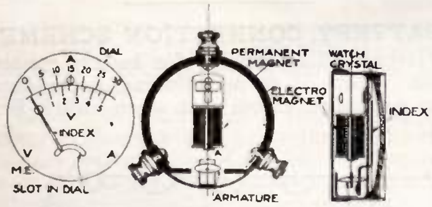


FIG. 3 FIG. 2 FIG. 1

The case and cover are then shoved on a stick and the other end laid on the bench. Then, with a small screw driver, make some dents through both as shown at B, Fig. 1, so the cover will snap on or off. Then the dial is soldered in the case. It is made of brass covered with paper on the upper side, with a slot as shown for the index, which is a piece of copper beaten thin and cut to the right size. It is weighted on one end so it will balance on a knife placed where the axle will come.

The axle is a sewing needle broken at the right length and ground to a sharp point. The index and armature are soldered to the axle. The armature is a piece of tin cut to the shape shown.

The lower bearing is a piece of brass soldered to the case, with a hole drilled not quite through, for the axle to go into. Do the same in the dial for the other bearing.

The electro magnet is a piece of very soft iron or a bundle of regular core wire. The back end of the bobbin is a piece of heavy brass soldered to the magnet and bent L shape, with a slot as shown in Fig. 2, and fastened to the dial with a small screw bolt. The magnet is well insulated and wound with as little as possible of about No. 16 wire, and on top of this is wound as much as possible of about No. 38 or 40 wire. The amount can be ascertained by experiment in each case, and connected as shown; one end of each coil is soldered to the magnet at A, Fig. 2.

A wire ring is put around on the dial, as shown, and the crystal put in, and another ring put on top, and a touch of solder put in several places. The permanent magnet is made of pieces of ⅜-inch clock spring, bent as shown in Fig. 2 and magnetized weakly, so it will not lose much magnetism, thereby varying the reading of the instrument.

The binding posts can be taken from the carbons of old dry batteries.

Contributed by

J. CECIL HEBB.

AT LAST! A DETECTOR OF MERIT

A really good detector is an instrument dear to the heart of every amateur, and one such as is described below fills a long-standing want. This detector is a first class production in every particular, such as proportioning of parts according to their function and, in particular, to the arrangement provided for adjustment. If made according to the dimensions given, the apparatus will possess a rugged appearance pleasing to the eye and forming an improvement to any station.

It will be noticed that the contact point is near the fixed end of the spring and that the adjusting screw is at the outer end. This results in a very much finer adjustment of contact pressure than is possible with the ordinary arrangement.

In general this detector consists of the usual marble base, of which Fig. 2 shows the dimensions, the holes indicated being drilled from the top, to prevent chipping, and counter sunk from the bottom for a depth of ¼ inch with a ¾ inch drill and the necessary brass pieces. The pieces have been numbered for convenience of description, of which the following is the required list:

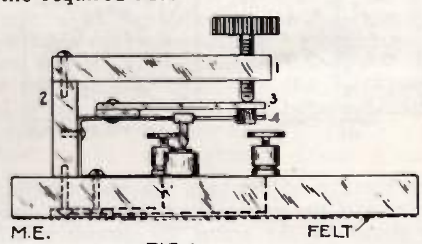


FIG. 1

Piece No. 1, crosspiece, see Fig. 1—
Dimensions.............3¼x⅜x⅜ inches
Piece No. 2, upright, see Fig. 1—
Dimensions.............1⅜x⅜x⅜ inches
Piece No. 3, crosspiece A, see Fig. 3—
Dimensions.............2½x⅜x⅛ inches
Piece No. 4, crosspiece B, see Fig. 3—
Dimensions...........3½x⅜x1/32 inches

Also the requisite number of machine screws are needed, all measuring ⅛ inch in diameter and having a length of ¾ inch. The two holes shown in Piece 1, Fig. 3, are 3/16 inch and ⅛ inch in diameter, respectively. The 3/16 inch hole is threaded for the adjustment screw. The three holes shown in Piece 2 are all threaded. All other holes are smooth. The hard rubber or fibre slider is used to vary the flexibility of the arm, the most rigid form being used for carborundum,

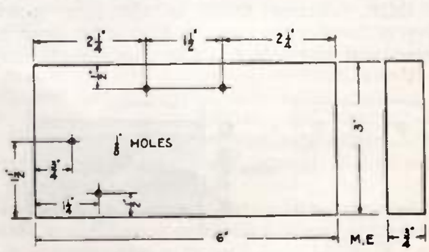
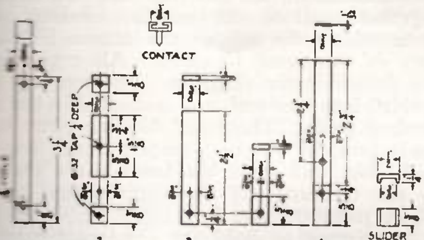


FIG. 2

with the position varying for other minerals in a degree indicated by experience.

For the contact point use a short brass peg fastened to a spring, Fig. 5, in order that it may be moved along the crosspiece, the most delicate adjustment being afforded when the peg is nearest to the upright. The mineral cup is fastened to a post passed through the hole A, Fig. 2, and is slotted so that it may be shifted around with the contact pin. If several pins are provided, each having a point varying in sharpness from a round point to a needle point, a valuable means of adding sensitiveness is obtained.



ALL HOLES 1/8" DIAM UNLESS OTERWISE NOTED
FIG-5 M F

Contributed by

PAUL HORTON.

SECONDARY INDUCTANCE COIL

A great many amateurs that have small spark coils that give only a stringy spark, will find this coil a great help to increase the heat of their spark, without decreasing the spark length. The coil is constructed from a test tube ¾" in diameter and six inches long. This is wound for four inches of its length with number thirty-six double cotton-covered copper wire; this winding is then boiled in pure paraffine or sealing wax. I have a coil as described and find it increases the heat of the spark quite a little. This may also be of use to gas engine tenders who have trouble in getting a hot spark for ignition. I have not used this coil on an induction coil of more than one-half inch spark so I don't know how it will work with a larger coil.

Contributed by

CARL FARRELL.

Note.—Coils of this sort are useful in the secondary leads from the spark coil or transformer to the condenser in preventing kick backs from the condenser circuit into the secondary of the spark coil of a wireless set.—Ed.

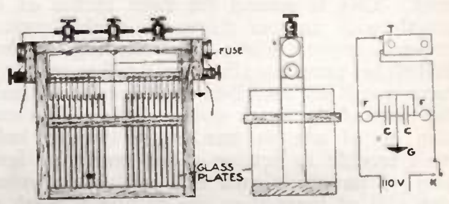
A KICK-BACK CONDENSER

Those who use a transformer of more than ½ kw. output are often troubled by "kick backs" or high voltage surges flowing back from the transformer into the power lines, and which puncture insulation, burn out meters, transformers, etc. Manufacturers will not guarantee their transformers, and in many places lighting companies will not furnish current unless kick-back protective apparatus is installed. In addition this protection is required by the Underwriters. In order to provide for these high potential surges it is only necessary to connect a condenser across the power circuit, the condenser being connected to the ground. In practice two condensers are used, whose middle point is connected to earth, and each condenser is shunted by a spark gap; also a small fuse is connected in each side of the circuit to prevent any accidents, if the condensers should short circuit.

To make a suitable condenser for this purpose it is necessary to obtain 20 glass sheets measuring 5x7 inches, and on each side of each sheet glue a sheet of heavy foil 3x5 inches in dimensions. On each pane bring out a lug to the top and bring the rest out to the side, as is shown in the sketch. The condenser is divided into two sets, having 10 sheets in a set. After mounting in the support connect all the afore-mentioned side lugs together and to the middle binding post mounted on the top of the frame. This in turn is connected to earth. All connections are shown in the diagram. The top lugs are divided into two sets and connected to the end binding posts. These end binding posts have leads brought out to 3-ampere fuses, one on each side, and from the fuses wires are run to the terminals of the transformer, across which the condenser is shunted.

The frame to hold the condenser may be made of any hard wood, and should be polished up and varnished. The pieces needed in constructing it are: One base, 7x5 inches; one top, 7x2 inches; two sides, 10x2 inches, and four supports, each 6x½x½ inches. The supports are slotted to receive the condenser plates, and have each slot lined with tinfoil to facilitate the connection.

In operation an extra high potential surge would jump the gaps. If the power current tries to arc across the gaps the fuses will



blow.

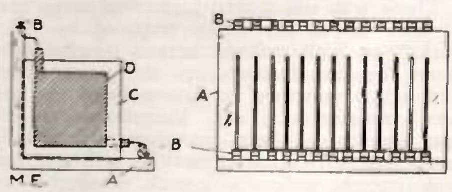
Contributed by

PAUL HORTON.

ADJUSTABLE SENDING CONDENSER

The diagrams are, I think, self-explanatory. However, a few words may help some.

A, is the frame of wood or hard rubber having grooves to hold plates. Any carpenter shop having a circular saw will cut the



grooves accurately. B, are Fahnestock double spring connectors. My reason for using double ones is that in case a plate is removed for repair, the connector does not have to be

Fastened. One spring is used for the plate and the other for the outside connection.

Loops of lamp cord are used to connect the plates together.

If preferred, binding posts may be put on both ends of base and upright.

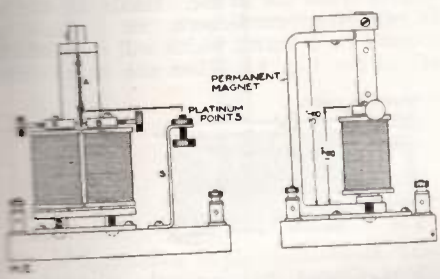
Contributed by

FRANK X. KEILING.

POLARIZED RELAY

As a polarized relay is essential to a great many experiments and is very expensive to purchase I will try to show how one can be easily made.

Procure an old 1,000 or 1,600-ohm ringer such as is used on a party line in the country and is of dimensions somewhat near those in the drawing.



Take it apart and unwind the coils carefully as the wire may be used again. Then cut the cores off and add pole-pieces as shown. They should be about 3/16 of an inch apart and should have holes drilled through for the knurled head screws.

The permanent magnet is turned bottom up and the electro magnet clamped on one pole. A piece of 5/16 square brass is then clamped on the other pole by a screw passing through the hole. The brass rod has a slit cut in it large enough to receive a strip of phosphor bronze ⅜ inch wide.

The armature, A, consists of two strips of very soft iron ⅜ by 1⅜ riveted together with the phosphor bronze strip in between. The armature is hung between the pole pieces and the bronze strip clamped by a screw through the 5/16 square rod. The armature must hang freely between the pole pieces and must not stick to either when it swings from side to side; of course, the points of the knurled brass screws must protrude slightly so as not to allow it to make actual contact.

A small strip of brass is attached to the armature and carries a platinum point that makes contact with the platinum on the support, S.

One of the screws in the pole pieces should be screwed up to prevent the armature from vibrating too much.

