MODERN ELECTRICS

"THE ELECTRICAL MAGAZINE FOR EVERYBODY"

Edited by H. Gernsback

Volume V FEBRUARY, 1913 No. 11

CONTENTS

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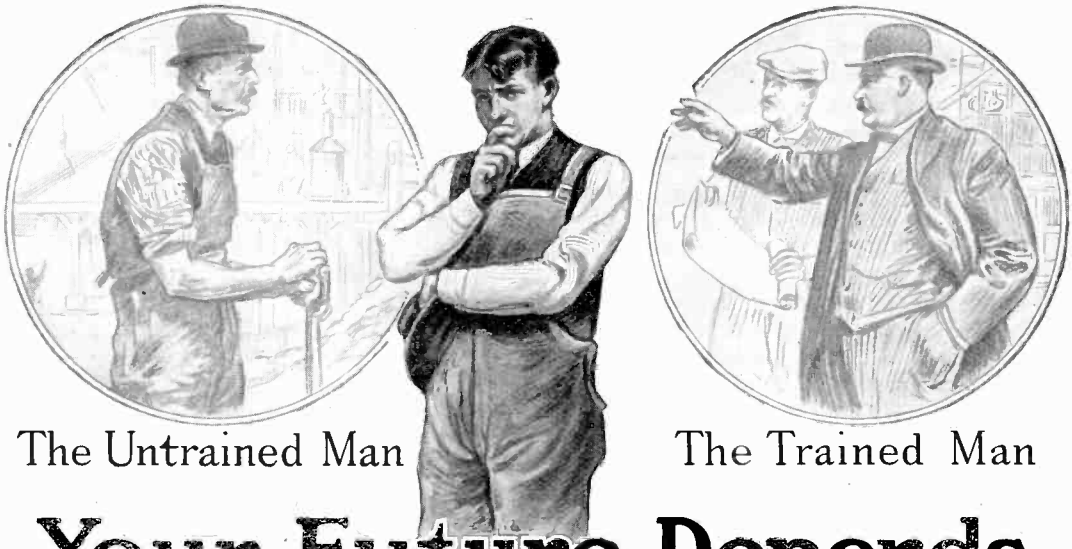

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Modern Electrics

VOL. V. FEBRUARY, 1913 No. 11

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)

113. Limits of the Heating of Conductors

The heating of conductors must never become dangerous, and for this reason the extreme limits must never be exceeded, as the conductor, if heated too high might melt. The practical limit depends on the cross section of the conductor, its insulation, *i. e.*, covering, and the possibility of cooling action, and its resistance.

Ordinarily for bare wires suspended in the air, the diameter of which does not exceed 0.15 inch, and which as compared with pure copper have a conductivity of 95 per cent., the following extreme limits should not be exceeded.

	Amperes per square inch.
Bare wires	3900
Cotton covered wires	2600
Rubber covered wires	1600
Lead covered wires	970

In apparatus where the wires do not have a chance to cool, even lower densities than those mentioned in the above table are used. It is also self-evident that the above table does not hold good for iron, brass, German silver, or other resistance materials, but only holds good for copper.

In order to calculate electromagnet coils and solenoids the following figures will give a good idea of the current which such wires can carry safely.

No. 8,	No. 11,	No. 12,	No. 15,	No. 18,
48,	28	15	9	4

No. 21, No. 24, B & S.
2 1 amperes.

A very clever electric incubator is shown in Figs. 175 and 176.

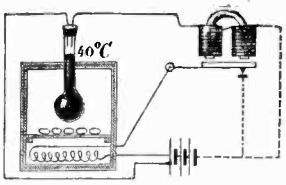


FIG. 175

In a wooden box having double walls the eggs are placed on cotton or other soft material. This material is usually placed on a small shelf which may be perforated as shown in the illustration. The small space underneath is heated by means of a strong battery or from the lighting circuit, the spiral being constructed of iron or German silver, the

diameter and length of the wires to be ascertained by experiment.

The temperature is kept constant by means of the mercury thermometer which interrupts the circuit at 40° C, (104° Fahrenheit), as the rising mercury, touching the platinum wires, connects the circuit through the electromagnet, which, attracting its armature, disconnects the current from the heating spiral.

As soon as the temperature sinks again, the mercury of course, drops and the heating commences again, thus the eggs will always be kept at a uniform temperature.

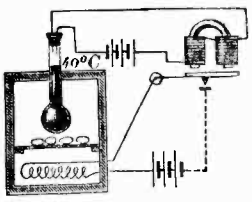


FIG. 176

In Fig. 176 a similar arrangement is shown, only here two sets of batteries are used, but the action is practically the same.

A good heater can be made as follows:

Take an ordinary tin can and wrap a thin layer of asbestos around it. On this wind a spiral of some resistance wire, and after the connections have been made by suitable means, the entire contrivance is sunk in another vessel containing plaster of Paris, cement, or the like, and after this has set, a good electric heater is the result. Of course, it depends upon the wire what degree of heat such a heater will give and it also depends on what the heater is to be used for. By using less wire, the heat of course, will be more intense and the heater may then be used for boiling water and so on.

Electric Cauterizer

Instead of cutting off warts, etc., with a knife, a much simpler way to do it is to take a thin platinum wire and, placing a loop of the wire around the wart, the wire is heated for a few seconds and the wart is taken off without occasioning any loss of blood. It would be thought that the pain of such a procedure would be intense, but the contrary is the case. It seems that the intense heat has an anesthetic action which deadens the pain. Of course, some pain is experienced afterwards, but not much is felt during the actual operation.

Electric Welding

La Grange and Hoho (1893) use for the anode (positive) a lead plate which is placed in a bath of cold water in which sodium carbonate is dissolved. The negative wire (cathode) is attached to a pair of metal tongs. The metal to be welded is next picked up by the metal tongs and is then plunged into the water. If sufficient current is used, it immediately becomes red hot and is furthermore cleaned of all grease, dirt, etc., and may even be caused to melt when using a current of 220 amperes at 120 volts. When the metal piece is withdrawn it is possible to hammer and weld it.

The hydrogen which is developed during the heating action represents quite a high resistance between the water and the cathode and right here almost the entire energy of the current is transformed into heat.

114. Calcium Carbide and Acetylene

Calcium carbide is usually manufactured by means of electric furnaces as shown in Fig. 177. The furnace is made of two large pieces of firebrick of the shapes as shown in the illustration. By

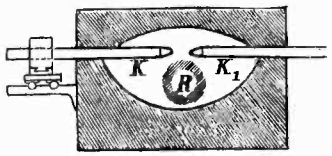


FIG. 177

means of the carbon rods, K and K1, the current is introduced, and through the tube, R, made of some fireproof clay, the materials to be heated are introduced into the furnace. These materials comprise the following:

Burnt lime 87.5 parts and carbon 56.25 parts;

$CaO + 3C = Ca C_2 + CO$; 100 parts calcium carbide, 43.75 parts carbon monoxide.

The calcium carbide is decomposed in cold water after the formula,

$$\underset{\text{(Calcium Carbide)}}{Ca C_2} + \underset{\text{(Water)}}{2H_2O} =$$

$$\underset{\text{(Hydrate of lime)}}{Ca(OH)_2} + \underset{\text{(Acetylene)}}{C_2H_2}$$

115. Rheostats

Rheostats or regulating resistances are apparatus used to keep the amperage

and voltage of an electric current within certain limits between two given points.

The action is based upon the phenomenon that as soon as an electric resistance is placed in a circuit, the voltage and amperage decrease immediately. Resistances are usually placed directly in the circuit of the working current which is to be regulated or sometimes in shunt, as for instance, the field magnet of a dynamo.

The materials from which rheostats are constructed are numerous, such as German silver wire, iron wire, brass wire, sometimes also copper, in wire form or strip form; carbon rods and carbon plates are also used a good deal; furthermore a good many solutions such as sulphate of zinc, in which two zinc plates are placed, or copper sulphate solution in which two copper plates are placed, and which are mounted in such a manner that they may be moved a greater or lesser distance apart, thereby varying the current.

A bare wire resistance spiral which

FIG. 178

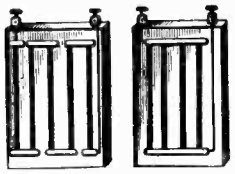


FIG. 179

does not touch any material may be heated to such a heat that it gives off a hissing sound when it is touched with a wet object. Wound on solid material it is possible to heat the resistance wires to a greater degree, especially if fine wires are used, as the wire spirals when suspended freely lose their shape due to the heat and their weight.

The method of winding the wire spirals is also of the greatest importance; it is therefore necessary to know the two factors, namely, the diameter of the spirals and the width of the winding. Some spirals may be wound very close together, while others must have a greater clearance between any two adjacent convolutions. Thus for instance a spiral of 0.5" diameter will work best when the distance between its adjacent wires is equal to twice the diameter of the wire itself.

The wire rheostats are cooled automatically when placed in the open air, but sometimes they are placed in non-conducting baths, such as transformer oil and the like.

Rheostats made of iron wire are very cheap, but their resistances vary widely with the temperature changes and they are, therefore, only used where great accuracy is not required.

From the table as shown on page 1020 of our last issue the resistance of most

FIG. 180

any material can be figured out. Thus, for instance, the resistance of ordinary German silver wire is 18 times that of pure copper wire. Thus if a No. 24 B & S copper wire has a resistance of 20.9 ohms per pound, the same size wire of German silver will have a resistance of 18 times this or 376.2 ohms. Aluminum wire has 1.8, iron (soft) 6.1, nickel 7.9, platinum 5.7 to 9.8, steel (soft) 10, times the resistance of copper and so on.

116. Forms of Rheostats

The rheostats with fixed resistances such as are connected in multiple with arc lamps are usually made of a spiral of iron or German silver wire, and the wire has such a length that its resistance equals that of the arc lamp.

A rheostat that can be regulated is shown in Fig. 178 and is made by winding a German silver wire on a porcelain cylinder leaving a clearance between

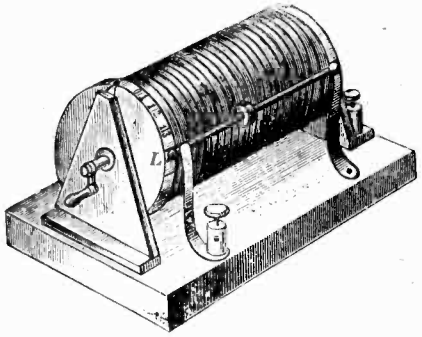


FIG. 181

each adjacent wire of from 1/16 to 1/8 inch.

Sometimes it is not convenient to use a lot of wire for the rheostats as such rheostats would occupy too much space,

therefore, sometimes types such as are shown in Fig. 179 are used. These are made of thin carbon rods which may either be connected in series as the one shown on the left or connected in multiple as the one shown on the right. Such rheostats have small dimensions and a high resistance and very often come in quite handy.

It is also possible to make fairly good rheostats by using pencil leads, which have quite a high resistance. In order to change the resistance, the form shown in Fig. 178 is the one most commonly used, as the resistances can be varied within the widest limits.

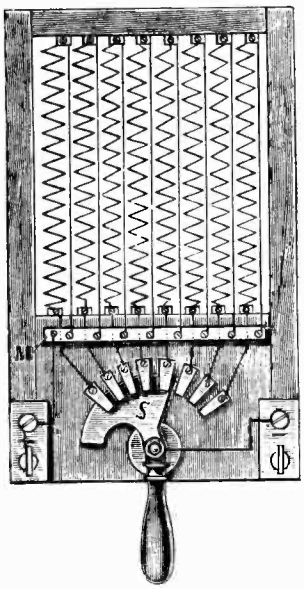


FIG. 182

Another variable resistance that is perhaps the very cheapest that can be made is illustrated in Fig. 180. This is nothing but a few feet of resistance wire supported by four insulators which may be fastened to a long board or to the wall or on the table. The current enters and leaves as shown by the arrows.

A simple metal slider made of a piece of brass bent around so as not to fall off is placed over the wires as shown. By moving this back and forth, the resistance is varied quickly and in a satisfactory manner. This is a good way to make a rheostat as it is air cooled and the ventilation is ideal. The construction is very cheap.

By marking off a strip of paper in inches and pasting this underneath the wire, a handy scale is made and we now have an indicating rheostat.

If, instead of using inches, the resistance is written on the scale, we will have a direct reading rheostat.

Cylinder rheostats are not much used now, but were used a great deal during the last century.

In Fig. 181 is shown a resistance wire wound on a cylinder which may be either paraffined wood, marble, glass or even a porous cup, etc. The ends may be made of the same material as the main cylinder. A thread is now cut or filed on the cylinder and the wire is wound in the groove which keeps it from shifting sideways. There should be about ⅛ inch clearance between adjacent wires. There is only one connection made with the wire at the end as shown in our illustration and this is made direct to the axis or wheel of the apparatus. The end of the wire is easily soldered to the axis or otherwise attached.

A small brass wheel, which has a circular groove around its circumference, runs loosely on a round metal rod which is supported by two stiff springs which press the small wheel against the wire convolutions on the cylinder. Turning the crank revolves the cylinder and as the wheel will naturally travel on the wire convolutions more or less resistance is put in the circuit as the case may be.

From the illustration it will be seen that the other connection is made directly to one of the springs which connects through the rod with the small wheel.

The only fault of this rheostat is that it does not work quickly and considerable cranking must be done, especially if regulation from maximum to minimum or vice-versa is desired.

The form of rheostat used perhaps more than any other is shown in Fig. 182. The construction is easily understood by studying the figure, from which it will be seen that the spirals of the resistance material are stretched between two points in an open frame while the ends of each spiral go to contact pieces which connect with the slider piece, S, of the handle.

This is quite a satisfactory means of regulating current and it is used quite frequently.

(To be continued)

The Lepel Quenched Spark System

By Stanley E. Hyde

THE quenched spark system for generating high frequency currents that send out practicaly undamped waves in undoubtedly one of the best systems of wireless telegraphy at the present time. The Lepel system is a very good example of this, and will be described in detail below.

A transmitting diagram is shown in Fig. 1, and includes a very short spark gap which is supplied with direct current at 500 volts pressure. Around this gap is shunted the familiar inductance and capacity, one or both being variable, preferably the inductance. This spark gap is water cooled and the positive electrode is made of very pure copper, hollow, to admit the circulating water which is supplied from a small tank. The negative electrode is composed of Delta

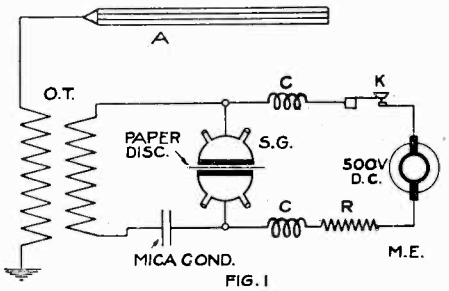


FIG. 1

metal and is backed up by a water cooled chamber having a separate cooling system from that of the positive electrode so that the water would not short circuit the gap electrically, when in operation. The two surfaces of the gap are held apart by a thin paper disc with a hole punched in the middle for the arc to start from, and by its slow combustion presents a clean surface to the arc which improves the tone emitted.

The inductance is made of large copper ribbon wound on a cylindrical form, and the condenser is composed of copper foil with mica as a dielectric. This condenser should be rather large in capacity. A secondary inductance is coupled to the primary inductively and its extremities connected respectively to the aerial and ground.

In the diagram, the coils marked, C, are choke coils to prevent the oscillations from entering the generator circuit, and K is the transmitting key. R is a resistance similar to that used in Nernst lamps and is made of iron filaments inclosed in glass bulbs containing hydrogen gas. This arrangement constitutes a device

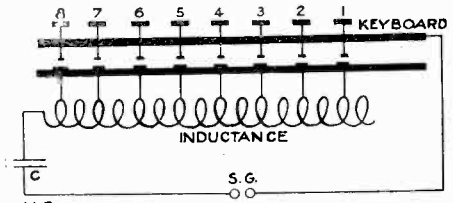


FIG. 2

whereby the current is kept constant, for if the spark gap becomes short circuited for any reason the filaments increase their resistance and the current is kept from rising to dangerous proportions. In this system only one wave is emitted instead of the double wave that is radiated by ordinary spark systems, the reason being that the gap is so small compared with the size of the sparking surfaces that the primary oscillations are rapidly damped out and cease to exist after two or three surges and as the energy is transferred to the secondary and the inductive coupling broken the

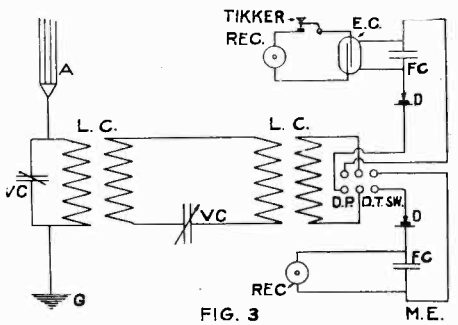


FIG. 3

secondary is left to oscillate at its own frequency, and as the spark gap is cooled and consequently its high resistance restored, the secondary ceases to transfer energy to the primary after each complete condenser discharge. This means of generating electrical oscillations is very efficient and as high as 85 per cent.

is claimed. The oscillations sent out are very feebly damped and are so nearly constant that the effect on a telephone receiver is a faint sighing sound and could not be heard very far without the use of an interrupter similar to a Tikker, which sends through the telephone windings a rectified current.

By shunting around the spark gap a musical note arrangement, as shown in Fig. 2, which is nothing more or less than a "Singing Arc" device, invented by Mr. Duddell, and described by the writer in the September issue of *Modern Electrics,* any number of musical notes can be used, that will operate an ordinary spark installation. Lepel stations are supplied with a keyboard consisting of eight notes so the operator can use the one that will work through static or interference from other sparks operating at the same time, or he can play simple tunes if he has the ability to do so. For ordinary transmitting a Morse key with large contact is used, but when the musical note device is used this key is shorted and the buttons on the keyboard used for making the characters of the code, while the arc is kept going constantly.

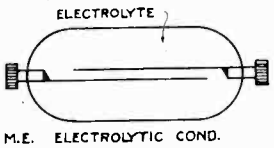


FIG. 4

Fig. 3 shows the receiving units, which consist of two loose coupled coils with their respective variable condensers for tuning. The secondary of the second loose couple is called a tertiary or third unit, and makes the tuning extremely sharp when used with the variable condensers. All of these coils are also variable in inductance by tapping at equal distances and the leads brought out to a many point switch. As shown, there are two distinct detector circuits that can be used in connection with the loose couplers by throwing the DPDT switch, one being for the reception of damped wave spark systems and the other for receiving undamped oscillations. The first is composed of the familiar condenser and detector circuit, thermo-electric detectors being used in both circuits. The second circuit is more complicated and is composed of the usual blocking condenser and detector, but shunted across the condenser are two pieces of apparatus known as an electrolytic condenser and a Tikker (interrupter). The electrolytic condenser is shown diagrammatically in Fig. 4, and is composed of two small pieces of metallic foil separated from each other and sealed into a glass tube containing an electrolyte. Small wires are brought out through the walls of the tube from the two foil strips for connection. In series with the telephone is the interrupter, which the reader is no doubt familiar with. The electrical actions taking place in a circuit of this kind are as follows: When the oscillations cross the thermo-electric detector, which consists of a fine graphite point resting on Galena, this junction is heated and a small direct EMF is generated at its terminals which flows into the electrolytic condenser and polarizes it, i.e., an extremely thin film of hydrogen gas is formed on the surfaces of the plates and insulates them from each other, thus making the affair a condenser, as the film of hydrogen constitutes the dielectric, and as this film is microscopically thin the capacity is enormous, being about 2 micro-farads. After the polarization is accomplished, the current from the thermo junction charges the condenser, and this charge is discharged through the telephones each time the interrupter closes its contacts. These actions are similar to the Poulsen apparatus in that the energy is collected over a given time by the large capacity of the electrolytic condenser, determined by the speed of the interrupter and then sent through the telephone, producing a strengthened effect. On the interrupter is an adjustable thumbscrew so that the tone of the incoming signals can be varied to suit the operator. If the interrupter is vibrated fast the tone will be a high shrill musical note and if it is run slower the sound produced will resemble that of a rotating spark. High musical sparks of this kind are a necessity in the tropical climates where static is so bad that operators can stand outside of the station for some distance and hear the crashing of the static as the telephones lie on the operating table.

It is now possible to send wireless messages around the world.

German telephone lines are owned and operated by the government.

The Scientific Adventures of Mr. Fosdick

By Jacque Morgan

Mr. Fosdick Goes in for Synthetic Chemistry

WHEN Bud Saunders dashed breathlessly into the chop mill and handed Eben Stetzle a note, Mr. Stetzle became quite as excited as the boy. Messengers with notes were most unusual in the quiet life of Whiffleville, and instantly there was conjured in the mind of the apprehensive Mr. Stetzle a score of most horrible catastrophes. In a tremble of anxiety he hastily tore open the envelope and read:

"DEAR EBEN—Just a few minutes ago I discovered a great scientific truth, which, commercially exploited, will make millions. Hurry down to the shop.

"JASON Q. FOSDICK."

A smile of gratification stole over Mr. Stetzle's countenance, and opening a letter file marked "Important," he carefully placed the note therein, snapped the file shut and put it back upon the dusty shelf.

Mr. Stetzle, keenly aware and somewhat envious, if the truth be told, of the royalties that came each month to Mr. Fosdick on his patent nut-cracker, lost no time in hurrying down to the tinshop.

He found the inventor reared back in his chair dreamily contemplating the unwashed window that looked out on Main street. Mr. Fosdick was thinking.

"Well?" breathlessly inquired Mr. Stetzle. "What is the big secret?"

For a long minute Mr. Fosdick remained silent.

Mr. Stetzle fidgeted with impatient curiosity. "What have you discovered, Jason?" he demanded.

Mr. Fosdick took his heels from the workbench and sat erect in his chair. "Eben," he said, gravely, "I have made the most wonderfully scientific discovery of the century."

"And it is?"

Mr. Fosdick looked impressively around for possible eavesdroppers, and lowering his voice said: "Nothing more or less *than a milk mine!*"

"Jehoshaphat!" ejaculated Mr. Stetzle, dropping into a chair. "Where?"

"Behind the shop. You know that well I had bored last week?"

Mr. Stetzle nodded energetically.

"That is it," said the inventor.

"Milk from a well? Milk comes from cows!"

Mr. Fosdick smiled tolerantly. "Milk will come from my well," he said. "'Fosdick's Mineral Milk' will be known around the world."

Mr. Stetzle stared incredulously.

"Listen, Eben. Do you know what synthetic chemistry is?"

Mr. Stetzle shook his head.

"Well, it is the chemistry by which things are made out of chemicals. Here is where I first ran across it," and Mr. Fosdick picked up an almanac, grimy with much handling, and pointed to a short paragraph under a column of jokes. He read aloud:

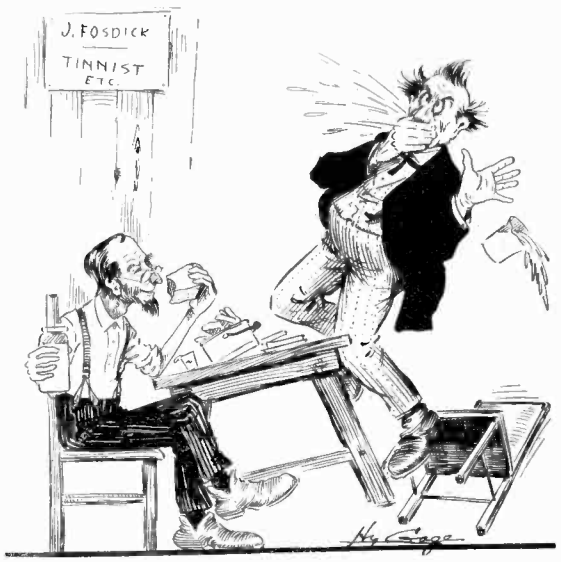
"Among the wonders of synthetic chemistry are the manufacture of vanilla from coal tar, and rubber from cornstalks. Indigo, perfumery and other inorganic substances are now being manufactured by the chemist from the elements of which they are composed."

"And you will be able to make milk?" inquired Mr. Stetzle.

"I have made it," replied Mr. Fosdick calmly.

Mr. Stetzle gasped.

"Milk is what?" said Mr. Fosdick. "Milk is simply an emulsion of butter fat and water. And what is butter fat? Butter fat is simply a hydro-carbon. Now, what's in that well? Water and oil. And what is oil? Answer, a hydro-carbon. So you see that well is simply a milk mine. It furnishes the raw material, so to speak, and all that has to be done is to clarify and deodorize it, and the result is—*milk!*"



"SUFFERIN' CATS—IT AIN'T MILK, IT'S HAIR OIL."

Mr. Stetzle became visibly excited. "Good Lord, Jason, if we can make it cheap enough there's no end of money in it."

"*I* can make it," said Mr. Fosdick, calmly disregarding Mr. Stetzle's pronoun *we*, "at an approximate cost of a cent a barrel."

"Jehoshaphat! And what can we sell it for?" feverishly demanded Eben, again using the plural pronoun.

"*It* will sell for $6.78 a barrel, leaving a profit of $6.77."

"Jehoshaphat!" reiterated Mr. Stetzle.

"And that," continued the inventor, "is only a starter. I will add to the line butter and cheese. Think of 'Fosdick's Mineral Butter'—clean, wholesome, and absolutely pure, at three cents a pound, and 'Fosdick's Mineral Cheese'—of any consistency and odor—as gauged by my new odorometer—at four cents a pound. And I may go in for eggs—'Fosdick's Artificial Eggs'—six cents a dozen."

Mr. Stetzle's eyes shone covetously. "I should think," he said, after a moment's thought, "that a better name for the manufacturer would be something like 'The Mineral Food Products Company, Limited.' The company would be a great corporation, with you president and myself secretary and treasurer. I see a fellow advertising charters in a Western State for any amount of capital for a dollar and a half. Our company would have a million dollar capital stock—half preferred and half common. We would take the preferred, giving the public the common. The preferred would draw ten per cent. cumulative dividends, which would make our profit fifty thousand a year—not counting our salaries of, say, ten thousand each, which we would draw as officers of the company."

HE MADE MR. STETZLE "TASTER" FOR THE COMPANY.

Mr. Fosdick's jaw dropped. He gazed at his friend in evident admiration, and it became Mr. Stetzle's turn to smile tolerantly.

"You are all right, Jason, when it comes to inventing, but you need a financier to show you how to get the money out of your inventions."

Mr. Fosdick pondered gravely. "I believe you are right, Eben. I hadn't thought of preferred stock and salaries. I believe we would make a good team—I'll furnish the brains and you'll do the financiering."

Mr. Stetzle leaned forward in his chair and grasped his friend's hand fervidly. "*Brother!*" he ejaculated, at the same time giving Mr. Fosdick the grip of their lodge. "You have made the proper beginning."

Getting out of his chair, Mr. Fosdick with a kindly smile opened a drawer and drew forth a bottle. "Eben," he said, giving the bottle a vigorous shake, "we will celebrate the occasion."

Mr. Stetzle's keen eye detected the whitish liquid even before the inventor had poured out a tumblerful. "It's the mineral milk!" he exclaimed. "I know it."

Mr. Fosdick nodded genially. "Eben, you are to have the great honor of being the first person to drink it."

"Haven't you tried it?" faltered Mr. Stetzle.

"I don't have to try it," replied Mr. Fosdick. "I know what it is—a scientist always does."

He handed the tumbler to Mr. Stetzle, who hesitated a moment and then took a gulp. "Sufferin' cats!" he ejaculated, spitting in all directions with great effusiveness. "It ain't milk—it's hair oil!"

Mr. Fosdick was unperturbed. "No doubt, Eben, it has a slightly oily taste, but that can be removed by filtering and refining."

"I tell you it's hair oil!" vociferated the financiering partner between gargles of water at the sink.

"It's white, isn't it?" demanded the inventor, shaking the bottle.

"Yes."

"Then it's milk."

Mr. Stetzle took a prodigious chew of tobacco to get the taste of the oil from his mouth, and then, somewhat mollified, he seated himself and listened to the inventor's plausible explanation of how the mineral milk was to be sweetened and deodorized.

In the middle of his discourse the inventor looked up at the clock. "Gracious, Eben!" he exclaimed, "it's half-past twelve—too late to go home to dinner. You will have to eat with me."

Mr. Stetzle nodded an unwilling acquiescence. It was indeed after the usual Whiffleville dinner hour and Mr. Stetzle, with a thought of Mrs. Stetzles temper upon such occasions, knew that he would be in for a cold meal and a hot tongue at home.

From his dinner bucket Mr. Fosdick took a napkin, spread it upon the grimy workbench and laid thereon a number of sandwiches and cookies, then abstracting from a drawer of the bench a box, he spread the contents over a slice of bread. Mr. Stetzle, after putting aside his quid and once more rinsing his mouth at the sink, seated himself and took a bite of the bread. Instantly there was a sputtering noise and an odd mixture of near-profanity and consonant noises.

"What in the name of Sam Hill did you put on that bread—axle grease?" hotly demanded Mr. Stetzle.

"Mineral butter, Eben," naively replied Mr. Fosdick. "Don't you like it?"

Mr. Stetzle's reply was lost in a prolonged gargle as he stood head back, bird-wise, at the sink.

While his friend was in this attitude Mr. Fosdick again reached into the drawer and this time drew forth a soap-like slab of substance of a sickly yellow color which he placed beside Mr. Stetzle's glass.

The self-appointed secretary and treasurer returned to his chair with an air of wounded dignity. He examined the yellow substance warily. "Cheese?" he queried.

Mr. Fosdick with a mouthful of cake nodded.

Mr. Stetzle took one bite, spat out the substance which fell upon the floor with a thud like that of a leaden slug, and glared at the inventor long and hard. It was the crowning indignity.

"Have you got any of your mineral eggs?" he sarcastically inquired. "I might as well go the full route while I am at it."

"Not yet, Eben," replied Mr. Fosdick cheerily. "We will take that up later."

"We will—like the devil!" ejaculated Mr. Stetzle savagely. "I'm going home." And rising from his seat the angered guest put on his hat preparatory to leaving. "You can take your mineral milk, cheese, eggs, butter, and the whole devilish smear and go to—and go to—" Mr. Stetzle's voice faded away as his eyes fell upon a pink slip of paper lying upon the end of the bench. It was a check signed by the great Ajax Manufacturing Company and it called for precisely four hundred and thirty dollars—one month's royalty on Mr. Fosdick's patent nutcracker. "As I was saying," he amended, "it's a devilish good line of products—if you can make 'em palatable."

"Easiest thing in the world, Eben," assured Mr. Fosdick, cheerfully brushing the crumbs aside and putting the lid on the dinner bucket. "Filtration, distillation, and—well, mixing generally will do the work."

Mr. Stetzle hesitated—and was lost. Like one in a dream he listened to the plausible Mr. Fosdick; his head swam with the abracadabra of chemistry which Mr. Fosdick reeled off with nimble tongue—stills, filters, test tubes, pipettes, condensing chambers and what not befogged his brain and in the end he feebly drew his fountain pen and made out a check for twenty-five dollars, payable to the inventor for one-half interest in the million dollar corporation to be,—The Mineral Food Products Company of America, Limited.

II.

The first thing that Mr. Fosdick did by way of establishing the milk plant was in having a large sign mounted upon the roof of the tin-shop where all might read:

THE MINERAL FOOD PRODUCTS COMPANY OF AMERICA, LIMITED.

Later a tower-like structure arose over the well in the rear of the shop and sundry tanks, pipes and stacks gave the place an air of prosperity. The inhabitants of Whiffleville looked on amazed at all this and asked many questions, but from the inventor and from his backer there came not a word. The literature of the company was now clogging the mails, and the public awoke to the fact that the great blessing of cheap mineral milk, butter, cheese, and, perhaps, eggs, were to be conferred upon them, thereby materially reducing the high cost of living. Immediately there was a panic in packing-house and cold-storage circles and the price of their securities dropped to the lowest ebb in the history of the trade. And Mr. Fosdick was proclaimed the greatest public benefactor of any and all time. But this was a somewhat premature honor, for as yet the factory had not made a single shipment—a fact due in a great measure to the inventor's refusal to sample the product. *He made Mr. Stetzle "taster" for the company and for two weeks that unhappy individual sat ten hours a day at a revolving table sampling small beakers of experimental milk* as fast as the energetic Mr. Fosdick could produce them—which was some six hundred a day. At last the secretary and treasurer rebelled. He declared that the Fosdick product had taken all the skin off his gums, and that he could not determine the difference between asphaltum and benzine. He said

LEFT THE BODY TOO NEAR THE STOVE AND IT TOOK FIRE.

that his mouth tasted like a paint factory, and that Mrs. Stetzle had filed suit for divorce, alleging that he had a breath like a gasoline engine.

Other trouble soon developed. Stock in the company had been sold and the inventors were clamoring for dividends. "The product of the factory must be marketed," they said. And so Mr. Fosdick, though protesting against it, crated ten gross of bottles and shipped them as far away as possible—to a mining camp in

Idaho where the company had an agent who ran a livery stable. For two weeks Mr. Fosdick anxiously awaited the result of this shipment, and then he received a letter from the agent:

red butte, idaho

deer sir—I hearby resine as agent for your miniral milk. We tried it on a injun and it kiled him. The coroner left the body too near the stove and it took fire, burning for three days and nights and could not be put out although we draged it into the creek and sank it under ten foot of water. The mine boss of the Wild Wildcat *being out of giant pouder put a quart charge of your stuff in on the* 1200 *foot level and it blew up the hole dam mine. Some of the boys that took a spoonfull of it in their coffey are sitting around afraid to breathe. How long does it take for the effecks to wear off?*

Respectively yours,

Tom Hobb, ex-agent.

Upon reading this Mr. Fosdick was vexed. He felt that the explosive nature of the product might be considered by the public as detrimental. He determined to say nothing of the matter to Mr. Stetzle, for of late his partner had begun to show some signs of worry and upon several occasions he had been undeniably cross. Mr. Fosdick pondered over this new problem for some time; the solution came to him like a flash one evening when he and Mr. Stetzle had tarried after working hours. "The trouble is simply a surplusage of hydro-carbons!" he exclaimed, and having discovered the fault he set about remedying it. Deftly he changed the adjustment of the pipes, altered the condenser, reversed the stills, inverted the heaters, tightened the gadgets, loosened the kerflopper, and did other things. Having accomplished this he sat down to think out the cause of the trouble. Then something happened.

"RUN FOR YOUR LIFE! THE MILK MINE HAS EXPLODED!"

Mr. Stetzle had been fooling around the well adjusting a troublesome snarkin. In Mr. Stetzle's teeth was a lighted cigar. Mr. Stetzle leaned far over the gunk pole in an effort to reach the snarkin—and the cigar fell out of his mouth and down into the yawning hole. Instantly there was a blinding column of flame, a deafening roar, and *Mr. Stetzle burst into the room in a hysteria of fright. "Run for your life!" he screamed. "The milk mine has exploded!"* Mr. Fosdick needed no second warning. With a bound he cleared the door, closely followed by his fear-stricken partner. Neither paused to look at the terrifying spectacle behind them. The streets of the town were as light as day, illuminated by a roaring geyser of flame that shot heavenward to a height that was afterward estimated at three miles. They took down the main street of Whiffleville at something less than a mile a minute gait, passing the Afro-Methodist church just in time to collide with two hundred panic-stricken darkies as they emerged from the doors and windows shouting that judgment day had come.

Not until they had become winded on the long hill four miles south of town did they pause in their flight. Totally overcome, both men sank to the ground where they lay for a long time panting with exhaustion. At last Mr. Fosdick, with a great effort, raised himself to a sitting posture and gazed with fascination at the burning milk mine. "By jings!" he exclaimed, "that thing gives me a new idea."

"Dodgast your new ideas!" exploded Mr. Stetzle. "Where's my twenty-five dollars gone?"

Mr. Fosdick turned and stared at his companion in amazement. "Why, Eben," he said "what more would you want for your twenty-five dollars than a good, first-class volcano? There's a lot of money in that thing if it's handled right. There's a barrel of money in it! We can fence it in and charge twenty-five cents admission. Now, say we have an attendance of only ten thousand a day—twenty thousand would be more likely—but even at ten thousand, that's twenty-five hundred dollars a day for exhibition purposes alone. Take the energy that's going to waste—a hundred thousand horse power, easy. We can sell that at——"

"O, shut up!" growled Mr. Stetzle, rising to his feet in disgust. "I'm going home."

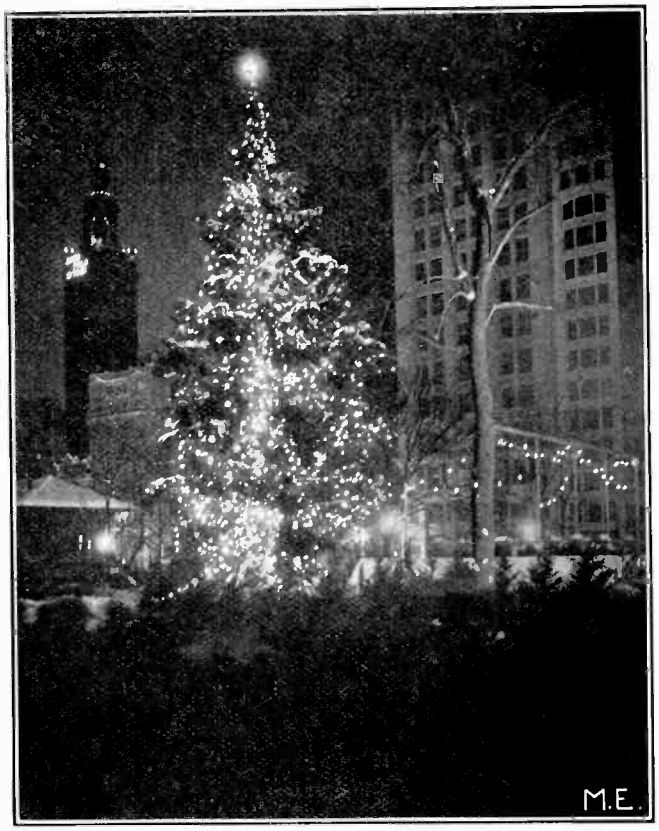
Father Knickerbocker's Christmas Tree

With a tree and a carol, the Christmas spirit was revived in New York, and thousands of dwellers in that busy town where sentiment is supposed to lie dormant, paused in their hustle and bustle to gaze at a thing of beauty that blazed gainst a background of park elms and tall buildings. It was the "tree of light," to provide cheer for those in whom the spirit of Christmas might need awakening, and all the holiday week it gleamed every night in the darkened park.

The out-door Christmas was a gift in every sense. The tree was presented by a club, its transportation was donated by the railroad company, it was erected by an interested New Yorker, the wiring was a gift and the illumination was provided by the lighting company. Even the soloists, the choral societies, and members of the band gave their services without cost to the committee.

Late in the afternoon of Christmas Eve the "tree of light" was ready. Long before the appointed hour, Madison Square Park was thronged. People had come from all over the city to see it, and hundreds paused on their way home. There were Christmas shoppers with their arms filled with bundles and tired girls who had waited upon them, but they all stood patiently until the trumpeters sounded the fanfare from Parsifal, when high at the top of the evergreen appeared the faint glow of a star, symbolical of the Star of Bethlehem, of two thousand years ago. Slowly, as its message seemed borne upon the great throng, it gained in brililancy until at last it burst forth in all its glory. For several minutes it ruled the darkness, and then the great tree seemed to spring to life as cluster after cluster of vari-colored globes shed their radiance from the branches.

At first the crowd stood in an awed silence, then a burst of applause swept over the throng and as the choir burst into "Holy Night," the carol was taken up until a thousand voices were united with those of the singers on the platform. The program continued until one o'clock, when the lights were turned off. Each succeeding evening until New Years, the tree gleamed from dusk till midnight.



Courtesy N. Y. Edison Co.
THE TREE LIGHTED UP

Eight candlepower lamps were used for the illumination. At first it was thought twelve hundred would be sufficient, but at a trial illumination it was found these hardly did the tree justice so eighteen hundred more were added the next day, the electricians, among

(*Continued on page* 1168)

Simple Method for Designing Wireless Transformers

By Paul Horton

SO much excellent descriptive matter pertaining to high tension transformers and their construction has been published that in the following article no space will be given to matters of detail in construction. However, due to erature upon the subject of transformer the pronounced scarcity of available litdesign, it has been endeavored to develop the dimensions of the apparatus described below in a simple manner, comprehensible, it is hoped, to all non-technical readers. While a complete mathematical exposition of transformer design, entailing numerous and complex calculations cannot be entered into here, a series of computations showing the relations of the various parts of the instrument, will be given in a way that will enable anybody to design their own transformer. Only one of the two existing types will be considered, namely the closed core form. Doubtless the reader is familiar with the details of shape and construction of a trasformer, so a description of the same will not be necessary.

In calculating the efficiency of a transformer it is necessary to consider numerous factors, each contributing towards or against perfection which are beyond the scope of this article, but after considering the sum of all the defects in the average amateur built instruments, it is safe to place the resulting efficiency at 90 per cent., that is to say the secondary will return 90 per cent. of the total energy passed into the primary. Assuming the transformer in question is expected to deliver 750 watts (¾ k.w.) to the sending condenser, it is clear that at an efficiency of 90 per cent. the total required input, will be 835 watts.

It is supposed that the builder intends to make use of a 110 volt supply circuit, therefore to determine the size wire necessary to carry the primary current, without heating, we resort to the use of the formula, Amperes = Watts ÷ Volts.

Assuming 835 watts as the input, then the amperes = 835÷ 110 = 7.6 nearly. Now to reduce this result to wire size B. & S., we merely multiply by 1000, this being the number of circular mils, standard allowance, cross section area of a copper conductor per ampere current density, thus obtaining 7,600. Referring to the table appended, we find that No. 11 wire comes nearest to the size required for the primary conductor. In the calculations for the size of the secondary wire, identically the same means are employed. If you expect the instrument to develop 12,000 volts secondary potential then the amperes will equal 750 ÷ 12000 = 0.062. Now multiplying by 1000 gives us 62 C. M. as the cross sectional area of the required conductor, which, upon referring to the table below, indicates the use of No. 32 wire.

TABLE I

	Gauge B. & S.	Sectional area cir. mils	Feet per pound	Turns per square inch
Primary	9	13094	25.2	
	10	10382	31.8	
	11	8234	40.1	
	12	6530	50.5	
	13	5178	63.7	
	14	4107	80.4	
				Enamel Wire
Secondary	29	127	2607	6600
	30	100.5	3287	8260
	31	80	4414*	10830
	32	63	5226	13430
	33	50	6590	16830
	34	40	8313	21000

We found above that an input of 835 watts was required to secure an output of 750 watts, therefore we presume that the difference, 85 watts, must be lost somewhere in the process of transformation. In fact, this loss is due to eddy currents and hysteresis in the core and the I^2R loss or heating effect in the windings. Laboratory investigation has shown that about 45 per cent. of the total, or 38 watts, are due to the first two of the above losses, of which 79 per cent., or 30.2 watts, are accredited to hysterisis alone. These 30.2 watts are called the

iron losses of the transformer, and the core must incorporate enough volume to properly dissipate 30.2 watts. Now, referring to the standard work upon transformer design, we will find that the practice is to allow 0.15 watt loss to each cubic inch of core. Hence, by simple division we find the required core volume to be $\frac{30.2}{0.15}$ or 201 cubic inches. The loss above given is calculated upon the presumption that the core was built up of shellac insulated standard transformer iron laminations.

The shellac is used to prevent excessive loss due to eddy currents. The point has now been attained where we are no longer able to follow the guidance of a set rule, and results are obtained only by the exercise of a sense of proportion and the use of a little experience. In other words, we are now ready to assign definite dimensions to the core. As I have said, there is no rule to follow, but a few points to be avoided may help to point out the best sizes to be decided upon. In the first place, the core must be long enough to accommodate the windings and also wide enough to prevent the coils touching in the center space. Again, if the core is extremely long, the magnetic flux would pass with difficulty, due to the increased reluctance of the magnetic path, also it would have a bad effect upon the windings, requiring an excessive number of turns which is known to be detrimental to efficient operation. Withal, it may be stated that a good plan is to keep the core nearly square, never allowing the length to become much greater than the width. Keeping the above facts in mind, it is found that a core having the outside dimensions of 11½ x 9½ and a cross section of 2½ x 2½ is about right, having a volume of 200 cubic inches; these dimensions, however, are not arbitrary, and may be changed slightly, so long as care is taken to keep the volume as near 200 as is possible.

After constructing and insulating the core in the usual manner, we are now able to proceed with the primary coil. First, we will determine the required number of turns by using the well-known formula

$$\text{turns} = \frac{\text{voltage} \times 10^8}{4.44 \times F \times f}$$

here 4.44 and 10^8 are constants. Voltage = 110 and f = 60 cycles or frequency. F equals flux or the number of magnetic lines passing through the core. This quantity is obtained by multiplying the cross sectional area of the core (2½ x 2½) by the maximum flux per square inch. Upon referring to a standard text, we find the flux allowed at 60 cycles to be 30,000 lines per square inch. Performing the calculation 2½ × 2½ × 30,000, and we get for "F" 187,500 lines. Substituting in the above formula, the number of turns are found to be:

$$\frac{110 \times [(10^8) = 100000000]}{44.4 \times 187500 \times 60} = 220 \text{ primary turns.}$$

Allowing ⅜ inch space at each end for insulation, the winding space will be 11½ — (2½ + 2½ + ⅜ + ⅜) = 5¼ inches long. There being 9½ turns per linear inch of No. 11 DCC wire, then by multiplication we find that 49 turns may be applied in each layer. Now, if the first two layers are made full 49 turns and each of the succeeding three layers are reduced two turns per layer, we will have applied 233 turns, which is near enough to 220 for all practical purposes. In order to furnish a means of adjustment a tap may be brought out from each of the three last layers. The fewer layers of primary in circuit the higher will be the secondary voltage, but an inductance coil will be needed to control the current if all turns are not in circuit. The calculations needed in computing the secondary turns are now very simple, the turns being in the same proportion to the primary turns as the voltages, thus in the proportion 110 : 12000 :: 233 : X we find that the secondary turns equal $\frac{12000 \times 233}{110}$ or 25,418 turns.

The secondary is best wound in pies, but if enamel wire is used the layer method may be used, provided that the

(*Continued on page 1151*)

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H. GERNSBACK, Editor

C. A. LeQUESNE, Jr., Assistant Editor

O. J. RIDENOUR, Business Manager

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EDITORIAL

THERE seems to be as yet, quite a little misunderstanding about the new wireless law and the writer would like to make a few points clear.

Receiving Stations.—**No receiving station is required to be licensed under the law.** *You can receive as long and as much as you please,* but you must keep the information thus conveyed to you secret. This does, of course, not hold true for every case, as for instance distress calls, calls for assistance, etc.

Sending Stations.— **Only stations that send messages over a state border, or those sending messages from one state into another are required to be licensed.** Sending stations located in the same state can communicate with each other *without requiring any license,* provided they do not send across the nearest border, and providing that they do not interfere with stations doing interstate business. To make this plain: Under ordinary circumstances a one-inch spark coil cannot transmit more than 8 miles; a two-inch coil will not reach over 16 miles and so on. (These values are for spark coils.)

Open core transformer coils in connection with electrolytic, interrupters transmit not above one mile for every five watts input in the primary. Close core transformers transmit about one mile for each ten watts. Thus a ½-kw. transformer will transmit about 50 miles.

For example, if you live in the city of Pittsburgh, Pa., you will find that the nearest border line (West Virginia) is 26 miles distant. If you use, therefore, nothing larger than a three-inch spark coil you do not require a license. On the other hand, if you live in New York City (Manhattan) the nearest state border (New Jersey) being less than one-half mile away, a license must be obtained.

Eighty per cent. of the amateurs in America use spark coils, while fully 90 per cent. of them live at least 10 miles or more away from a state border. It therefore becomes apparent that only those living close to state borders need licenses.

At the same time the writer would like to see EVERY amateur owning a sending station, take out a license. *It is an honor to be licensed* and it gives the amateur a high standing in the community, for it means that Uncle Sam has put the seal of approval on the wireless station that has been licensed.

Wireless and the Amateur

A Retrospect

By H. Gernsback

ON December 13, 1912, the new wireless law went into effect. The average wireless "fiend," who has not followed the topic from the start will be interested in the following facts:

The very first talk about Wireless Legislation in the country started in 1908. The writer in his Editorial in the November, 1908 issue of *Modern Electrics* pointed out that a wireless law was sure to be passed in a very short while. In order to guard against unfair legislation as far as the wireless amateur was concerned the writer, in January, 1909, organized the "Wireless Association of America." This was done to bring all wireless amateurs together and to protest against unfair laws. Previous to this time there was no wireless club or association in the country. In January, 1913, there were over 230 clubs in existence, all of which owe their origin to the "Wireless Association of America."

The association had no sooner become a national body than the first wireless bill made its appearance. It was the famous Roberts Bill, put up by the since defunct wireless "trust." The writer single handedly, fought this bill, tooth and nail. He had representatives in Washington, and was the direct cause of having some 8,000 wireless amateurs send protesting letters and telegrams to their congressmen in Washington. The writer's Editorial which inspired the thousands of amateurs, appeared in the January, 1910, issue of *Modern Electrics. It was the only Editorial during this time that fought the Roberts Bill.* No other electrical periodical seemed to care a whoop whether the amateur should be muzzled or not. If the Roberts Bill had become a law there would be no wireless amateurs to-day.

That editorial quickly found its way into the press and hundreds of newspapers endorsed the writer's stand. During January, 1910, the *New York American*, the *New York Independent*, the *New York World*, the *New York Times*, the *Boston Transcript*, etc., all lauded and commended the writer's views. (See Editorial article February, 1910, *Modern Electrics.*) Public sentiment quickly turned against the Roberts Bill and it was dropped.

The first wireless bill not antagonistic to the amateur, The Burke Bill, appeared on March 8, 1910. It had some defects, however, and was dropped also.

The Depew Wireless Bill appeared May 6, 1910, but did not meet with general approval, as the writer pointed out in his Editorial in the June, 1910, issue of *Modern Electrics,* it had several undesirable features, and the bill was never seriously considered, although it actually passed the Senate. (See Editorial, August, 1910, *Modern Electrics.*)

At last the Alexander Bill made its appearance on December 11, 1911. This bill as far as the amateur was concerned was not quite acceptable to the writer, who had the amateurs' rights at heart, and steps were immediately taken to bring about an amendment as the writer, perhaps, more than anyone else, realized that this bill, in some form or other, would become a law sooner or later. This is clearly stated in his Editorial in the February, 1912, issue of *Modern Electrics.* In that Editorial is to be found also the first and now historical recommendation that if a wireless law was to be framed it should restrict the amateur *from using a higher power than 1 kw. and his wave length should be kept below 200 metres.* No one else had thought of this before, and it is to be noted that when Congress finally passed the present wireless law, *it accepted the writer's recommendation in full,* thus paying him the greatest compliment, while at the same time acknowledging the fact that he acted as the then *sole* spokesman for and in behalf of the wireless amateur.

In March, 1912, the writer, in a letter to the *New York Times,** pointed out the shortcomings of the Alexander

*See page 24, April, 1912, issue *Modern Electrics.*

Bill, and protested against unfair legislation.

The Times, as well as a host of other newspapers took up the cry and published broadcast the shortcomings of the Alexander Bill.

All this agitation had the desired effect and Mr. Alexander for the first time realized that the amateur could not be muzzled, especially when there was such a periodical as *Modern Electrics* to champion his cause. Promptly in April the Alexander Wireless Bill, *amended,* appeared and here for the first time in history the amateur and his rights are introduced by any wireless bill.

Mr. Alexander and his advisers accepted the writer's recommendation as set forth in his Editorial in the February, 1912, issue of *Modern Electrics* and the new paragraph (15) in the amended bill reads thus:

General Restrictions on Private Stations.

Fifteenth. No private or commercial station not engaged in the transaction of bonafide commercial business by radio communication or in experimentation in connection with the development and manufacture of radio apparatus for commercial purposes at the date of passage of this Act, *shall use a transmitting wave length exceeding two hundred meters, or a transformer input exceeding one kilowatt,* except by special authority of the Secretary of Commerce and Labor contained in the license of the station.

It will be noted that it copied the writer's recommendation word for word.

The amateur had at last come into his own. This is all the more remarkable as this is the only country that recognizes the wireless amateur.

On May 7, 1912, the Alexander Bill amended, now known as S-6412 passed the United States Senate and on May 8th was sent to the House of Representatives and referred to the Committee on the Merchant Marine and Fisheries,* The bill was signed on August 13th by President Taft, thus making it a law.

In the March, 1912, issue, *Modern Electrics* long before the passage of the wireless law and ahead of any other periodical published an article on "Limited Wave Lengths" preparing the amateur for the new law and paving the way towards standardizing amateur stations.

Finally in the November, 1912, issue, page 829, the full text of the new wireless law was published, and it was announced that the law would go into effect December 14, 1912.

In the December, 1912, issue,† the new law was fully discussed and all phases explained.

Again *Modern Electrics* was the only periodical to publish the license blanks and to show the amateur how to fill them out. No other periodical had enough interest in the amateur to render this important service to him.

And last but not least in this issue we are printing a facsimile copy of an original license, which up to the present minute closes amateur wireless history in the United States.

This terminates the fight which the writer has waged single-handedly for almost five years in behalf of the American amateur. It must be apparent even to the layman, who has not followed the evolution of the present law, that unquestionably the entire credit for obtaining the amateur's rights belongs to *Modern Electrics*. This is freely admitted today by all. The indisputable facts enumerated in this article make this clear.

Now that it is all over, and that Uncle Sam has set his seal of approval upon the amateur's wireless, the writer cannot but extend his heartiest congratulations to the 400,000 American amateurs; and he furthermore wishes to extend his thanks to all the amateurs who have supported him in his fight to bring about a new wireless era in America.

Long live the Wireless! Long live the Amateur!!

*See June, 1912, issue *Modern Electrics*, page 245.

†Page 922.

PUTTING IT ON THE AMATEUR AGAIN

Arlington, Va.—Officers here say the operator at Mare Island was mistaken in believing that he exchanged messages with Arlington several nights ago. They think some mischievous amateur in the vicinity of the California station used the Arlington signature.

When you can't think of anyone else blame it on the amateur.

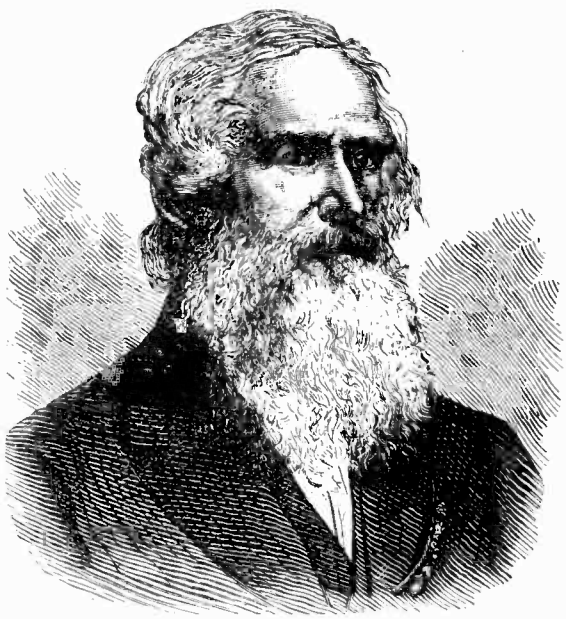
Samuel F. B. Morse

Samuel Finley Breese Morse was born on the 27th of April, 1791, at Charleston, Mass.

He started first as a painter and in order to get a better technique he studied in Europe, twice, during the years 1811-1815 and from 1829-1832.

During the return voyage from Europe, after his second visit in the year 1832, it happened that he made the acquaintance of Prof. Chas. T. Jackson, of Boston. On the ship he noticed the electrical experiments of the Professor during which the latter made the remark that it should be possible to use electricity as a means for signaling.

After his return from Europe, Morse again devoted all his time to his painting but he did not seem to make a success of it and was always more or less in financial trouble.



S. F. B. MORSE

He was at the head of the National Academy of Painters and in the year 1835 received the title of Professor; and in November, 1835, he took up his telegraphic experiments, but inasmuch as he did not have much experience in electricity, and as he was not much of a mechanic, he did not obtain any results whatsoever.

In the year 1836, the Professor of Chemistry, Leonard Gale, gave Morse a great many pointers on electricity, and it was through him that Morse was able to construct his first electromagnet. As it happened Prof. Gale afterwards became the associate of Morse.

Only in the year 1837 were his labors finally crowned with success and his first apparatus to transmit signals is shown elsewhere in this issue.

About this time Morse made the acquaintance of Alfred Vail, who supported him financially and Mr. Vail also became one of Morse's associates.

A good machine was now built, and on the 4th of September, 1837, the experiment finally could be called successful as the first real transmission of signals from one point to another was made on this day. However, the world did not accept the great invention immediately, and Morse at various times tried to interest capitalists in his invention.

Mr. O. J. Smith, a member of Congress supported Morse financially a great deal, and it was possible for him to go to Europe with the view to exploiting the invention. This, however, proved a failure, and he returned to New York in 1839. Morse again resorted to painting in order to gain a living. Finally, in the year 1843, Congress appropriated the sum of $30,000 to put up a large experimental line.

This first line, 40 miles long, was erected between Washington and Baltimore and in May, 1844, was tested out for the first time.

Morse's apparatus during this time had undergone a great many changes, and in such a degree that they approach to-day's intsruments to a certain extent.

After this, the Morse telegraph, in an astonishingly short time, found its way all over the world. Morse became an electrician of the New York and Newfoundland Telegraph Company, and Professor of National History at Yale

(*Continued on page* 1153)

Operators and Station Licenses for Amateurs

THROUGH the courtesy of Mr. W. D. Terrell, Radio Inspector for the Port of New York, we are enabled to present this month reproductions of the forms upon which the station and operators' licenses will be granted to amateurs. Fig. 1 shows the first grade amateur operators' license, which is issued to amateurs after they have been examined and found competent to operate and have charge of amateur radio apparatus under the law. The qualifications necessary in order that an applicant may pass the examinations are set forth in the Department of Commerce and Labor Regulations Governing Radio Communication, under date of September 28th, 1912, and which were abstracted in the article on the Wireless Amateur and the Wireless Law in our December and January numbers. We are also able, through the courtesy of the Navy Department, to present herewith a list of questions which applicants for a radio operator's license are expected to answer.

The examination consists of a demonstration of the applicant's ability to send and receive in the Continental Code, but no minimum speed is required. In addition, written answers must be given to a typewritten list of twelve questions taken from the list printed below. Amateurs are not asked the questions marked *.

Fig. 2 shows the form of the Second Grade amateur operator's license. This license is merely a temporary permit issued by Radio Inspectors to amateur operators who find it impossible to go to the nearest Navy Yard or other point where the examination is held, in order to take the examination. There are comparatively few cases, except where an amateur lives at a great distance from the place where the examinations are held, that the amateur cannot arrange to take the examination in the regular way, and for this reason very few second grade licenses will be issued, and it will be necessary for those who apply for this grade of license to present pretty good reasons to the Radio Inspector before he will receive a second grade license. In other words, it is apparent that many of the amateur operators, either from fear of their inability to pass the regular examination, or from unwillingness to take the necessary time and trouble to be examined in the regular way, will apply for the second grade licenses. It should be distinctly understood that the Radio Inspector will not issue these second grade licenses except in comparatively few cases, where it would be imposing an unnecessary hardship upon the applicant to make him take the regular examination.

It should also be understood that those who do receive the second grade license will have to pass an examination anyhow when the Radio Inspector examines their stations, the Radio Inspector conducting the examination, and if the applicant is then found to be entitled to a First Grade license the same will be issued to him by the Radio Inspector, and if not the Second Grade license will be cancelled and the applicant not permitted to operate radio apparatus.

On the back of these two licenses is printed the following oath of secrecy, which must be signed and sworn to before a notary public before the applicant may receive the license.

I, ..., do solemnly swear that I will faithfully preserve the secrecy of all messages coming to my knowledge through my operation under this license; that this obligation is taken freely, without mental reservation or purpose of evasion; and that I will well and faithfully observe the obligations of a licensed radio operator: So help me God.

.....
(*Signature of holder*)
Date of birth, ... Place of birth....
Sworn to and subscribed before me this ..... day of .....
A. D., 191 .

....., *Notary Public.*

As the notary public is entitled by law to charge a fee for his services, it may be necessary for the applicant to pay a small fee of 25c or 50c, although a good many notaries public make no charge for this service. This is the only fee which

Form 759

The United States of America

NUMBER 290

DEPARTMENT OF COMMERCE AND LABOR

LICENSE

TO

RADIO OPERATOR, AMATEUR FIRST GRADE

This is to certify that _____

has been examined and shown to have a knowledge of the adjustment and operation of apparatus and of the regulations of the Radiotelegraphic Convention and the Acts of Congress in so far as they relate to interference with radio communication and impose certain duties on all grades of operators sufficient to entitle him to a license, and he is hereby licensed as required by law Radio Operator, Amateur First Grade for two years.

The candidate was examined and shown to have knowledge (excellent or good) in the following additional subjects.

(a) general adjustment, operation and care of apparatus [1] _____

(b) transmitting and sound reading Continental Morse at a speed of [2] _____ words a minute.

(c) general knowledge of international regulations and Acts of Congress to regulate radio communication _____

_____ (Examining Officer)

_____ (Title)

CHARLES NAGEL, Secretary of Commerce and Labor.

Place _____ Date _____ 191_

1 Excellent or good. 2 Insert speed.

FIG. 1

Form 760

UNITED STATES OF AMERICA

No. 1850

Department of Commerce and Labor

RADIO SERVICE

License to Radio Operator, Amateur Second Grade

This is to certify, that _____

has presented satisfactory evidence that he has a knowledge of the adjustment and operation of apparatus and of the regulations of the Radiotelegraphic Convention and the Acts of Congress in so far as they relate to interference with radio communication and impose certain duties on all grades of operators sufficient to entitle him to a license, and he is hereby temporarily licensed as RADIO OPERATOR, AMATEUR SECOND GRADE, for the period of eight months or until he has been duly examined.

He has also shown that he has knowledge (excellent or good) of the following additional subjects:

(a) General adjustment, operation, and care of apparatus _____ (Excellent or good.)

(b) Transmitting and sound reading Continental Morse at a speed of _____ words a minute.

(c) General knowledge of international regulations and Acts of Congress to regulate radio communication _____ (Excellent or good.)

CHARLES NAGEL,
Secretary of Commerce and Labor.

_____ (Certifying officer.)

_____ (Title.)

Place _____ Date _____ 191

FIG. 2

an applicant would have to pay in connection with the securing of the licenses, and was overlooked when the article on the Wireless Amateur and the Wireless Law was written.

QUESTIONS.

Section I.

1.—Practical demonstration of ability to send and to receive by ear at speed of not less than 12 words a minute Continental Morse, five letters to the word.

Section II. Theoretical Radio

*1.—Make elementary sketch of transmitting set with which you are familiar, showing all apparatus from power source to antenna.

*2.—Describe and give uses of a type of transfer switch.

*3.—How is the wave length of the closed circuit affected by changing the number of jars? By increasing the number of turns on the helix?

*4.—Name all uses of anchor spark gap. Has it any disadvantages?

*5.—Make diagram of receiving set with which you are most familiar.

6.—Explain how a buzzer tester can be used to detect faults in telephone, detector, etc. How can you use such a tester to show that your receiver is in good working order from antenna to detector? Give full diagram of connections in this case.

7.—Draw a diagram of a buzzer tester, showing it in position to test the sensitiveness of a detector.

*8.—Name four types of detectors and show how each is connected to the receiver. Name advantages and disadvantages of each type.

Section III. Practical Radio.

1.—What simple test can you apply to see if your antenna is grounded somewhere outside of the station.

2.—How can you tell if your antenna is radiating? Describe apparatus in detail. If apparatus customarily supplied for this use should be disabled, what simple test can be applied?

3.—If you get an arc in your spark gap instead of a snappy sounding spark, what would be the trouble and how would you remedy it?

4.—In case your antenna was destroyed and you could put up only one wire between the masts, how would you adjust your transmitter to the same wave length as before? What would be the most noticeable probable change in the transmitter?

COPY

Form 765 *Number*

LICENSE FOR ..... (General or restricted) **AMATEUR RADIO STATION**

Department of Commerce and Labor
RADIO SERVICE

Pursuant *to the act to regulate radio communication, approved August 13, 1912,* ....., *a citizen of the State of* ....., *having applied therefor, is hereby granted by the Secretary of Commerce and Labor, for a period of one year, on and subject to the restrictions and conditions hereinafter stated and revocable for cause by him, this License to use or operate the apparatus for radio communication (identified in the Schedule hereinafter) for the purposes of receiving for pleasure radiograms and signals and of transmitting for pleasure radiograms or signals, notwithstanding the effect thereof extends beyond the jurisdiction of the State or Territory in which the said station is located:* ***Provided,*** *That no other interference than may result under the restrictions in this License contained shall be caused with the radio communication of stations of the Government of the United States or licensed stations.*

2. The use or operation of apparatus for radio communication pursuant to this License shall be subject also to the articles and regulations established by the International Radiotelegraphic Convention, ratified by the Senate of the United States and caused to be made public on May 25, 1912, by the President "to the end the same and every article and clause thereof may be observed and fulfilled with good faith by the United States and the citizens thereof," and shall be subject also to such regulations as may be established from time to time by authority of subsequent acts and treaties of the United States.

3. The apparatus shall at all times while in use and operation be in charge of a person or persons licensed for that purpose by the Secretary of Commerce and Labor, and the operator of the apparatus shall not wilfully or maliciously interfere with any other radio communication.

4. The station shall give absolute priority to signals or radiograms relating to ships in distress; shall cease all sending on hearing a distress signal; and shall refrain from sending until all the signals and radiograms relating thereto are completed.

*5. The station shall use the minimum amount of energy necessary to carry out any communication desired, and the transformer input shall not exceed one-half kilowatt.**

6. The station shall not use a transmitting wave length exceeding 200 meters.

7. The station shall not use a transmitter during the first 15 minutes of each hour, local standard time, whenever the Secretary of Commerce and Labor by notice in writing shall require it to observe a division of the time, pursuant to the Twelfth Regulation of the act of August 13, 1912.

11—4000

* Strike out "one" if the station be within 5 nautical miles of a naval or military station; otherwise strike out "one-half."

FIG. 3

5.—Describe in detail how you tune a receiver to an incoming wave, using receiver with which you are most familiar.

6.—What form of detector have you found best for strong signals, and what for weak signals?

7.—If you had only one pair of telephones, and they tested open when the tips were connected to the terminals of a cell, what would you do to see if you could remedy the fault or in any way get messages?

8.—How do you change from one wave length to another on any set with which you are familiar?

*9.—How may the amount of power used in sending be changed?

Section IV. Practical Motors, etc.

*1.—Suppose on starting a motor the breakers tripped and fuses blew, where would you look for trouble and why?

2.—If your A. C. voltmeter registered little if any voltage when running, what might be the causes?

*3.—How would you increase and decrease the voltage of your A. C. generator.

*4.—If your motor runs too fast, how can you reduce the speed? How can the speed of a motor be increased?

5.—What is the effect of starting a motor too slowly? If started too quickly? How do you tell the correct speed for operating the starting rheostat?

6.—On starting a motor, what effect will an open

field on the motor have on the behavior of the machine? When a generator is running, what is the effect of an open field?

7.—Suppose the line voltage of your supply (as shown by the voltmeter in the radio station) is too low, what steps must be taken, and where, to bring the voltage up to normal?

8.—If motor will not start until starting handle is almost full over to running position, what might be the probable causes?

*9.—If after the motor has been started to full speed the starting lever flies back to the off position when released, what would be the trouble and how would you repair it temporarily?

Section V.

1.—State briefly the requirements of United States law that operators are bound to observe.

2.—What is meant by a pure wave? A sharp wave? What changes in the apparatus would affect the pureness or sharpness of waves?

*3.—What are the Berlin convention regulations regarding the secrecy of messages?

*4.—What is the signal for ships in distress and what would you do on hearing such signal?

*5.—Give Berlin convention regulations for: (a) Calling shore station. (b) Answering. (c) How much time must elapse between calls if first call is not answered after being repeated three times?