Four or six binding posts may be used. One on each terminal of the magnet coils, which will allow them to be connected in series or in parallel, and one each to the upright and the frame.

This relay was wound to 200 ohms and would ring a bell through 3 or 4 thousand ohms with a single dry cell.

Contributed by

EDWARD THINEMAN.

AMALGAMATING ZINC

The difficulty in amalgamating zinc is in rubbing the mercury into the surface. The following method will eliminate such a difficulty.

The surface to be amalgamated is cleaned, and then it is placed in a solution of a soluble mercury salt. Corrosive sublimate is a good salt to use. The salt will be decomposed and the mercury will unite with the zinc.

Contributed by

SPENCER M. GOWDY.

A COMPACT RECEIVING PORTABLE OUTFIT

The core of the tuning coil is square and hollow. On one end is a container for the receiver when not in use. Inside the box are the detector, condensers, etc., which are mounted on a board, which will slide into the coil, as per Fig. 3. When not in use simply

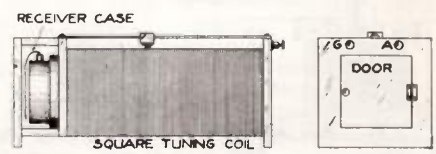


FIG. 1 FIG. 2

push the board containing the detector, etc., in as far as it will go, and close the little door as per Fig. 2. On the inside of the box, at each side two strips are fastened, as shown in Fig. 4, to form slides for the board on which the detector, etc., are mounted. Flexible cord will do to connect the other ap-

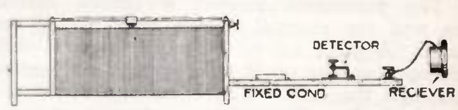


FIG. 3

paratus to the tuning coil. Two binding posts, one for the aerial and the other for the ground, may be mounted on one end of the tuning coil. One, two or three sliders may be provided. Some annunciator wire will do for

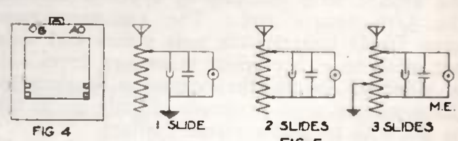


FIG 4 FIG. 5

the aerial. A little improvement will be to put a strap from one end to the other of the tuning coil so it can be carried easy.

The hookups are shown in Fig. 5.

Contributed by

WYLY DEWEY NELSON.

MECHANICAL LAMP FROSTING

The simplest method of frosting an electric light bulb is to hold it on a carborundum wheel, revolving the wheel slowly, and pressing the bulb against the wheel with a pressure equal to about the weight of the bulb. Almost any grade of carborundum wheel will do, but a wheel that is too coarse is liable to break the bulb. The above method may be employed in frosting windows, lamp chimneys, bottles, etc., at practically no cost, and besides it does not come off by handling, rubbing and washing, and fumes cannot affect it any more than glass itself.

Contributed by

WM. H. DETTMAN.

HOW TO MAKE AN IMPROVED MINIATURE DRY CELL

There have been so many makeshift batteries described for use in the receiving circuits and other applications, that I have de-

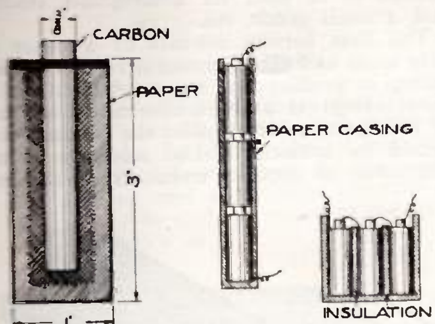


FIG. 1 FIG. 2 M.E.

cided to describe a really meritorious, nearly non-polarizing dry cell. A battery used in conjunction with an electrolytic or other detector has only to supply a constant voltage, the current being practically nothing.

The cell described below is very simple in construction and much cheaper than purchasing. Secure the requisite number of zinc discs 1" in diameter and the same number of zinc sheets measuring 4" by 3". Now roll these sheets about a wooden cylinder, 1" in diameter, and carefully solder the lap together. Remove the zinc cylinder and solder the bottom discs in place. Caution: use a high lead solder and take care to keep the solder on the outside, preventing any from running inside where it would be corroded by the chemicals. Now line the cup with brown paper, leaving about an inch projecting above the top. Place a little of the following mixture on the bottom forming a layer ⅜" thick Paste No. 1.—Plaster-of-Paris 12 parts, ammonium chloride 5 parts, zinc chloride 3 parts, water 22 parts, all by weight. See Fig. 1. Place a ½" wooden rod in the center and fill all around it to within ⅜" of the top of the zinc, with the same paste. After standing a while remove the rod and place the ⅜" carbon in place, filling the remaining space with the following depolarizing compound. Paste No. 2.—Carbon dust 35 parts, manganese dioxide 5 parts, zinc chloride 1 part, ammonium chloride 5 parts, potassium nitrate ½ part, potassium sulphite 1 part, potassium permanganate ½ part, all parts by weight, water to make a stiff paste. After filling in this last mixture fold the projecting paper down about the carbon rod and fill the cell level full with wax or pitch, punching a small hole through the wax to provide for the escape of the disengaged gases. The cells may be mounted in any convenient manner and should be connected up the same as ordinary dry cells. Two methods of mounting are shown in Fig. 2. These cells will give good service in a wireless station, giving a steady voltage of 1½ volts per cell.

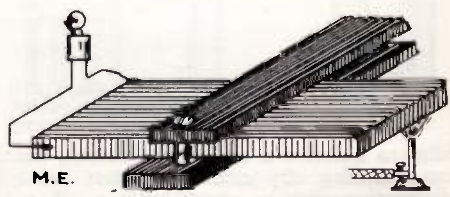
Contributed by

PAUL HORTON.

A HEAT BATTERY

This battery is a very interesting electrical experiment that I think will interest your readers. The experiment is to produce a current from a flame. This current is strong enough to be used for a telegraph, electric bell, a small motor, etc.

The heat battery consists of a series of fifty brass and fifty German silver bars, alternating in position and separated by strips of mica, except at a short interval at one end of each pair, at which point the bars are connected by soldering. The soldering occurs alternately at opposite ends. When the heat



is applied to one end of the series it will cause a current to flow.

Contributed by

GEO. W. CASEY, JR.

ADJUSTABLE SENDING CONDENSER

Here is an original liquid condenser. The capacity is large and variable at will, while the cost is very little.

Prepare a base, 1, and get a metal pan (tin), 3. Solder this to a sheet of tin, 2, about the size of the base. Fasten the tin on with tacks (the soldering is shown at 4 and 5). Then fasten posts of hardwood or better insulating material to base, as shown at 6 and 7. Slot the top of post, 7, and fit on its top a brass piece, 9, with a long machine screw, 10, through it, as shown in Fig. 3. The brass piece, 9, should have a lug on it to hold one end of the spring, 11.

Then get a copper or brass rod (No. 4 or 6 wire), about 2 inches longer than the distance between the posts. Flatten one end and bore a hole through for a screw. Then slip it under the screw, at 7, and fasten the flat end to post, 6, by a small screw driven in loosely. This completes the framework, all but the spring and filing a few notches in the rod, 8. Then select several small white glass bottles, of different sizes. Put a copper wire through the cork of each, and bend the top end of the wire into a hook. Then file small notches, *a*, *b*, *c*, etc., in rod 8, to catch the copper wires, 14. Fasten some form of binding post, 16, to the thin plate on the base, at 17, and another on the rod, at 18. It is convenient to place a screw-eye, at 15, to guide the wire. A spring is placed at 11 to pull the rod up. The fluid is salt water. The pan is nearly filled with the solution and so are

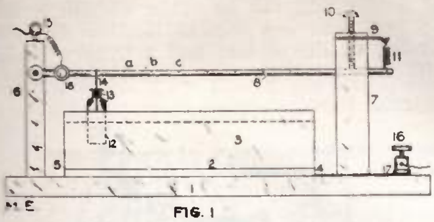


FIG. I

FIG. 2

FIG. 3

the bottles. The corks are then put in and sealed, Fig. 2. The hooks catch in the notches in the rod. To operate: Remove one or more of the bottles till about the right capacity is secured, and then more accurate adjustment may be made by means of the screw, 10.

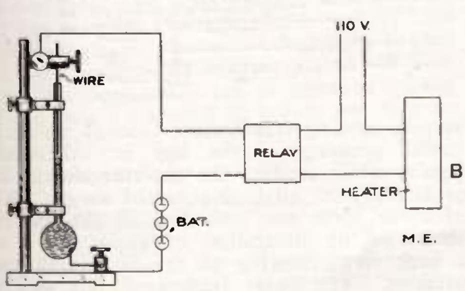
Contributed by

OTIS BARRALL.

AN ELECTRIC HEAT REGULATOR

Having seen nothing of this kind in *Modern Electrics,* I decided to send you this description of an electric heat regulator, the parts of which are: a glass tube, 6" long and ⅛" inside diameter, with a ¾" round globe blown on one end. In this globe is to be sealed a wire. This wire should make contact with the mercury which is contained in the globe and extends about two inches up the tube. Into the top of the tube wire, a, four or five inches long is lowered. This wire must be movable so its height can be regulated.

Put the tube in a frame as per sketch and regulate it as follows: after connecting as per diagram, raise the wire from the mer-



cury and turn on the heater, b. When the desired temperature is reached lower the wire so it barely clears the mercury.

Then when the room grows hotter the mercury will expand, and make contact with the wire, a. This will operate the relay, which has its contacts reversed, which will open the circuit of the heater.

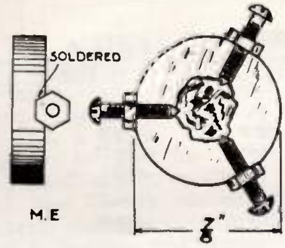
The device is shown connected directly to an electric heater. It may, however, be arranged to operate a motor to open and close the drafts of a hot air furnace or the boiler of the house heating plant.

Contributed by

HAROLD VENARD.

DETECTOR CRYSTAL CLAMP

I enclose herewith sketch of a simple crystal holder that can be made without a drill, tap, etc. The cup may be made of brass according to the sketch, and 3 battery binding nuts are soldered to the sides in the form of



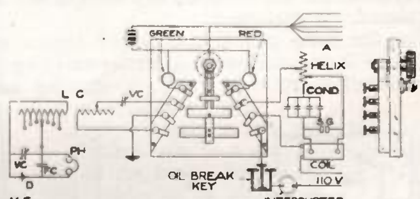
a triangle. Three No. 8-32 x ½" brass machine screws are filed to a point at one end, and screwed in place. Now the crystal may be put in, and is clamped between the three screws. Any crystal as silicon or galena may be used.

Contributed by

PAUL J. HOFFMAN.