*6.—What class of messages have precedence over all others?

*7.—How do you count the words in a message? What is the count in the following message?

Chicago, Ill., Decemher 10, 1912.

A. B. Ford,
S.S. Moro Castle,
Via Radio, Key West.

Hold five days. Instructions countermanded. Return without delay. J. Brown.

Note.—The word receiver, where it occurs in the above questions, means the receiving set.—Ed.

Figs. 3 and 4 show respectively the front and back of the Amateur's Station license. This is the form used for either the general or restricted amateur radio station, and is filled out and delivered to the applicant by the Radio Inspector after he has made an inspection of the station and found it to conform to the regulations. It will be noted that the form shown is marked "Copy" and that the number is left blank. This license is made out in triplicate, that is: the original and two copies. The original is not marked "Copy" and the number is printed on the license. The original is delivered to the owner of the station, one of the copies is forwarded to the Department of Commerce and Labor at Washington, D. C., and the other is kept by the Radio Inspector for his records. The station must conform to the regulations of the Department of Commerce and Labor as set forth in the article on the Wireless Amateur and the Wireless Law, above mentioned.

At the Brooklyn Navy Yard during the month of January applicants for operators' licenses will be examined each week day with the exception of Thursday and Saturday, or a legal holiday. At other points the examination date should be obtained by communicating with the commandant of the yard or station where the examination is to be taken. The arrangement at the Brooklyn Navy Yard is the same as has been in force during the month of December. The examination dates during the month of February have not yet been announced, but will depend upon the number of applications received during the month of January.

8. The President of the United States in time of war or public peril or disaster is authorized by law to close the station and cause the removal therefrom of all radio apparatus or may authorize the use or control of the station or apparatus by any department of the Government upon just compensation to the owners.

9. The Secretary of Commere and Labor and Collectors of Customs or other officers of the Government authorized by him may at all reasonable times enter upon the station for the purpose of inspecting and may inspect any apparatus for radio communication in such station and the operation and operators of such apparatus.

10. The apparatus shall not be altered or modified in respect of any of the particulars mentioned in the following Schedule except with the approval of the Secretary of Commerce and Labor.

SCHEDULE OF STATION AND APPARATUS

Name of owner, ... *; Age,* .....

Location: State, ... *; County,* .....

City or town, ... *; Street,* ..... *, No.* .....

Official call, ...

Name of naval or military station, if within 5 nautical miles, ...

.....

Power: Transformer input, ... *W.**

Antenna: Type (T, ⊓, *fan, umbrella, etc.*), ...

Vertical height, ... *; Horizontal length,* .....

Wires: Number in vertical part, ... *; In horizontal part,* .....

The normal sending and receiving wave length shall be ..... (Not exceeding 200) *meters and the station is authorized to use the following additional wave lengths, not exceeding 200 meters:* ..... *meters,* ..... *meters.*

Satisfactory proof has been furnished that the station was actually operating August 13, 1912.

This License expires on ....., *191*

BENJ. S. CABLE,
Acting Secretary of Commerce and Labor.

Delivered by .....
(Radio Inspector)

Place, ..., *Date,* ....., *191*

*Not to exceed 1,000; or if the station be within 5 nautical miles of a naval or military station, not to exceed 500.

11—4000

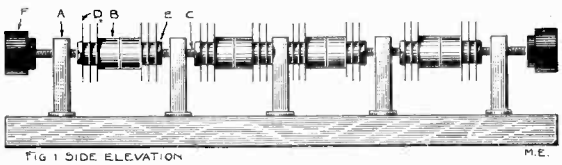
FIG. 4

A Series Spark-Gap

By P. Mertz

A SERIES spark-gap that gives a sharp, snappy sound to the spark very nearly like that of the quenched spark-gap is shown in the illustrations.

Figs. 1 and 2 show the assembled gap, while the other illustration shows the separate parts of the gap.

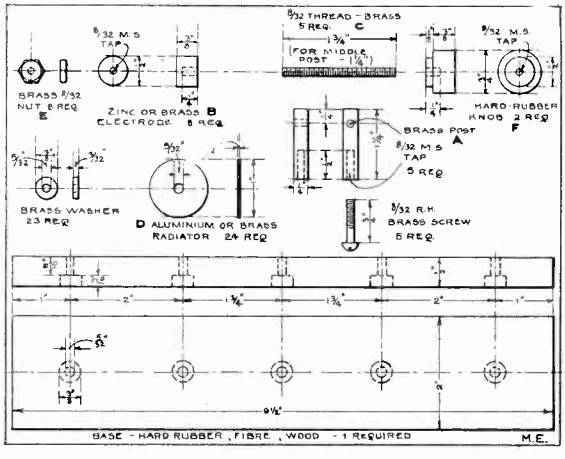


The posts, A, are made of ¼-inch square brass rod, such as is used for slider rods. Two holes are drilled in each and tapped with 8/32 thread, as shown.

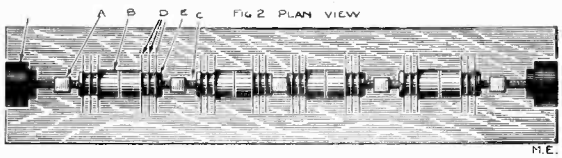
The electrodes, B, can be made of brass or zinc; the former was used in the gap upon which this description is based. They were turned out on a lathe, but it would be just as well to make them of round rod ½ inch in diameter.

The electrodes are screwed on to pieces of brass rod, C, 1¾ inches long, threaded with an 8/32 thread.

Radiators, D, are mounted with them, as shown, to decrease heating at the spark-gap. These radiators are made of sheet aluminum an inch in diameter and are separated by brass washers.



If desired, the radiators can be made of brass. They are fastened onto the rods, C, by means of 8/32 nuts, E. It will be noticed that in the middle post the rod, C, is made a little shorter than in the others (1¼ inches instead of 1¾ inches), so that instead of nuts, E, washers separate the radiators from the post. Thus the gap electrodes mounted on that post are stationary. The reason for this will be seen further on.



On the end rods hard-rubber knobs, F, are mounted as shown in the illustration.

The instrument is then mounted on a base, preferably of hard-rubber or fibre; although the one being described was mounted on a wood base, with excellent results. For the sake of appearance, washers are placed under the posts, as shown. The metal parts of the instrument are then to be polished, if possible, with Venetian red on a buffer; and lacquered or nickel-plated.

In adjusting the gap, the electrodes nearer the middle are to be attended to first. They are adjusted by turning the screws, C, carrying the electrodes, having previously slipped a sheet of ordinary writing paper between the latter. When the paper is screwed down quite tight, it should be taken out, and the gap is now adjusted. The end gaps are then adjusted in the same manner.

A spark-gap constructed and adjusted as above described gave a reading of 350 milliamperes on a hot-wire meter, using a half-inch coil on 12 volts. An ordinary gap showed up only 275 milliamperes, using exactly the same apparatus and adjustment as before; besides, the pitch of the spark was not nearly as

sharp. This shows how much greater the efficiency of this gap is than that of the ordinary style, and gives an idea of how its use can increase the range of any transmitting station using a small coil. The advantage of this gap is that, unlike the rotary or regular quenched-spark gaps, it can be used on the smallest coils as well as the larger ones, and with equally good results.

TRANSFORMER DESIGN

(Continued from page 1141)

insulation is well proportioned. Allowing the pies to be ¼ inch in width and spaced ⅛ inch apart for cooling purposes, then $\frac{5\frac{1}{4}}{\frac{1}{4}+\frac{1}{8}}$ or 14 pies will be needed. Since there are to be 25,418 turns applied, then each pie will contain 25,418 ÷ 14 = 1,675 turns. To compute the space occupied by the secondary inside the transformer or the width of the pies, we proceed as follows: From the table given, we find that No. 32 enamel wire winds 13,430 turns per square inch by machine, but allowing 25 per cent. loss for hand winding, we ought to be able to wind 10,073 turns per square inch. Since 25,418 turns are needed, then we will require $\frac{25{,}418}{10{,}073}$ or practically three square inches of space. Then 3 square inches distributed among 14 pies will make them nearly 1 inch in width, or rather depth. Therefore, if we allow ¼ inch for core insulation and another possible ¼ inch for taping and bulge, the pies will take up 1+ ¼ + ¼, or 1½ inches. The primary will take up about 1¼ inches, then we find that the space between the two coils is 4½ — (1½ + 1¼) = 1¾ inches, this being ample for insulation. However, if cotton insulation had been used, the space would have been narrowed down to about ¾ inch, thereby necessitating the use of a fibre insulating block. This is the sum of our calculation, unless we wish to determine the weights of the various materials used.

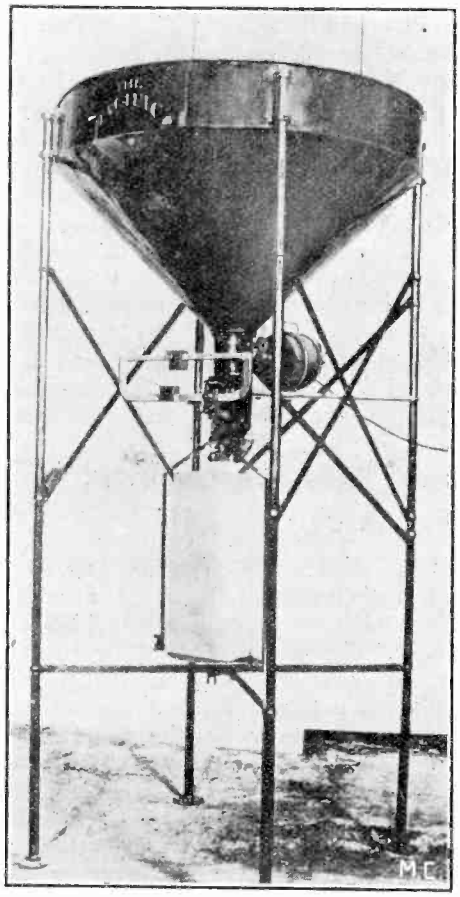
To find weight of core multiply the number of cubic inches by 0.268. Thus our core used above weighs 200 x 0.268 = 52.6 pounds. The weight of the primary is found as follows: The insulation about the primary leg of the core is ⅛" thick, therefore, the perimeter of the first turns is 4 (2½ + ⅛ + ⅛) = 11. The perimeter of the longest turns is allowing the primary coil to be 1" in radius, 4 (2½ + 2) = 18. Then the average length of turns is (18 + 11) ÷ 2 = 14½ inches. There being 233 turns, then 233 × 14½ or 3475 inches of wire will be used. 3475 ÷ 12 = 281 feet. Referring back to the table we find that No. 11 wire runs 40 feet to the pound. Hence 281 ÷ 40 or 7 pounds will be required. The secondary is figured in a like manner. The insulation about the core being ¼" thick, the perimeter of the shortest turns is 4 (2½ + ¼ + ¼) = 12 inches, likewise the outside turns are 4 (3 + 1 + 1) = 20 inches or the mean perimeter is 20 + 12 ÷ 2 = 16 inches. 16 × 25,418 = 406,500 inches or 33,900 feet of wire needed for secondary. The table shows that No. 32 wire runs 5226 feet to the pound, therefore, we will need $\frac{33{,}900}{5226}$ or 6.5 pounds.

The amateur is especially urged to use a transformer designed after the above plan on account of its high efficiency. The drawback usually brought forward against the use of a transformer without a magnetic leakage gap, is that it tends to arc badly, but this defect is entirely overcome by the use of a rotary gap, and its advantages are numerous, among which is the point of efficiency. Even the Clapp-Eastham Co., claim no more than 85 per cent. efficiency for their type "E" apparatus as against 90 per cent. to 94 per cent. perfect action of the transformer without a leakage gap. If the transformer is designed for 90 per cent. efficiency and proves more efficient than this in operation, the only effect the wrong designing will have is to increase the capacity. The transformer described has a theoretical capacity of ¾ kw., but in actual use it will deliver very nearly 1 kw. If the adjustment feature is used as was suggested a suitable choke coil will have to be used. Also the protective condenser described in a late issue of this magazine should be used to prevent a burn out of the primary.

AUTOMATIC WEIGHER

A novel and useful application of a small motor is in connection with a new weighing machine shown in the accompanying illustration.

The weighing is entirely automatic; always correct—no more—no less—can



AUTOMATIC WEIGHER

be adjusted for any weight and can be done in much less time and with much greater precision than is possible by hand weighing. The machine, therefore, is very valuable to sugar refineries, candy manufacturers, salt works, coffee and spice factories and any place where like materials are put up in definite weight packages.

The material to be weighed—sugar for example—is put in the large hopper. An agitator which is geared to the motor stirs the sugar and insures an even flow into the container, and prevents the sugar from lumping and clogging the outlet of the hopper.

The motor is controlled by a switch in connection with the weighing beam.

While there is less than the required weight of sugar in the container the circuit is closed and the motor operates the agitator and keeps the outlet port open, but as soon as the beam comes too near the horizontal position the contact is broken, which stops the motor and at the same time the flow of the sugar.—*J. C. Munn.*

ELECTRIC HAND MIRRORS

This novelty comes from Paris. It is an artistic hand mirror having a small bull's-eye lamp at the top. This lamp may be lighted from a six-volt storage battery or from the house lighting current. A flexible cord leading out of the handle from the mirror is used to

CLEO DE MERODE WITH THE NEW ELECTRIC MIRROR

make the connection. A button in the centre of the handle, when pressed, closes the circuit and the light is thrown on the face.

Our illustration shows Cleo de Merode, the actress, using the new mirror.

Morse's First Telegraph

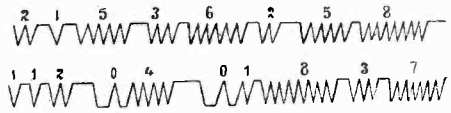
The first apparatus that was used by Morse is shown in the illustration.

Morse used nine symbols, namely, the figures from 1 to 9 and these figures combined, formed certain letters and words which afterwards had to be looked up in a special telegraph code in order to understand the various symbols.

In our illustration the frame cc is mounted on a table in a vertical position and has a sort of pendulum, oB. The electromagnet is shown at E. On the pendulum the armature of the electromagnet is carried and at the lower end a little pencil or other marking point is provided. Below the writing point a paper tape is made to move over the two pulleys, r and r', and the central large pulley, B.

At the normal position of the pendulum the writing point will mark a line parallel with the edge of the paper strip. If, however, the armature is pulled to the magnet it becomes evident that the pendulum will swing in a direction at right angles to the movement of the paper which is kept in motion by the clock work, h. When the magnet ceases to attract the armature the pendulum will, of course, come back to its original position. Due to this the characters, as shown in the illustration are recorded on the paper strip and thus it will be seen that the figure 1 is represented by one triangular or wedge-shaped signal, the figure 2, by two of these, and so on.

The lever, L, of the sender carries a small weight, n, and directly underneath this a wedge-shaped piece of metal, as clearly shown in the illustration. At the left end of L the two ends of a stiff piece of wire dipped into two mercury troughs and it is clear that every time



A FACSIMILE OF THE FIRST TELEGRAM RECEIVED

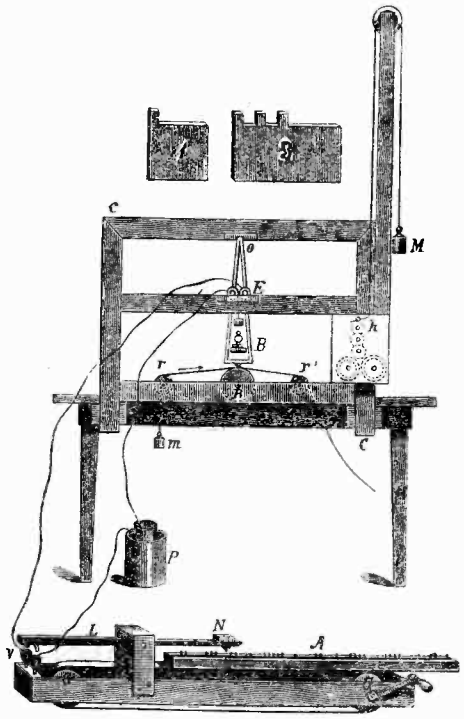
N is raised, L will move down and close the circuit of the battery, P, operating the electromagnet, E. In the movable piece of wood, A, metal pieces are inserted as shown at 1 and 3.

If now by means of the crank and the pulleys, GG, A is moved in one direction the small metal pieces will move N up and down as the case may be, and thus send the symbols over the line.

The first message that was sent by the Morse Telegraph, and shown in the illustration above, contained the following numbers:

215, 36, 2, 58, 112, 04, 01837.

This, translated in the telegraph code,



UPPER APPARATUS, RECEIVER
LOWER MACHINE, SENDER

reads: "Successful experiment with Telegraph, September 4th, 1837."

From the above description one must actually wonder at the complicated nature of the device and marvel that Morse did not hit at once upon the simple expedient of reading the symbols by ear with the sounder, which Morse used long afterwards.

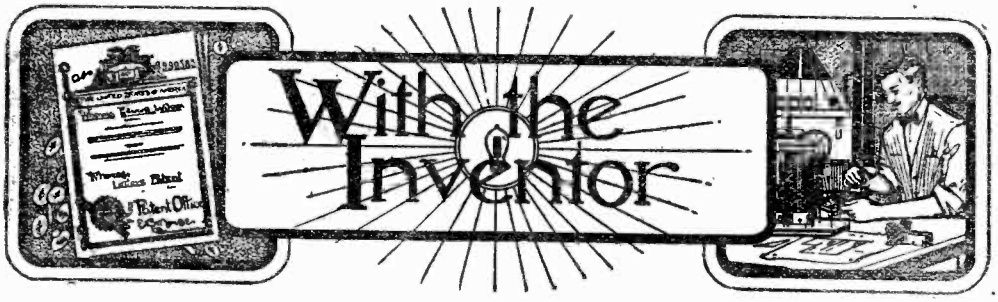
S. F. B. MORSE

(*Continued from page* 1145)

College, New Haven, Conn.

In the year 1857 ten of the countries of Europe, united in presenting him with a gift of $100,000.

He died near Poughkeepsie, N. Y, April 2nd, 1872.



PATENT NO. 1,047,157, FOR A DEVICE FOR DETERMINING DIRECTION, HAS BEEN GRANTED TO DONALD M. BLISS, OF STAMFORD, CONN.

Here is something really new in an electrical invention and while we do not know how well it works it seems quite plausible.

Our illustration in Fig. 1 shows an armature, A, wound with exceedingly fine wire. It will be noticed that no metallic field is used, but that the earth's magnetic field supplies the flux, which acting on the wire convolutions of A, operates the millivoltmeter shown in I. If now, this apparatus is installed on board of ship for instance, it is evident that a current will be generated, as the case may be, the maximum naturally being when the axis of the armature points to north. Therefore, Mr. Bliss has graduated his milli-voltmeter scale not in volts but in the points of the compass as shown in illustration. It is of course understood that the armature must be revolved and this is done by means of the

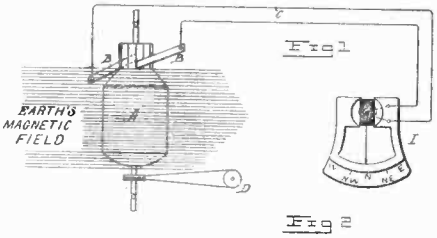


Fig 1

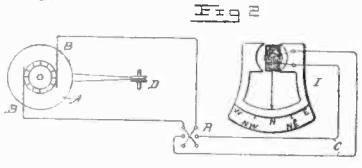


Fig 2

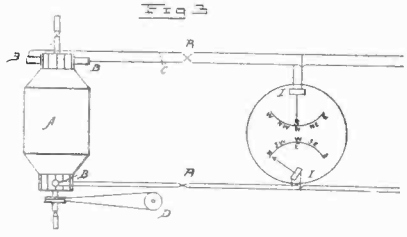
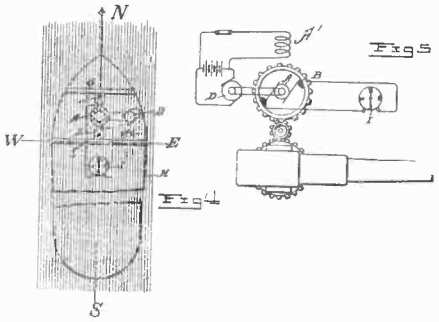


Fig 3

small motor, D, while the exceedingly small amount of current generated in the armature, A, is taken off by means of the brushes, BB, and thence from A, to the direction meter I.

In Fig. 3 Mr. Bliss provides an elaborate form whereby readings may be obtained around the entire compass.

Fig. 4 shows how the apparatus is mounted



on shipboard, but the most interesting application of this new invention is shown in Fig. 5.

We quote the language of the inventor as follows:

"Generally speaking, my device, as has been said, is capable of many applications. In Fig. 5 I have shown its application as a range finder for a large gun. The armature A is mounted at any suitable point near the gun and the brushes B, B, are fixed to an annulus Y geared to the central trunnion or support on which the gun turns. The brushes are thus moved with respect to the earth's field as the gun is turned. The brushes may, of course, be geared to the turret in which the gun is mounted, and the gears being suitably proportioned, the results will be the same. Likewise my device may be applied to telescopes or may be used for signaling purposes between guns placed at some distance from each other, it being possible to place the indicator at any desired point."

GOTTLIEB HONOLD, OF STUTTGART, GERMANY, HAS BEEN GRANTED PATENT NO. 1,047,524, FOR CONTACT TERMINAL FOR INTERRUPTING ELECTRIC CIRCUITS.

This curious invention relates to contact terminals for interrupting electric circuits; and, more particularly, to one employed in devices for ignition of the gas mixture in combustion engines.

This is really a remarkable patent, and we do not see on what ground a patent has ever been issued. The idea is as old as the hills

and well known to any student in this particular branch of electricity; we profess we do not know of how much particular use the invention is.

We quote an extract from the patent:

"Upon interrupting an electric circuit there is produced at the place of interruption a spark having the nature of an arc, in consequence of which, in cases wherein the electrical energy stored in the circuit is to be utilized at a point other than the place of interruption, a large proportion of the energy is lost. This is especially true in the ordinary devices for the ignition of the gas mixtures in combustion engines wherein the interruption of a circuit for the production of a high inductive effect at the place of ignition is employed. In fact, this difficulty is of such marked degree that the formation of the spark at the place of ignition in the engine cylinder is greatly interfered with or the spark greatly reduced in intensity.

As tests have shown, the formation of the arc at the place of interruption, is due to the fact that the arc travels along the interrupter contacts and burns the neighboring metal parts, whereby metallic vapors are produced and deposited upon the contact surfaces of the interrupter, so that these surfaces become coated with the oxidized metal until the formation and propagation of an arc is facilitated to an extraordinary degree.

Fig. 1

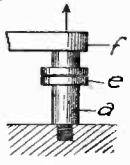


Fig. 2

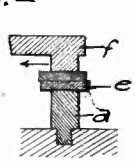


Fig. 3

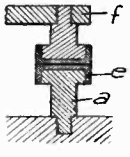


Fig. 4

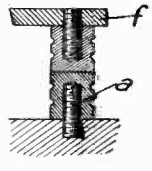


Fig. 5

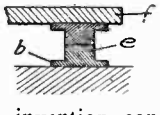
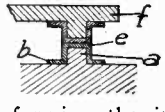


Fig. 6



The invention consists in forming the interrupter contacts from some metal that strongly resists oxidation, such as platinum or the like, and giving them such shape that the path along the platinum surface from the place of interruption to the supporting metal of more easily oxidizable nature is as long as possible, and is preferably interrupted by one or more sharp edges. In this manner the spark or arc forming at the place of interruption is prevented from reaching the more easily oxidizable metal. In the devices of this kind heretofore used the arc due to an interruption formed between the edge of the contact member and the closely adjacent support of brass or other easily oxidizable metal, in consequence of which the brass or other metal was heated until it generated a vapor which coated the contact surfaces.

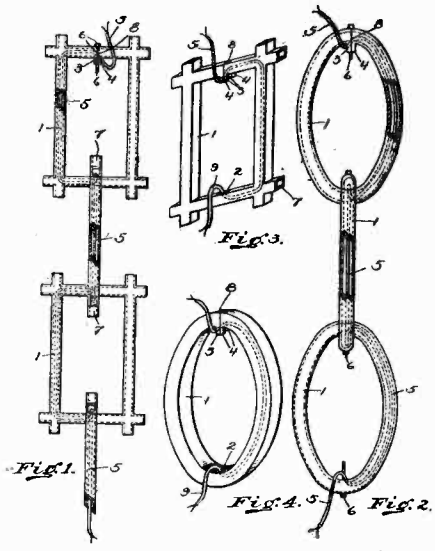
In the accompanying drawings forming a part of this specification, Figures 1 to 6 show various modifications of contact terminals constructed in accordance with my invention."

The illustration explains the idea sufficiently.

PATENT NO. 1,047,568, FOR ELECTRIC CHAIN, HAS BEEN GRANTED TO WILLIAM H. REISS, OF CINCINNATI, OHIO.

The following invention belongs to that class of chains which hold concealed electric wires known as art chains or electric chains.

We quote from the patent as follows:



"It is often desirable, in order to produce a fanciful fixture for electric or gas lighting, to make or form the suspension device for holding the lamp, lantern, light or light fixture, of a unique design, the contour whereof is both ornamental and useful and pleasing to the eye and architecturally designed to match contour and form, at the same time such a construction must be produced which will hide or conceal the electric wires, so that the appearance of the suspension device will not be marred. To attain these ends electric chains have been produced formed of a series of ornamental links interwoven to conceal the wires, but they are complicated, marred by interruptions in their contour to allow means for placing the wires in and out of the chain, and to interweave or bind them together; they also being costly to manufacture and flimsy in combination, inasmuch as lateral and up and down strains are not taken care of in their construction and manipulation.

"The object of my invention is to overcome those objections and produce a concealed elec-

tric wire holding chain, which shall be as strong as a welded chain, cheap of manufacture, simple in construction, efficient in use and unique in appearance and pleasing to the eye."

By perusing the illustration it will be seen how the inventor executes the idea, which, after all, is quite simple.

There is also an important feature worked out in this patent, namely, the lugs, 4, in Fig. 3, which are used, of course, incorporated in the other shapes also. These lugs keep the rings or squares from shifting, which would naturally in time wear the insulation off the wire.

We should think that there is a good demand for such an electric chain, as on the present art chains the outside wire always makes a more or less unsightly combination with the chain itself.

WILLIAM PERSCHEL, OF WINNIPEG, MANITOBA, CANADA, HAS BEEN GRANTED PATENT NO. 1,045,880, FOR A BATTERY.

The present invention relates to a battery, and while there is nothing absolutely new

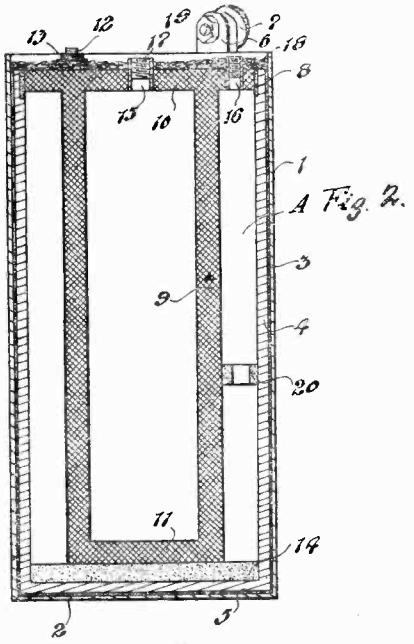


Fig. 2.

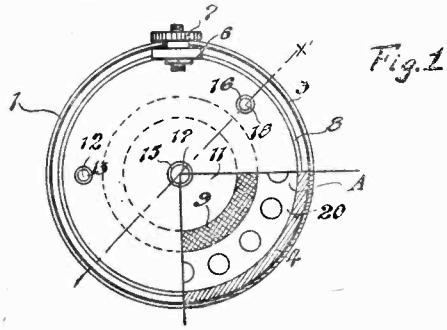


Fig. 1.

shown, the points of construction will no doubt interest our readers, as they make towards a good battery, and we quote herewith a part of the specification from the patent:

"In the drawing like characters of reference indicate corresponding parts in each figure.

"1 represents a cylindrical casing or box having a closed bottom 2 and open top within which casing and bottom is inserted an insulating material 3 formed from fiber or paper.

"4 represents the positive or zinc electrode, which is cylindrical in form and is provided with a closed bottom 5 and fits snugly within the paper insulator. The zinc electrode is supplied with a terminal 6 or binding post carrying a thumb nut 7 and a ring of insulated material 8 at its upper end, which ring insulates the carbon, later referred to, from it.

"9 is the negative or carbon electrode, which is cylindrical in form and has a closed top 10 and bottom 11, the top being enlarged so as to extend outwardly to the insulator 8 when said electrode is inserted within the zinc electrode.

"12 represents the positive terminal which is supplied with a thumb nut 13.

"14 is a fiber or insulating disk inserted between the bottom of the carbon and zinc electrodes.

"15 and 16 are interiorly threaded ferrules passing through the top of the carbon electrode and fitted with removable plugs 17 and 18, respectively. The ferrules extend beyond the top of the electrode so as to be clear of the cement or composition 19 which seals over the top of the battery and retains the parts permanently within the casing.

"20 is a perforated insulating ring located between the carbon and zinc electrodes and held in position by frictional contact with the aforesaid parts.

"It is to be noted that the plug 17 is located so that the depolarizer such as nitric acid can be placed within the carbon electrode while the plug 18 allows the negative electrolyte to be placed within the chamber A located between the negative and the positive electrodes, it being understood that the plugs are kept clear of the sealing compound so that they can be removed at any time."

We do not know how this battery will work its way in the market, but it certainly has a few good points that should appeal to the average battery user.

PATENT NO. 1,046,288, FOR ELECTRODE OF SECONDARY BATTERIES, HAS BEEN GRANTED TO HENRY GARDE AND ALFRED JAMES ADAMS, OF LONDON, ENGLAND.

This invention covers electrodes of a storage battery of the pasted type and has for its object to provide thinner electrodes of greater porosity than have heretofore been in use, and which are supposed not to grow, buckle, bend or otherwise lose their shape.

We quote from the specification as follows:

"In the drawing Figure 1 illustrates one form of grid for the manufacture of electrodes in accordance with my invention. Fig. 2 is a perspective view of the plate inserted in a containing vessel.

"In carrying our invention into practice, grids or supports *a* of soft lead or some other ductile or expansible suitable metal or alloy

having their edges *b* and bridges *c* of the same thickness and strength as the rest of the plate, are covered with a paste made up of lead oxide and sulphuric acid, and after being allowed to set and dry are reduced to a spongy lead condition or formed negative in a forming bath of sulphuric acid of suitable density. They are then removed from the forming bath and subjected to strong pressure between sheets of wool or felt so as to increase the cohesion of the active material. They are

Fig. 1.

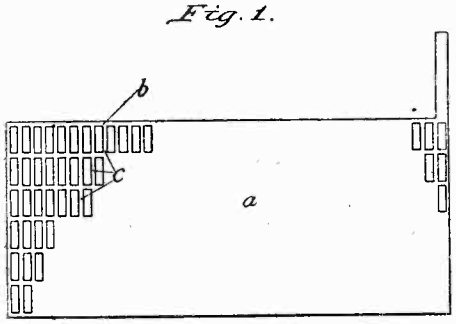
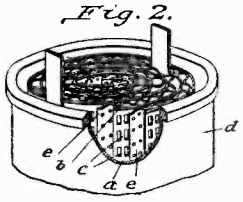


Fig. 2.



then allowed to dry, in the course of which they become hot, owing to the oxidation of the spongy lead in the atmosphere, or preferably they may be dried in a strong current of air, which will prevent the heating. When thoroughly dry they are replaced in the forming tanks and formed positive or peroxidized at a medium current, when it will be noticed that the growth above referred to will take place to an extent dependent upon how far the formation is pushed. They are then completely discharged or reversed to the same extent, and afterward again charged at a heavier current, when the growth will be still found to continue to increase. This process may be repeated one or more times at a gradually heavier current until the growth ceases, at which stage the active material may be regarded as fully peroxidized. The plates are then again discharged and reversed until they become again in the spongy lead state, when they are again removed from the forming tanks and again pressed. They will now be found to have a much greater area than before and the active material in them will be of greater porosity. The plates are then rolled into the form of a double or multiple roll or spiral, after which they are inserted in their containing vessels *d* with separators *e* of insulating material between them and charged in the ordinary way."

PATENT NO. 1,047,881, FOR REGENERATIVE DEVICE FOR ROENTGEN TUBES, HAS BEEN GRANTED TO HEINZ BAUER, OF BERLIN, GERMANY.

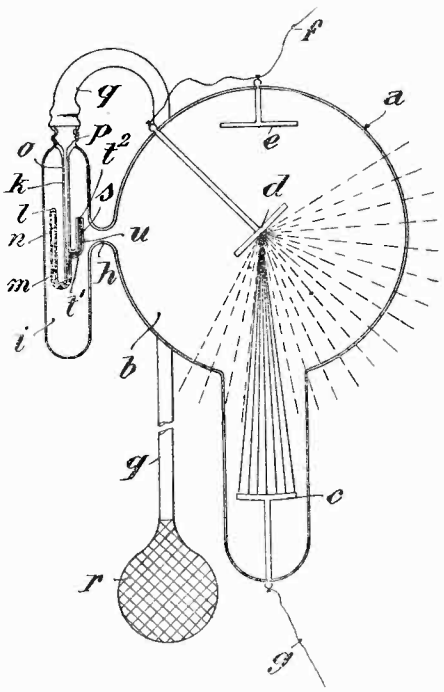
This invention relates to regenerative device for apparatus for producing X-rays and the like.

This is quite a clever invention and we quote herewith the language of the inventor:

"It is well known that vacuum tubes within which electrical discharges take place obtain, owing to these continued electric discharges, a constantly higher vacuum, which would finally render them unusable. To prevent this such vacuum tubes are provided with a regenerative device by which small quantities of air or gas can be admitted into the tubes. Regenerative devices used heretofore require special care in manipulation and, above all, the operator attending them has to be in immediate proximity to the Roentgen tube.

"Now, a primary object of my invention is to provide a very simple regenerative device able to be actuated from a distance.

"My device comprises a column of mercury or similar liquid which is to be moved by the pressure of the air or gas, and by varying the pressure of the air or gas releases or closes means which are permeable to air and indeed all gaseous and vaporous substances, but are impervious to liquids.



"One illustrative embodiment of my invention is represented by way of example in the accompanying drawing.

"Referring to the drawing, *a* designates a Roentgen tube into whose evacuated chamber *b* project the cathode *c*, the anticathode *d* and the anode *e* connected with the latter. The anode *e* and the cathode *c* are connected by conductors *f* and *g* with a generator of high tension current, not shown.

"The chamber *i* of the regenerative device is connected by a tube *h* of any suitable shape

with the chamber *b* of the Roentgen tube. Into said chamber *i* projects a U-tube *k* or a tube of like shape closed at its one end at *l*. Mercury or a similar liquid is filled into the U-tube *k* in such manner that a chamber *n* filled with air or other gaseous body is formed between its one end and the end closed at *l*. The open limb *o* of the tube is formed as a branch *p* on which a tube *q* provided with a bulb *r* can be placed. Somewhat below the level of the mercury in the open limb of the tube this limb is provided with a branch *s* which is closed both at its end located nearest the tube *k* and also at its other end opening into the chamber *i* with a porous stopper t', t^2. These stoppers are pervious to air and other gaseous or vaporous substances, but not to mercury and similar liquids. Between the two porous stoppers is a mass *u* of suitable material such as gold beaters' skin, metal shavings or the like.

"The described apparatus operates as follows: When the vacuum has become too high in the chamber *b*, the bulb *r* is pressed at any desired place. The mercury in the open limb *o* is hereby caused to sink and compresses the air or gas in the chamber *n* in the closed limb of the tube *k*. As soon as the mercury has sunk so far that the porous stopper *t* is no longer contacted by mercury, the air or other gaseous substance in the tube *q* and the bulb *r* penetrates through the porous stopper *t*. The gas traverses the filtering mass *u* and is here liberated from any particles of liquid or mercury which have been accidentally carried along. The gas purified in this manner flows through the second porous stopper t^2 into the interior *i* of the regenerative device and in this manner increases the pressure below atmospheric existing in the chamber *b* of the Roentgen tube *a*. When this pressure below atmospheric is sufficiently increased, for which purpose only very small quantities of gas or air are requisite, the bulb *r* is released, whereupon the mercury or other sealing liquid employed rises so far in the open limb *o* of the tube *k* that the porous stopper t' is completely shut off by the liquid from the air or gas chamber in the tube *q* and its bulb *r*."

FREDERICK J. B. CORDEIRO, OF NEWTON CENTER, MASS., HAS BEEN GRANTED PATENT NO. 1,046,982, FOR SOUND REPRODUCING AND AMPLIFYING APPARATUS.

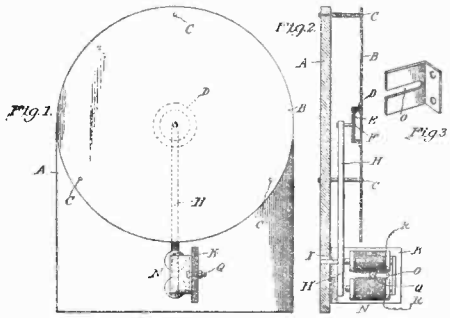
This invention relates to an improvement in sound producing and amplifying apparatus, whereby music, speech, etc., may be reproduced at a distance.

This is quite an interesting patent and will probably appeal to some of our readers. We quote herewith the language of the inventor:

Figure 1 is a side elevation of my improved sound reproducing apparatus. Fig. 2 is a central vertical sectional view through the instrument, and Fig. 3 is a detail view of a part of the invention.

Reference now being had to the details of the drawings by letter, A designates an upright base board, which may be of any suitable size and thickness, and in the present instance I have illustrated the upper end of the board semi-circular in outline.

A sounding board, designated by letter B, shown in the drawings as circular in outline and *preferably of spruce*, is secured to the base board by the bolts C, three in number being employed in the present instance, and affording means for holding the sounding board, which should be of suitable thinness, the said bolts being spaced apart any suitable distances. Secured to the other face of the sounding board and projecting therefrom is a metallic ring D, to the top of which is secured a glass diaphragm E of suitable diameter, and which is apertured centrally to receive a bolt F fastening the same rigidly to the lever H.



A cross-piece, preferably of wood and designated by letter K, is fastened to the base of the device at one side of the central meeting line of the latter. Mounted upon said cross piece is an electro-magnet N, and against the upper pole of which magnet said lever is firmly held by means of the stud I which projects from said base board. It will be noted that a small space or gap intervenes between the lower portion of the lever and the lower pole of the magnet. The yoke of the magnet has preferably right-angled flanges and in the center of which is a slot O through which the bolt Q passes and affording means for adjustment of the electro-magnet, said bolt passing through the cross-piece K. Said electro-magnet has wires R fastened thereto, forming means whereby the same may be placed in the circuit with the transmitter, not shown.

In operation, the parts being assembled as shown, any vibration, such as sounds of music, speed, etc., at a distance and being transmitted through the wires in which the apparatus is in circuit, will act upon the apparatus, causing an exact reproduction or amplification of the same, although the source from which the sounds are produced may be remote from the instrument."

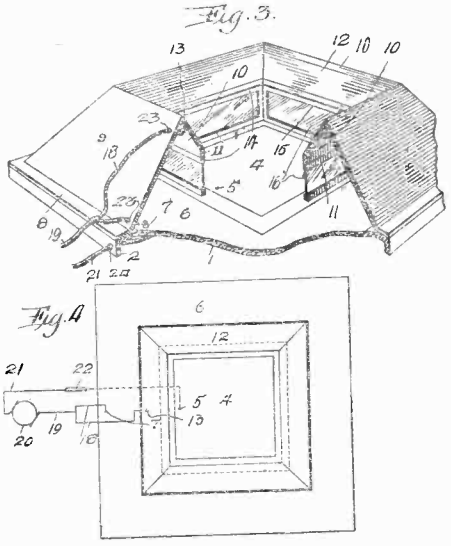
PATENT NO. 1,046,662, FOR ELECTROCUTING DEVICE, HAS BEEN GRANTED TO JOHN BALINT, OF CINCINNATI, OHIO.

This is another electrocuting device for animals, and in the language of the inventor, it is claimed that his "invention provides a device that can be safely used in large buildings infested with rats and other rodents, and for electrocuting the rats and exterminating same."

This device, the same as all others described before, lacks the means of doing away with the dead carcass.

Our illustration is quite clear and we only

need to add that the bait is placed on plate, 4, while electrical connection is made with this plate, another connection going to the part shown at 11. The rat therefore is supposed to be electrocuted when touching the plate and



the part, 11, after it has eaten up all the bait and is about to leave the electrocuting device.

Of course, there will be no more bait left for the next rat, and if by chance any rat quite out of its senses should look down in the pit, it will, of course, see the dead carcass of its comrade and beat a hasty retreat. Such devices as these are satisfactory to kill one rat each night and that is about all.

PATENT NO. 1,047,545, FOR APPARATUS FOR THE PRODUCTION OF HIGH POTENTIAL ELECTRIC CURRENTS, HAS BEEN GRANTED TO DAVID G. McCAA, OF LANCASTER, PA.

This invention relates to an improved apparatus for producing either unidirectional pulsating high potential current or alternating high potential current.

This is quite an interesting patent and we are pleased to quote an extract from the patent itself:

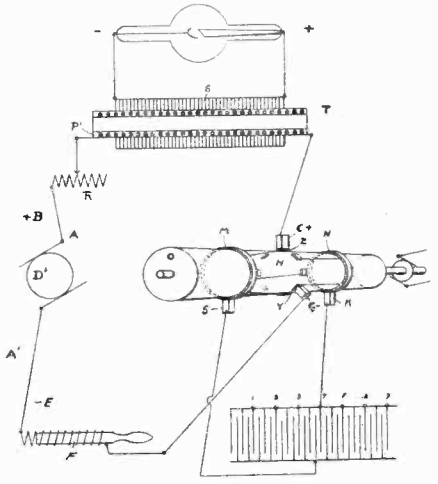
"The object in view is the arrangement of a plurality of improved means connected and associated in such a manner as to cause a continuous supply of current to force a pulsating unidirectional current through the primary of a transformer in order to create in the secondary either a unidirectional pulsating high potential current or an alternating high potential current.

A further object of the invention is the arrangement in a device of the character described, of a rotating armature structure designed to have the brushes thereof connected to a circuit, including a source of current, and a primary winding of a transformer, and a condenser connected to the lugs or bearing members of the commutator in such a manner as to reverse the current entering the condenser, whereby successive impulses of current are permitted to pass through the primary winding of the transformer, whereby unidirectional pulsating current or alternating current may be taken off the secondary winding of the transformer.

With these and other objects in view, the invention comprises certain novel constructions, combinations, and arrangement of parts, as will be hereinafter more fully described and claimed.

In the accompanying drawings the figure is a diagrammatic view of one embodiment of the invention.

In constructing a device embodying the invention, the same may be used for charging a condenser for high frequency currents with high potential alternating current, or for providing high tension unidirectional current, *i. e.*, pulsating current without any reverse tendency to the current, such pulsating unidirectional current being especially adapted for use in X-ray work. When providing high potential unidirectional pulsating current for X-ray use, an X-ray device is connected to the secondary of a transformer, and the primary of a transformer is connected with a source of direct current and with a pole changing device. The pole changing device is connected with a condenser and is rotated at any desired speed for controlling more or less the pulsation of the current in the transformer. The pole changer, however, is limited in its action on the current in the transformer by the condenser, or rather by the speed or capacity with which the condenser is adapted to be charged with current. By the particular construction of the pole changer, and the particular connection of the condenser thereto



the condenser acts as a load, but as what might be termed an intermittent load, so that when the condenser is empty the current will flow rapidly into the condenser, but the flow will gradually decrease as the condenser is charged. This will cause a sudden rise in the magnetic effect of the primary of the transformer and a comparatively slow fall. The rise is from zero, and the fall is back to zero but not below.

In order that the invention may be more clearly understood an embodiment of the same

is shown in the accompanying drawings, in which 1 indicates a source of direct current which furnishes current to the primary windings 2 of the transformer 3, which current is controlled by devices hereinafter fully described for causing the current to pulsate through the primary windings 2, and cause either an induced alternating or an induced unidirectional pulsating current in the secondary winding 4 of the transformer, so as to provide a purely pulsating direct current to X-ray device 5. The secondary winding 4 is, of course, provided with any desired number of turns for raising the tension of the induced current to the desired extent for use in the X-ray device. Current flowing from the source of current 1 will pass through wire 6, variable resistance 7, primary winding 2, wire 8, a switch changing device 9, condenser 10, and associated parts, wire 11, a variable self-inductance or choke coil 12, and wire 13, back to the source of current 1. This provides a complete circuit for the current, though, as a matter of fact, the current does not flow directly through the condenser 10, but charges the same with different polarity as the pole changer is rotated.

The pole changer 9 comprises a cylindrical member 14, constructed preferably of hardened rubber or other insulating material, and is mounted on a supporting shaft 15. Connected with the supporting shaft 15 is a motor of any desired kind, as, for instance, an electric motor, for rotating the shaft, and member 14, which is rigidly secured thereto. Rigidly secured to the drum, or member 14, are continuous metallic rings 17 and 18, which have connected therewith wires 19 and 20, respectively. Wires 19 are connected with metallic lugs or segments 21, and wires 20 are connected with metallic lugs or segments 22. The lugs or segments 21 and 22 are rigidly secured to the member or drum 14, and are arranged in a circle, but spaced apart, so that the brushes 23 and 24 make contact with the respective lugs as member 14 is rotated, the distance between the respective lugs being such that the brushes will leave one lug before it contacts with the next succeeding lug. Ring 17 has a brush 25 contacting therewith, while ring 18 has a brush 26 contacting therewith. Brushes 25 and 26, as well as brushes 23 and 24, are ordinarily stationary, though the same may be adjusted if desired, while the rings 17 and 18, and the lugs 21 and 22, rotate continuously as long as the pole changer is being operated. Brush 25 is connected by wire 27 to one side of condenser 10, while brush 26 is connected by wire 28 to the opposite side of condenser 10. By this structure and by the rotation of the pole changer positive current may pass in through wire 28 into the condenser for charging the same for a short time, or until brushes 23 and 24 have changed segments, whereupon the positive current will be switched to wire 27, and the negative side of the source of current will be switched to wire 26, so that the positive current will begin to flow into the negative side of the condenser or into what might be termed an electrical vacuum, which will, in a certain sense, draw the positive current therein. Positive current will flow over wire 27 into condenser 10 until the condenser is fully charged, or until the polarity of wire 27 has been changed by the pole changer. If the pole changer is not being rotated or is being rotated slowly the flow of current through wire 27 will cease when the condenser is fully charged, and will flow freely over wire 26 when the pole changer has been moved for shifting the lugs 21 and 22. By a device of this character current passing through the primary winding 2 of the transformer will cause a sudden or quick rise of lines of magnetic force by reason of the condenser 10 being in condition for receiving a charge. As soon as the condenser is charged or practically charged the current in the primary winding 2 will gradually decrease to zero, but will again rise to maximum upon the shifting of the lugs 21 and 22, as the polarity of the condenser will thereby be changed, so that the positive current may freely flow into the negative side of the condenser, and the positive side of the condenser be neutralized by the negative side of the source of current. It will be noted that there is practically no discharge of the condenser, but the same is continuously charged. When the condenser is charged so that one side is positive and the other negative, if the positive side of the source of current is switched to the negative side of the condenser, and the negative source of current to the positive side of the condenser, the negative side of the condenser will charge with positive current flowing into the same, and the positive side of the condenser will charge with negative current flowing into the same. This reversing of the polarity of the source of current connected to the condenser is continued so that the result in the primary winding 2 is a pulsating current. When the current in the primary winding 2 follows a curve, that is, when the time constant of the circuit is small, the secondary winding of the transformer will produce a current having a wave, as shown by oscillographic readings. It will be observed that the induced current in the transformer would have a negligible reverse current, but this is damped out by the resistance of the secondary, so that the X-ray device 5 is supplied with a uniform unidirectional pulsating current of a high tension.

When it is desired to change the time factor of the primary of the transformer 3, the variable resistance 7 is operated for causing the more or less lag of the current.

By the structure set forth it will be observed when the pole changer or commutator is rotated a succession of unidirectional pulsations of current will occur in the primary winding 2 and produce in the secondary winding either a pulsating unidirectional current of high potential or an alternating high potential current, provided the choke coil is properly adjusted as well as the primary winding resistance of primary circuit. This pulsating current produced in the secondary is of peculiar advantage in use in X-ray devices as there is no inverse wave. The inverse wave in an X-ray device will have an injurious or more or less undesirable effect upon the X-ray device itself, and also will cause more or less objectionable effects and even disease to

(*Continued on page* 1192)

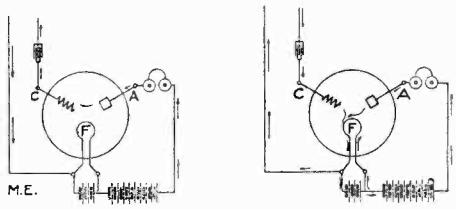
The Audion Detector

By B. N. Burglund

THERE are a good many wireless experimenters all over the country who for a long time have tried all sorts of detectors from the simple crystals to the electrolytic and with patient adjustment they have obtained excellent results, but the moment they touch the key they have had all of their painstaking trouble for nothing. Their detector is out of adjustment again;—very aggravating when you are trying to work with somebody; when he is so faint that a pin dropped behind your back would have caused "99" or interference.

There are no crystal detectors so far to my knowledge that don't have their troubles. Some are very rugged, but not very sensitive. Some are too delicate for practical use. Some like Perikon are very short-lived and very easily put out of adjustment. The moisture of the operator's breath will often spoil a good piece of zincite, and all of them are very wasteful of the delicate incoming wireless currents. Some of these incoming wireless currents that can be easily read with a good detector and high wound "phones" are so small that there is no measuring instrument known that will measure them. For instance, NAX is sending out 30 amperes on their antenna and using 10 kw. input in their transformer. This current travels more or less through space in all directions from the charged antenna. Now what part of that current are you absorbing in your wireless receiving set? There is some of it going through everybody's receiving instruments all the time no matter how far you are sending, but it is so small that even with the very best receiving sets the ear is not capable of hearing it. NAX (Colon, Panama) or any good wireless station can be heard as far as Maine or up in Lake Superior very easily, if the receiving sets and detectors are constructed so as to utilize these very delicate currents. Most receiving sets that I have had experience with do more harm than good. They are constructed in such a manner that they dissipate the current long before it reaches the detector circuits. Insulation cannot be too carefully looked after. Eddy current losses in the windings of the loose coupler or tuning coil is another factor to be considered. Capacity effect between turns and between primary and secondary of loose couplers are sources of loss. Too much wire, or turns, are more sources of trouble. Sliders, as a rule, cause great trouble unless they are properly designed. They short circuit turns and thereby produce damping, and that will make any signal faint, no matter how strong originally. The efficiency of the receiving condenser is another very large factor to be considered as a poor condenser may be the source of nine-tenths of all the trouble. Too large or too much capacity is as bad as not enough. Paper and paraffine are worthless as it requires too much current to keep this type charged, and then paraffine is not suitable for very delicate high frequency currents, as the hysteresis losses are too great.

My best experience has been with a condenser using air as the dielectric. I find that a small variable condenser with high polished plates works best. One with a capacity of about 0.0003 mfd. enclosed in a case where the air can be kept perfectly dry. In this type the losses are kept down as low as possible. We will now consider we have a fairly good receiving set as far as the detector circuit. Here we bump into a stone wall and if it were not for Dr. Fleming and his invention of the



oscillation valve later improved by Dr. DeForest, we would still be wasting nine-tenths of our current through inefficient detectors of the crystal type.

Detectors of the vacuum type can be divided into two classes: one class acts as rectifiers only, while the other acts as an intensifying relay. Of the latter we will speak more fully at the present. The present day type of vacuum relay acts very much like the old style coherer, that is, the resistance breaks down and lets a definite amount of current pass through it while a Hertzian or wireless wave is passing through, but, unlike the old style coherer, they are self-restoring, and many times more sensitive. I find they are about five times more sensitive than any crystal detector I have had experience with.

Let us examine very closely what takes place in the vacuum;—then we will be in a better position to fully understand why this detector is very sensitive. Scientists have taught us that a vacuum when very highly heated by an incandescent body, becomes ionized, or, in plain English, it becomes a conductor of electricity in certain directions only.

If we take advantage of this principle and construct a detector with a suitable sized bulb inside of which are a heating element, in the form of a lamp filament, also very closely adjusted to this are two more parts, one to act as a cathode, the other to act as an anode. Here we also find that current will travel

from one pole to the other, but it has the peculiar property of not letting the current get back again. Consequently the very high frequency alternating currents can pass in one direction only. Now, using the heating filament as the negative side, and one of the poles connected in series with a 35 to 40 volt battery and a pair of wireless telephones, and the other space pole to the receiving circuit, and the other side of the receiving circuit connected to the heating filament, we have a compound relay action which works as follows: We will consider for clearness of explanation that the incoming wireless wave comes in very slow so that we can count the alternations at will. A positive impulse comes from the receiving condenser, reaches the anode and from there passes to the negative or heating filament and back to the receiving set again. This positive impulse in its travels across the vacuum in the detector breaks down the resistance of the highly ionized gases momentarily and allows some of the current from the battery to flow through the telephone and thereby produces a loud, audible sound, but as soon as the positive impulse stops the vacuum again becomes an insulator and consequently the current through the telephone receiver ceases to flow.

Now let us see what takes place when a negative impulse arrives. The vacuum already being highly heated allows the current to pass only one way. There are in this case two paths for the current to flow, but owing to the construction of the anode and cathode the current has no choice,—it must pass through the path of least resistance, and that will be from the anode or plate to the cathode or grid, and not through the heating filament as the positive did before. Now in getting to the cathode it has to travel through the battery (40 volt), where a little more force is added to it, then through the telephone receiver across the vacuum to the cathode, then back to where it came from. In its travels this negative impulse also produces a sound in the receiver owing to the fact that it breaks down the vacuum momentarily while it jumps across from anode to cathode. So by this action repeated many times per second both impulses are heard in the telephone receiver as one sound impulse, but twice as loud as each individual impulse would have been. We not only hear the current (wireless) itself as we would in a galena or silicon detector, where we only hear one-half of the incoming current, the other half passing through the detector to earth and not being heard, but in the "audion" we hear both sides of the incoming wave, as well as the sound produced in the telephone by the drop of voltage of the 40 volt battery in series with the telephone. If the manufacturer's instructions are very carefully adhered to as to voltage, polarity, etc., we have the very best that science can give us to-day for making the extremely minute incoming wireless currents audible. The double relaying actions multiply their intensity and do not diminish as do the rectifying crystal or electrolytic kind do. The audion has another great advantage,—when once properly adjusted it will not get out of order. In fact I do not find it required to shut it off even while sending. I have had a 6-inch spark jump from the antenna switch into the receiving set while the audion was connected and it did not injure its adjustment (but it did burn out a good pair of phones). The heating filament should never be heated beyond the safety point, as the hotter it gets the shorter will be its life, and, up to a certain point, nothing is gained as with a suitable adjustable battery in the telephone circuit, having a range from 24 to 40 volts, it is not necessary to use full voltage in the heating filament. Use a small rheostat in series with the heating battery and the life of the audion will be doubled. A good many of my amateur friends may think this is a very expensive form of detector, but I find that for the service it renders it is the cheapest and most economical detector I ever used and I certainly would not use any other form of detector until something better has been invented.

The battery required for the telephone circuit does not need to be large, as no perceptible current is used. The only thing required is a difference of potential or voltage, consequently a very small cell will last indefinitely. The three and one-half volt flashlight batteries used in the vest pocket size answer the purpose very well. If these are bought by the dozen they can be had for about 10 or 20 cents per set. I would recommend ten sets of 3½ volts each mounted either inside of the receiving set or else in a small wooden box with a ten point switch on top of the box, each set of cells brought out to a point on the switch. For the heating element large size dry cells will do, but they are not as satisfactory as two small storage cells. One point further to impress upon all users of the audion and that is this: keep everything well insulated, have all of the wires leading to the batteries as short and straight as possible, keep the batteries away from all other wires,—especially wires containing power current A. C. or D. C., as the audion is very sensitive to all kinds of outside currents, especially electric light currents. If you have been accustomed to using a crystal detector and the receiving is very quiet, and when you get the audion properly connected you find that you get a roar loud enough to be heard half way across the room, don't be discouraged,—that is the best indication that you have it hooked up right. Now if you use a double slide tuning coil and are anywhere near an electric light circuit you will naturally have a hum on A. C. or a singing noise on D. C. This can be eliminated by using a loose coupler set. You may also find that it changes your tuning. I found in some sets that on a certain tuning using an iron pyrite crystal I heard waves of about 350 metres; but cutting over to the audion I found these same waves or stations on entirely different coupling and tuning. It may take a little time and patience to understand it, but when you have once mastered it you have something that is well worth the time spent.

HONOLULU GREETS WASHINGTON BY WIRELESS

It is reported that all previous records for long-distance communication by means of wireless telegraphy were eclipsed on the evening of December 8th, when S. B. Maddams, operator at the Honolulu station, of the Federal Telegraph Company, carried on an aerial conversation with the Arlington station, near Washington, D. C., where C. F. Elwell, chief engineer of the Poulsen system, scarcely able to believe his senses, sat before his instrument.

The Federal Telegraph Company has been experimenting on what is termed "land messages" for some time, and Sunday evening the operator at the South City (San Francisco), station of the company, succeeded in establishing a connection with Arlington, 3,500 miles away. Several messages from the Eastern station had come flying through space, and Chief Engineer Elwell was listening intently for an answer from San Francisco when he was astonished to hear clearly the signal of the Honolulu operator. Immediately breaking in upon the message which was coming from this city, Elwell grasped the sending key and crashed out this message to San Francisco.

"Call Honolulu and tell him to listen, for we get him fine."

The San Francisco operator immediately did as requested, and as soon as he had been informed that Honolulu was ready Elwell launched this aerogram into the air:

"This is C. F. Elwell, at Arlington, near Washington. How do you get us? We get you!"

In just five minutes he received the reply from Honolulu:

"If this is surely Arlington, I hear you O. K., but I can't believe it," and then, "This is S. B. Maddams. Give C. F. Elwell my regards and tell him that we launched a yacht here to-day, named the *C. F. Elwell.* You come pretty good. Go ahead again and give O. K."

Almost overcome with the wonder of it, Elwell again seized the sending key and sent this message in reply:

"S. B. Maddams, Honolulu: Thanks, Maddams. We will be at 2, our time, tomorrow with Chicago and Kansas City. Good night. "C. F. Elwell."

On hearing of the making of the new record, H. P. Veeder, of San Francisco, who is secretary and treasurer of the Federal Company, sent a message direct to Honolulu to verify the report from the East. Operator Maddams of the Honolulu station at once replied, his answer not only repeating the message which broke the record, but also stating that the messages "came clear and fairly loud." The distance covered is close to 5,600 miles.

RIGHTS OF THE AMATEURS

The vast army of wireless men who "listen in" so industriously actually play an important part. This army is scattered for the most part along the coast lines. Let a distress signal be flashed from the sea, it is certain to be read by scores, perhaps hundreds, of alert amateurs. The message might by chance fail to be picked up by the regular commercial or Government stations. But the wireless amateurs sift out the air very thoroughly. There is little chance that much of importance will get past them. The wireless amateur is an additional safeguard for the shipping of every coast.

W. D. Terrell, United States Radio Inspector for New York, said in discussing the new law:

"The new law regulating wireless messages will work no hardship to the amateur operator. It is the intention, first, to classify the various operators and place each operator in his proper class. They will then be permitted to work or play as much as they please, but under an intelligent, general supervision. Only those stations are affected which are near enough to the coastal stations to offer interference, or which work across the State lines, which brings them under the supervision of the inter-State laws. I would like to make it very clear that the license costs the amateurs nothing, and that the Government is willing to facilitate the wireless operators in every way possible to secure their license.

"The greatest value of wireless telegraphy is obviously in linking ships at sea with the land. In the past there has been a great deal of unnecessary interference with the transmission of messages between the ships and coastal sta-

tions. Many of the amateurs use much more power in sending their messages than is necessary. There are a number of experimental stations, again, which have been carrying on tests at all hours, which tend to drown out important messages. Many of the operators are often thoughless or worse.

"Now, under the new law the wireless stations are definitely classified. The amateurs are not permitted to use a wave length greater than 200 meters in length. Many of them must work with shorter waves. Now the ships work with waves of from 300 to 600 meters. Consequently there will be no interference. The high-power long-distance stations for oversea transmission, on the other hand, work with waves above 1,600 metres, so that the ships will have virtually a clear field.

"Every wireless operator before receiving his license is obliged to take an oath of secrecy. There is often much valuable information floating about the air, official matters which in the interest of the Government must be safeguarded. The operator swears not to divulge such information unless directed to do so by some court of law.

"And we do not anticipate any trouble in regulating the stations under the new law. There are several wireless stations in and about New York under Government control, at the Brooklyn Navy Yard, Fort Wood, and Sandy Hook, for instance, which will be on the lookout for offenders. It is often difficult, of course, to locate the exact position of a station, but we will have the assistance of all the licensed operators, who in turn will be on the lookout for any operators who transgress the law. With so many operators on the watch, we will be sure to run down the offenders sooner or later.

AMATEUR INTERFERENCE IN CONNECTION WITH THE ACCIDENT TO THE TURRIALBA

It has come to our attention that during the time the United Fruit Company's steamer, *Turrialba* was ashore on the New Jersey coast a number of amateurs who are apparently making no attempt to comply with the provisions of the wireless law, seriously interfered with the transmission of messages to and from the stranded steamer; and who not only caused interference, but refused to keep quiet when instructed to do so by the commercial and government operators. Two of these young men, one in New York City and the other in Yonkers, the names and addresses of both of which are known, were particularly persistent in operating their sets during this time and will probably be severely dealt with by the government. This sort of interference is a pretty serious offense under the law now, and these two young men deserve all they get.

In this connection we may say that from our observations it appears that comparatively few if any amateurs in the vicinity of New York have taken any steps toward making their transmitting sets conform to the requirements of the law. Those that have done nothing so far are apparently assuming that it is unnecessary for them to do anything in this respect until they are personally notified by the government that they are violating the provisions of the law. While it is true that the law provides that the government must notify the owner of a station that his transmitting wave does not conform to the law, with respect to its purity and sharpness of tuning before imposing the penalty upon him for the violations of the requirements, there is nothing in the law which requires the government to notify him that he is using a wave length of more than 200 metres nor more power than is prescribed by law before proceeding against him, and we warn all those amateur operators that they had better take immediate steps to cut down their power and their wave length and to make their transmitting wave conform as nearly as they possibly can to the requirements before the government finds it necessary to proceed against them for violating the law.

The law does not take into account the fact that the owner and operator of an amateur station may not know how or have the facilities to properly adjust his apparatus,—in other words, *It is up to the amateur to find out how to adjust his apparatus, and then make the necessary adjustment or quit operating.* Any other course will only result in trouble for him and the sooner he realizes this, the better off he will be.

THIRTY-FIVE MILE WIRELESS TALK

Cambridge, Mass. — The Harvard Wireless Club made some successful experiments with wireless telephones recently, and Prof. Pierce talked a distance of thirty-five miles over an apparatus which had been rigged up. John Hays Hammond, Jr., who is a member of the club and is much interested in the subject, gave the use of his laboratory at Gloucester for the experiments.

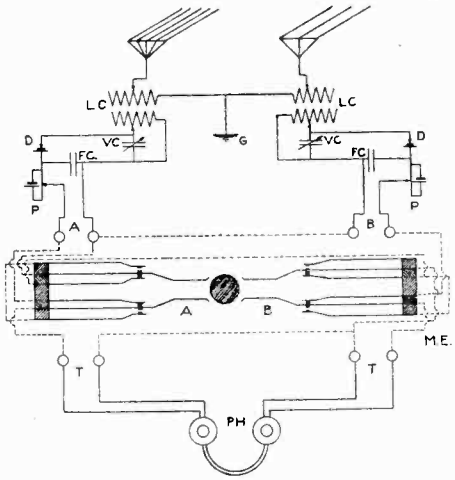
One of the twin instruments was put in Mr. Hammond's laboratory at Gloucester and the other at Harvard. Prof. Pierce did the talking from the Harvard end of the line and carried on a conversation for fifteen minutes with the man at the other end. The voices of both talkers were reasonably distinct and there was no trouble in catching meanings. The experiment is regarded as a huge success by members of the club and by Prof. Pierce.

THE WIRELESS SPECIALTY LISTENING-IN KEY

The Wireless Specialty Apparatus Company's Listening-in Key is for the purpose of using two wireless receiving sets connected to two aerials so that the operator can listen to two different stations of different waves at the same time. The Berlin International Radio Telegraph convention provides two wave lengths for shipboard stations calling, namely, 300 and 600 metres. Each one of the single 'phones on the head band is connected to one of the receiving sets through the listening-in key. One of the sets is adjusted for a certain wave length and left there. The other receiving set is worked by the operator just as before when there was only one set installed in the station. When the operator hears a station calling him on either set he throws the key to one side or the other depending on which set is tuned to the station calling him.

When the key is thrown either way it cuts in the two 'phones, in series, on the one set and the operator can then work with the station calling. When the key is thrown the other way it cuts the two 'phones in, in series on the other set. One of the sets is generally set on the 300 wave and left there, that being the standard tune for shipboard stations calling. Now that standardized wave lengths are coming into more general use the listening-in key is very handy.

When first using a listening-in key it sounds very queer to hear a ship with a low frequency spark and a low wave in one 'phone and a shore station with a high wave and probably a Telefunken spark in the other 'phone and both of the same intensity. Either of the stations may be cut out and the other cut into the both 'phones by throwing the key lever to the right or left.



The construction of the key is something like two telephone jacks. The spring contacts of this key are mounted in a neat box, 3 x 5 x 2¼ inches with a hard rubber top with the six binding posts and the key lever on it.

It can be seen how this listening-in key works by tracing the diagram out.

Although, not a new piece of wireless apparatus the U. S. Government has begun to equip its shore stations with it. The Guantanamo and the Cape Henlopen as well as several other stations on the Atlantic Coast are already using them.—*William Klaus.*

FUND TO ASSIST YOUNG INVENTORS

We are advised by the American Federation of Licensed Wireless Operators, that they are establishing a department to be known as the Inventors' Guild, the object of which is to establish a fund to furnish patent fees for young inventors. Any communication on this subject should be addressed to Mr. Leo Bentley, 1526 Signal Street, San Pedro, Cal.

MUFFLED NUMBER

The Wireless Screech

OUR MOTTO . . — — . . . . — — .

THE ETHER: SIZZLING

No. A No. 1 FEBR-U-R-E Price: Priceless

The Wireless Screech

A Modern, most Modish as well as Modest Monograph of Wireless Screechings, Molesting no one with its Model and Moderate Momentous monstrosities but monopolizes all motionless Molasses covered Monodies regardless of their Morals.

Mohammed Ulysses Socrates Fips, Editor.

Subscription Price for 365 Days:—One pieces of 8.

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Forms will not close this month on acc't of Housewarming of the Editor.

The Editor would respectfully call the attention of contributors to the fact that on account of the New Parcel Post law, eggs should not be sent to this office in lieu of return postage for M.S.S. Freshly laid butter as well as Modern vegetables however are gratefully accepted.

On account of the Parcel Post law M.S.S. containing jokes must be labeled in large letters "PERISHABLE." Humorous side-splitting jokes are not mailable under any condition as they might cause serious damages to other fragile parcels when splitting the sides of mail bags.

Address all Parcels to the Editor, not to individuals.

Idiotorial

Until further notice the "Wireless

Screech" will publish each month the daffest, crazy Patent invented during the month. The editor invites all to give suggestions, with or without drawings and the daffy Patent that is published will get a reward of $1.00 each month.

Rules—1° As many suggestions or drawings as desired may be submitted.

2° The Patent must, of course, be absolutely useless as well as ridiculous.

3° There must be something electrical incorporated with it else it cannot be published.

4° Address all letters to Daffy Patent Editor, % The Wireless Screech, 231 Fulton Street, New York.