AN UP-TO-DATE AERIAL SWITCH

Any aerial switch of any merit at all has three important points to be considered in the construction and operation. It must first of all be simple in construction, having few complicated parts, and after assembling must be easy to manipulate, requiring but a single simple movement to shift all connections. The third point is a matter of connections. It is imperative that the contacts be so arranged that while receiving it is impossible to oper-



ate the sending transformer through an accidental pressing of the key or otherwise. Again, while sending the detector should be protected from all high potential surges. All of these ideas are embodied in the switch shown in the illustration, of which Fig. 1 is a back view, showing all the necessary connections. The novel feature of this switch is in the use of the red and green miniature lamps as indicators of the position of the contact arm, *i. e.* whether the receiving or sending instruments are connected in circuit. When the arm is midway the lamps are both dark.

The panel consists of a square piece of hard wood, or better, a piece of red fibre cut to size shown and polished. The supports to hold it the necessary distance from the wall may be hard wood and are about 3 inches long.

The supports holding the fixed contacts must be of a good insulating substance, as the weakest point of the average station is in the aerial insulation. The dimensions of the contacts and their arrangement upon the fibre piece are indicated in the drawing. It may be added here that the further apart the contacts numbered 1 and 2 are placed, the better, and the constructor may govern himself accordingly.

The arm is made of a fibre strip 3½" long. One end is clamped to a brass rod and is supported at a suitable height from the panel, about ⅛ inch, just enough to prevent rubbing. The end contact is merely screwed on the arm and has no outside connections, but serves only to connect the two side contacts. It is made of heavy copper of the dimensions shown. The other contact piece is made T-shaped, and the end is securely clamped under the head of the pivot. A hard rubber knob is fastened on the remaining end of the pivot and is used to rotate the arm, 1/6 of a revolution being sufficient to shift all connections. If the pilot lamp indicator is not wanted the contacts, A and B, are not needed, thus further simplifying the construction.

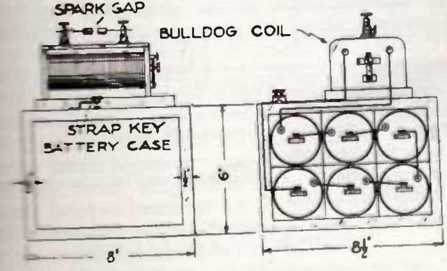
Contributed by

PAUL HORTON.

Note.—If pilot lamps are used the wiring and batteries for same must be insulated from ground very carefully as they are connected to the aerial and the insulation must be able to stand the full voltage impressed upon the latter.—Ed.

PORTABLE SENDING SET

I enclose a drawing of a portable sending set which may interest some of your readers. I have noticed that several portable receiving sets have been described in your magazine, but no sending sets, so I think this may be of some use. The case for the batteries is made of one-half inch wood and having an inside measurement of 7 x 7½ x 5 inches, into which six dry batteries of standard size will fit. One end of the case may be put on hinges so that the batteries may be easily replaced. A one-inch "Bulldog" spark coil is mounted on top of the case (it should be put to one side so as to leave room for the key). A strap key



may be fastened, beside the coil, on top of the case or a key can be made out of a piece of spring brass. The top of the hard rubber binding posts on top of coil should be unscrewed and double hole brass binding posts should be screwed on in their place. Two pieces of brass wire about five inches long and small enough to go through the top holes of the binding posts should be secured and round zinc plugs about ¼ inch in diameter and ½ inch long should be soldered on the wires which should then be placed in the top holes of the binding posts so as to make a spark gap, and connections are made to the aerial and ground at the bottom holes. Next connect up the batteries and key to the primary of the coil as shown in the drawing.

The case may be made larger, if desired, and a glass plate condenser for sending placed in a division in the bottom.

Contributed by

CHARLES KEEVIL.

FUSIBLE ALLOYS FOR DETECTORS

Many amateurs after having ruined many good crystals in attempting to mount them in ordinary solder, have given up this, the most efficient mode of mounting crystals, and reverted back to the use of a set screw, to secure the crystal. Others have used mercury, and this, too, has its drawbacks. The principle of crystal detectors demands that one contact be large in extent and the other a sharp point, and for this reason the minerals are mounted in a metal base. The most desirable of the low melting-point alloys are given in the table below. All that is needed in compounding the alloys is the metals and an iron ladle and, of course, a fire. These alloys melt at temperatures below that of boiling water and their use could not possibly spoil a crystal.

Metal.	Lead.	Tin.	Bismuth.	Cadmium.	Melting point.
Rose's	1	1	2	0	93° C.
Woods' ...	2	1	4	1	60° C.
Newton's .	5	3	8	0	94° C.
Newburg's.	3	2	5	0	91° C.

The lead should be melted first and the other metals added in the order given.

The addition of a small quantity of mercury to any of the above alloys will cause a further reduction of the fusing temperature.

However convenient the above alloys may be, a copper-mercury mixture or amalgam is, in the writer's opinion, the most handy of all.

To make this amalgam it is necessary to reduce the copper to a powder and this may be accomplished in the following manner: Dissolve about 5 oz. of copper sulphate ($CuSO_4$) in about 20 oz. water. Now precipitate the copper by means of zinc, adding zinc until the solution becomes clear. Now wash the precipitated copper by decanting, that is, let the particles settle and pour off the clear liquid. Then pour in some clean water, stir up, let settle and again pour off the liquid. This should be repeated several times. Next remove the copper, dry it and bottle for future use. To use add enough mercury to about a teaspoonful of copper to make a paste which is to be kneaded with the fingers until the metals are thoroughly united. Place in the mineral cup and push the crystal down in it. Next morning, or in 24 hours, the metal will have become as hard as copper itself.

Contributed by

PAUL HORTON.

BOSTON SCHOOL OF TELEGRAPHY

TRAIN YOUNG MEN TO BECOME WIRELESS OPERATORS

20% Discount all students enrolling on or before December 9th, applications must be in on that date, day or evening.

Six Months Course Complete - - - - - - $100.00
Three Months Course Complete for Advanced Students, 50.00

We teach Railroad, Commercial, and Brokerage Telegraphy, day or evening.

Students have access to one of the largest wireless stations in the country.

WRITE OR CALL FOR INFORMATION.

Boston School of Telegraphy

18 Boylston Street, Boston, Mass.

DOES YOUR STATION COMPLY WITH THE NEW LAW?

Is your wave length less than 200 meters? Does your logarithmic decrement exceed two-tenths? Do you know that your wave form meets the requirements? Have you a maximum sending distance with 1 kw. limit?

HALCUN WAVE METER

Will answer the above and satisfy the government inspectors that you are operating within the law. Send stamp at once for descriptive matter.

HALLER-CUNNINGHAM ELECTRIC CO.

428 MARKET STREET, SAN FRANCISCO, CAL.

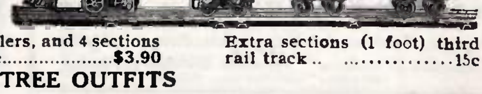
NEW BIG 1913 CATALOGUE JUST OUT

Showing a complete line of **Electrical and Gas Supplies, Wireless Material, Novelties.**

Christmas Tree Outfits, Lionel Trains and Electrical Toys

Mailed upon receipt of ten cents in stamps, for which we will include with the Catalogue 20 Coupons entitling you to our **Free "Wireless Course"** in 20 lessons and **rebate memo covering 10cts. in stamps** which you may use as part payment with your first order of $1.

No 2. **Complete Electric Train Outfit**, consisting of Locomotive Tender, 2 trailers, and set of third rail tracks (2 straight and 4 curved). Will operate on 1 or 2 dry cells. Holiday price, complete by express **$1.85**
No. 3. **Same Outfit with Electric Headlight......2.35**



No. 9. **Larger Locomotive** with headlight larger trailers, and 4 sections straight and 4 sections curved track. Price complete......................**$3.90**

Extra sections (1 foot) third rail track 15c

CHRISTMAS TREE OUTFITS

One half regular price. Quality the best. 8 light battery outfit complete with 3 dry batteries............**$2.35**

FOR 110 VOLT CIRCUIT	ASSORTED FRUIT
8 light.....$2.40 16 light.....$3.90 24 light.....$5.65	8 light.....$3.25 16 light.....$6.30 24 light.....$8.50

Extra lamps supplied with each eight lamps.

Western Agents for Electro Importing Co. on Wireless Goods. Same Catalogue. Same Prices

ANDERSON LIGHT & SPECIALTY CO., Chicago, Ill.

134-6 No. La Salle St. Dept. C Opposite City Hall

Advice on Patents

ANOTHER RAT TRAP

(85.) Mr. Abner B. Shaw, Massachusetts, sends in a new device on an electric rat trap, but at the same time he admits himself in his letter that he does not think there is much demand for an electric rat trap.

A.—The design shown, while it does away with the carcass of the rat, electrocutes the rat at the top of the device, which certainly leaves enough odor behind to scare away any mouse or rat coming afterwards. In this respect it acts the same as all the foregoing traps described in this department; like they this one also is a failure.

SPRING BINDING POST

(86.) Mr. C. M. Frykman, Minnesota, has sent in a sample of a spring binding post, also description of same. He wishes to know if a patent can be obtained on same.

A.—The idea is not bad and the post does not present an ugly unfinished appearance, especially if it can be nickel plated and polished. We are also sure that a patent can be obtained on this device and while such a post will probably find some use on some instruments it cannot be used generally, as the spring would surely break a fine wire if attempt was made to connect, say, a No. 30 wire with this post. Also, it seems to us that no heavier wire than No. 16 could be used. However, for all around use this post will probably find a certain market.

"ELECTRIC BANK TRAP"

(87.) Mr. Denis T. Murphy, Massachusetts, sends in a design of an apparatus which he terms an "electric bank trap." He says that he conceived this apparatus after he read about banks being robbed, and the idea in short is to trap a burglar by means of electricity, similar to an electric rat trap. Of course, the burglar does not get electrocuted, but is simply held till the police comes.

A.—The idea, while fantastic, is not as bad as it looks at the first moment; of course, we do not venture to say how many banks would make use of such a device, but the chances are that some might adopt the idea and be glad for having it.

We believe a patent might be obtained on this device.

COPIES OF PATENTS

(88.) Mr. Wm. Hoffman, Illinois, wishes to know how he can get copies of existing patents. He also wishes to know whether it is necessary to have a lawyer make a search and whether it is necessary to first find out how many patents were obtained upon the article desired and cost for the copies of the patents, etc. Our correspondent writes that he wishes to get copies of all patents that have been issued on certain kinds of machinery.

A.—This is a daily request and we print it for the benefit of our readers.

When the inventor has worked out a new device it usually pays to spend a little money, which usually does not amount to over $10, and write to some reputable Washington attorney to make a search for patentability of the device. The patent attorney will then usually forward to the applicant all the copies of patents bearing upon the invention that have already appeared; and anything that comes near the applicant's invention will be sent to him. In this case the applicant can satisfy himself as to what has been covered in the same art before and whether his invention is original enough, and has sufficient novel points to make a new patent possible. Most inventors, after seeing the reference patents, will have no trouble to decide for themselves whether they can obtain a patent or not.

REVISION OF WIRELESS CALLS

(*Continued from page* 1056)

of radio communication, technical and training school stations, and special amateur stations will be allotted by the Bureau of Navigation.

The call will consist of three items, the number of the radio district, followed by two letters of the alphabet. The first letter will be:

X for experiment stations;
Y technical and training schools;
Z special amateur stations.

Twenty-six different combinations for each class in each district, of course, are possible. If more should prove necessary for any class in any district, a third letter will be added to the call.

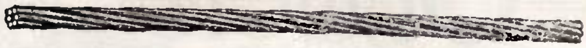
Benj. S. Cable,
Acting Secretary.

OCEAN WIRELESS LETTER

The Telefunken Wireless Telegraph Co. has instituted an ocean wireless letter service similar to the night letter and day letter service of our telegraph lines. The operation is as follows: A traveler on an outward bound vessel writes his wireless letter of thirty words or more which is transmitted by wireless to the nearest homeward bound German vessel, where it is reduced to writing, placed in an envelope, and mailed when the vessel first reaches port. The service was first tried on the steamers of the Hamburg-American Line from Hamburg to South America. The charge is $1.19 for the first thirty words and 2½c. for each additional word, plus 12c. for postage, and conveyance.

NEWS

Phosphor Bronze Aerial Wires



This is the wire for you to get. It solves your most difficult aerial problems. If you wish to see your aerial "stay put," use our cable, and your troubles are over. Our 2509 wire measure .077 in. diameter, and the weight is 1½ pounds per hundred feet.

The No. 2510 wire measures .060 in. diameter, weight per hundred feet is 14 ounces.

The No. 2509 has seven strands No. 22 B. & S. wire, while the No. 2510 has 4 strands No. 22 B. & S. wire.

We are introducing the smaller size for general amateur stations on account of its cheapness. See our Cat. No. 11 for further description.

No. 2510 4 stranded cable per hundred feet—**45c.**; thousand feet lots—**$4.00.**
No. 2509 7 stranded cable per hundred feet—**75c**; thousand feet lots—**$7.00.**

"Electro" Adjustable High Tension Condensers

The latest advance in sending condensers. Now that the wireless law has been passed, you must have an accurate adjustable condenser. Ours has been proved superior in exhaustive tests. The arrangement is such that either one or more plates can be put in circuit, and the capacity can be varied through the widest range.

No. 530 has 9 metal plates and 10 glass plates, size 8 x 10, capacity is .009 M. F.

No. 531 has 19 metal plates and 20 glass plates, 8 x 10 inches, capacity is .0203 M. F.

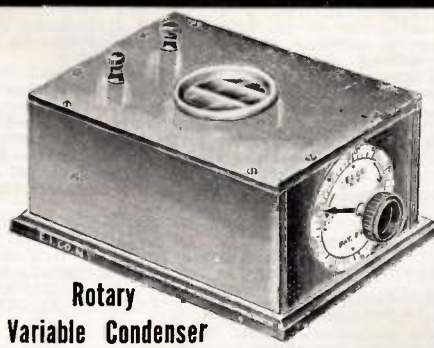
No. 530 is used with coils from 2 in. up to 10 in. or ½ K.W. transformer coil.

No. 531 is used with ½ K.W. up to 2 K.W. transformers.

See our Cat. No. 11 for further description.

No. 530 Adjustable Condenser.............. **$5.00**
No. 531 " " **$6.50**

Rotary Variable Condenser



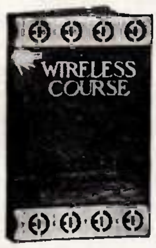
This rotary variable condenser has the highest capacity of any variable condenser on the market. If you pay more money for a variable condenser you are getting robbed. You must have seen this variable condenser in operation to appreciate its wonderful working. **Capacity is .01 M. F. We will refund money if any of our statements on this variable condenser are not correct.**

See our Cat. No. 11 for full description.

No. 3509 Variable Condenser................ **$4.00**

Patented July 23, 1912.

Do Not Be Hoodwinked!



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? ? Do You Build A Coil ? ?

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SAMPLE SPOOL

The most important sale on enameled wire ever held. This wire is manufactured by the Western Electric Company, and we have secured so much of it at a special price, that we must let you in at special prices, in order to dispose of the enormous quantity we have on hand. **All the wire is absolutely new, unused, and guaranteed. Your money back, if you do not like the wire in any respect.** It comes on one and two pound spools. **This wire is just the thing for wireless coils, etc.** You will never get such bargains on enameled wire as these. You save positively 300% on your enameled wire.

No. 34 B. & S. enameled wire per pound **70c.;** Regular Price $1.73
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233 FULTON Street, New York City. Retail store 69 W. B'way, N. Y.

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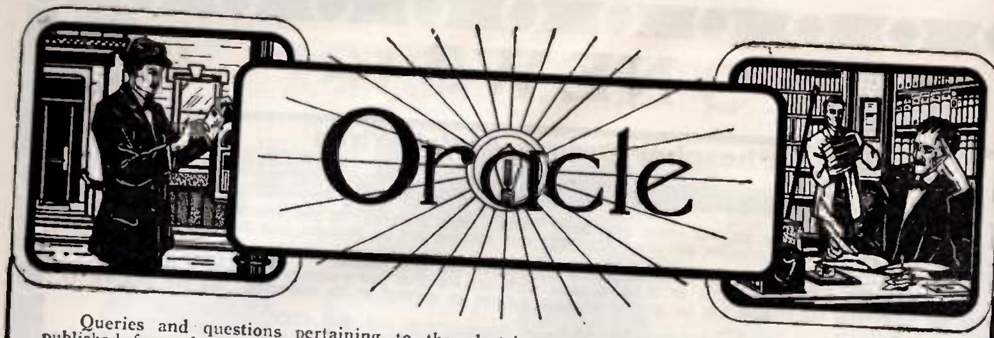


Queries and questions pertaining to the electrical arts, addressed to this department, will be published free of charge. Only answers to inquiries of general interest will be published here for the benefit of all readers.

On account of the large amount of inquiries received, it may not be possible to print all the answers in any one issue, as each has to take its turn. Correspondents should bear this in mind when writing.

Common questions will be answered by mail if 10 cents to cover expenses have been enclosed for each question. This class of correspondence has grown to such proportions that we can no longer answer questions by mail free of charge.

Owing to the additional labor required in the gradual advance of the date of publication of this magazine, there will be more or less delay necessary in answering questions and we therefore cannot undertake to furnish quick replies, for the next few months at least.

Special information requiring a large amount of calculation and labor cannot be furnished without remuneration. THE ORACLE has no fixed rate for such work, but will inform the correspondent promptly as to the charges involved.

NAME AND ADDRESS MUST ALWAYS BE GIVEN IN ALL LETTERS. WHEN WRITING ONLY ONE SIDE OF QUESTION SHEET MUST BE USED; DIAGRAMS AND DRAWINGS MUST INVARIABLY BE ON A SEPARATE SHEET. NOT MORE THAN THREE QUESTIONS MUST BE ASKED, NOR SHALL THE ORACLE ANSWER MORE THAN THIS NUMBER. NO ATTENTION PAID TO LETTERS NOT OBSERVING ABOVE RULES.

WE CANNOT ANSWER QUESTIONS REGARDING SENDING AND RECEIVING RANGES.

LICENSE FOR RECEIVING STATION

(2255.) Norman Gould, Nebraska, writes:

Q.—In the November issue of the *Marconigraph* and the December issue of *Popular Electricity* it is stated that a license is necessary for a receiving station, if you receive messages from another state or from beyond your state. In the article on the Wireless Amateur and the Wireless Law in your December issue you state that a license is not necessary for a receiving station not equipped for sending. Which is right?

A.—You *do not* require a license for a station, which is equipped for receiving only, and it makes no difference whether you receive from your own state or from anywhere else. This is specifically stated in the regulations issued under date of September 28th, 1912, by the Department of Commerce and Labor.

TWO OR MORE ELECTROLYTIC INTERRUPTERS IN SERIES

(2256.) Edward L. Werden, New York, writes:

Q. 1.—It is advertised that two electrolytic interrupters connected in series will give twice as good results as one. If this is true, will six or eight interrupters connected in series give a six- or eight-inch spark when connected with a one-inch coil? If not, why not?

A. 1.—In a few instances it has been found that connecting two electrolytic interrupters in series, an increase of spark length was obtained, but ordinarily two interrupters so connected will not work at all.

Q. 2.—What is the greatest number of interrupters that may be used with a one-inch coil?

A. 2.—One.

ALLOY FOR MOUNTING DETECTOR CRYSTALS

(2257.) Maurice Clark, Missouri, asks:

Q. 1.—Where can I get the soft metal used in holding minerals in detector cups?

A. 1.—Any wireless supply house can furnish it. It may also be purchased from Eimer & Amend, 205 Third Ave., New York, N. Y.

Q. 2.—Does perikon take a heavy or light adjustment?

A. 2.—For strong signals from nearby stations the contact pressure should be heavy to avoid burning out the sensitive point, while for weak signals from long distances the adjustment should be very light, in order to gain sensitiveness.

DOES NOT COMPLY WITH WIRELESS LAW

(2258.) C. J. Sedlak, New Jersey, writes:

Q.—Below find a description of my apparatus and please tell me whether I am within the limits of the law? Electro 1-inch coil worked on 6 volts 12 amperes batteries, or 110 A. C. with Gernback interrupter; condenser 16 plates of glass 1/16 inch thick 8 x 5 inches, tinfoil on both sides, 3 x 5 inches; helix 9 inches in diameter, 10 inches high, No. 9 wire 1 inch apart, 10 turns. Aerial from instruments (25 feet high) to end 75 feet, 4-wire, inverted L type. Ground wire No. 4, 8 feet long.