Now I hope that all Daffy screechers will get busy and we will see who gets that first dollar. A sample of a Daffy Patent is published elsewhere.

WHAT IS IT?

I am never dressed. I am forced to run around during the day as well as night. I have been in places where no human has ever set foot. In many houses I am received enthusiastically, but in a great many more, I am refused an audience. I am fleet of foot and long of body. However, my master says that I am dissipating my energy too much by trying to conquer unsurmountable difficulties. He also claims that I am running around in circles far too much. Although I serve my master faithfully, he sends me out into the cold night and he feels no scruples when I'm gone forever, tho' it must be said to his credit that, occasionally he makes inquiries among his friends to ascertain if I really called on them. I have helped to save many lives, but I have never received a medal. Altho I cannot swim I like the ocean best. I hate cities and the sun; I love the open most, and it is better for me to romp about under the cover of night.

(For answer see March issue.)

MORE ELECTRIC GUY.

I am the Guy who put the Buck in Turnbuckle.

I am the Guy who put the Air in Aerials.

I am the Guy who put the Ant in Antenna.

I am the Guy who put the Bull in Bulldog Coil.

I am the Guy who put the Fire in Rectifier.

TRY THIS RECORD ON YOUR PHONOGRAPH

FIPSORISMS

Screech, and the world screeches with you. Don't screech and you screech alone.

It is a long Dachshund that has no turning.

DO others as you would have them DO you.

From NOTHING, not even NOTHING comes, because it *is* something being composed of seven typed lead letters, costing about one-quarter cent. That's something. Hence we have to correct the old saying: From nothing, something comes—but you had better not bank on it!

He who saws wood, reaps sawdust.

A penny *found* is a penny earned.

A switch in time, keeps a girl in her prime.

People living in glass houses require no fire insurance.

The modern man doesn't have to go climb on the roof to shout down from the housetops. His aerial does it better and more efficiently, and he can be heard further.

The proof of the pudding is in the indigestion.

While there's strife, there's hope.

A hat in your hand, is worth three spinning on the pavement.

It is an accomplishment to save pennies, but it is an art to save dollars.

The Grattle

Forum for Foolish Questions.

(200m) K. Bangs, Bangup, Okla., snickers:

Q. I have invented a detector which rectifies the incoming wireless telegraph signals into articulated human speech. Do you think I can get a patent on it? I am sending model separately.

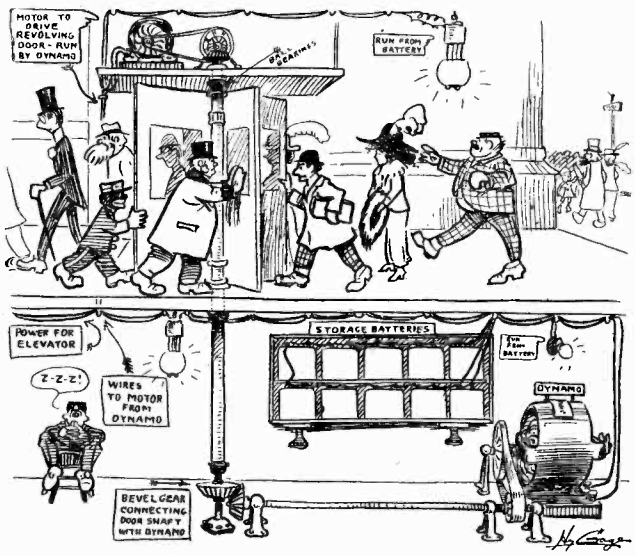
A. "Archie," dear, we have returned your model separately, and if you didn't live at a safe distance from us the editor he would come and make mincemeat of you and your detector. The trouble is the doggoned thing works too good. We tried it as soon as it came and listened in to a message from the "International Catsup Co." They had no more than gotten under way when the catsup became rectified and squirted right out of the detector into the editor's left eye. When he tried to tune the dod-gasted catsup company out, he turned right into a message of the Crude Oil Co., and simultaneously had a full charge of crude oil squirted into his *right* eye. Never again.

P. S.—You might try to sell the detector to Eben Stetzle!!

Daffy Patent Department

You have all seen the big revolving doors in our big office buildings. But did it ever occur to you how much energy there is loss on such a door, daily? Peter Frazzlegook, the statistician has calculated that it takes at least 6498.55 H.P. to operate such a door in a busy skyscraper. Now why not place the door on ball bearings which we know saves ½ of the energy? Then we would have a surplus of 3249.27½ H.P. which could be utilized to run the dynamo in the basement (see illustration), which, in turn, charges the storage battery. The storage battery lights the house, runs the elevators, milks the cows, etc., but now comes the best part of it. We reserved it till the last for a surprise to suffering humanity.

On top of the door we see an innocent looking motor whose shaft connects with the shaft of the revolving door. This motor drives the revolving door, thus making the latter work easier, saving *at least* 1800 H.P. This gives us *a grand total surplus of* 5049.27½ *H.P.*, which is utilized to run the dynamo. Isn't it grand?



Now you may ask, WHAT current runs that door motor. Sh—that's the best part of the patent. The dynamo runs it of course!!

WAVE LENGTH

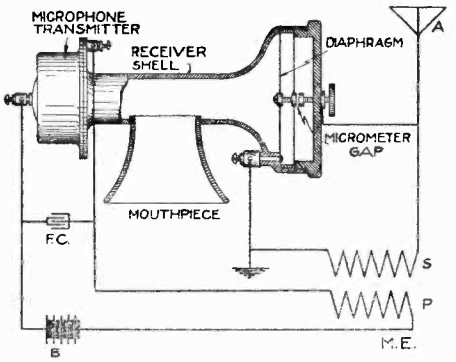
(9÷6'5"7) Achilles S. Tatic, Blowout, Vt., snivels:

Q. I have twelve silicon detectors, three hot wire helices, one set of air cooled head 'phones, two stationary loose couples, one transformer on the installment plan, one D. P. D. T. switch that can be thrown from east to west, one audion with air on the outside, a rotary fixed condenser, a storage battery with the + pole on the starboard side, a 200 meter oscillation transformer ½ meter long, ¼ meter high, a variometer with a hot water bag attachment, and a rotary spark gap with plugs made of plug tobacco.—What is my wavelength?

A. Inasmuch as the differential amplitude created by your oscillation transformer, shunted across the poles of your condenser, will cause a disturbing effect upon the magnetic circuit of your spark gap, thereby creating a pusillanimous torque upon the hysteresis field of the storage battery, a reversion of polarity of the latter will almost certainly be the result on the negative pole at the lee side, effecting thereby a compensating discharge near the magnetic field lying at right angles to the horizontal plane of the inductance, whereby the capacity of the silicon detectors will be propagated inversely with the square of the ensuing capacity of the stationary variable condenser, which naturally changing the natural wave length of the impinging oscillations, determines the mean value ½ times within the angle of velocity near the aerial, thus reducing the induction between the lateral fields of force to 300,000 kilometers per second, creating a final wave length of 92 millihenries, at a normal temperature of 89 degrees centigrade in the shade, 11¼ feet above sea level, along the 33rd meridian.

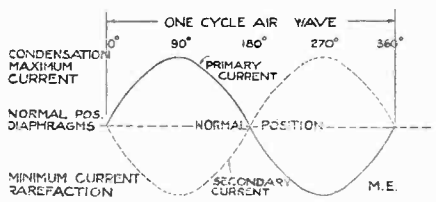
NEW BATTERY WIRELESS TELEPHONE

This article describes a new wireless 'phone constructed by the writer for working over short distances with battery power. Having done considerable experimenting with the spark telephone I found that the chief difficulty was in getting the aerial to discharge, that is, in getting the sparks to jump the gap. With the introduction of the mechanically quenched gap for telegraphy, the



thought occurred to me that it might be possible to discharge the aerial by mechanical means for telephony, and the following was developed along those lines.

As will be seen from the drawing, both diaphragms are acted upon at the same time by the voice waves in the air. Now consider one complete cycle of the diaphragm, consisting of one condensation and one rarefaction. When the micro-

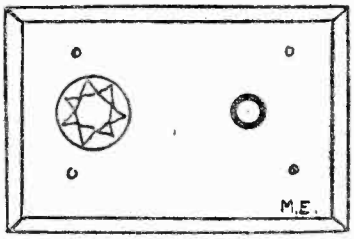


phone diaphragm is all the way out at rarefaction (*i. e.*, when the rate of change of magnetic density in the core is greatest) the secondary current will be at a maximum, 180° ahead of the primary current, and the micrometer gap is at its maximum separation, thereby charging the aerial. The microphone diaphragm comes back to normal position, but is carried beyond by the condensation, and as it is about to return the primary current is greatest and the secondary current has its least value, while the micrometer gap is closed, discharging the aerial. No sparking is noticed at the gap when the correct adjustment is found, which requires extreme care.

With a set of this kind the writer has talked a distance of four miles and the voice has been heard (though not understood) at twenty, on three dry cells and a 1-inch coil. The hookup can be varied, but I have found the simplest to work best. The wave is very short. The transmitter used has carbon diaphragm and round grains.—*W. R. Organ.*

NO MORE WORRY OVER BASEMENT LIGHT

A handy little switch has been made which has a miniature lamp connected in the basement light circuit, so that when the lights are lit, the switch lamp



glows. Thus, one may tell without going down to look, whether they turned out the lamp the last time they looked at the furnace.

KNICKERBOCKER'S CHRISTMAS TREE

(*Continued from page* 1139)

them a number of the men who wired St. Patrick's Cathedral during the 1911 blizzard, working during the snowstorm to have the lights ready in time. The circuits all came to a switchboard installed at the base of the tree, and from this all the lights were controlled. Current was taken to the tree from the Edison mains in Madison avenue and Broadway, the wires being carried from the street through the branches of the park trees.

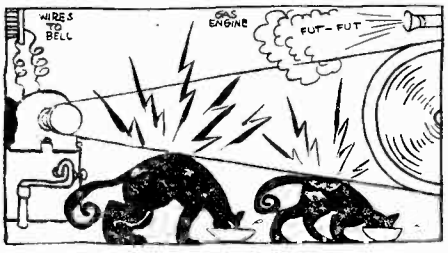
Flying Sparks

A FINE DOG

"You certainly have a magnificent dog, sir."

"Yes; but you ought to see him when he stands up. . . . Here, Cæsar, get up . . . !!

COMMERCIALIZING THE CAT

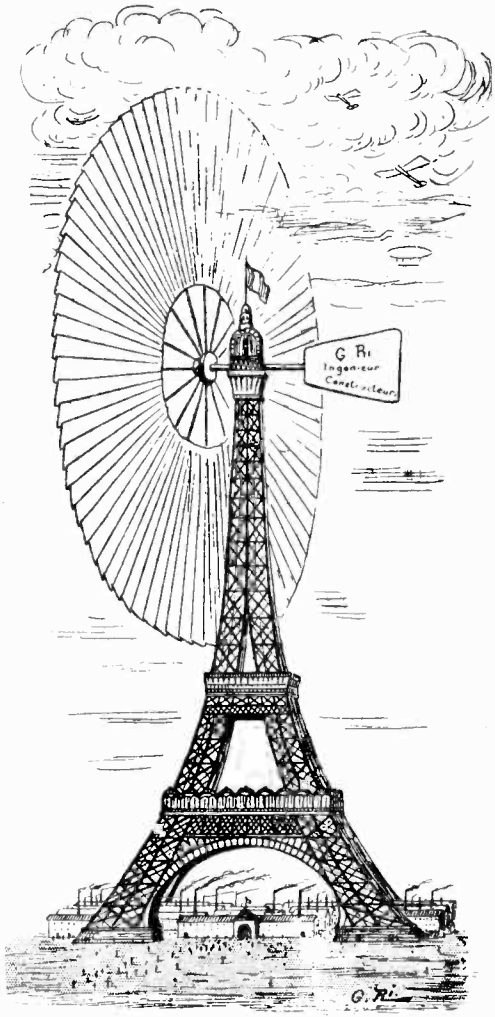


The Pussy-Cat electric generator supplies the house with heat, light and power, according to its inventor. —*N. Y. World.*

NATURALLY

"Do you play any instrument, Mr. Jimp?"
"Yes; I'm a cornetist."
"And your sister?"
"She's a pianist."
"Does your mother play?"
"She's a zitherist."
"And your father?"
"He's a pessimist."

A GREAT INVENTION



How Mr. G. Ri, of Paris, proposes to utilize the Eiffel Tower, by making a huge aeromotor of it, to supply Paris with electric energy. Our American skyscrapers and the Statue of Liberty could be utilized similarly!—*Pêle Mêle.*

Our Wireless Station and our Laboratory Contest will be continued every month until further notice. The best photograph for each contest is awarded a monthly prize of Three (3) Dollars. If you have a good, clear photograph send it at once; you are doing yourself an injustice if you don't. If you have a wireless station or laboratory (no matter how small) have a photograph taken of it by all means. Photographs not used will be returned in 30 days.

PLEASE NOTE THAT THE DESCRIPTION OF THE STATION MUST NOT BE LONGER THAN 250 WORDS, AND THAT IT IS ESSENTIAL THAT ONLY ONE SIDE OF THE SHEET IS WRITTEN UPON. SHEET MUST BE TYPEWRITTEN OR WRITTEN BY PEN. DO NOT USE PENCIL. NO DESCRIPTION WILL BE ENTERED IN THE CONTEST UNLESS THESE RULES ARE CLOSELY ADHERED TO.

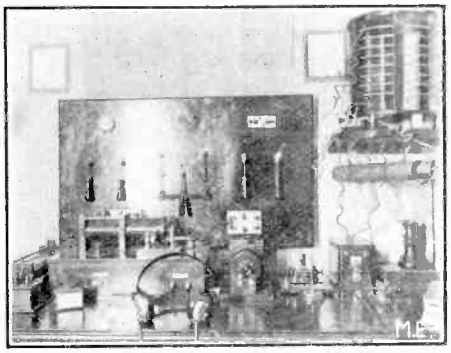
It is also advisable to send two prints of the photograph (one toned dark and one light) so we can have the choice of the one best suited for reproduction.

This competition is open freely to all who may desire to compete, without charge or consideration of any kind. Prospective contestants need not be subscribers for (the publication) in order to be entitled to compete for the prizes offered.

FIRST PRIZE, THREE DOLLARS

Enclosed find flashlight photo of my wireless outfit.

The aerial is 125 feet long, 60 feet high at one end and 35 feet at the other. It is of the four-wire aluminum inverted "L" type, on 12-foot spreaders.



WOERNER STATION

Receiving: Two loose-couplers; fixed, and twenty plate variable condensers; five detectors, silicon, perikon, electrolytic and two galena detectors. With this set I have received up to 900 miles in the summer. I have two pair of 'phones, one, a pair of Brandes Superior Type and a pair of 3,500 ohm 'phones.

I have an extra receiving set consisting of a large three-slide tuner, fixed and variable condensers, and the same detectors, which I can throw into either set by a double-pole double-throw switch. The large switch in the center of the switchboard is the aerial and ground switch.

Sending: This consists of a "Mesco" 1-inch spark coil, a home-made helix, commercial leyden jar, home-made spark gap, and a wireless key. Set is run on a six volt, sixty ampere-hour storage battery.

I think *Modern Electrics* is a very good magazine and recommend it to every amateur who does not get it. Would like to hear from any one that is in my range. Call me up in either Morse or Continental Code. Call letters CAW.

CHARLES A. WOERNER,
New Jersey.

HONORABLE MENTION.

Herewith is a photograph of our station. It was taken on a dark day, and so is not very good.

The station was built entirely with the sole idea of simplicity and power.

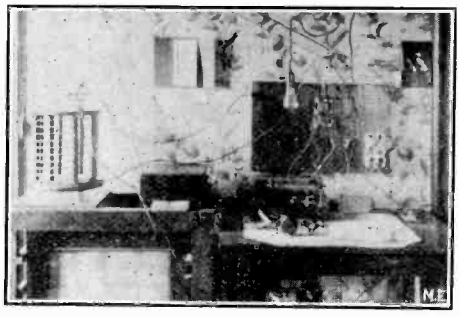
The transmitting apparatus consists of a ¼ kw. transformer of exceptional power. It is of the closed core type. It was built by myself, and represents many new improvements on the small power transformer. The helix which you see on the left of the picture, together with the transformer, is set on top of the condenser. The condenser is really the best piece of apparatus which we

have. It consists of a holder or rack which has a capacity for ten plates; size, 24x24.

The receiving set consists of a tuning coil (double slide), variable condenser, two fixed condensers, potentiometer and ferron detector. With this set and our large aerial, now 80 feet high, T shape to comply with the new law, coast stations come in very loud, and C X comes in so loud that it is possible to hear him with the 'phones lying on the table. Above the operating table is the switchboard. The 'phones are a pair of Brandes' transatlantic type.

All instruments were made by myself and partner, with the exception of the 'phones and key. Under the table you will see our rotary spark gap, which is not connected at time of taking picture.

Our call is E. B., and we shall be



BRENNER & ZOBEL STATION

pleased to work with anybody within a radius of 50 miles.

EDWARD H. BRENNER,
BENJ. ZOBEL,
Michigan.

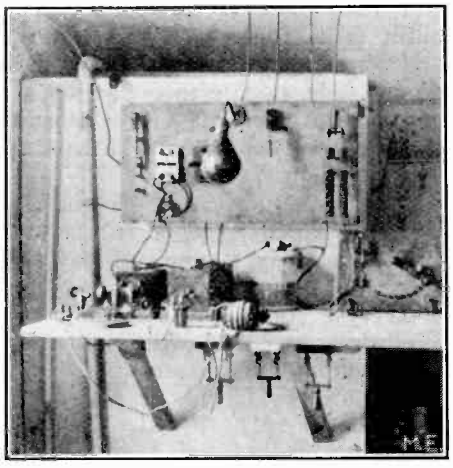
HONORABLE MENTION

Here is a picture of my wireless station which I wish to enter in the Wireless Telegraph Contest.

My instruments are, for receiving: Perikon and cat whisker detectors, potentiometer two fixed condensers, Holtzer-Cabot 2,000 ohm 'phones and a double slide tuner wound with No. 22 bare wire.

For sending I use a 1-inch spark coil, electrolytic interrupter, key, spark gap and rheostat. The rheostat is made of starting box parts and is very handy for cutting down the current supplied to the interrupter.

The switchboard is of slate and all the



BULL STATION

necessary switches are mounted either upon it or under the table. The batteries are on a shelf at the right.

My aerial is composed of 4 strands of No. 14 aluminum wire, spaced 2 feet apart and 80 feet long. It is about 55 feet above the ground.

With this set I get good results. I can communicate easily with two other amateurs in town.

ARTHUR BULL,
New York.

HONORABLE MENTION.

I submit herewith a picture of my

LUCE STATION

wireless outfit, which, though it may not be as elaborate as others, answers

the purposes for which I want it exceedingly well.

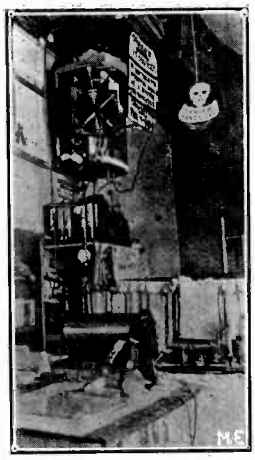
My receiving set consists of one silicon detector, a tuning coil, condenser, and 1000 ohm. receiver. My sending outfit is as follows: One ½-inch coil and gap, key, and Leyden jar, with a double pole, double throw switch. The aerial is 30 feet long, three strands of No. 14 bare copper wire 1 foot apart, 100 feet high.

The Leyden jar can be seen in back of the coil, which is connected across the spark gap. The tuning coil may also be seen.

Every evening before retiring I catch Wellsfleet, on the cape, very plainly. The sending instruments I use only among my boy friends of this neighborhood. STAMFORD L. LUCE,
Massachusetts.

HONORABLE MENTION.

The illustration shows a flashlight 'photo of my wireless station. I have two outfits. The large one consists of sending a 1-inch "Mesco" spark coil, zinc spark gap, key, "Electro adjustable sending helix; the power is supplied from a 6-volt, 30-ampere storage battery. For receiving, I have a large double slide tuning coil, electrolytic detector, two fixed condensers, one variable condenser, potentiometer and a pair of 2000 ohm 'phones.



HOLMES STATION

My small receiving outfit consists of one Precision Coherer and Decoherer, a 75 ohm relay and a tape register. For the small sending set I use a ¼-inch spark coil, zinc spark gap, two leyden jars, key, and the current is supplied by the same storage battery. I use two D. P. D. T. switches, one for each outfit.

My aerial is 85 feet long, composed of 4 strands of No. 14 aluminum wire, spaced 1½ feet apart, and is stretched 20 feet above the roof of a seven-story house.

I have a telegraph line connected to a friend of mine.

I made the leyden jars and fixed condensers myself.

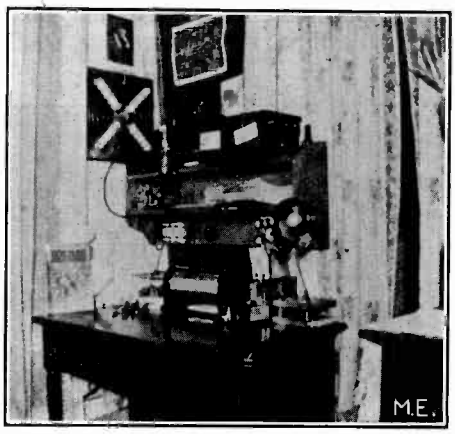
I hear every night the stations within 100-200 miles of N. Y. C. My call letters are HGH.

GEORGE HOLMES, New York.

HONORABLE MENTION

Enclosed please find photo of my wireless station. The following is a description of the same:

Receiving: Three slide tuner, silicon detector, fixed condenser, two variable



VAN SLYCK STATION

condensers, Brandes 'phones, and necessary switches.

Sending: ¼-kw. closed-core transformer operated on 110 volt, 133 cycle, A. C., large spark gap, sending condenser, key, and pancake helix.

My aerial is 100 feet long, six wires, 46 feet high.

My receiving range is 400 miles, and my sending range twenty.

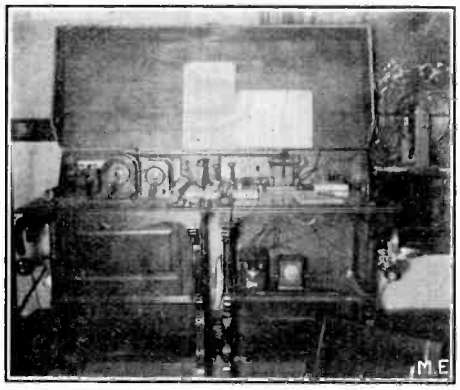
I think *Modern Electrics* is the only magazine for the amateur.

W. VAN SLYCK,
Wisconsin.

HONORABLE MENTION

I herewith enclose photo of my wireless station. Sending: Two-inch spark coil, oscillation transformer (as described in June issue of *Modern Elec-*

trics), glass plate variable condenser, muffled spark gap and heavy key. Operated on six storage batteries. Quick action 3 P. D. T. switch. Receiving side: Loading coil, two loose couplers,



BANKS STATION

two fixed condensers, two variable condensers (cylindrical), ferron silicon galena and electrolytic detectors, 3000 ohm 'phones, and one 1500 ohm 'phone, which I use for visitors.

Most of the instruments were made by myself. My aerial is eight No. 14 aluminum wires, 80 feet long and about 80 feet high on 12-foot spreaders. My call is JMB.

J. M. BANKS, New York.

HONORABLE MENTION.

Here I enclose a picture of my wireless set. It consists of a Long Distance Co.'s receiving set and Western Elec-

BEYNON STATION

tric head set. My detectors are ferron and silicon. I also have a loading coil.

My sending set consists of a helix, a 1-inch spark coil, two leyden jars, a rotary spark gap, and another spark gap on the helix, an extra heavy key, an E. I. Co.'s switch, and an interrupter. My aerial is 50 feet high. I can pick up vessels in the Gulf easily. I read your magazine every month and have received lots of helpful hints.

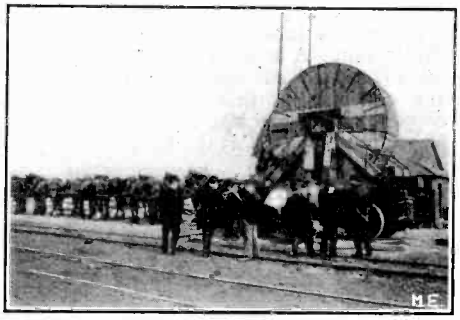
EUGENE T. BEYNON, Texas.

DIFFICULTIES OF INSTALLING LARGE ELECTRICAL MACHINES

Most machines, no matter how heavy when set up, can be divided into many parts so that transportation and handling is simple.

Large electrical machines, however, are an exception. They are made in only two parts, the frame and the armature, and further division is out of the question. Their transportation therefore is often a problem especially when they are to be installed at a place away from railroads, as is often the case.

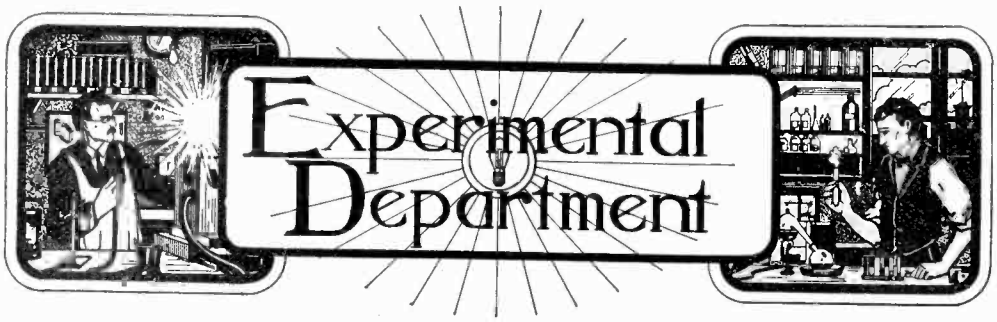
The illustration, which was taken at



the terminal of a British railroad, shows the armature of an American-made 1,800-kilowatt generator boxed and loaded on a specially-made horse-drawn truck ready for a several miles journey overland to the place of installation.—*J. C. Munn.*

ELECTRICITY IN ARABIA

It is reported that the Palace of the Sultan at Oman is to be equipped with electric lights by an electrical contractor from Hyderabad, India. He has also obtained permission to set up and operate a commercial lighting plant. The power house equipment will probably be direct current generators driven by oil engines.



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

CONVERTING A DOUBLE-SLIDE TUNER INTO A LOOSE COUPLER

It often happens that an experimenter possessing a double-slide tuner would like to have a loose coupler, but does not care to construct an entirely new instrument.

A simple way of converting a tuner of this type into a loose coupler is shown in the illustration. A strip of paper about 1⅛ inches wide is wound and sheilacked over one end of the coil. Over this is wound a layer of copper wire of any size from No. 30 to No. 36. Then comes another thickness of paper and

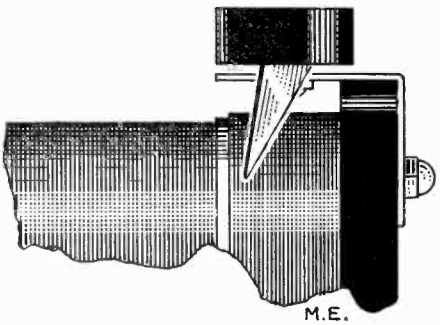


FIG. 1

another layer of wire. A switch arrangement is made, worked by a hard rubber or fibre knob, as shown in Figs. 1 and 2. The end of the switch lever is made narrow, so that in bearing upon the wire (which has been bared at that place) it will touch the least possible number of turns at a time. The lever should be very thin and flexible, and it should bear lightly on the wire, so as not to cut it.

The auxiliary winding serves as the secondary of the loose coupler, while the turns between the sliders on the regular winding serve as primary. The coupling is varied by moving both slides over the primary coil, keeping them the same distance apart. If a single slide tuner is used instead of one with two slides there can be no variation of coupling. If a three-slide tuner is used one slider remains unconnected.

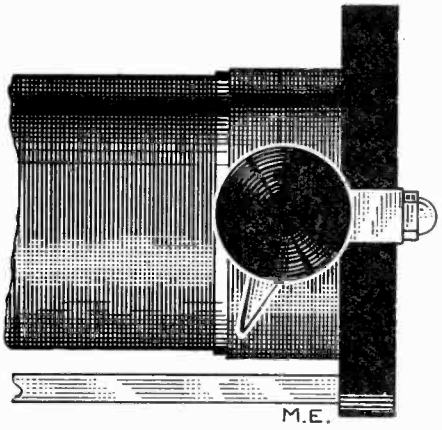


FIG. 2

The object of having two layers of wire on the secondary is to use as little room as possible and yet have enough turns in the secondary. Since the two layers of wire are in series, it will be seen that the least number of turns that can be in use in the secondary must be the number in the underlayer. Since a number of turns less than that

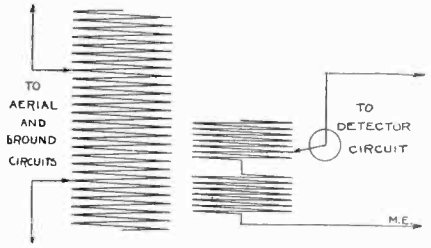


FIG. 3

is very rarely used in the secondary in practice, the instrument will be found of the right wave-length for all practical purposes. For convenience, a diagram of the wiring of the instrument is shown in Fig. 3.

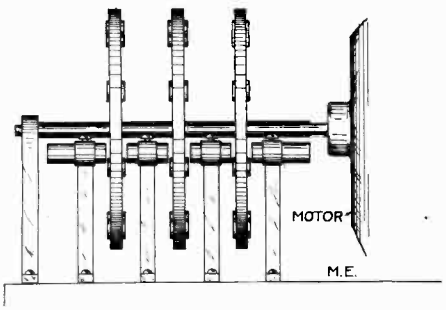
Contributed by

P. MERTZ.

Note.—This arrangement will work better if the switch be moved off center so the end of the lever touches the wire about where the center of the knob is shown in Fig. 2.—ED.

SECOND PRIZE ONE DOLLAR
A COMBINED ROTARY AND SERIES GAP

The three-fibre disks are six inches in diameter and five-sixteenths inch thick, mounted on a quarter inch shaft, and kept in place by one-quarter inch brass tubing. The electrodes on the wheels are nine in number and one-half inch in diameter. They should be placed



exactly opposite each other on the three wheels. The uprights holding the stationary electrodes are each composed of a brass standard and a short piece of tube fitted with a set screw soldered to the top. The stationary electrodes are the same diameter as the revolving ones, but considerably longer. If your motor has the same diameter shaft you can couple it directly to the gap by a short length of brass tubing, otherwise you will have to use another bearing and drive it with a belt. The motor should have as high a speed as possible.

To operate it as a series gap, a set of electrodes on the disks will have to be brought in line with the stationary electrode. For a smaller transmitter than one-half kilowatt smaller electrodes should be used.

Contributed by

EDWARD H. KURTH.

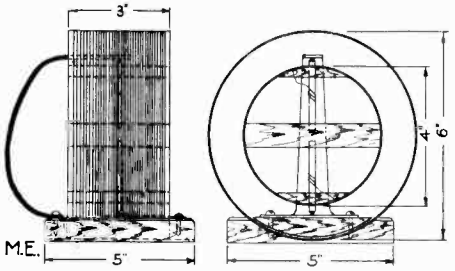
VARIOMETER

This variometer is easy to make and gives good results:

Both coils are made on pasteboard tubes and are 3 inches long. The larger is 6 inches in diameter and the small one 4 inches. They are wound with No. 22 bare copper wire, which may be evenly spaced by winding twine on beside the wire and afterwards removing the twine. The edges of the coils should be covered with tape to prevent unwinding.

A 4½x5x¾ inches board is used for a base, the coil fitting into a large groove and fastened as shown in the sketch.

The inner coil turns on a perpendicular axle made of two pieces of large copper wire. A wooden crosspiece is placed in the middle of the inner coil to separate the two parts of the axle, and wood blocks are glued at top



and bottom of the coil where the axle passes through.

The lower bearing is made from a piece of brass 2½ x 2½ inches. The upper bearing is made from a piece of rather heavy spring brass 2½x9 inches. Connections with the inner coil are made through the bearings. The two coils are connected in series.

Mount the whole on a base with a 3-point switch, so that none, one, or both of the coils may be used. After applying a coat of black shellac you will have an attractive and useful instrument.

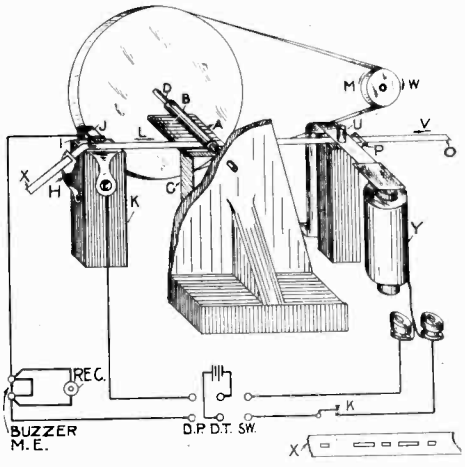
Contributed by

PAGE HASELTON.

CODE LEARNING MACHINE

These directions show how to make a machine for practicing and learning the codes.

In the diagram R is the receiving side and S the sending side; C is a stiff piece of tin with an oblong top, A, wound with string; B is tape wound on shaft, D, which is turned

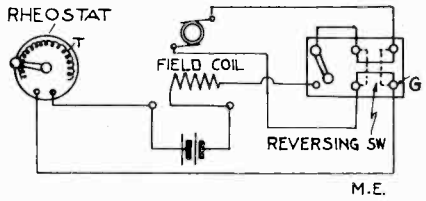


by the motor pulley, E. The speed of E is regulated by rheostat, F. It is also reversed and stopped by G.

For sending first prepare the code alphabet, or whatever you wish to receive, on a strip of paper as shown at X. Cut the dots and dashes right out. Pass the end of X through hole, H, over tin top, I, of post, K, and under brush, J. Then pass it between B and A,

which should touch firmly. By starting the motor in the direction of arrow, M, so as to pull X in the direction of arrow, L, connections will be made by J through the holes in X. The speed of the message may be regulated by F.