A.—No. You cannot get a pure or sharply tuned wave from this set. See article on the

SENDING AND RECEIVING WIRELESS OUTFITS

COMPLETE — PORTABLE

IDEAL SETS AT A PRICE YOU CAN AFFORD TO PAY

Mounted on solid oak base, size 7 x 12

No. 796—$5 Value $3.90

Sends ½ to 1 Mile—Receives up to 500 Miles

This new, up-to-date, guaranteed, portable set, consisting of one ¼-inch spark coil, equal to the average ⅜-inch coil, and high tension vibrator, 1 combination universal detector; one 75-ohm, nickeled case, exceptionally sensitive telephone receiver and cord; 1 large high efficient flat plate secondary condenser; 1 sending key; 1 condenser switch; 1 spark gap with lathe turned ⅜-inch zinc spark ends; 1 tuner 4½ x 2 inches, latest type, wound with bare copper wire; 1 special primary condenser; 1-inch wollaston wire; 1 double throw double pole aerial switch; 120 feet aluminum aerial wire; 2 insulators, complete directions. The raw material alone would cost you this amount were you to build the set yourself. *Operates on two batteries*..........................Price............**$3.90**

No. 798—Same as above, with ½-inch coil. Sending radius 1 to 2 miles. Price............**$5.00**

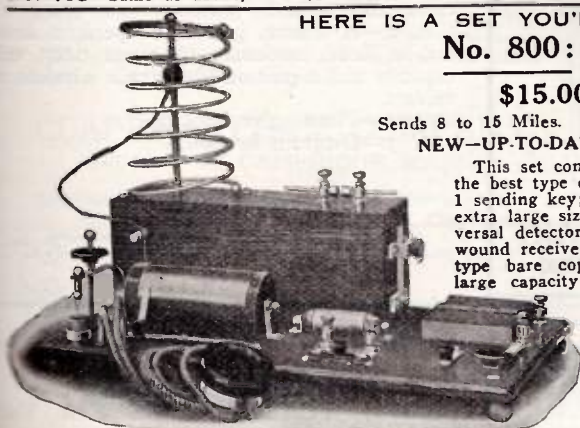
HERE IS A SET YOU'LL BE PROUD TO OWN

No. 800: $8.95

$15.00 Value

Sends 8 to 15 Miles. Receives 600 to 800 Miles

NEW—UP-TO-DATE—GUARANTEED



This set consists of a guaranteed 1-inch spark coil, the best type ever placed on the market for wireless; 1 sending key; special flat plate secondary condenser, extra large size; primary condenser; combination universal detector; very fine 1000 ohm, silk copper wire wound receiver and flexible receiver cord; the newest type bare copper wire wound tuner, exceptionally large capacity; spark gap with lathe turned 3.8-in. zinc ends; 1 condenser switch; 120 feet aluminum aerial wire; double pole; double throw switch; 2 insulators; 1-inch Wollaston wire; proper capacity sending helix; 8 to 15 miles sending. 600 to 800 miles receiving. Regular $15.00 Value. *Operates on 6 batteries.* Price complete........**$8.95**

Mounted on solid oak base, size 8½ x 16 inches.
Equipped with 2,000 ohm Receivers and Headbands........**$12.25**

For the Beginner

No. 797 Mounted on Solid Oak Base .... $2.50 VALUE......... Receives up to 500 Miles **$1.95**

This consists of a combination universal detector; 75 ohm nickeled case, exceptionally sensitive receiver and telephone cord; tuner 4½ x 2-inch latest type, wound with bare copper wire; 1-inch Wollaston wire; 2 insulators; 65 feet aluminum aerial wire. **Price**......................**$1.95**

Equipped with two receivers, 150 ohm, headband and cord **$3.80**

Equipped with 1,000 ohm 'phone................**$3.05**

By Mail 32c Extra

WIRELESS SPARK COILS

We give a greater value in spark coils than any other firm in America. Our coils are larger than other coils of the same quoted spark length as we put more working material inside of them. Our vibrator platinum points are PLATINUM AND WON'T STICK by welding together as alloy points are bound to do. We guarantee the spark lengths given below and you can have your money back if they don't come up to the values promised. These coils are put up in hard wood cases finished in an elastic varnish and then rubbed down to a dead finish making the handsomest coil on the market.

No. 200	¼ in. coil	**$2.00**
No. 201a	⅜ " "	**3.00**
No. 201b	½ " "	**3.30**
No. 201c	¾ " "	**3.65**
No. 202	1 " "	**3.95**
No. 203	1½ " "	**5.50**
No. 204	2 " "	**7.75**
No. 205	3 " "	**15.50**
No. 206	4 " "	**25.00**
No. 207	6 " "	**50.00**
No. 208	8 " "	**75.00**
No. 209	10 " "	**100.00**

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Wireless Amateur and the Wireless Law beginning in the December number.

THREE SLIDE TUNER

(2259.) R. I. Taylor, Canada, inquires:

Q. 1.—I desire to build a three-slide tuner. Will you please give me the formula for finding the amount of wire used in feet? (Size of tuner is 8 inches diameter, 15 inches long.)

A. 1.—The length of the wire in feet is equal to

$$\frac{\pi\ d \times n \times l}{12}$$

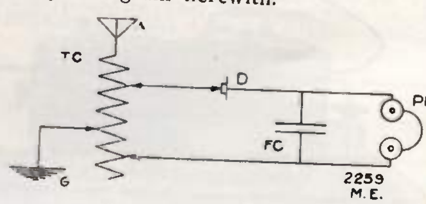
Where d is the diameter in inches, n is the number of turns per inch of winding space and l equals the length of the winding space. $\pi = 3.1416$. The number of turns per inch may be obtained from any wire table.

Q. 2.—What other instruments with this tuner would I need for a receiving set to receive 2,000 miles?

A. 2.—A silicon, galena, or perikon detector, a fixed condenser of about 0.003 mfd. capacity and a pair of high grade wireless receivers.

Q. 3.—Please give hook-up?

A. 3.—Diagram herewith.



SIZE OF LEAD-IN

(2260.) Ferdinand Thiede, New York, says:

Q. 1.—According to the Fire Underwriters is it necessary to have the aerial lead-in of number 4 wire or just the outside ground?

A. 1.—This refers only to the outside ground.

Q. 2.—I have a four-wire aerial 45 feet high at one end and 25 feet at the other. If I made it an eight wire of the same size would it be better? The aerial is 60 feet long.

A. 2.—Yes, it would be better, if the distance between wires is the same as at present, but if you place eight wires on the same spreaders you are now using, the results will not be so good.

Q. 3.—Do you think it is possible to receive from Cape Cod with the above aerial and the following instruments? Loading coil, double slide tuner, galena detector, fixed condenser, variable condenser and a pair of 2,000 ohm Mesco phones. If not, what could I do to better my set?

A. 3.—Yes.

SMALL DYNAMO

(2261.) Arthur C. Beals, Indiana, writes:

Q. 1.—I have a small dynamo, the field is all right. I made the brushes myself of brass strip. I failed to detect any current when the armature (16 segments) was revolved swiftly. Is the fault with the brushes or the armature?

Blitzen Receiving Transformer.

NEW! NEW! NEW!

Under the new Federal Radio Regulation Act your transmitter must give a pure, sharp wave not over 200 meters in length. The *NEW* Clapp-Eastham Hot Wire Meter is the finest instrument we have seen for tuning the transmitter. Price, 5 Amp., $10.00; 10 Amp., $11.00; 15 Amp., $12.00. The *NEW* Clapp-Eastham Wave Meter to be used with your own detector and phones will tell you your own wave length and the wave length of all other stations within range of your instruments. Price, $8.00.

The Blitzen Receiving Transformer will give you the sharpest tuning and the greatest receiving range, and is particularly designed for operation on pure, sharp waves. Price, $15.00. 4c. stamps brings complete catalog of up to the minute apparatus and places you on our mailing list. Your subsequent order brings the kind of service and apparatus that makes dealing with us a mutual pleasure.

Precision Hot Wire Meter.

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HIGHEST GRADES OF

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Used on all Insulators, Bases for Detector Stands, Etc., Handles, Keys and Switch Bases, Buttons, Receivers for Head Bands, Bushings.

THE SIEMON HARD RUBBER CORP.

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SPECIAL HOLIDAY OFFER

You can get our regular $2.50 **COMET SHAVING SET** for **$1.00** by sending us the attached coupon.

The vital part of any razor is the cutting edge. Through a new process of tempering and grinding, our blades are now so near perfection that it is impossible to conceive of a keener or more lasting cutting edge.

COMET SAFETY RAZOR CO.
258 Broadway, New York
Enclosed find $1.00 for which send me prepaid one Comet Shaving Set.
Name..........................
Address..........................
City..................State.........

The COMET SHAVING SET consists of
Comet Safety Razor,
Six guaranteed blades,
Stropper for blades,
Williams' shaving stick
Shaving brush,
each article heavily nickel plated.

A. 1.—The brushes may not be properly set or there may be something wrong with the armature, or perhaps the field magnet did not retain sufficient magnetism to enable the machine to build up its voltage when driven at this rate of speed.

Q. 2.—How can I test the armature windings of the above dynamo?

A. 2.—Connect the field winding to a battery and revolve the armature at its rated speed, then move the brushes around the commutator by means of the rocker arm until the maximum voltage is generated by the armature. If on the other hand you do not get any voltage under these conditions there is something wrong with the armature and it will have to be rewound.

Q. 3.—The castings of the above dynamo are not magnetized. Is it necessary that they should be?

A. 3.—The field castings do not have to be strongly magnetized when the machine is idle, but they should retain sufficient magnetism to enable the machine to build up its voltage when properly driven and the armature and field winding should be so connected together that the current generated by the armature tends to increase the magnetism left in the field magnets. If the connections are reversed the current generated by the armature will kill the magnetism remaining in the field and the machine will not build up.

VACUUM PUMP

(2262.) Leslie Emrick, Ohio, writes:

Q.—While reading through your answer to No. 2233 in the December issue concerning the passage of heat through a vacuum I became much interested therein. You state that no mechanical device has yet been perfected that will extract the last particle of gas from a vessel. I fully understand the imperfections of pumps for that purpose. However, is not the Torricellian vacuum at the top of the mercurial barometer an absolute vacuum? Of course, it does not extract the gas, for there was none there to extract, but simply removes the mercury and does not let any gas get in. Is this not true?

A.—The Torricellian vacuum is not a true vacuum as the space above the mercury in the tube is filled by mercury vapor due to the evaporation of a very small amount of mercury when the mercury drops down in the tube. Were it not for the presence of this mercury vapor a perfect vacuum could be obtained by this means.

RHEOSTAT. ELECTROLYTIC INTERRUPTER

(2263.) James Lupton, New York, asks:

Q. 1.—Has the circular potentiometer in the May, 1912, issue of *Modern Electrics* enough resistance to bring down a 110 volt A. C. line to 9 volts, or the required number to run a 1-inch coil?

A. 1.—Probably it could be used for short periods, but it will heat up on the 110 volt current and may set fire to the wooden block in which the resistance material is embedded.

Q. 2.—Will you kindly give a definite amount of acid to use in the electric lamp electrolytic interrupter described in the July, 1912, issue of *Modern Electrics?*

A. 2.—We have no data on the amount of acid to be used in this interrupter and it will have to be found by experiment as noted in the article mentioned.

WIRELESS TELEPHONE. RECEIVER RESISTANCE

(2264.) Frank Ferrin, Wisconsin, wants to know:

Q. 1.—What are the necessary instruments for receiving in wireless telephony?

A. 1.—The ordinary wireless telegraph receiving set works very well.

Q. 2.—Are there any such stations in range of Milwaukee?

A. 2.—None that we know of.

Q. 3.—I have a 75 ohm receiver on a telephone line and a 1000 ohm phone for my wireless. Why is it that I can hear Milwaukee louder with the 75 ohm phones?