For receiving a blank strip of paper, O, is



passed through hole, P, beneath crayon, U, and between B and A. You can see that, with E turning in direction of arrow, W, and moving O in direction V, if the key is pressed, magnet, V, will pull down tin armature, T, and crayon, U, will make a mark on the moving paper. In this way messages may be recorded and practice can be had in sending.

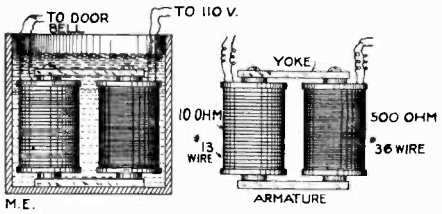
Mount the apparatus, with switch, key, etc., on a suitable base and connect it as per diagram. I use a "Little Hustler" motor and connect it to my reversing switch as in the diagram.

Contributed by

G. WILSON ROOD.

A SIMPLE DOOR BELL TRANSFORMER

Many so-called "money savers" have been described relating to methods of utilizing the alternating current lighting circuit as a source of current supply, but this method at best is risky and requires special wiring. The only practical way is to use a small step-down transformer, but even these are rather difficult to construct. However, the writer solved the problem by the simple scheme shown below.



Obtain a good set of 1000 ohm ringer coils from any telephone exchange. Remove one magnet, and substitute in its place one wound with No. 13 wire. Place a bar of iron in the bottom of a tank of the required size, place the magnet upon it in the position shown in the drawing. Fill the tank with a good grade of oil or melted paraffine. Connect the 500 ohm coil in the alternating current circuit with a ½ ampere fuse, such as is found in incandescent lamp rosettes. The other coil goes to the bell circuit, which is wired with the usual wire. This arrangement uses practically no current when the secondary circuit is open.

Contributed by

PAUL HORTON.

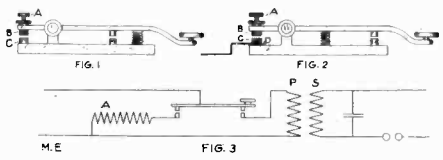
HOW TO STOP FLICKERING LIGHTS

I was bothered by complaints from the rest of the family because I flickered the lights, so I finally thought of this scheme to stop it. It does not look quite so good on paper as it really is, for one can think of several ways in which it would not work, but in reality it works to perfection on my ¼ kw., and I think it would be good on larger powers.

Figure 1 shows how I adapted my "Boston" key to this method, but the scheme may be used with any key having an insulating base. Solder two dimes or Canadian nickels to two small knurled nuts, such as come off batteries, or to two pieces of brass rod which have a tapped hole in the center, and screw one of them to the adjusting screw, A, and the other to the screw which is in the base for A to strike; or if there is none, one can easily be placed exactly under A. One terminal is taken from C, as will be shown.

If the base is conducting, the easiest way to fix it is shown in Fig. 2. The contact, C, is soldered to a strip of brass, which is screwed to the table so the two contacts meet, but insulated from the base by a strip of mica, D.

I should have said that when the dimes have



been soldered to the nuts the key will present a much better appearance if the dimes are then filed down to the same diameter as the nuts. This will give about a ¼-inch contact, which is enough for all ordinary currents.

The connections are shown in Fig. 3. A is an impedance or water resistance about equal to the primary, P, of the transformer. It may be a little less, as a small difference will not cause the lights to flicker. For my ¼ kw. I use an impedance which draws about 200 watts. It will be seen that when the key is not depressed the current will flow through the impedance, and when depressed the current flows through the transformer in the usual manner. If the key is adjusted so that there is not too much play there will be no flicker at all.

Contributed by

SIDNEY E. ANDERSON.

This is a good scheme. Its only disadvantage is that you are drawing current all the time you are operating. Even if the power circuit is lead through an extra contact on the aerial switch the lights will blink whenever the aerial switch is thrown.—Ed.

DEVICE FOR ELECTRICALLY RAISING AND LOWERING BICHROMATE BATTERY ZINCS

The bichromate cell would undoubtedly be used more in experimental work if it were not necessary to lower and raise the zincs into and out of the electrolyte each time current is used. On account of the nature of the positive and negative elements of the cell,

however, this is imperative, and a device for mechanically performing this work should in many cases add to the popularity of this type of battery, as the amperage is large and the voltage exceptionally high for a primary cell.

The accompanying sketch (Fig. 1) shows such a device. The battery is placed in an ordinary wooden box, the size of which will be governed by the number of cells used, and pencil zincs for each cell are fitted in the piece of wood, "A." A pulley, "B," is fastened

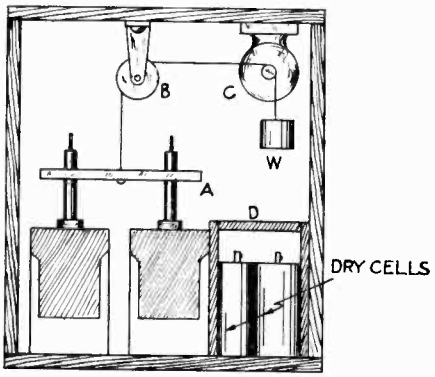


FIG. 1

to the top of the box directly over the center of "A," and the writer has found nothing better or more efficient to use here than the hub from the front wheel of an old bicycle, as the friction at this point should be reduced as much as possible. A small toy motor, such as every experimenter probably has around, is screwed to the top of the box in the position shown in the illustration. A cord fastened to the center of "A" passes over both pulley "B" and the motor pulley, and to the other end of this cord is attached a weight of some kind, which should be about as heavy as the zincs,

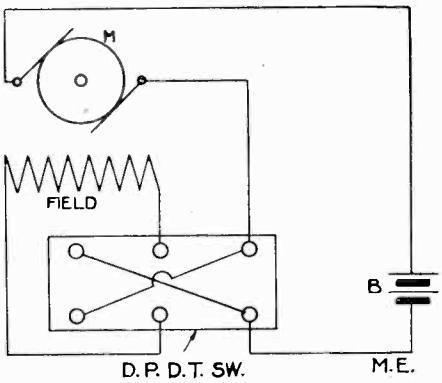


FIG 2

and the cord should be just long enough to permit the weight to touch the support "D" when the zincs are clear of the electrolyte.

The motor is operated by a pole-changing switch and wired as in Fig. 2, thereby permitting the motor to be run in both directions for either raising or lowing the zincs. Two dry cells are ample current to run the motor, which as a rule is very economical.

The bichromate battery, when used in connection with this device, will be found just as handy to use as the regular dry or wet cells more commonly in use, since the circuit can thereby also be made and broken by the operation of a single switch, and the experimenter will no doubt find the idea outlined to be useful in making this type of battery more convenient to use.

Contributed by

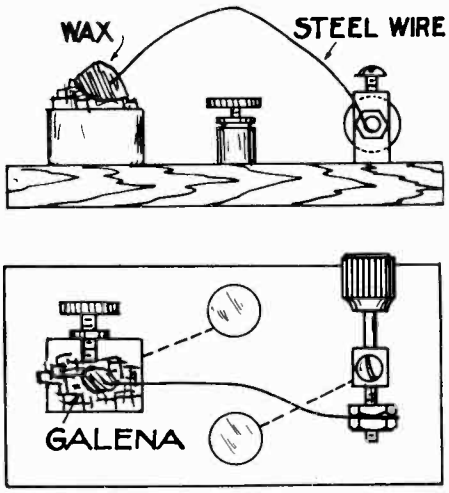
W. INGRAHAM.

A REAL IMPROVEMENT IN DETECTORS

The following improvement, applicable to any crystal detector, accomplishes what has long been sought by all—an adjustment that is mechanically perfect.

All that is necessary is to get the detector into its most sensitive condition, and then to seal the couple at the point of contact with a non-hygroscopic substance, such as sealing wax. The writer uses the compound made for filling screw holes in porcelain apparatus.

With a steel wire (instrument string is excellent) on galena, adjusted and sealed in this



manner, I have copied messages by the dozen from over 3,000 miles with 100-foot aerial. This detector is so sturdy it can be knocked around on the table and handled more roughly than any other detector known. I have repeatedly, while demonstrating, struck it such a blow with a pencil as to knock the mineral out of the holder, when upon replacing it was found to retain its sensitive condition.

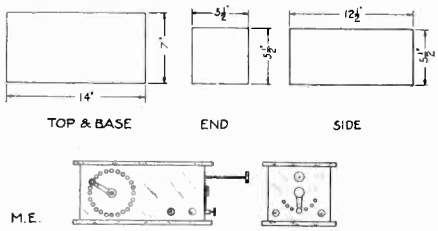
Contributed by

W. R. ORGAN.

ENCLOSED LOOSE COUPLER

The making of this instrument is very simple and requires no great skill. The primary coil is wound on a tube 5x4 inches in diameter. No. 20 S. S. wire is used for the winding of the primary. Now, instead of using a slider on the primary, taps are taken off at intervals and connected to a multi-point switch. This does away with any loss of energy which re-

sults when sliders are used. The tapping is left to the discretion of the maker, who may tap as often as he wishes. The coupler described is tapped about 25 times in the primary. The leads are brought to switch points on the outside of the box and the inductance is varied by means of the switch. The secondary coil should be 5 inches long and of such dimensions that it just clears the primary into which it slides. It should be wound with No. 30 S. S. wire. The secondary may be tapped, if desired, and leads be brought to switch contacts on the box. The leads should be of flexible lamp cord so as to prevent any interference with the variation of the coupling. The secondary slides on a single brass rod. Another rod, attached to the secondary, protrudes through the end of the box, by the use of which the coupling is varied. I will not explain any way to set up the coupler in the box. The person who makes this instrument may do it as he sees fit. A variable condenser should be shunted across the aerial and ground or around the ends of the primary. Another variable should be connected across the secondary. This is not absolutely necessary, but it aids materially in tuning. The base of the box in which the coupler is set up should be 14x7x½ inches. The top is of the same dimensions as the base. The ends should be 5½x5½x¼ inches, and two are necessary, of course. The other two sides should be 12½x 5½x¼ inches. The box should be assembled as in the figure, leaving ¾ inch of top and base to project on all sides. The instrument described was finished with mahogany stain, but any kind may be used. This instrument, if constructed properly, should make a worthy addition to any set. It is more efficient, as all loss of energy through poor contact of sliders is abolished. The cost of construction is not high, which makes this instrument in reach of all.



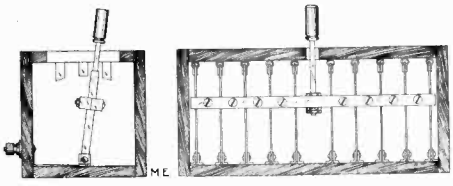
Contributed by

J. W. D.

SELECTIVE SWITCH FOR USE WITH A STEP DOWN TRANSFORMER

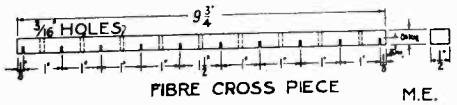
Any person constructing a step down transformer of the variable voltage type, *i. e.*, one having leads brought out from the secondary, enabling the sections to be grouped in various ways, thus allowing one to obtain the required voltage, will greatly simplify the task of making connections and also reduce to a minimum the danger of burning out the transformer through a short circuited section, by building a simple three-voltage selective switch after the plans and description given below. In manipulation this switch is a model of simplicity, requiring only a slight motion of the handle to change the circuit from a series to parallel connections yielding one-quarter the series voltage, or to a parallel series giving twice the parallel or one-half the series voltage.

Perhaps the wiring diagrams may need a little explanation as to the meaning of the empirical figures used as indicators. It is seen that the secondary coils are grouped under two heads, namely, those on leg 1 and those on leg 2 (see diagram). In the transformer taken for example the secondary was divided into two parts, one-half of the total coil being wound on each leg. This explains the meaning of the figures leg 1 and leg 2. However, it is not necessary that the secondary coil be divided; the primary and secondary may be wound on separate legs if so desired, but a longer piece of secondary wire will be needed to give the required number of turns, thus cutting down the amperage. The numerals 1, 2, 3, 4 indicate which blade of the switch a certain lead of the secondary is to be connected to. To obtain these figures as they are shown, and it is necessary that they should be, proceed in the following manner: Start with, say, the right end of the winding space on leg 1, and apply one layer of wire, tagging the beginning No. 1 and the end No. 2. Now, begin at the right end again and, winding in the same direction as the first layer, apply layer No. 2, tagging the beginning and



end Nos. 3 and 4, respectively. On leg 2 proceed in the same manner, winding the wire this time, however, in the opposite direction to the wire on leg 1. The outline of the wire if correctly wound will resemble a letter S.

In the construction of a switch the following pieces are required and should be cut from good oak stock: One base and one top 5½x 10x½ inches, and also one back and one front piece measuring 4⅜x10x½ inches. The blades of the switch, measuring ⅜x4 inches, are mounted upon the back board and held in



position by suitable supports or pivots such as are always used in switch construction. The supports themselves, of which ten are needed, are held in place by binding posts or screws, which also serve to make connection to the outside circuits and to the secondaries. The ends of the blades away from the supports are held securely clamped between two slotted fibre pieces, which are shown in detail in the drawing. The pieces are held together

DEEP BREATHING

By D. O. Harrell, M. D.

I BELIEVE we must all admit that deep breathing is a very desirable practice. Furthermore, we know it to be a fact that not one person in twenty, or perhaps one person in a hundred, really breathes deeply. Every physician can verify the statement that we are daily called upon to prescribe drugs for ailments that owe their cause directly to insufficient and improper breathing,—Oxygen Starvation.

Breathing is the Vital Force of Life. Every muscle, nerve cell, in fact every fibre of our body, is directly dependent upon the air we breathe. Health, Strength and Endurance are impossible without well oxygenated blood. The food we eat must combine with abundant oxygen before it can become of any value to the body. Breathing is to the body what free draught is to the steam boiler. Shut off the draught, and you will kill your fire, no matter how excellent coal you use. Similarly if you breathe shallowly, you must become anæmic, weak and thin, no matter how carefully you may select your diet.

I might continue indefinitely to cite examples of the great physiological value of deep breathing. For instance, it is a well-known fact that intense mental concentration and nerve strain paralyzes the diaphragm, the great breathing muscle. This depressing condition can be entirely counteracted through conscious deep breathing.

The main benefit of physical exercise lies in the activity it gives the lungs. What we term "lack of healthful exercise," in reality means insufficient lung exercise. Since few persons have the strength and endurance to exercise violently enough to stir the lungs into rapid action, common sense dictates that the lungs should be exercised independently, through conscious breathing. Exercise that fails to excite vigorous lung action is of little real value.

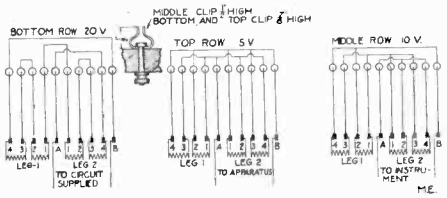
Unfortunately, few persons have the slightest conception of what is really meant by deep breathing. In fact, few physicians thoroughly understand the act. Ask a dozen different physical instructors to define deep breathing, and you will receive a dozen different answers. One tells you it means the full expansion of the chest, another tells you it means abdominal breathing, the third declares it means diaphragmatic breathing, and so on. In the end, one becomes thoroughly confused, and justly forms the opinion that most teachers of physical culture are incompetent to teach deep breathing.

Recently, there has been brought to my notice a brochure on this important subject of respiration, that to my knowledge for the first time really treats the subject in a thoroughly scientific and practical manner. I refer to the booklet entitled, "Deep Breathing," by Paul von Boeckman, R. S. In this treatise, the author describes proper breathing, so that even the most uninformed layman can get a correct idea of the act. The booklet contains a mass of common sense teachings on the subject of Deep Breathing, Exercise and Body Building. The author has had the courage to think for himself, and to expose the weaknesses in our modern systems of physical culture.

I believe this booklet gives us the real key to constitutional strength. It shows us plainly the danger of excessive exercise, that is the danger of developing the external body at the expense of the internal body. The author's arguments are so logical it is self-evident that his theories must be based upon vast experience. Personally, I know that his teachings are most profoundly scientific and thoroughly practical, for I have had occasion to see them tested in a number of my patients.

The booklet to which I refer can be had upon payment of 10 cents in coin or stamps by addressing Dr. von Boeckmann directly at 1750 Terminal Bldg., 103 Park Avenue, New York. The simple exercises he describes therein are in themselves well worth ten times the small price demanded.

by six 3/16-inch bolts. This cross piece also serves as a support for the handle, which is held firmly in place by means of two nuts on the end of the brass rod, which is to be threaded for the purpose. The knob is hard



rubber. The contact clips, of which thirty are used, arranged in three rows, ten in a row, on the front board, are made of 1/16-inch sheet copper, and one representing the middle row is shown in detail, being ½-inch high, while the two outer rows are ¾-inch high. These clips are held in place by short bolts, through which the clips of each row are connected together, there being no external leads. Connect the clips together exactly as shown in the diagram, using No. 16 rubber-covered wire. Any deviation from the plan shown will produce negative results. In order to obtain the voltages shown, *i. e.*, 5, 10 and 20, it is necessary that there be four layers in the secondary, whether or not they be on the same leg, and the primary turns must be to the secondary turns, using 110 volts, in the ratio of 50 to 1. This determines the voltage, but the amperage depends upon the actual number of turns and the size wire used. The external circuit is supplied through A and B.

Contributed by

PAUL HORTON.

AUTOMATIC RECEIVER

In *Modern Electrics* for August, 1912, E. H. Thineman gave directions for making an automatic transmitter. Now, a good companion for that nice instrument is an automatic receiver. It can be used on line telegraph work or wireless if you use a coherer or polarized relay, and perhaps with some detectors.

The drawing will explain the electrical con-

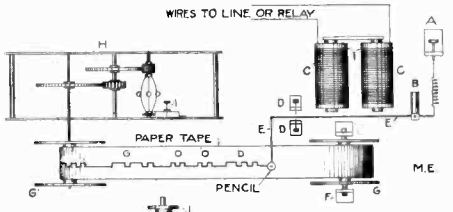


FIG. 2

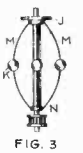


FIG. 3

nections and show how it operates. On E there is a place to fasten a pencil, and under the pencil point there is a smooth piece of brass in the shape as shown in Fig. 2. This serves as a guide and support for the paper tape where it passes under the pencil point.

You want good, strong magnets, and placed where they have good leverage. B is the pivot

for E; D is to regulate the space E moves. Spool 1 is free, and moves as spool 2 takes up the paper. Spool 2 is operated by old clock works.

Now, to fix the clock works. An eight-day set of works is best. Remove the escapement wheel and make a governor as shown in Fig. 3. This is made of thin strips of phosphor bronze (No. 30) and as long as the spindle will allow. In the middle of each spring solder a ¼-inch ball. It takes three strips and three balls to make the governor. Fasten the strips, at N, to the spindle; but J is a disk with a hub on one side. J must be free to slide up and down the spindle. When in place the governor must have a spring and adjusting screw, I, to adjust the speed.

When mounted and adjusted it will surprise you what a good receiver you have.

The combination of this and the automatic transmitter will place you so you can send messages and receive them before you learn to read by ear; but you want to have your receiver or a sounder in connection with this automatic receiver, and it will help you learn fast.

The word written on the tape "is g-o-o-d."

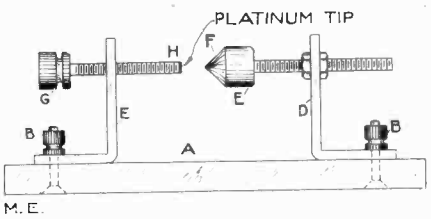
Contributed by

W. HALL MOSS.

PEROXSIL DETECTOR

Below is a diagram of a new detector which I discovered while experimenting and which I find to be the most sensitive detector I ever used;—and I have used many.

A is hardwood base, 5" long by 3" wide and ½" thick; B-B are binding posts from



dry batteries; C and D are brass strips ½" wide by 3" long, bent as shown; E is a cup from an ignition dry battery filled with composition, F. F is a composition made up of equal parts of pulverized silver nitrate and lead peroxide formed to the shape shown by dampening with glue or other adhesive. G is a thumb-screw 8/32 thread. H is a small piece of platinum soldered to point of thumb-screw, G.

Contributed by

EDWARD H. CUNNINGHAM.

A SMALL LOOSE COUPLER

I have constructed a loose coupler, and thought that perhaps your readers would appreciate knowing an easy way to get the drums on which to wind the coils. I procured an old Edison amberoid phonograph record and the box that belonged to it. I wound the secondary with one layer silk-covered wire on the record, then I shellacked the box well and wound the primary on it. This instrument works excellently.

Contributed by BEN A. GREEN.

When writing, please mention "Modern Electrics."

ELECTRIC FIRE ALARM

The accompanying drawing shows a simple and easily made fire alarm. The base, B, is of wood. S is a piece of spring brass or other metal, fastened to the base by a screw. Directly under it another screw is placed.

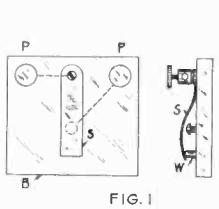


FIG. 1

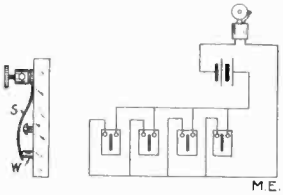


FIG. 2

Both screws are connected to the binding posts, P. The circuit is kept open by a piece of wax, W. When the temperature becomes so high that the wax melts the metal springs against the screw under it, closing the circuit and causing a bell to ring. Fig. 2 shows how several of these alarms can be placed in different rooms so that each will ring the same bell in case of fire.

Contributed by
JOHN F. THORNTON, JR.

HIGH POWER, AIR COOLED, VARIABLE SENDING CONDENSER

After building several different styles of condensers and then having the dissatisfaction of seeing them burn up on my 1½ kw. closed core transformer, this one I am going to describe has given entire satisfaction.

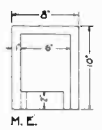


FIG. 1

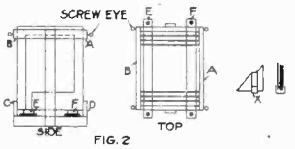


FIG. 2

It is as follows: After you have decided on the number of plates (I use twenty 8"x10" photo plates) obtain several pounds of heavy tinfoil (about 600 square inches to the pound), as none other will do. Cut the tinfoil into pieces as shown in Figure 1, so that there are twice as many as there are sheets of glass.

After the plates are thoroughly cleansed give each a coat of shellac all over and set aside to dry. After the shellac has dried fasten the tinfoil sheets on half the glass plates as shown in Figure 1, the lug on the front sheet of foil coming at the right and the lug on the foil on the back at the left, as shown. The foil is fastened on by giving the plate another coat of shellac and rubbing the tinfoil sheet down while the shellac is still wet.

The tinfoil on the other half of the plates should be placed so that the lug on the front side of the plate is at the left and on the back at the right. The reason for this will appear later.

Then small clips made from thin sheet brass should be placed over the end of each lug and the edge of the glass plate as shown in the detail X. After the tinfoil sheets have

all been fastened on the plates should all be given another coat of shellac and set aside to dry.

While the shellac is drying you may proceed to make a frame as per Fig. 2, A, B, C, D being strips having grooves cut so the plates will easily slide in them. Two strips of brass ½ inch wide by ⅛ inch thick and about 1 inch longer than the frame, are secured to the bottom piece of the frame, using some insulation between brass and wood frame as shown at E and F.

In assembling, the plates are dropped in the grooves from the top, beginning at one end of the frame. They must be put in first with the front plate with the lug at the right, the next plate with the front lug at the left, the third plate to the right and the fourth to the left, and so on until they are all in, the little brass clips resting on the brass strips, E and F, the shellac being of course first removed from the clips where they make contact with the brass strips. The reason for placing the plates with the front lugs alternately to the right and left is that the tinfoil sheets on adjoining plates which face each other and are separated only by air must be of the same polarity; that is, they must be in contact with the same strip, either E or F. If this is not done there is liable to be sparking across from one plate to the next, which, of course, is undesirable.

This condenser will not heat up even if run for hours. If a plate is ever punctured all you have to do is to pull that one out (which takes but a second) and go on sending; another plate can be put in later.

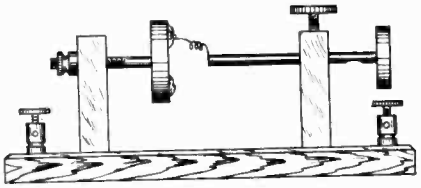
Contributed by

EARL CLINE.

GALENA

I think that without doubt galena is by all means the most sensitive detector mineral yet discovered, and I believe this because I have made a special study of the electrolytic detector and about every detector mineral yet found.

But still most of the amateurs throw it down as being worthless, and most of the commercial operators also. The reason for



M.E.

this is that the amateurs and professionals get disgusted too soon. In the first place most of them probably don't get the right piece of mineral, and in the second place, they probably use it in the wrong kind of a stand altogether.

Galena is very sensitive, and therefore wants a most delicate kind of a point resting upon its surface. If the first piece you try does not work, don't get disgusted, but split it up into other pieces until you get a nice shiny surface, and then try it. The saying about galena is that only about one piece in ten is

any good, and I believe that this is true; but I also believe that if you get the "good piece" you have the best detector yet discovered.

The writer has a galena detector that he has tried against high grade detector stands of different minerals, including Pickard's perikon, and every time has found his to win out; and another good point is that it is easy to adjust, and that it does not get out of adjustment frequently.

I'll guarantee that if you get the right stuff and use it in a stand such as described herewith, that you can't heat it no matter what you try. It does not hurt the mineral any to mount it in melted Wood's metal.

Contributed by

E. E. HAYWARD, JR.

KEEPS AERIAL FROM TWISTING

I have a method to keep the aerial horizontal that I have not seen illustrated. It is very simple, requiring only two ordinary flatirons and a piece of clothesline. A piece of clothesline is attached at each end, forming a triangle, with the lower corner about three or four feet down, according to size of aerial. The iron is attached at the lower corner. If desired, insulators may be put in rope.

Contributed by

HARRY H. KARSTENS.

Stand from under.—ED.

What's the irons for? To iron kinks out of the messages?—"Fips."

LEAD-IN INSULATOR

Knowing how hard it is for the amateur to insulate the aerial lead-in, I am sending the following description, which I hope will be of use to someone who lacks the means of obtaining a better one.

Drill a hole through the center of the bottom of a one quart or, better, a two quart, fruit jar. Then cut away the center of the zinc top, leaving just enough around the edge to hold the glass cover in place. This may be done with a sharp knife, as the zinc is soft.

Then drill a hole through the center of the glass cover. These holes may be drilled with an ordinary twist drill if same is turned backwards and the drill is kept wet with turpentine. They should be no larger than the lead-in wire.

Holes may then be cut in the wall of the same diameter as the jar and the jar inserted therein.

Although I have no sending outfit at present, I believe this insulator would hold 5 kw. It increased the intensity of the incoming signals fully 100 per cent. over a common porcelain tube during rainy weather.

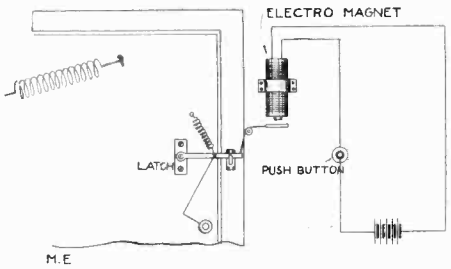
Contributed by

WILLARD HURLEY.

ELECTRIC DOOR LATCH

I have not seen an electric door latch in the experimental department for a year at least.

An old bell coil or other coil is used for the magnet, and the latch is an old-fashioned door latch. The door is closed and then the



knob turned from either side. This draws the latch down into place and it is automatically locked. The button is located in a convenient place (two may be had if wanted), and when it is pressed the electro-magnet attracts the armature, which releases the latch and a common door spring opens the door. About three or four dry cells works it nicely.

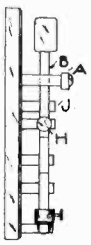
Contributed by

I. O. BUCKNER.

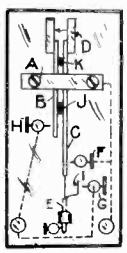
A HIGH SPEED WIRELESS KEY

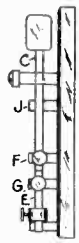
This key is built on the principle of a vibroplex and is easily made. A base is made of hard rubber or wood about 8x4x ½ inches. A bevel is cut around it. The yoke, A, is placed as per diagram, crosswise in the middle of the base, 2½ inches from one end. It consists of two rubber pillars each drilled lengthwise to receive a 3-16-inch brass bolt. A piece of square slider rod is bolted across between the two pillars, through the latter and through the base.

Three more pieces of slider rod are cut, one (C), 3½ inches, one (B), 3 inches, and one (E), 2 inches in length. C and B are each drilled 2 inches from one end, to take a ⅛x1½ inches pin. Solder one of these pins in each rod so that half the pin extends on each side. Mount these rods un-



DASH KEY
M.E.





DOT KEY

der the yoke, A, as per diagram. Another pillar is mounted at F, and one at H, long enough to allow the thumb-screw in each to intercept the movement of the levers. With these the amount of play in the levers can be regulated to suit the operator. Levers, C and E, are slotted at one end to take a piece of clock spring, I, of which

there is left about one inch between C and E. On E is mounted a weight, the size of which is varied according to the springiness of the clock spring. Another pillar is mounted at G with a setscrew to make contact with a bent piece of spring, which latter is also placed in the slot in E. As C is pressed with the thumb, E vibrates, and the bent spring, coming in contact with G, makes a series of dots. J is a block of metal or wood, fastened to the base and placed between the levers to serve as a rebound.

A small expansion spring is placed between the two levers at K. At the hand end of each lever is placed a telegraph key knob, or other insulating handle, D. Two binding posts are mounted on the base and connections made from one to A and F, and from the other to G and H.

Lever C is used for dots and lever B for dashes. The number of dots is judged by the pressure of the thumb on C. The weight, when placed nearest the clock spring, allows the dots to be made faster, when at the other end of E they are slower.

The contact points should be tipped with silver or platinum.

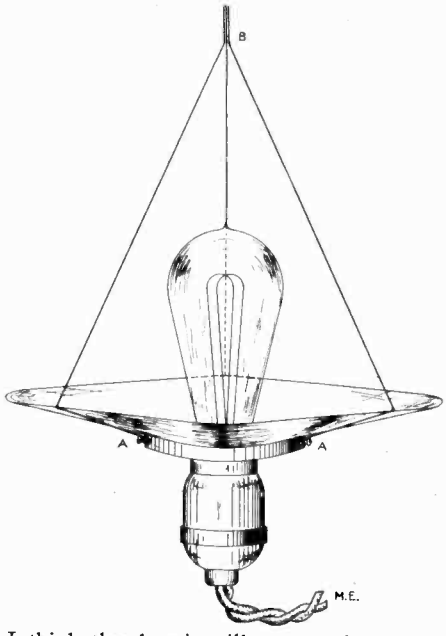
Contributed by

THOMAS HUNTER.

INDIRECT ILLUMINATION

The drawing illustrates a simple and very effective means of lighting the wireless station or any other room.

This arrangement gives a soft light, without glare or shadows, making an excellent lamp for reading or doing any fine work.



I think the drawing illustrates the arrangement clearly, but a word or two will not be amiss. The lamp, socket and shade are inverted and a piece of string tied to each screw that fastens the shade to the holder. These strings are then brought over the edge of the

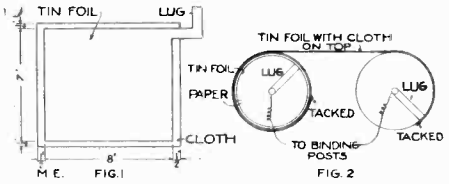
shade and joined together at B. A string is then fastened to this end and then to a hook in the ceiling. In this way the lamp is hidden from view but the light is reflected by the ceiling.

Contributed by

WILLARD S. WILDER.

VARIABLE RECEIVING CONDENSER

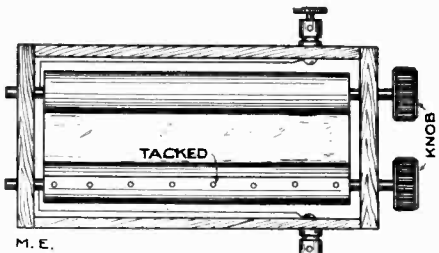
Procure two tubes of cardboard or two rollers of wood about seven by two inches. Shellack one of these tubes, using quite thick shellac. Then while the shellac is still wet



cover the tube to within a half inch of each end with tinfoil, placing the lug or lead at one end under the tinfoil; next get some thin, waxed paper and cover the tinfoil, holding the cylinder over the gas until the paraffine melts and holds the paper in position. (It may be necessary to first shellac the paper in place.) After this is done trim the extra paper off, leaving it come to about ¼ inch from each end of the tube.

Next get some silk or non-stretchable cloth, a piece about 8" x 10" will be plenty, and lay it flat on a board. Then paste on it a piece of tinfoil large enough to go around one of the cylinders. Use a good glue such as Le Page's. Trim off the cloth, leaving about ¼ inch beyond tinfoil on side that will be towards end of cylinder and ½ inch on sides that will run parallel to it, as in Fig. 1. Leave a piece of tinfoil for connecting as in drawing.

Now put the cloth (which is merely to

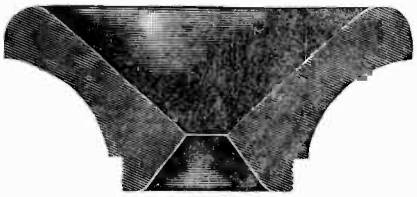


strengthen the tinfoil so it will stand the strain of moving back and forth), with the tinfoil inside, carefully around the tube with the tinfoil and paper on it and carefully tack cloth through the half inch flap. Be careful not to let the tacks come in contact with both sheets of tinfoil. Then tack the other half inch flap on the other tube likewise. Now it is evident that by rolling one tube around we will vary the amount of active surface in the condenser and thus change the capacity. To do this, get a box a little larger than the two tubes and bore holes in front and back op-

(*Continued on page* 1192)

TELEPHONE MOUTHPIECE.