A. 3.—Your 1000 ohm phone must be a very poor one. Possibly it is wound with German silver wire instead of copper.

GALENA. LOOSE COUPLER WINDINGS

(2265.) Syle Scott, Minnesota, would like to know:

Q. 1.—Where can the sensitive galena crystals be purchased? I have read in a back issue that such crystals can be had at the mines near Galena, Illinois. Who could I write to at this city to obtain the minerals?

A. 1.—Almost any wireless supply house could furnish you galena. If you attempted to get it at the mines you might have to sort over a ton of mineral to get a good piece.

Q. 2.—What size wire is best for the secondary of a loose coupler, and why do some firms put No. 32 or 36 on their loose couplers? Theoretically, fine wire is best, then why is No. 28 used on the majority of makes? Would it improve a loose coupler's working to change from No. 28 to No. 36 on the secondary?

A. 2.—This is largely a matter of preference. Where the loose coupler is to be used for long wave lengths the fine wire is better, but where ordinary or short wave lengths are concerned the coarser wire is better.

Q. 3.—Please give data for a 200 metre helix used with the following: One kw. transformer, 18,000 volts; rotary spark gap; condenser, 16 grape juice bottles, foil 7½ inch high outside, salt water inside; aerial 60 feet high, 70 feet long, 4 copper wires, 2½ feet apart, inverted "L" type. Aerial is 60 feet high at one end, 30 feet at other.

A. 3.—Spark sets employing a helix do not conform to the new wireless law and we will not furnish data on the construction of helices. Make up an oscillation transformer as shown in the supplement to the June issue of *Modern Electrics.*

HOUSE WIRING FOR AERIAL

(2266.) G. Wilson Rood, Massachusetts, writes:

Q.—My house is wired for electric lights,

but we do not use them. Shouldn't this wiring make a good aerial? I have tried it, but it does not work. My instruments are double slide tuner, condenser, silicon detector and 1000 ohm phone. These instruments work well with my regular aerial, but with the wiring as an aerial all that I can hear is a very loud buzzing sound. Please explain?

A.—The house wiring may be grounded or may be run in conduit, either of which would prevent you from hearing anything when the receiving set is connected to it. The buzzing noise is due either to leakage or induction from power supply wires.

BREAK-IN SYSTEM

(2267.) R. Woodward, New Jersey, asks:

Q. 1.—Kindly give me a diagram of a break-in system using the following instruments: Sending: Coil, key, gap, condenser batteries. Receiving: Tuning coil, condenser, perikon detector, receivers and aerial switch.

A. 1.—See page 261 of the June issue of *Modern Electrics*. Aerial switches are unnecessary when break-in systems are used.

Q. 2.—Please tell me what is the best number wire to connect up a 1 kw. set?

A. 2.—Copper or brass ribbon ½ inch to 1 inch wide and 1/32 inch thick.

Q. 3.—What amperage does your ½ kw. transformer coil take on a 6 volt storage battery?

A. 3.—We do not manufacture wireless apparatus of any kind.

POULSEN SYSTEM

(2268.) C. E. Watkins, Kentucky, asks:

Q. 1.—Can you use an ordinary arc lamp run on 220 volts D. C. as an arc for sending in the Poulsen system; if not, what kind of an arc can be used?

A. 1.—An ordinary arc can not be used with any success for wireless telegraphy or telephony for the reason that it is almost impossible to maintain the arc in a steady burning condition. The only arc device which has been proven practicable up to the present is some such an arrangement as the Poulsen arc.

Q. 2.—What is the use of the magnetic coils in this system and how can I make them?

A. 2.—The electro magnets are used to quench the arc or, in other words, to blow it out. These magnets are simply made up with laminated cores either made of sheet iron or iron wire and wound with insulated wire, the gauge and the number of turns of which depends on the amount of power to be used in the arc.

Q. 3.—Will you give me a diagram of the wiring of this system for both sending and receiving and what is needed?

A. 3.—See article on the Poulsen system on page 21 of the April, 1912, issue of *Modern Electrics*.

GROUND PLATES

(2269.) Chauncie C. Maher, Illinois, wants to know:

Q. 1.—What size storage battery would a 7 volt dynamo charge and how long should the dynamo be connected to batteries?

A. 1.—This depends upon the size of the dynamo.

Q. 2.—Would a galvanized tin plate covering 50 square feet of surface on one side be sufficient ground for the following receiving instruments, to receive at least 200 miles: Double slide tuner, two variable condensers, one fixed condenser, two 1000 ohm receivers, silicon detector, and aerial of six wires 80 feet long and 60 feet high?

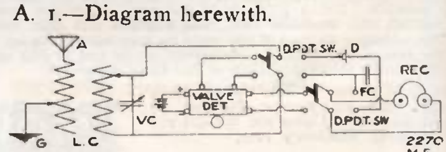
A. 2.—Yes. This ground plate should give fairly good service, but better results would be obtained if the plates were divided into from five to ten equal plates, buried some distance apart from each other, and each plate connected to the station ground lead by a suitable copper wire or cable.

WALLACE VALVE DETECTOR

(2270.) R. L. Hart, 2d, Pennsylvania. would like to know:

Q. 1.—How should a pole changing or other switch be inserted in my receiving circuit so that either the perikon or a Wallace valve detector may be used without changing the fixed connection of the latter?

A. 1.—Diagram herewith.



Q. 2.—Give diagram of Wallace valve detector?

A. 2.—The exact scheme of connections used in this detector is not available to the public, as the manufacturers do not care to give out this information. However, the valve is simply an audion, and we understand the wiring differs but slightly from that shown in answer to No. 2100 of the Oracle in the August, 1912, issue of *Modern Electrics.*

Q. 3.—Give dimensions of choke coil for ½-¾ kw. transformer?

A. 3.—The dimensions of the choke coil depend upon the dimensions and winding of the particular transformer you are using and cannot be determined off hand and used with any old transformer.

WIRELESS WITHOUT AERIAL

(2271.) Francis Murphy, Massachusetts, asks:

Q.—Please tell me whether or not I can receive wireless messages without an aerial, and if I can, what instruments must I use?

A.—It is possible to receive wireless messages without an earial, but the results are poor. The editor of this column has received messages from nearby commercial stations by means of an ordinary loose coupled receiving set connected to the ground wire, but having the aerial disconnected. However, these were 2 kw. sets within five miles of the receiving station, and the results even at that were not satisfactory. It has been reported from Paris that a French engineer has developed a system for receiving wireless messages without either an aerial or ground connection. Details of this system are kept secret for the present and are not available for the public.

WIRELESS ABBREVIATIONS

(2272.) Edward Roesken, New Jersey, writes:

Q. 1.—What do the following signals mean? DE, generally used before a station signs its call?

A. 1.—This is a signal which is supposed to be used at all times by a calling station, and stands for the word "From."

Q. 2.—RD, used in O. K.'ing a message?

A. 2.—Received.

Q. 3.—4, used a great deal by stations in New York? The letter I is often an answer to it, and sometimes No is used as an answer?

A. 3.—This signal is used by a station which wishes to call another, but whose operator wishes to know beforehand whether he will be interfering with the reception of messages of other stations. If other stations in the vicinity are not receiving at the time their operators signify the fact by saying "I" or "Yes," after which the station that desires to call goes ahead with his business. If, on the other hand, these stations are receiving messages they do not want interrupted, their operators answer "No" or "min pse," meaning "Minute, please."

TUNER ADJUSTMENT. WAVE LENGTH CAPACITY

(2273.) Alexander S. Butler, Colorado, asks:

Q. 1.—When a receiving station is receiving from a transmitting set a given distance away the sliders on the tuning coil or the receiving end are moved to a certain position where the signals come in the loudest, thereby increasing or decreasing the wave length. The station is now said to be in tune with the other. Now, the wave length of the receiving apparatus is of a certain value. Does this correspond exactly with the wave length of the sending set? If so, would the position of the said sliders, or the wave length, remain the same if the same identical transmitting apparatus using the same wave lengths as before were moved a much greater distance away?

A. 1.—Yes. The adjustment of the apparatus would be the same whether the station were nearby or far away, provided the wave length were exactly the same in either case.

Q. 2.—What is the maximum and minimum wave length of my station if the aerial is composed of four strands 165 feet in length? The top is elevated 80 feet, while the lower extremity is 15. The wire is so arranged that, beginning at the bottom, it is continuous, ending again at the lower end. The lead-in is taken from these two ends. A small Murdock variable condenser shunted around the primary of a Clapp-Eastham tuning transformer makes up my tuning apparatus.

A. 2.—The natural wave length of your aerial is 440 metres, and this is the minimum to which you can tune unless you use a variable condenser in series with the aerial and the primary circuit of your tuner. We do not know the maximum wave length you may be able to tune to with your apparatus, but it would probably be from 2000 to 2500 metres.

Q. 3.—What special instruments are needed in order to receive from a Poulsen station located 28 miles distant?

THE GREATEST WIRELESS
BOOK VALUES EVER OFFERED

HOW TO MAKE WIRELESS INSTRUMENTS, by Twenty Wireless Experts, 96 Pages, 75 Illustrations, Third Edition.

This book is chock full of information and shows how to make different instruments and wireless appliances and information not usually found in other books. You will be surprised how carefully this book is gotten up and how easy it is to make your own instruments. Price **by mail, 25c.**

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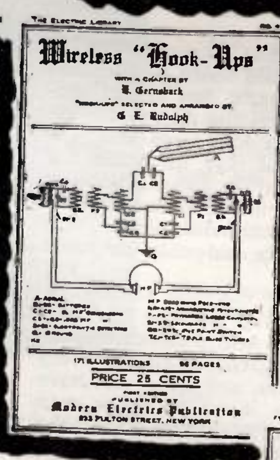

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A. 3.—You should use a couple of loading coils about 6 inches in diameter and 2 feet long wound with No. 24 S C C or enamel wire and an interrupter in the detector circuit. One of these loading coils should be inserted in the aerial circuit and the other in the detector circuit. They should be adjustable.

AERIAL WAVE LENGTH. DEFINITIONS

(2274.) Edward Werner, California, wants to know:

Q. 1.—Will an aerial as per enclosed diagram be within the wave length limit? Is the wave length limit for amateurs 200 or 600 metres?

A. 1.—The natural wave length of your aerial is just about 200 metres. This is a little too high to enable you to use a tuned transmitting set and still keep within the amateur wave length limit, which is 200 metres. An untuned transmitting set will not be permitted under the law in any case, except in cases where no interference could result from the use of such a station. See article on the "Wireless Amateur and the Wireless Law," beginning in the December issue of *Modern Electrics*.

Q. 2.—What is the wave length of aerial as in diagram, leaving out the lower section and having the lead-in come from the highest end?

A. 2.—One hundred and sixty-five metres.

Q. 3.—Please give a complete definition for the electrical terms, "Syncrony" and "Self-induction?"

A. 3.—We have never heard of the word syncrony, although we presume that synchronism is the word that is intended. The exact definition of this word cannot be very well stated, but its meaning can be illustrated by an example, for instance, if two machines which are alike in all respects, though not necessarily connected together, perform the same work, and the successive movements of the two machines occur at exactly the same time in each case, the two machines are said to be in synchronism with each other. As a simple illustration, take the case of two pendulums, each of which has exactly the same period of vibration, and that they are both set swinging at the same instant, so that when one pendulum reaches the limit of its swing in one direction at exactly the same time that the other pendulum reaches the limit of its swing in the same direction, and they continue to preserve this relation as long as they are in motion, the pendulums are said to be in synchronism with each other. Self-induction may be defined as a magnetic property of an electrical circuit which tends to oppose any change in the value of the current flowing through the circuit. In other words, if the current tends to increase, the self-induction will oppose, though not necessarily prevent the increase, or, on the other hand, it will oppose though not necessarily be able to prevent a decrease in the current. This phenomenon is due to the fact that a conductor of any sort carrying a current is surrounded by a magnetic field, the direction of the lines of force in the magnetic field being dependent upon the direction of the current in the conductor. If

the current be increased this results in an increase in the intensity of the magnetic field, which increase sets up a counter pressure or counter electromotive force, which is opposite in direction to the pressure or electromotive force which causes the current to flow through the conductor. This counter electromotive force tends, although it is not necessarily able to, prevent an increase in the current. On the other hand, if the current value be decreased this results in a decrease in the intensity of the magnetic field, which decrease sets up in the conductor an electromotive force which is in the same direction as that which caused the current to flow in the conductor, and this tends to, although it is not necessarily able to, prevent a decrease in the current.

GROUND ON HYDRANT. OPERATORS' SALARY

(2275.) Homer Atchison, Oklahoma, writes:

Q. 1—My wireless station is about 35 feet from the hydrant, and will it be all right if I run a wire under the ground until it reaches my station?

A. 1.—Yes, this arrangement should work satisfactorily.

Q. 2.—What number of wires should be used?

A. 2.—This should consist of from 30 to 40 strands of No. 14 to No. 18 copper wire and should make a thoroughly good connection on the hydrant. If preferred, a flat strip of copper about 1/16 inch thick and from 4 to 6 inches wide may be used in place of the wire.

Q. 3.—What is the salary of most of the wireless operators of the United States?

A. 3.—See answer to No. 2143 of the Oracle in the September, 1912, issue of *Modern Electrics.*

POSITION OF HELIX. WIRELESS TELEPHONE

(2276.) J. L. Derfus, California, writes:

Q. 1.—I have been told that a helix would not work good if it was placed horizontal. I think it will. Who is right? Please give data on a loose coupled sending oscillation transformer, using ribbon, working the same as a loose coupler (power, 1 kw.)?

A. 1.—It makes no difference whether the helix stands on end or is laid down on its side. See supplement to the June issue of *Modern Electrics.*

Q. 2.—Can a wireless telephone be used on rectified current? Mercury or electrolytic.

A. 2.—Direct current must be used for wireless telephony. Rectified current makes the set noisy at the receiving end.

FLICKERING LIGHTS AGAIN

(2277.) Charles F. Jacobs, New York, states:

Q.—I have a Gernsback electrolytic interrupter which I am using on 110 volt direct current in connection with a 1-inch bull dog spark coil, and I find that it works fine, with the exception of the lights flickering all through the house. I would like to know if there is any way possible to remedy it? We have 110 volt 20 ampere fuses in our switch-

box. The interrupter is fitted with a 5-ampere tube.

A.—This question has been answered in the Oracle a number of times. See answer to No. 2224 in the December issue of *Modern Electrics*.

GROUNDING TRANSFORMER SECONDARY

(2278.) Robert Robb, Pennsylvania, asks:

Q. 1.—I am using 110 volt 60 cycle A. C. (3-wire system, the neutral wire of which is grounded) on a transformer. Does this not connect the secondary post, which is also grounded, with the primary, a thing you well insulate to avoid against?

A. 1.—Yes. This indirectly connects one end of the primary and one end of the secondary windings together, but there is no objection to this. The insulation between the primary and the secondary is for the purpose of preventing the secondary from sparking over into the primary and short-circuiting itself.

Q. 2.—I have a 200 foot 2-wire No. 14 copper aerial. Please give me data as to the construction of a helix (square) and condenser for a type H 2 Thordarson "flexible" transformer to comply with the new wireless law?

A. 2.—See answer to No. 2265 in this issue.

Q. 3.—I subscribed to a magazine, *Wireless News*, situated at 527 Fifth avenue, New York, N. Y., and received but one issue. I have written about it several times, but received no answer. What has happened to the magazine, and can I get my subscription price back?

A. 3.—So far as we know, the last issue of *Wireless News* which was published was the May, 1912, issue. Other than this we are unable to furnish you with any information concerning the magazine or its publishers.

STATIC ELECTRICITY

(2279.) Nellie B. McQuarrie, Massachusetts, writes:

Q. 1.—If a condenser is made of two pieces of tinfoil, one pasted on each side of a sheet of mica, and the coatings are given opposite charges of electricity, one positive and one negative, what effect has one coating upon the other and why are their capacities increased? Why is a condenser used?

A. 1.—When one coating of a condenser receives a charge of electricity an equal charge of opposite polarity is induced in the other coating. These two charges attract each other and tend to stay in the coatings, or rather on the surface of the dielectric immediately beneath the coating, until the potential difference between the two coatings is neutralized, the current flowing from one to the other either through leakage or a direct connection or a spark from one to the other. The fact that the condenser's capacity is greater when mica is used in place of some other insulating material, such as ordinary glass, is that the mica possesses the property of receiving and retaining on its surface at a given potential a greater charge or a greater quantity of electricity than has the other insulating material. In sending circuits a condenser is used, in connection with inductance in the helix, and

the spark gap, to form a resonant circuit of comparatively low resistance and in which the high frequency currents necessary in wireless sets may be set up. This also applies to receiving circuits as well, except that the spark gap is not used. In the case of the transmitting circuits the high frequency current is set up by the condenser being charged by an induction coil or a transformer and then discharging through the spark gap and the inductance, while in the receiving circuit the high frequency current in the latter is produced by tuning the circuit until its natural resonant frequency corresponds to the frequency of the current set up in the antenna circuit by the magnetic waves from some distant sending station. Condensers are used in ordinary telephone circuits for preventing battery current flowing through certain portions of the circuit, while at the same time they do not prevent the passage of alternating current.

Q. 2.—Please explain the complete action in a Holtz induction machine?

A. 2.—As you may know, the essential parts of a Holtz machine are as follows: First, the stationary glass plate held in position by insulated supports; second, a revolving plate, which is close to but does not touch the fixed plate; third, two segments called armatures, made of varnished paper firmly fixed on the farther side of the fixed plate adjoining holes cut in the fixed plate, the holes being called windows. On each of these paper armatures are tongues of paper having teeth cut along one edge. These teeth point in the direction opposite to the rotation of the revolving disc. Fourth, two metal combs are in close proximity to the other revolving plate and are connected metallically to the discharging rods, which terminate in spark balls on the front of the machine. To operate the machine the discharging terminals are first placed in contact. Then a small initial charge is given to one of the paper armatures by holding an electrified body against it and then revolving the plate by means of the crank. The spark balls are then separated slowly as the activity of the machine increases.

The following explanation of the action of this machine is due to Prof. S. P. Thompson: "Suppose a small positive charge is imparted at the outset to the right hand armature; this charge acts inductively across the discs upon the metallic comb, repels electricity through it, and leaves the points negatively electrified. They discharge negatively electrified air upon the front surface of the revolvin plate; the repelled charge passes through th brass rods to the balls, and is discharge through the left comb upon the front sid of the revolving plate. It acts inductively o the paper armature, causing that part whic is opposite to itself to be negatively charg and repelling the positive charge into the pap tongue, which, being bluntly pointed, slow discharges a positive charge on the revolvi plate. As the disc is turned farther this po tive charge on the back moves over from t left to the right side, and when it gets oppos the comb increases the inductive effect of already existing positive charge on the arr ture and repels more electricity through brass rods and knobs into the left co

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Meantime the negative charge, which we saw has been induced in the left armature, has in turn acted on the left comb, causing the positive charge to be discharged by the points on the front of the revolving plate, and drawing electricity through the rods and the knobs, has made the right comb still more highly negative, increasing the discharge of negatively electrified air upon the front of the revolving plate, neutralizing the positive charge which is being conveyed over from the left. These actions result in causing the top half of the revolving plate to be negatively electrified. The charges on the front serve, as they are carried round, to neutralize the electricities let off by the points of the combs, while the charges on the back, induced respectively in the neighborhood of the armature, serve, when the rotation of the disc conveys them round, to increase the inductive influence of the charge on the other armature.

Q. 3.—Why does a charge of electricity tend to stay on the outside surface of a conductor?

A. 3.—The charge on a conductor may be said to be made up of an infinite number of minute charges all of the same polarity, and as charges of the same polarity tend to repel each other they naturally tend to get as far away from each other as possible, and this condition can only be realized when the particles are all on the surface of the conductor. Moreover, the electricity on an insulated conductor acts inductively to all surrounding bodies, inducing charges of opposite polarity in them, and these induced charges in turn react upon the original charge and draw it to the surface of the conductor.

RHEOSTAT INFORMATION

(2280.) Theodore L. Smits, New York, writes:

Q. 1.—I intend to build a starting rheostat for my rotary. It is to have 10 points. It must carry 6 volt 5 amperes continually without overheating, and should be made to allow an increase of ½ volt on every point as the lever is advanced—drop of ½ the other way. What is the size of wire (German silver 18 per cent.) necessary? Would No. 11 B. & S. be suitable? Total number of feet and pounds needed, number of feet of wire between each two points?

A. 1.—Use No. 14 B. & S. gauge. A total of 20½ feet or 0.3 pound will be needed. Each of the 9 coils connected between the 10 points of the rheostat will require 2.22 feet of wire.

Q. 2.—Give me a formula to calculate the resistance necessary to produce the drop of ½ volt between points?

A. 2.—The formula used is Ohm's Law:

$$I = \frac{E}{R}$$

the terms of which may be transposed to read:

$$R = \frac{E}{I}$$

in which R is the resistance, E is the drop in volts and I is the current. In this case E equals 4.5, I equals 5, therefore R equals [illegible] or 0.9 ohm. From a wire table we find the total number of feet of 18 per cent. German

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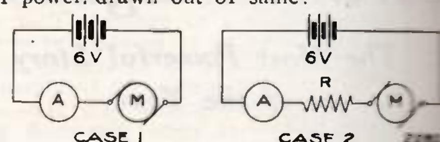
silver wire of a size whose carrying capacity is 5 amperes and whose resistance would be 0.9 ohms. This is the total length of wire in the nine coils. Then it is only necessary to divide this by 9, as there are 9 coils, and the drop in each one is ½ volt. This rule applies to any case dealing with direct current.