A telephone mouthpiece of distinctive design has recently been placed on the market by the Electrose Manufacturing Company, of Brooklyn, N. Y. The particular improvements claimed for this style of attachment over the type now in use are that it is more sanitary and more substantial. The bell of the mouthpiece is made shallower and more flaring than the mouthpiece now in general use, so that it lends itself more readily to the application of the dust cloth. The shell is made thicker than on the older design, and this, combined with the reduced depth of the shell, makes it able to withstand rough usage. Instead of containing several perforations for admitting the sound waves, one large circular aperture is used, which is nearly large enough to admit an ordinary lead pencil. These mouthpieces are manufac-



tured to fit the face plate of any standard transmitter. It is claimed that the volume and quality of transmisssion are as good as with any other type.

AMATEUR OPERATORS PROFICIENT

The skill of many of the amateurs who have taken the examinations for operators' licenses has rather surprised the navy people. Commander Carter said that the young son of an army officer of Fort Totten who secured an amateur's license might easily have qualified for a commercial license if he had known a little more about the care of the apparatus he used so skilfully.

WIRELESS ASSOCIATION APPROVES THE PROVISIONS OF WIRELESS LAW.

It was at first reported that the Wireless Association of Pennsylvania objected very strongly to the questions asked of applicants for amateur licenses under the new law, but it now appears that the provisions made for the examinations of prospective wireless operators is entirely satisfactory to the members of the Association.

Advance on Patents

UNDERGROUND TROLLEY SYSTEM

(89.) Ralph Ford, of Columbus, Ohio, wants to know what we know of an undergound trolley system.

A.—The question is not quite complete enough and it is hard for us to understand just what is meant. There are, of course, a good many underground trolley systems, as the street cars of New York for instance. Most any good book on electric railways gives full description of nearly all of them.

HIGH FREQUENCY GENERATOR

(90.) G. Proctor, of New Britain, Ct., sends in a design of a high frequency rotary generator which, to us, does not present any novel points as such generators have been built for quite some time. Fessenden has built several and quite a few German companies are making a specialty of building such generators.

We do not think a patent can be obtained on this device as nearly all of its features have been used before.

BINDING POST

(91.) John B. Schmidt, of San Leandro, Cal., sends in several designs of a new spring binding post, which seems to possess some merits.

The only objection we find is that the design is too crude and that it will cut the user's hands, but we believe this can be overcome. We think a patent might be obtained, but it would be a good idea to first get the reference patents through some reputable attorney before actually applying for the patent.

Our correspondent asks us if we approve of him sending samples of the device to firms who are large users of such binding posts as disclosed in his device.

We would advise all inventors not to submit the inventions to manufacturing companies unless they know them well. While very few would actually appropriate inventions, quite a few might improve the invention to such an extent that not even the original inventor would know that he had been the originator of the device. For that reason, it is safer and better to get the patent first and do the talking afterward.

RHEOSTAT CONTROLLER

(92.) Ival Kincaid, of Centerville, Ind., sends us a description of a starting box or rheostat connected with a switch in such a manner that the main switch cannot be closed while the arm of the rheostat is in a specified position.

A.—Inasmuch as we think the idea good and patentable we do not further disclose the meritorious points of the invention and we are pretty sure that a patent can be obtained. At any rate it will pay our correspondent to have a search for patentability made in the patent office.

WIRELESS TELEPHONE

(93.) Fred E. Gould, of Charlemont, Mass., has sent in a description of a photophone operating with selenium.

While some of the points mentioned in the description are novel, there has never been any great use for a photophone, as no great distance can be covered and the action of the apparatus is too uncertain, and depends upon there being no obstructions between the sender and receiver.

While a patent could no doubt be obtained on the device which the writer has sent in, there would, most assuredly, not be any sale or demand for it.

POLISHING TOOL

(94.) Carl Beadsley, of Elysian, Minn., sends in a design of an electrically operated polishing tool, emery wheel and the like, using a flexible shaft through which the power is furnished. He wishes to know if the invention is new and whether it can be patented.

A.—This is quite an old idea and has been in use for years. Nearly every dentist is using the very same idea and it has even now been extended to draftsmen who use a revolving eraser with which they erase pencil and ink marks on their drawings or tracings.

PATENT NO. 1,047,545

(*Continued from page* 1160)

the operator. Also it will be noted that by the absence of spark gaps and other similar devices a larger amperage is provided in the secondary, and also the pulsation is more frequent, whereby the current produced is especially good for giving the best possible effects to the X-ray device with the least possible injurious effect."

VARIABLE CONDENSER

(*Continued from page* 1187)

posite the centers of the tubes. (If cardboard tubes are used fit wooden ends to them.) In one end of the tubes drive nails for them to revolve on, and put these nails through the holes in back of case. In the front ends of the tubes or rollers drive nails and thread each for an electrose knob, Fig. 3. To make connections proceed as follows: Connect tinfoil lugs to nails in back. Then solder flexible wire to these nails and connect to binding posts. Put tubes about ½ inch apart in case. I think the drawings explain the details. This condenser, connected in parallel with my primary, enables me easily to receive Cape Cod with an indoor aerial.

Its capacity is very high, and by properly finishing the case it will look very well and cost only:

Two binding posts, three cents each	.06
Tinfoil and paraffine paper	.05
Shellac and stain	.10
Total	.21

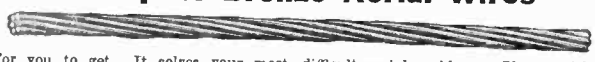
And it works better than many 25-plate ones.

Contributed by

E. R. PROCTOR.

WINNERS

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.

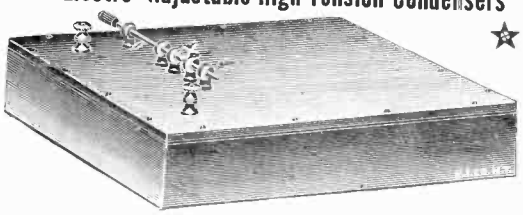
The No. 2509 has seven strands No. 22 B. & S. wire, while the No. 2510 has 4 strands No. 22 B. & S. wire.

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.

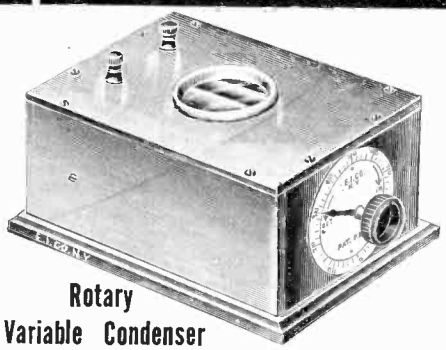
No. 530 is used with coils from 2 in. up to 10 in. or ½ K.W. transformer coil.

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. 3500 Variable Condenser..... **$4.00**

Patented July 23, 1912.

Shipping Weight, 3½ lbs.

? ? Do You Build A Coil ? ?

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

No. 35 B. & S. enameled wire per pound **80c.**; Regular Price $1.86

No. 36 B. & S. enameled wire per pound **90c.**; Regular Price..... $2.12

OUR WIRE COMES ON SPOOLS

SAMPLE SPOOL

FREE TO ALL

our customers. We have decided to publish a new electrical magazine, which is to contain a maze of new and original electrical, as well as Wireless matter. We will begin mailing the first edition towards the end of January. The magazine will be published once every two months and will be mailed **absolutely free to all who have ever sent us an order.** If you are not a customer of ours (that is, if you have never sent us any order) we will send you the new magazine for a year if you will send us 12 cts. in stamps to cover the necessary mailing charges. This is the only means we have to tell whether you are interested enough to read a strictly up-to-date publication. If you do not find 12 cts. worth of information in the first issue, tell us and back comes your money.

Address all correspondence, remittances, contributions, etc., to

Editor "E. I. Co. News," 233 Fulton St., New York City.

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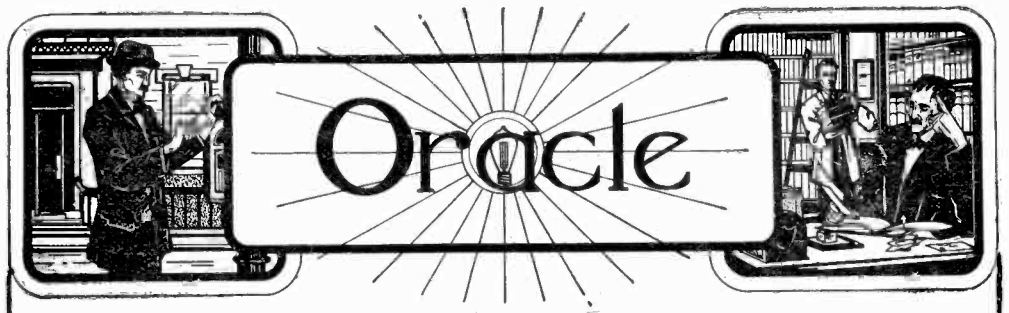


Queries and questions pertaining to the electrical arts, addressed to this department, will be published free of charge. Only answers to inquiries of general interest will be published here for the benefit of all readers.

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.

PLEASE NOTE

We frequently receive questions for the Oracle accompanied by the request, Please do not refer me to back numbers as I have only a few. In order to comply with requests of this sort, it would be necessary to repeat over and over again in this column information that had already appeared either here or in the body of the magazine, and this the Oracle has no intention of doing. If you do not happen to have a back number referred to you can probably borrow it from a friend or in the event that you cannot get hold of it in any other way, we can probably supply you with a copy.

AMOUNT OF WIRE NEEDED

(2286.) Carleton Iseminger, Iowa, asks:

Q.—How many pounds of No. 30 B & S gauge enamel wire will be required to wind on a rod 32 inches long and 2 inches in diameter?

A.—0.44 lb. or about 7 oz.

INTERFERENCE FROM ARC CIRCUITS

(2287.) Herman Wudtke, Jr., Wisconsin, writes:

Q. 1.—About twenty feet from my aerial there are alternating current wires running along and at night when the arc lights are turned on, I can hear a constant buzzing in my phones, what kind of condenser is best to use, or are there any other means of avoiding this? Would an E. I. Co. No. 9241 variable condenser do it?

A. 1.—It is useless to try to eliminate interference of this sort by the addition of coils and condensers to your set. The only thing you can do is to swing your aerial around so that it is at right angles with the wires which cause interference.

Q. 2.—My aerial has about 200 feet of wire in all, what is my wave length?

A. 2.—This depends upon the way the wire in the aerial is strung and connected, and also what apparatus you have connected to it.

INSULATING SECONDARY PIES

(2288.) Lloyd Copp, Indiana, writes:

Q. 1.—I have wound secondary for a 2-inch coil using enamel wire No. 30. Would it be all right to wrap the pies which are ¼" thick with ordinary friction tape instead of using waxed paper between

A. 1.—No. The insulation is not good enough.

Q. 2.—If not, what can I use to wrap the pies similar to transformer sections?

A. 2.—Use empire cloth tape.

UNDERWRITERS' GROUND WIRE

(2289.) Henry Paulson, New York, would like to know:

Q. 1.—What is the largest and highest power wireless station in the world?

A. 1.—See answer to No. 2044 in the June issue of *Modern Electrics*.

Q. 2.—How many strands of phosphor bronze aerial wire (if I can use it) will I need twisted together to be sufficient to the Board of Underwriters?

A. 2.—This depends upon the size and the number of wires in the strand. If the strands are made up of No. 22 wire enough strands must be used to be equivalent to seventy No. 22 wires, or if No. 20 wire is used in the strands forty-nine wires must be supplied.

USE OF A VARIABLE CONDENSER

(2290.) Chester Fuss, New York, writes:

Q.—I have an E. I. Co. No. 9240 variable condenser, but I am unable to find a place to connect it and get any results. My tuner is of the loose coupled type with one slider on primary and a six point switch on the secondary. When I connect the variable condenser across the secondary of the loose coupler, it cuts out messages entirely. When I use it in series with my ground wire, it cuts out some stations entirely and makes the rest fainter. When I connect it across the phones it cuts down the strength of the messages. When I connect it across the ends of the primary winding I can hear nothing except when the plates intersect about one-quarter of an inch. I would like to learn where to use this condenser so as to do away with a little static and not the messages?

A.—The trouble you are having in the use of this condenser is that you are evidently not familiar with its operation in connection with a loose coupler. Where you use the condenser in series with the primary or across the secondary you will in nearly all cases secure poor results, if you adjust the apparatus to its maximum sensitiveness first and then attempt to cut in the condenser. Where only one variable condenser is used with a loose coupler it is generally connected directly across the secondary terminals and it is especially useful in this position when the secondary is adjusted by means of a switch as in your case. To use it properly in this position adjust the primary and secondary switch until the maximum strength of signals is secured and then move the secondary switch so that it cuts in one less section. This you will find will cut down the strength of the signals somewhat and then by inserting a portion of the variable condenser you will find that the strength of the signals increases again and in some cases is even greater than where no condenser is used. A good many operators do all their tuning on the secondary side of the loose coupler by means of the condenser never shifting the switch on the secondary when the necessary adjustment can be secured by the use of the condenser alone.

The variable condenser is only used in the aerial or ground lead or in other words in series with the primary of the loose coupler, when it is desirable to receive wave lengtns which are shorter than the set can be tuned to, without using the variable condenser, this, of course, is assuming that the adjustment of the primary is made by means of a slider. If the primary, however, is wound in sections connected to a switch in the same manner as the secondary, then the variable condenser is necessary to tune the primary circuit accurately, the condenser being in series with the primary for short wave lengths, and in multiple with it for wave lengths which cannot be reached by means of the loose coupler alone. The use of a variable condenser across the phones is not recommended except in the case where no fixed condenser is used in the detector circuit, in which case this variable should replace the fixed condenser and the phones connected across it. This arrangement could only be used with detectors requiring no battery. Where the detector re-

quires battery there is no advantage to be gained by connecting a condenser of any sort across the phones. The addition of the variable condenser as a means of doing away with static, in most cases proves a mistake in judgment, for this sort of interference cannot be eliminated entirely except at the expense of the diminished strength of signals received and even then very complicated hook-ups must be used.

COHERER SET WITH DETECTOR

(2291.) H. Koenig, New York, asks:

Q.—Kindly let me know if I can use a Western Electric relay sounder and key combined with a fixed condenser, variable condenser, tuning coil, silicon detector instead of using phones and how to connect the instruments for receiving with an aerial?

A.—No. It won't work.

WAVE LENGTH

(2292.) Joe Scalco, Alabama, writes:

Q.—Please give wave length of my transmitting instruments: aerial, 4 wires spaced three feet apart 100 feet long; 55 x 45 feet high lead in from center T aerial divided in four vertical parts 3 feet apart 40 feet length each to central point, from central point 1 wire 20 feet long to transformer; ground lead 25 feet No. 8 wire to water pipe; helix, wound No. 4 copper wire 25 feet; ½ kw. transformer with suitable condenser?

A.—We cannot say exactly as you have not given us the dimensions of the helix, but it is probably about 250 metres.

WAVE LENGTH OF AERIAL. ROTARY SPARK DISC

(2293.) Frank S. Fischer, Illinois, would like to know:

Q. 1.—What is the wave length of an aerial a hundred and twenty feet long, fifty-five feet high, four wires spaced three feet apart. The length of the wire from the spark gap to the aerial is forty feet. If this aerial, connections of same shown on separate sheet is more than two hundred metres is there any way I can connect it in order to stay within the two hundred metre limit?

A. 1.—The way you have the aerial shown, its wave length is about 380 metres. In order to keep within the requirements of the law you will have to either shorten it to about 70 feet and connect all the wires together at each end or use a series condenser in the transmitting set. See article on the Wireless Amateur and the Wireless Law in the December and January issues.

Q. 2.—What size wheel is best for a rotary spark gap for a Blitzen ½ kw. transformer and how many points should there be?

A. 2.—The disc may be made about 8" in diameter and have from 12 to 20 plugs on it.

Q. 3.—What does the addition of more points do?

A. 3.—Within reasonable limits the addition of more plugs to the gap increases the pitch of the note from the spark, but when too many are used the results are not satisfactory.

RECEIVING SET

(2294.) Edward Ton, New York, would like to know:

Q. 1.—What are the names of the commercial stations nearest me?

A. 1.—Station CI at Erie, Pa., is the nearest, also there are stations BF and CB at Buffalo.

Q. 2.—With an aerial of 6 strands 70 feet long and 40 feet high and with an E. I. Co. interstate receiving outfit do you think I could hear them?

A. 2.—You may hear CI, but it is doubtful if you hear the others.

Q. 3.—If not, what more instruments would I need?

A. 3.—A good loose coupler, variable condenser, fixed condenser perikon or audion detector and a high grade head receiver set.

EDISON PRIMARY BATTERIES

(2295.) Ray C. Armstrong, Illinois, writes:

Q. 1.—I have three Edison Lelande Batteries and do not know solution used in them. What solution should be used?

A. 1.—The solution consists of caustic soda and water, and is covered with a layer about ¼ inch thick of a heavy mineral oil. If the oil is omitted the zincs are eaten off at the surface of the solution and drop down into the jar thereby becoming useless.

Q. 2.—How are the batteries connected?

A. 2.—These cells may be connected in series or in multiple the same as any other type of primary battery, the zinc forming the negative pole and the copper oxide element the positive pole.

Q. 3.—What voltage should I get from each?

A. 3.—On open circuit the voltage per cell is about 0.9 volt while on closed circuit the voltage varies from 0.7 to 0.6 volt per cell depending upon the amount of current drawn.

GROUNDING SWITCH

(2296.) Page Haselton, New Hampshire, asks:

Q.—Please give the essential dimensions for a 100 ampere switch, which I understand the Fire Underwriters require to be used in grounding a wireless aerial?

A.—Blade 1 inch wide x ⅛ inch thick, jaws and hinge plates 1 inch wide x 3/32 inch thick. The length of the blade is immaterial, but the distance between the jaw and the hinge clip should be great enough to prevent sparking across from one to the other when the sending apparatus is in operation.

MOLYBDENITE DETECTOR

(2297.) A. Hultsch, Indiana, wants to know:

Q. 1.—What kind of detector must be used with molybdenite, kind and size of point?

A. 1.—A thin piece of the molybdenite should be clamped between two brass plates one of which has a hole in it exposing the surface of the mineral. this arrangement taking the place of the ordinary cup for mounting crystals. The clamp is connected to one side of the detector circuit and contact is made with the exposed surface of the molybdenite through the hole in the plate above mentioned by means of a brass or copper rod having a bluntly rounded or even a flat end. This detector requires a rather firm contact between the rod and the mineral. It is not very sensitive and has no marked advantages over any other form of crystal detector.

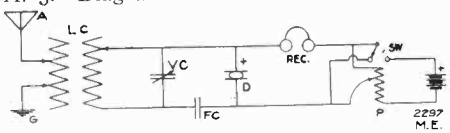
Q. 2.—After eleven o'clock at night, the only time when I have a chance to listen, I hear

some fellow sending press reports and can hear him half way across the primary. I have not been able to get his call. Have you any idea who this can be?

A. 2.—We do not know the name of the station.

Q. 3.—Please give me the hook-up on the following, for as yet I have been unable to get even static on the peroxide of lead detector, loose coupler, with two slides on primary, rotary variable condenser, peroxide of lead detector, junior fixed condenser, E. I. government phones, "electro"-circular potentiometer, dry cells and switch to throw the potentioneter out to use a galena detector. I want detector in series circuit.

A. 3.—Diagram herewith.



SERIES SENDING CONDENSER

(2298.) H. C. Spicer, Washington, asks:

Q. 1.—Is not a big aerial with condenser in series with the aerial and instruments to cut down wave length more efficient than a small aerial for sending, as was recommended in a recent issue of your magazine?

A. 1.—The series condenser with the big aerial is better than a duplex aerial, but is not better for sending than a small aerial alone.

Q. 2.—If the sending set is so small that it will not reach to the nearest commercial station, will I have to have a license to send?

A. 2.—If your sending apparatus is powerful enough to reach beyond the state boundary lines or reach the coast so that you can be heard by the operator on a vessel off the coast, you will need a license.

Q. 3.—Can you give a formula for finding the number of amperes that a choke coil will "let get by it," having given the core dimensions, voltage, frequency, number of turns of wire? This is for open and closed core coils.

A. 3.—A formula might be developed if you know accurately all these factors and several more, but it would probably be so clumsy that it would be more bother than it was worth.

RECEIVING SET WON'T WORK

(2299.) Julian Del Veechio, Tennessee, wants to know:

Q. 1.—Is there anything wrong in my receiving set, or any reason for it not to work. It consists of loose coupler, two variable condensers, fixed condenser, electrolytic detector, potentiometer, batteries and 2,000 ohm receivers—Aerial about 85 feet high and 90 feet long. 20 feet above building situated on the top of a very high hill. Ground wire connected through a lightning arrester to water pipe by No. 4 B & S copper wire. Aerial wire is 14 B & S aluminum (six wires), connected directly on to a metal spreader, which is connected to a metal mast. Should the aerial be insulated from the spreader and mast?

A. 1.—In all probability your aerial is grounded either through the mast or through the lightning arrester. The aerial

When writing, please mention "Modern Electrics."

wires should be insulated from the spreader or the spreader should be insulated from the mast. You should also be sure that there is not a permanent ground in the lightning arrester.

Q. 2.—In the usual symbol for the electrolytic detector, which side is the positive post and which the negative?

A. 2.—The U-shaped line represents the cup which is connected to the negative side and the straight line which terminates just inside the U-shaped line represents the wollaston wire, which is connected to the positive side.

Q. 3.—In the operation of the electrolytic detector, when the wire is immersed, is the buzzing heard all the time?

A. 3.—The buzzing or hissing due to the detector will die out if the detector is connected up right and the potentiometer correctly adjusted.

VOLTAGE REGULATOR

(2300.) Paul Horton, Ohio, writes:

Q. 1.—According to the modern theories of electricity regarding either the corpuscular or vibratory theories, the electrical energy is tranmitted by the mysterious fluid known as the ether, also the theory of ether states that it fills up all spaces, even to the molecular interstices of gold and other heavy metals. Now, placing two and two together, I wish to know why electricity will not pass through an almost perfect vacuum, the required ether being there to conduct it?

A. 1.—It does. If you don't think so, hook up a Geissler tube to a spark coil and watch it go through.

Q. 2.—In a certain power station I noticed a voltage regulator to be used on A. C. It appeared to have a small transformer mounted in the centre and around it were three vibrating springs, alternately making and breaking contact in a very irregular manner, but at the same time they did not all keep time to the alternations. Now, how does this arrangement regulate the voltage?

A. 2.—This apparatus is known as the Tirrell voltage regulator, or sometimes simply a Tirrell regulator. The movements of the vibrating contacts do not depend upon the frequency of the current generated, but are controlled by the variations in the voltage of the machine. When closed they put a shunt across the field rheostat of the exciter, and when opened the shunt is removed. What appears to be a transformer in the middle of the regulator is simply a relay which operates the vibrating contacts and which in turn is controlled by two solenoids, one of which is connected with a resistance, in series, across the armature of the exciter. This is known as the D. C. control magnet. The other solenoid has two windings, one of which is connected to a potential transformer connected across one of the phases of the alternator, the other winding being connected to a current transformer, which is connected in one side of one of the A. C. feeders. This solenoid is known as the A. C. control magnet. These two control magnets are usually located at the top of the regulator panel,

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the D. C. magnet being at the left side and the A. C. magnet at the right.

Q. 3.—If a certain two-phase induction motor is started upon two-phase current and then run with one phase switched off, how will the meter, a polyphase apparatus, be affected? Will it register one-half or double the actual current used?

A. 3.—The meter should read the exact amount of power if it is properly connected up, unless the voltage coil happens to be opened by the second phase being switched off, in which case the meter will not register at all.

LOOSE COUPLER TUBES

(2301.) Rey W. Neville, New York, asks:

Q. 1.—Which would be more efficient for wireless work in connection with a one-inch spark coil, a storage battery of correct voltage or a Gernsback electrolytic interrupter?

A. 1.—The electrolytic interrupter when operating well is much more efficient.

Q. 2.—What size wire is best to use in receiving circuits?

A. 2.—No. 18 flexible cord.

Q. 3.—Do the tubes of loose couplers have to be close together, or doesn't it make any difference? Does it in any way effect the efficiency of it?

A. 3.—It makes no difference so long as there is not too great a difference in the diameter of the two tubes. Also the two tubes should not be too nearly of the same diameter, for the reason that there then results an electrostatic coupling between the two circuits which interferes with the proper tuning of the primary and secondary circuits.

STATIC MACHINE FOR WIRELESS

(2302.) Edward J. Hogan, New York, inquires:

Q. 1.—Could I use an electrostatic machine run by an electroport dynamo, to generate a spark as big as three inches for use in wireless telegraphy?

A. 1.—No.

Q. 2.—Would the above plan help to enlarge my sending radius?

A. 2.—No.

Q. 3.—What spark does a one kw. transformer coil produce?

A. 3.—One-half inch to two inches, depending upon the secondary voltage.

INDUCTION FROM POWER WIRES AGAIN

(2303.) W. A. Sisson, Ohio, writes:

Q.—My receiving instruments include the following: Loose coupler, galena and silicon detectors, fixed condenser and 2,000 ohm head set, connected as the diagram. My aerial runs parallel to a 110 v. feed. At night I get a bubbling sound in my phones, varying with the adjustment of detectors and loose couplers. Another amateur five blocks away is also troubled. Could you please explain this and give me a hook-up to prevent it?

A.—See answer to No. 2287 in this issue.

WIRELESS BOOKS

(2304.) Don M. Hansell, Missouri, writes:

Q. 1.—What book would you recommend me to that I could find out all about maintaining and operating a wireless station?

A. 1.—"Experimental Wireless Stations," by Philip E. Edelman, and "A Treatise Upon Wireless Telegraphy and Telephony," by C. I. Hoppough.

Q. 2.—In the September Number of *Modern Electrics* there was a blue print of a "Modern Amateur Wireless Station." What would be the approximate cost of such a station? And where could I purchase the instruments?

A. 2.—See answer to No. 2189 in the November issue of *Modern Electrics*. The makers of all the apparatus listed are advertisers in the magazine. See their announcements. Or you may probably buy most of the apparatus at retail from J. J. Duck, of St. Louis, Mo.

BELL TO RING UNDER WATER

(2305.) Dr. T. E. Hoermann, Minnesota, writes:

Q.—I am making special phonetic studies and take the liberty of requesting your kind information. I wish to extend my experiments in such a manner as to have a small electric bell ringing under water and produce direct sound waves in the water. Will you please advise me whether I would be able to construct such a bell and rebuild myself a common door bell by simple means so it would work under slightly acidulated water, or where I could possibly get one which would answer the purpose?

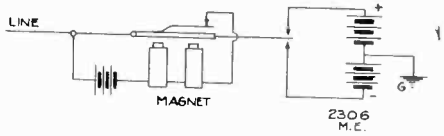
A.—Boil an ordinary electric bell in paraffine. Then remove the paraffine from the surface of the vibrating contacts and connect up in the regular way.

TELEPHONE RINGING MACHINES

(2306.) Paul Button, Michigan, asks:

Q.—Please give me a concise explanation concerning the construction of generators run on batteries such as used in telephone exchanges to ring subscribers?

A.—In large exchanges an alternating current generator driven by a motor is generally used. In small exchanges they use motor or hand-driven magnetos similar to those forming part of the subscribers' telephone instruments, but a little larger. In a few cases where batteries are used either a motor-driven reversing commutator similar to that shown with the stock ticker in No. 2253 in the December issue of *Modern Electrics* or a vibrating pole changer, of which an elementary diagram is given herewith, is employed.

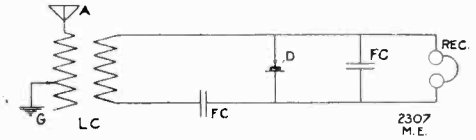


FIXED CONDENSER ACROSS PHONES

(2307.) E. V. Goetz, Missouri, inquires:

Q. 1.—Please explain why it is when I

connect a fixed condenser across the phones as in the following hook-up, it kills or destroys the incoming signals?



A. 1.—The capacity is too high.

Q. 2.—Can you give me a hook-up that will work satisfactory?

A. 2.—Remove the condenser now connected across the phones.

Q. 3.—In connecting a 75-ohm receiver with a 1000-ohm receiver in multiple sound is reduced considerably. Can they be connected in series to an advantage?

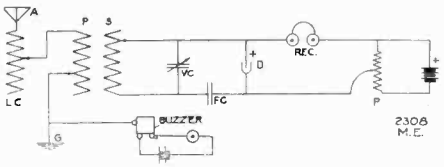
A. 3.—They may be connected in series, but the signals from the 75-ohm receiver will not be as strong as those from the 1000-ohm receiver.

RECEIVING SET

(2308.) Stephen K. Burgher, New York, writes:

Q. 1.—Please give me hook-up for loading coil, loose coupler, variable condenser, fixed condenser, potentiometer, detector, batteries and test buzzer for receiving set only. All parts made by myself.

A. 1.—Diagram herewith.



Q. 2.—Do I need a loading coil with this set?

A. 2.—This depends upon the winding of the loose coupler and the wave lengths you wish to receive. If the wave lengths are longer than those to which your aerial and loose coupler can tune, then you need the loading coil, otherwise you do not.

Q. 3.—To what does centre post of E. I. Co.'s electro potentiometer connect?

A. 3.—The slider.

ARC LAMP QUERIES

(2309.) James A. Coles, Minnesota, writes:

Q. 1.—In the "Practical Electrician" article of the December issue it states that carbon arc lamp rods are copper plated to give them a longer life. I have been always under the impression that this coating was merely to reduce the resistance of the rod, the copper carrying the current to the tip instead of the carbon. Which idea is correct?

A. 1.—As you probably know, the "Practical Electrician"' is translated from a German book of the same name, and you will perhaps from time to time find statements therein which are slightly at variance with American practice. Inasmuch as the plating of the carbons is very thin, it has little current carrying capacity, and at the present

time carbons are usually plated only at one end, in order to improve the contact between the carbon and the carbon clamp.

Q. 2.—In the same paragraph the impression is given that thin rods always give more light than thick ones, but would this be correct only when the current remained the same? My experience has been that for more light, thicker carbons must be used, which carry more current, the increased light being due to the increase in amperes.

A. 2.—This is true in a relative sense only, the light from the small carbon being proportionately greater than that from a large one. In other words, the light emitted by a large carbon does not bear the same relation to the light emitted by a small carbon as the relative size of the two carbons would lead you to expect.

Q. 3.—Is it not also correct that direct current arcs throw the light downward if the positive side of the line is connected to the top carbon, whether the carbon is cored or not?

A. 3.—Yes. The core is usually supplied only for the purpose of steadying the arc, that is, to prevent it from wandering around over the surface of the ends of the carbons, which would lead to unsteady light.

WIRELESS TELEPHONE

(2310.) Walter Smith, Illinois, would like to know:

Q. 1.—Can a wireless telephone be operated with a 1-inch spark coil and batteries, but without arc? Where can I get information concerning this system?

A. 1.—Such a system is described in this issue. Try it and let us know how it works.

Q. 2.—For the ideal oscillation transformer described in the June, 1912, issue, can No. 8 aluminum wire be used in place of the ribbon? If so, what amount?

A. 2.—Yes, wire may be used, but the results are not so good. The same length of wire will be used as is specified for the ribbon.

Q. 3.—If I erect two masts, each 100 feet high, having six wire aluminum aerial of the "T" type, 200 feet long, on 20 feet spreaders, and using in connection loose coupler, electrolytic detector, 2000 ohm phones, etc., will I infringe on the wireless law just passed? Could a one-inch coil be used on this for sending?

A. 3.—This subject is treated in the article on the Wireless Amateur and the Wireless Law in the December and January issues.

SPARK COIL TROUBLES

(2311.) Charles M. Fitzgerald, Ontario, asks:

Q. 1.—Could you explain to me the remedy for the trouble I have with my spark coil vibrator. I got the coil recently. I run it on six new batteries connected in series. At first it gave a splendid fat long spark which filled half the spark gap intended for a coil up to a two-inch. I would start sending a message, then just about the middle of a word it would stop. I immediately turned off the switch and found the vibrator stuck, and it would continue

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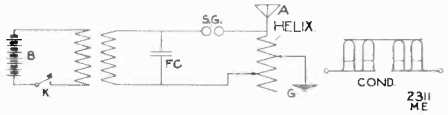
this same thing again. When I put on more batteries it would stick more, and when I lengthened the spark gap it would stick. When I took off batteries it wouldn't work at all, or, if it did, very weakly. I took off vibrator and filed the point very little and it gave better satisfaction, but it soon played up again. The point is supposed to be platinum. The spark at the gap now is branched and just goes from the edges of the gap.

A. 1.—In all probability the primary condenser is either not big enough or it has broken down, or it may be that the platinum points are not big enough and that the substitution of large silver contacts cut from an ordinary dime will cure the trouble.

Q. 2.—I have my spark coil condenser and helix connected as shown in sketch. The four jars of my condenser are six inches tall, one inch in diameter, and I have them connected as per diagram. When I switch in the condenser the spark stops at the gap and there is a queer noise in the jars. I have to put the gap one-eighth of an inch apart before I get a spark, and then there is only a slight change in the spark. Now I disconnect one of the wires and leave it one inch from the binding post on condenser and sparks jump the space better than if they had never been passed through the glass. The glass is about 0.05 thick ordinary glass. Would you tell me what is wrong and how I may remedy it?



A. 2.—A one-eighth inch gap is O. K. for a one-inch coil and your hook-up.

LAMP FOR TUNING. OPERATORS' QUALIFICATIONS

(2312.) Lovejoy Collins, Massachusetts, writes:

Q. 1.—I have constructed the oscillation transformer described in the June issue of *Modern Electrics*. I am using in connection with this a double auto coil, getting a five-eighths inch spark three-sixteenths inch thick. The current is supplied from a 120 watt step down transformer at a voltage of 26. The condenser is composed of five 2½x4 sheets of tinfoil separated with plate glass. I have tried to tune this set with the aid of a six volt tungsten lamp between the aerial and transformer, but could not even make the light glow, although I have seen a lamp of the same size lighted by a half inch coil. A loose coupled helix of the Clapp Eastham type was used with a condenser belonging to a one-half kw. transformer. Will you please tell me what is the trouble and how I can remedy the trouble, as I have seen other fellows build the close coupled helix and find no help from it.

A. 1.—The six volt lamp takes about one ampere to light it, and you should not expect your set to send this much current into the antenna. Probably no set smaller

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Hereafter it will be an honor for the amateur to be licensed in the United States as it gives him a recognized standing not possessed heretofore.