Q. 3.—When I hook my motor up as per diagram (case 1), running full speed, without load, the ammeter registers 10 amperes. However, when a resistance is inserted, as per case 2, and motor running slower, without load, the ammeter registers 5 amperes. In the first case the total amount of power used was 10 amperes. In the second case was it only 5 amperes that was taken out of the battery, or the 10 amperes, as in case 1, 5 being used by the resistance and 5 by the motor? If only 5 amperes are being used and half as much work is done by the motor, how is the rheostat or resistance wasteful of power? If the ammeter be connected to the positive pole of battery shouldn't it register the total amount of power drawn out of same?



A. 3.—You have got the wrong dope on this. Assuming the battery voltage is 6, in case 1 the power drawn from the battery is 6 volts multiplied by 10 amperes, or 60 watts, all of which was spent in the motor. In case 2 the power drawn was 6 volts multiplied by 5 amperes, or 30 watts, half of which was spent in the motor and half wasted in the rheostat in the form of heat. Thus while the amount of power drawn from the battery was half of what it was in case 1 the amount of power spent in the motor was only one-quarter of that in case 1. This should be sufficient to illustrate that the rheostat is wasteful of energy. If the current had been 6 amperes in case 2 the power would have been divided between the motor and the rheostat in the proportion of 6 to 4, instead of one-half in each. An ammeter reads current only, not power.

OPERATION AND ADJUSTMENT

(2281.) John Brown, Texas, asks:

Q. 1.—I am just a beginner, and would like to know the operation and hook-up for a double slide tuning coil containing about [illegible] feet of No. 22 enamel wire, a galena detector, a fixed condenser and 75 ohm phones?

A. 1.—We give you hook-up herewith for your apparatus. The operation of the set is as follows: First adjust the contact point on the mineral until a sensitive spot is found and signals may be heard; then move the slider which is connected to the ground wire until the signals come in as loud as it is possible to get them, by moving this slide alone; then adjust the position of the other slider until the signals come in as loud as it is possible to get them by moving this slider. The set is then in adjustment, and should signals from any station interfere with those you are trying to receive, the positions of both sliders should be changed, so that if possible the

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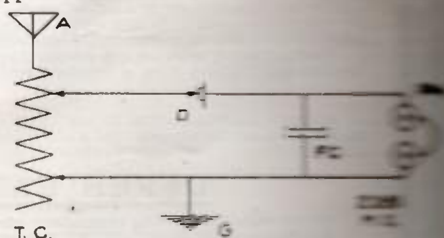

Q. 2.—My aerial is 30 feet high, [illegible] four wires spaced a foot and a half apart. The aerial lead-in is about 25 feet long, and the ground lead-in is about 20 feet. What is the receiving radius of the set in miles?

A. 2.—We do not answer questions of this sort. See notice at the head of this column.

Q. 3.—Are receivers connected in series or in multiple, and will 1000 ohm telephone receivers do for wireless?

A. 3.—They are usually connected in series. Yes.

COPPER CLAD AERIAL WIRE. INTERFERENCE WITH TELEPHONE LINES

(2282.) Charles Schilling, Kansas, wants to know:

Q. 1.—I have some copper-clad wire that I would like to use on my aerial if it is all right?

A. 1.—This wire should operate fairly satisfactory, but copper wire or phosphor bronze wire will be still better.

Q. 2.—Let me know whether or not my aerial will affect in any way the local telephone lines; aerial running at right angles to the telephone wires and about 20 feet above same?

A. 2.—If the telephone lines are grounded and cross under your aerial they may be noisy when you send, otherwise there should be no trouble due to the operation of your set.

QUENCHED ARC. BIG TESLA COILS

(2283.) Bryan Fitzpatrick, California, would like to know:

Q. 1.—Please give me data for building a transformer to be used on quenched arc outfit similar to the one described by Philip Edelman in the October, 1912, issue of *Modern Electrics*, to send 50 miles, stating kind, size and amount of wire and size of laminations?

A. 1.—The set described should work this distance under good conditions.

Q. 2.—Advise me where I can obtain copper plate ¼ inch thick and brass plate [illegible] thick?

A. 2.—This may be obtained from the [illegible] Hungerford Brass and Copper Co. [illegible]

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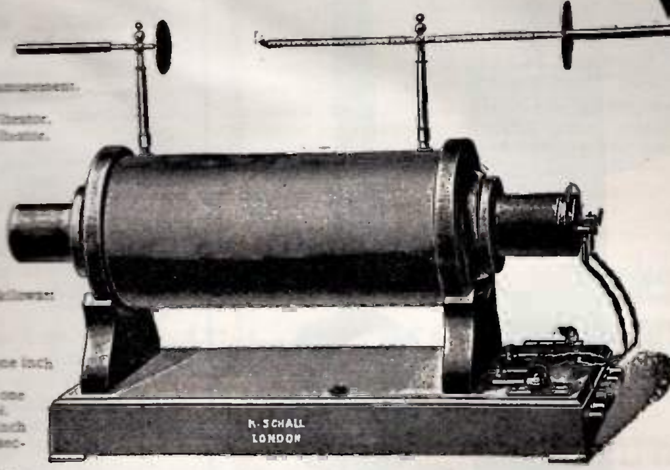

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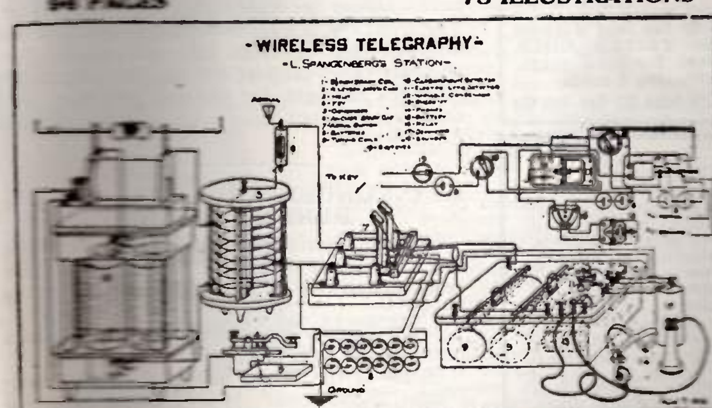

How to Make

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a microphone detector.
a simple antenna.
a spark gap muffler.
a 1000-ohm relay.
a carborundum detector.
a bare point electrolytic detector.
a selective tuner with weeding out circuit.
a coil vibrator attachment.
an electrolytic detector.
suspend and insulate aerials.
an iron pipe aerial.
a tantalum detector.
a small transformer.
a transmitting helix.
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A. 3.—We do not know where you may obtain specifications for a Tesla coil as large as this.

MAGNETIC RECTIFIER. ELECTROLYTIC RECTIFIER

(2284.) Walter Wheeler, California, asks:

Q. 1.—Could you tell me how I can make a magnetic rectifier for 110 volt A. C. 60 cycle?

A. 1.—A brief description of a rectifier of this type was given in the Paris letter on page 568 of the January, 1911, issue of *Modern Electrics*. However, we do not know whether the apparatus described is any good, for one of our readers wrote us to the effect that he had built one and could not make it work.

Q. 2.—Can I use A. C. on a Poulsen wireless system? If not, why?

A. 2.—We do not know. Probably the arc would not hold. If it could be used with good results the chances are the Poulsen people would use it in preference to D. C.

Q. 3.—I have made several electrolytic interrupters and have not received satisfactory results. When I first connect them up they work fine, but in a few minutes they refuse to work steady. What is the trouble?

A. 3.—There are a number of things which affect the operation of an electrolytic interrupter, among which are: The hole in the bottom of the tube may be stopped up by the rod forming the positive electrode, or the electrolyte may get too hot, or the overflow of electrolyte from the inner tube into the electrolyte outside the tube may occur in a stream, which acts as a conductor between the two portions of the electrolyte, which, of course, stops the operation of the interrupter. The overflow is usually arranged to cause the liquid to fall by drops into the outside electrolyte. The proportions of the interrupter may not be right for the coil you have used or there may not have been enough reactance in the circuit.

KEY CONDENSER. SENDING CONDENSER. LEAD-IN

(2285.) Calvin DesPortis, Georgia, writes:

Q. 1.—Please describe a condenser for preventing sparking at a key to be used on 110 volts?

A. 1.—Use two 2 mfd telephone condensers connected in series.

Q. 2.—Is the Clapp Eastham ¼ kw. transformer a good one? If it is, please state how many sections of Murdock moulded sending condenser should be used?

A. 2.—Yes. Six or seven.

Q. 3.—Is the following lead-in sufficient for the above transformer: A piece of No. 4 copper wire slipped into a ½ inch porcelain tube, and that slipped into another tube whose outside diameter is 1½ inch, and thick gum shellack poured in the cracks and allowed to harden?

A. 3.—Yes.

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(Continued from page [illegible])

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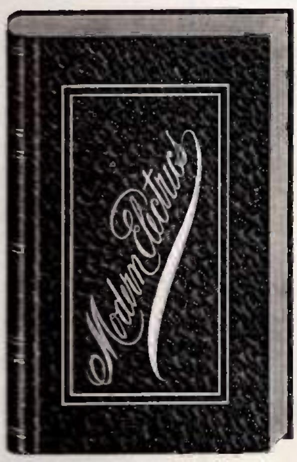

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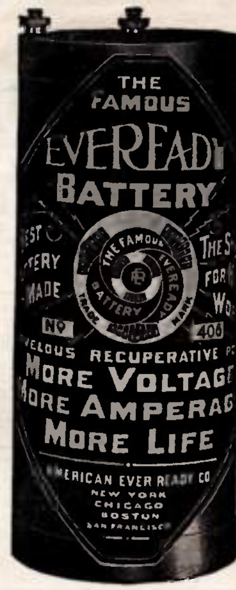

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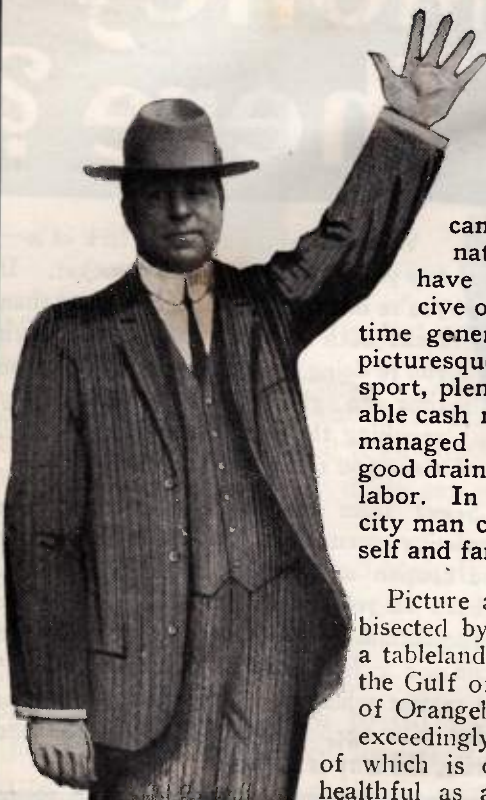

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