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4--Join the Wireless Association of America, and Wireless Pin, including Official Wireless Blue Book, 32 pages, and 13x10 in. chart of U. S. stations	.30
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than one-quarter kw. would be able to do this.

Q. 2.—In the regulations governing radio communication it states that the applicant for a license must have a sufficient knowledge of the adjustment and operation of the apparatus. Does this mean that at the time of the examination the applicant should actually show how the sending apparatus should be adjusted to avoid interference, or what does it mean?

A. 2.—In another part of this issue you will see a copy of the questions asked of applicants for radio operators' licenses and you can judge for yourself what you will have to know in order to answer them.

SENDING CONDENSER

(2313.) Percival D. Lowell, District of Columbia, writes:

Q. 1.—In building a glass plate condenser which is to be immersed in oil, will you please advise me what substance must be used to stick the tinfoil to the glass. This substance must, of course, be something which will not be affected by the oil, as the plates will be separated and the foil must not come loose.

A. 1.—Use shellac.

Q. 2.—How many plates with tinfoil 6x8 inches on both sides should be used with a one-quarter kw. closed core transformer?

A. 2.—See the table at the bottom of page 1036 in the January issue.

AMATEUR LICENSES. KICK-BACK CONDENSER

(2314.) E. H. Lee, California, asks:

Q. 1.—Does an amateur have to take out a license if his sending apparatus does not transmit as far as the State boundary?

A. 1.—Yes, if he interferes with any one else receiving messages from beyond the State boundary.

Q. 2.—How many plates and what size are necessary for a kick-back preventer for the type H-1 Thordarson step up transformer?

A. 2.—See page 1067 of the January issue of *Modern Electrics*.

Q. 3.—What size wire and what should be the dimensions of a Tesla coil to be used with the above transformer?

A. 3.—We refer you to our book, "Construction of Induction Coils and Transformers," which contains instructions for building several different types and sizes of Tesla transformers and gives the information in a much better way than we could do here. The price is 25 cents.

COHERER TROUBLES

(2315.) George W. Day, California, inquires:

Q. 1.—Why will my coherer not work? I have a Slaby-arco coherer, a Gernsback 75 ohm relay and a 2½-inch gong door bell. When I close the relay contact the bell, which is in series with coherer, the relay contact closes and rings the bell; if I adjust relay spring so bell won't ring, then I find the batteries are running down through the coherer and a nearby signal will not affect it to make it ring bell. It seems to me the coherer

plugs are too close together, but they are non-adjustable.

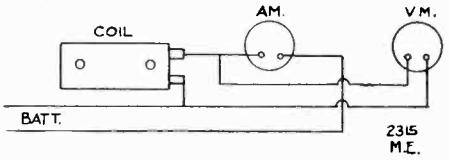
A. 1.—The relay is not delicate enough. Five hundred ohm polarized relays are generally used with these coherers. The coherer is probably O. K. and is properly adjusted before being sealed up.

Q. 2.—I have a good detector set, but for experimenting I would like to use the amplifier described in the November issue. Please tell me is the electro-magnet used one instrument with a pole to each needle?

A. 2.—Yes.

Q. 3.—How is the output in watts of any coil used for wireless determined, or is it measured with some instrument, and also how is the input measured?

A. 3.—The current may be measured by means of a hot wire meter and the voltage measured by means of a needle point spark gap. The output in watts is the product of the voltage and the number of amperes. The input may be measured by means of a watt meter or by means of an ammeter and a volt meter connected as per sketch herewith.



INSTALLING AERIAL

(2316.) Edward N. Koster, New York, writes:

Q. 1.—I live in a two-story building. There is a pole about 40 feet high about 50 feet from the house, on which I intend to put up the aerial from the pole to the side of the house. Would it be all right if I put an iron pipe on the pole with a large green glass insulator on top, with a wire about six inches to an insulator six inches long, or how should I insulate it?

A. 2.—Put a pulley at the top of the iron pipe and run a rope from the ground up through the pulley to the six-inch insulator attached to the spreader so that the aerial may be easily lowered for occasional repairs.

Q. 2.—Will a drain pipe six inches in diameter grounded to an iron pipe eight inches in diameter be satisfactory for a lightning ground with a wire composed of two No. 6 B. & S. gauge copper wire connected on it?

A. 2.—This should be O. K. if the pipes have a large area of ground contact or form part of the city water system.

BUZZER TEST. GROUND CONNECTION

(2317.) Raymond Peterson, Iowa, wants to know:

Q. 1.—Could you give me a diagram for a buzzer test and how to wire for permanent use?

A. 1.—See answer to No. 2308 in this issue.

Q. 2.—Will a ground wire work, which is No. 4, if soldered to a gas pipe running into a cistern, or will there be a resistance

in the water, and enough to bother sending and receiving?

A. 2.—No. The cistern is probably water tight and would make a poor ground. The ground wire should be connected to ground plates having an area of from 10 to 100 square feet. The greater the area the better the ground.

RECEIVING TROUBLE

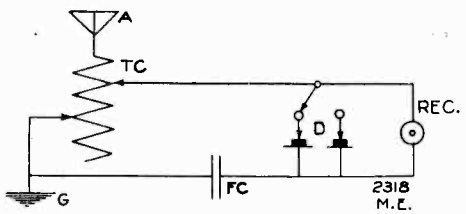
(2318.) Jerome Lalor, New York, asks:

Q. 1.—Please tell me why I do not receive? I have an aerial consisting of two wires 80 feet long, 75 feet high (they are between two houses), and a set consisting of a tuning coil (double slide), galena and carborundum detectors, a condenser and one 1000 ohm Brandes phone.

A. 1.—We cannot say. If the set is properly hooked up and adjusted you should get something.

Q. 2.—Please give me hook-up for the instruments?

A. 2.—Diagram herewith.



Q. 3.—Ought I be able to get Cape Cod? If not, what other instruments will I need to do so?

A. 3.—We do not think so, as your aerial is rather short. However, you might do it with this aerial if your tuning coil is long enough.

LONG DISTANCE WORK

(2319.) George A. Rauch, Arkansas, writes:

Q. 1.—I have an aerial 100x500, four wires spaced two feet, inclined type, 2000 ohm E. I. Co. phones, condenser, variable condenser, double slide tuner and silicon detector, all E. I. Co. make, with the exception of the detector. Am directional S. E. Wish you would explain the fact that I hear many stations using comparatively low power as loud and, in some instances, louder than I hear others using higher power and located nearer? For instance, I hear NAO, NAL and HA, all using only 5 kw., as loud as HK, who is much closer and uses 5 kw., and do not hear very much louder HB, NAT and some of the lake stations who are using from 10 to 25 kw. and are nearer. I also hear SLI, who, if I am not mistaken, is using only 2 kw., as loud as NAL, using 5 and much nearer.

A. 1.—You say your aerial is directional southeast, but your results seem to indicate that you are directional more nearly east than southeast. Most of these stations you hear best use Telefunken sets, which can be heard farther than ordinary apparatus. SLI has two sets: one of 5 kw. for ship work on 600 m., the other, said to be 35 kw. used now for "Press" on 2800 m.

Q. 2.—Why do the different papers, in-

cluding your publication, speaking of the new station, NAV, say it is expected that it will be able to reach NAR, NAX, etc., as if it was not a certainty that it is spoken of as if it will be something unusual if NAV can cover these distances? I hear NAW, who is much farther from here than NAV is from NAR, and they are using 5 kw. at NAW; also hear NAR and NAL work together, and they use 25 and 5 kw. Therefore, why is the expected work of NAV in covering these same distances with much greater power looked on as exceptional?

A. 2.—The sending range of the station is expected to be 3000 miles by daylight, and there will be nothing remarkable about reaching the stations mentioned. It is already reported to have worked direct with Honolulu, which is about 5,600 miles away.

LOADING COILS

(2320.) Harold Hood, Massachusetts, asks:

Q. 1.—Will you please tell me the best kind of wire (enamel or cotton covered) for a loading coil, and also the best size for same?

A. 1.—Use cotton covered wire; No. 22 to No. 24 is generally used.

Q. 2.—Can I connect a loading coil in series with a single slide tuner, and if so, should I connect it in the aerial or the ground circuit? If I cannot, please give me a diagram of how to connect it up.

A. 2.—Yes. It may be connected either in the aerial lead or the ground lead.

Q. 3.—Can I connect two tuning coils in series, one being a double slide and the other a single slide, so as to get more receiving range? If so, please give me a diagram.

A. 3.—No. The loading coil will not increase the receiving range, but will increase the wave length to which you may tune your set.

LOOSE COUPLER

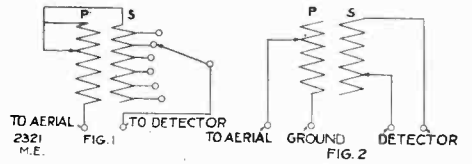
(2321.) William H. Kibbe, New York, inquires:

Q. 1.—Is it true that the variable condenser cuts down the wave length?

A. 1.—Yes. If it is in series with the aerial or ground lead.

Q. 2.—I built a loose coupler myself and connected it up as per Figure 1. When I changed the diagram to Figure 2 it did not work. Please explain why it did not work?

A. 2.—Figure 2 shows the loose coupler



as it is usually connected, and yours should work all right this way if it is properly hooked-up and adjusted.

Q. 3.—Are four pint Leyden jars enough for a one-inch coil?

A. 3.—Yes.

Apparatus Exchange Department

As announced in our January issue, the Technical and Scientific Apparatus Exchange Department will appear from now on for the use of our subscribers and readers in order to exchange articles for which they have no further use for other articles which they need. There has been a long felt want among experimenters and amateurs for a department of this kind, and it is offered for the free use of our readers, as no charge is made for these advertisements.

As previously stated, advertisements of articles intended for sale cannot be accepted. Advertisements of this kind may be inserted in our regular paid classified advertising column. Advertisements under this heading containing more than fifty words cannot be accepted; the right is also reserved to rewrite or refuse to insert any advertisement which will not be for the best interests of our readers. Advertisements under this heading will be inserted one time only free of charge. Advertisements should be addressed to "Apparatus Exchange Department, care *Modern Electrics*, 231 Fulton St., New York.

HAVE A 150 OHM RELAY IN FIRST CLASS condition; will exchange for equal value; would like a ferron detector. What have you? Chas. A. Wriggins, 18 Rodwell Ave., Irvington, N. J.

HAVE PRIMARY AND SECONDARY OF loose coupler to exchange—primary is scraped for use with slider; secondary has 8 taps—no woodwork; also plates of rotary variable assembled on rods with washers, etc.; bearings and box to hold it, all that is required. Will exchange for a split headband (not home-made) and electrose ball insulator, or what have you? J. W. D., 22 Vernon St., New Haven, Conn.

WHAT HAVE YOU IN THE LINE OF WIRELESS instruments to exchange for 12 (1910-11) copies of *Modern Electrics* and 12 (1910-11) copies of "Popular Electricity." These copies are mostly 1911. Apply, Fred Reich, 457 Fourth Ave., Long Island City, N. Y.

MODERN ELECTRICS, YEAR BEGINNING April, 1911, good condition; will exchange for copies of "Technical World" or other magazines. Page Haselton, R. F. D. No. 3, Nashua, N. H.

AN 8 x 10 CAMERA IN GOOD CONDITION; used for experimental purposes; cost $40. Will exchange for wireless instruments, receiving or sending, or any kind of electrical apparatus. Daniel H. Zorger, 409 Kelker St., Harrisburg, Pa.

WILL EXCHANGE ONE 1-INCH COIL FOR X-ray, fluoroscope, or what have you? Write or call Frank Copeman, 1253 Amsterdam Ave., New York City.

WILL EXCHANGE SPECIAL CONTACT RELAY, 150 ohms, worth $8 for professional wireless receivers (with split head band) or E. I. Co ¼ kw. transformer. Ernest Laug, 411 Spring St., West Hoboken, N. J.

WILL EXCHANGE A NO. 2 SET OF MECCANO, nearly complete (a few bolts and nuts needed), cost $4, for a 1-inch spark coil in good working condition, or what have you? William Baker, 103 Highland Ave., Jersey City, N. J.

WILL EXCHANGE FOR A GOOD WIRELESS receiving set, or part in exchange for 2000 ohm, receivers, or what have you? 2 permanent magnet ⅜-in. round, 4-in. long; 2 magnet bobbins, 75 ohms, each, for telephone; 1 J. H. Bunnell telegraph instrument, with key and crowfoot battery; 1 lb. No. 18 S. C. C. wire; 1 typewriter, small; 1 violin, Hoff; 1 camera, 4¼x6¼, with R. O. Co. lens; 1 Ideal portrait lens to fit the above lens; 1 Ideal telemeter for hand camera users. Henry L. Dillon, R. F. D. No. 3, Darlington, Pa.

WILL EXCHANGE A 20 OHM TELEGRAPH set with omnigraph attachment, and a 5 ohm set, for 1-inch spark coil, or what have you? C. W. Daugherty, 157 Brady St., Butler, Pa.

WILL EXCHANGE LONG-DISTANCE SERIES telephones, complete, with 4-bar magnets and ringer, with battery case, wall type, for ¼ kw. transformer or other wireless apparatus; also magnetos and parts of 'phones for what you have. Ralph Carnahan, 337 S. Church St., Urbana, Ohio.

A 6 V. 100 A. H. "EXIDE" STORAGE BATtery, Type S, No. 113. Used for private lighting plant, and in excellent condition. Will exchange for 1 kw. wireless transformer, Clapp Eastham, Worts McKisson, or H2 Thordarson; or ¼ or ½ h.p. Robbins & Meyer induction motor. State type. Clarence Etter, 635 Mack, Detroit, Mich.

WILL EXCHANGE A GOOD $5 POST CARD projector, complete, with acetylene gas generator, for a good dynamo, or what you have. Also have a brand-new E. I. Co. 1-inch box spark coil. Will exchange for what you have. Write, stating condition of articles, etc.. Donald E. Robinson, 422 Kingsboro St., Pittsburg, Pa.

COMPLETE RECEIVING OUTFIT FOR WIREless, composed of double slide tuner, 15 in. long 3 in. diameter; Manhattan large fixed condenser; Bunnell's silicon detector; E. I. Co.'s 1000 ohm. O. P. receiver and head band, for X-ray tube and fluroscope, or what have you? John H. Duane, 530 Manhattan Ave., New York City.

WITHERBEE STORAGE BATTERY, 6 VOLT, 60 ampere, beams, in excellent condition, in exchange for motor to run on 110 volts, 60 cycles, A. C. or D. C. Generator. Geo. H. Manley, 28 Woodland Rd., Maplewood, N. J.

A PONY RELAY, WITH RUBBER-COVERED magnets, in first class condition; retails at $2.50; bought it of the Mesco Co. this summer. Also a magneto, such as is used with the Bell telephone instruments, enclosed in a hardwood case, ready to screw on wall; practically new. Would like to exchange these for either a ½-in. "Bulldog" spark coil or a new Gernsback electrolytic interrupter. Ray W. Neville, 37 Darwin St., Rochester, N. Y.

A HOME-MADE PORTABLE RECEIVER SET, comprising loose coupler, galena detector and condenser, in imitation mahogany case, size about 7-in. wide by 10-in. high by 14-in. long. To exchange for 110-v. 60-cycle motor or rotary spark gap, ammeter, voltmeter, etc., or what have you? Set worth about $10. R. Hall, 25 Terrence St., Springfield, Mass.

WILL EXCHANGE BLAIR 4x5 PLATE CAMERA, in excellent condition, for a A. C. transformer wireless outfit, soldering iron, electric railway outfit, printing press, electric, what have you? Leroy B. Morrill, 19 Irving St., Malden, Mass.

A 110-VOLT 1/10-H.P. WESTERN ELECTRIC Co. direct current motor, minus field coils, in exchange for ¾-in. or 1-in. spark coil. Stanley Geipel, 207 Townsend St., New Brunswick, N. J.

A NEW THORDARSON 250-WATT WIRELESS transformer with regulating reactance box. Can be operated from 60-cycle, 110-volt lamp socket. To exchange for 6 or 8 inch induction coil, in first class condition, or for a Blitzen or equally efficient receiving transformer. Robertson, Room 718, 253 Broadway, New York.

A KNAPP, TYPE S, DYNAMO, HOME-MADE loose coupler and a 1-inch spark coil (I. W. T. Co.), all in good condition, in exchange for wet or storage batteries. Brent Daniel, Box 403 Farwell, Texas.

NEW FOLDING SENECA CAMERA, SIZE 2¼x 3¼, or 7 sectional aluminum telescopic tripod, in exchange for 3-6 volt dynamo or magneto, in good condition, or offers. Paul Button, 437 McMillan Ave., Detroit, Mich.

WILL TRADE A COMPLETE TRANSMITTING outfit, consisting of the following: Electro 1-inch guaranteed "Bulldog" spark coil, heavy wireless key, leyden jar, helix, spark gap and switch, correctly connected on polished base, with full instructions for a ½-kw. transformer coil with interrupter. Howard S. Pyle, 3311 37th Ave., So. Seattle, Wash.

WILL EXCHANGE ELECTRO STATIC MAchine, in good order, for Wireless Course in 20 Lessons, published by E. I. Co.; binder included. Lessons must be in good shape. Godfrey Flickenstein, Toulon, Ill.

DOUGHNUT TRANSFORMER, LOOSE-COUPLED tuner, large sliding plate condenser, spark gap, 2 detectors, receiving condenser (adjustable), D. P. S. T. switch, telegraph key, etc., in exchange for a self-inking printing press, 6x8-in. chase or larger, with or without outfit, in good working order. A. P. H. Saul, Box 333, Kenmore, N. Y.

1-H.P. G. E. 3-PHASE, 220-VOLT INDUCTION motor and 500-watt dynamo, 10-volt, 50-ampere; new, perfect condition; worth $95. Exchange for Robbins & Meyer motor generator or 110-volt A.C. ammeter and voltmeter, or Clapp-Eastham apparatus of nearly equal value. Thomas W. F. Drury, 1214 Edgar St., Evansville, Ind.

WILL EXCHANGE 3000 OHM RECEIVER FOR ½ kw. with vibrator; also ½-in. coil for good storage cell. Frank McGarrah, 2204 Seventh Ave., New York City.

I HAVE A GOOD SPARK COIL WHICH throws a fat ½-in. spark coil, which I purchased from the J. J. Deeck Co. a month ago, and will pay the difference in exchange for a motor to operate on a 110-volt D.C. Write me. William Finch, 1214 Jackson St., Cincinnati, Ohio.

LOOSE COUPLER, ELECTROLYTIC DETECtor, electrolytic interrupter, 220-volt, 10-ampere recording watt meter, 2000-ohm receivers, and a lot of other electrical goods. Also have a good Brownie kodak I would like to trade. I want a rotary spark gap, quenched spark gap, Blitzen receiving transformer, static machine, Geissler tubes, etc. Write me and get complete list; also mention what you have for exchange. Jas. L. Hodges, University, Miss.

WILL EXCHANGE A MURDOCK AM. DETECtor, cost $3; Murdock helix, cost $4; a pair of E. I. Co. amateur 1000-ohm. 'phones, cost $4.50, or a "Junior" tuner, fine for a portable set, cost $2; for a 8-volt, 60-ampere storage battery, a 1½-in. spark coil, or a rotary variable condenser of 15 plates or more. Make them of equal value. Fred J. Bergmann, 1310 W. Allegheny Ave., Philadelphia, Pa.

WILL EXCHANGE 2 TELEGRAPH KEYS AND 2 telegraph 4-ohm. sounders (original cost $3), in good condition, for 2 E. I. Co.'s detectors, the lytic and the peroxide of lead detectors, or will exchange 1 key and sounder for detector; detectors must be in good condition. Andrew W. Martin, Jr., 896 Walter St., San Francisco, Cal.

AN ELECTRO WHIMSHURST STATIC MAchine, in first class condition, original cost $4; also a quantity of apparatus for static experimenting, original cost $1; both in exchange for a good standard make 1-inch spark coil. C. G. Weir, 5 Park St., Springville, N. Y.

WILL EXCHANGE 150-OHM. RELAY, 2 STEEL lever keys, 2 sounders; all Bunnell make; also nickel-plated adjustable dis arrester, for an E. I. Co., W. E. Co., or Manhattan 1½ or 2 inch coil. W. S. Sherman, 311 Watauga Ave., Corning, N. Y.

WILL EXCHANGE A REGISTER, WORTH $50; can be used as a recorder in receiving messages for a dynamo giving about 8 or 10 volts. Address Gerald Tlapa, 4072 Rainier Ave., Seattle, Wash.

WILL EXCHANGE SET OR 2000-OHM 'phones, complete, worth $4; a combined silicon and electrolytic detector, a No. 3A Brownie camera, in good shape, for a printing press and supplies, or chemical apparatus. Robert E. Block, 162 Jared St., Brookville, Pa.

HAVE ¼-KW. HELIX, WOUND WITH NO. 4 brass wire, highly finished oak construction, with 2 clips and binding posts. Will take oscillation transformer or Blitzen variable condenser, or anything of equal value and use to me in exchange. Victor Lyman, Stapleton, N. Y.

TO EXCHANGE HUSSAR BICYCLE, COST $38 last May; clincher tires, steel rims, coaster brake, mud guards, etc.; in excellent condition; for 1-kw. closed core transformer, or what have you? John E. Maloney, 1375 Carroll Ave., Chicago, Ill.

WILL EXCHANGE HOME-MADE ¼-KW. closed core transformer, good insulation, for a No. 2 or No. 2 Junior omnigraph transmitter. Also a Mesco 2-inch wireless coil for pair of Murdock A.M. 'phones, 2000 ohms. B. B. Bignall, 305 Lincoln Ave., Freeport, Ill.

HOME-MADE LOOSE COUPLER, LENGTH, primary 6, secondary 5; diameter, primary 4, secondary 3½. Slides on primary, 7-point switch on secondary; also silicon detector; in exchange for Clapp-Eastham rotary, variable condenser, or set Brandes superior 'phones. Earl Fisher, 1505 Fifth Ave., Pittsburgh, Pa.

BRAND-NEW E. I. CO. LOOSE COUPLER, band-new E. I. Co. amateur 'phones, home-made tuner, double slide, E. I. sliders used, No. 24 B. & S. wire, winding 7¼ inches long, home-made fixed condenser, right capacity mica used as dielectric, E. I. Co. shunting condenser. Want a good aerial switch of good design and make, and what have you? Describe fully. Neill H. Martin, 1918 I St., N. W., Washington, D. C.

HAVE NO. 2 BROWNIE KODAK IN PERFECT condition to exchange for Electrlytis detector, Ferron detector, ¼-in. spark coil, or electro 1000-ohm amateur 'phone. W. Newmann, 747 West 177th St., New York City.

A BATTERY MOTOR NO. 2, PORTER MOTOR, or 4-bar magneto, or a telegraph set, exchange for a dynamo of equal price, or what have you? Harker Akins, 30 N. Worthington St., Ocala, Fla.

A 1¼-INCH SPARK COIL WANTED IN EXchange for a new 6-volt, 4-ampere dynamo motor, with hand drive. Dynamo was a Christmas present, and is in A1 condition. Home any day after 6 P. M. A. Plausics, 1326 Southern Boulevard, Bronx, New York City.

WILL EXCHANGE—GERNSBACK ELECTROlytic interrupter (almost new), E. I. Co.'s potentiometer (new), E. I. Co.'s electrolytic detector (new), tubular variable cendenser and large fixed condenser for A. C. motor not smaller than ⅛ h.p., or what have you? Jennings Don, 1212 Mason St., Toledo, Ohio.

HAVE A COMPLETE WIRELESS RECEIVING set; will receive from 800 to 2000 miles; will exchange for spark coil or transmitting wireless set, or what have you? First good offer takes it. Francis Murphy, 3 Granite St., Gloucester, Mass.

WILL EXCHANGE EXCELLENT SET OF 10 large perikon crystals for 1000 ohm Brandes 'phone; perikon detector for two 1000 ohm Brandes 'phones, or what have you? Jacob Goodman, 51 East 90th St., New York City.

WILL EXCHANGE ELECTRO IMPORTING CO. receiving set R. O. 100-v. for Brandes Navy type 'phones or Blitzen tuner. I have also Gernsback interrupter and Doughnut tuner. What have you of equal value to offer? All apparatus in good condition. Floyd Carter, Clinton, Ill.

EXCHANGE FOR MOTOR CYCLE—WIRELESS receiving set, as follows: 2000-ohm. receivers, 4 detectors, tuning coil, potentiometer, battery regulator, condenser, 2 learners' telegraph sets, galvanometer, 6-point switch; also tools, books and patterns for a "Brooks" launch. J. E. Cornwall, William Head, B. C., Canada.

LOOSE COUPLER, 2-SLIDE TUNER, 1-SLIDE tuner, large wireless key, 20-ohm telegraph set, in exchange for good volt or ammeter; also 3 good high amperage wireless telephone transmitters, for what have you? Chester Bean, 347 Parker Ave., East Toledo, Ohio.

A BLITZEN ROTARY VARIABLE CONDENSER, warranted, in exchange for a good pair of 2000-ohm 'phones, with head band; will exchange a commercial and actual interference preventer, in excellent condition, as described in *Electrician and Mechanic*, June, 1912, for a Photographic Clapp Camera. Otto Frank, 35 Crestwood, Springfield, Mass.

WILL EXCHANGE, "SMITH PREMIER" TYPEwriter, in excellent condition, for a first class cornet and case; also new "Blitzen" rotary variable condenser for anything of equal value. A complete high grade wireless outfit for, what have you? William H. Earl, 838 North 9th St., Fort Dodge, Iowa.

TWO A. C. MAGNETOS. WILL GUARANTEE them to be as good as new. Will exchange both of them for a 1-inch spark coil or one E. I. Co. static machine, or will exchange one for a ½-in. spark coil or two ¼-in. coils. C. O. Williams, White Plains, Ky.

WILL EXCHANGE 2 POUNDS ALUMINUM wire and 2 rolls guy wire, 100 feet each (E. I. Co.), for a battery voltmeter or small storage cell. V. P. Thompson, 416 East 182d St., New York City.

WILL TRADE ½-KW. TRANSMITTING SET, complete, ½-kw. transformer and condenser, mounted on polished case, helix and spark gap mounted on top, anchor gap inside of helix, for second-hand motor cycle, gasoline engine or good receiving set. Send description of what you have. M. Grubman, 160 Carondelet Rd., New Orleans, La.

½-KW. TRANSFORMER AND E. I. CO. ELECtrolytic interrupter; will exchange for a 2-inch E. I. Co. coil or a 1-inch coil and Brandes superior set of 'phones. John S. Dorsheimer, 530 Manhattan Ave., New York City.

A 3-BAR ALTERNATING CURRENT MAGNETO with hand gearing, a good battery motor, some large, strong horseshoe magnets and other experimental stuff, and several large pieces of galena, in exchange for a 1-inch or more spark coil or variable condenser, or what have you? Verlin Bloxham, Etna Green, Ind.

1500-OHM LONG DISTANCE RECEIVER, gold diaphragm, hard rubber case, perfect condition (Goetz type); also ½-kw. quenched gap. What have you in exchange? Philip Edelman, Lyndale Soutth, Minneapolis, Minn.

WILL EXCHANGE A 4-VOLT, TYPE D, KNAP dynamo, new, for a pair of head 'phones or loose coupler tuning coil. Lyndon B. Walkup, Riverdale-on-Hudson, N. Y.

WILL EXCHANGE A ½-INCH BOX TYPE COIL, spark gap and adjustable condenser, all of E. I. Co. manufacture, for 'phones, 2000 ohms. My instruments are all in A1 condition. Adjustable condenser not used over a dozen times. Norman Lowry, 173 Eighth St., Brooklyn, N. Y.

WILL EXCHANGE A LATHE (GOODELL-Pratt), takes wood or metal; run by foot power for any wireless apparatus. Write for particulars, Donald C. Blake, Old Church Rd., Greenwich, Conn.

WILL EXCHANGE A SPARK COIL GIVING A good ¾-in. spark for rotary variable condenser. The coil is shopworn but in good working condition. Will work with interrupter only. Emil Korab, 418 W. Clay St., Richmond, Va.

FOR EXCHANGE—ONE 4-MAGNET GENERAtor with multiple hand gear, which may be removed; heigh, 5¼ inches; weight, 7¾ pounds. Original cost, $5.50. In good condition. Will trade for a good 1½ or 2 inch spark coil. Address Ken W. Koht, 925 West 18th St., Des Moines, Iowa.

A MAGIC LANTERN WITH 240 PICTURES; will throw a picture life size; in exchange for a variable condenser of any make. Archie Currie, 949 34th St., Oakland, Cal.

ONE EACH, CLAPP-EASTHAM MODEL LOOSE coupler, Ferron detector, fixed condenser, sliding plate, variable condenser; all in perfect condition. Want good ½-kw. transformer, closed core, 110-v. 60 cycles primary, about 13000 v. Secondary, with high power factor, or what have you? Have just purchased a large receiving set. Address Elmer M. Ashelby, 419 St. James' Pl., Chicago, Ill.

HAVE 1/6-H.P., 110-V. D. C. MOTOR, LIKE new; will exchange for ⅛-h.p., 110-v., 60-cycle induction motor; also have an $8 set of cycle engine castings; will exchange for 1-in. Americoil, or what have you? Leroy Clausing, 406 Nye St., Lima, Ohio.

WILL EXCHANGE 1 HOME-MADE LOOSE coupler, 1 double slide tuning coil, 1 150-ohm. W. U. relay (without key). 1 owl game board and 1 pair ball-bearing roller skates, for rotary spark gap, spark coil or transformer, or other wireless instruments. Write for particulars, James Crow, 5047 Washington Ave., St. Louis, Mo.

E. I. CO. 1-IN. SPARK COIL, BOX TYPE, FOR rotary condenser, glass plate condenser for above coil for good fixed receiving condenser; also two 4-ohm telegraph instruments for a perikon detector; all of the above in first class condition. P. J. Hoffman, 1688 Second Ave., New York City.

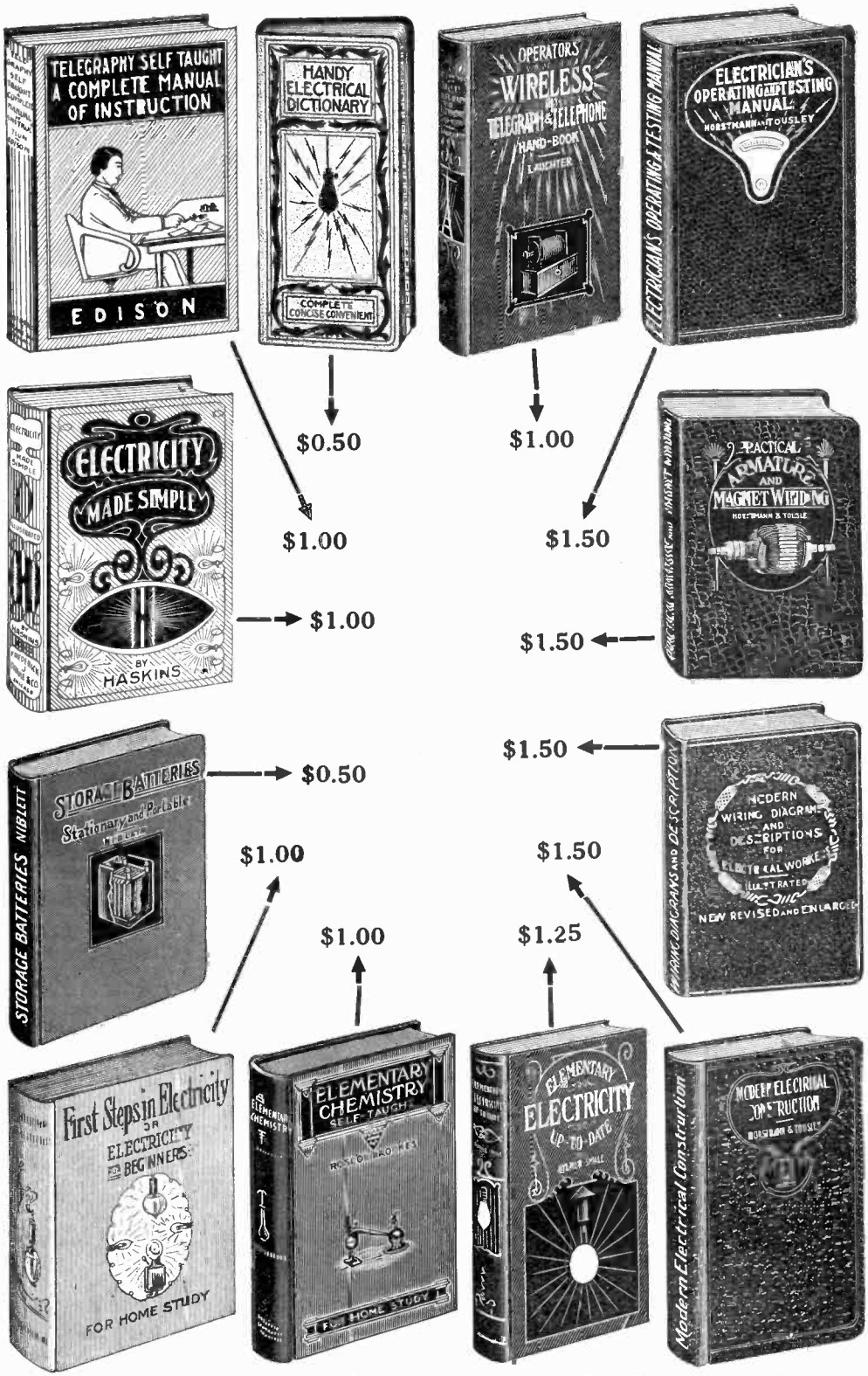
FOR EXCHANGE — ONE 12-INCH COIL, IN first class shape; one electrolytic interrupter; also one 6-inch coil, in good shape. Both are suitable for wireless or X-ray work. Prefer a 1912 motor cycle. W. B. Parker, Smithville, Tenn.

"ELECTRO-CIRCULAR" POTENTIOMETER, IN good condition, and bare point Electrolytic detector, slightly used; in exchange for rotary variable condenser or sliding plate condenser. Lawrence Myers, 1006 Powell St., St. Joseph, Mo.

I HAVE ONE 5-BAR TELEPHONE MAGNETO hand-driven and one 4-bar with grooved pulley. Both are powerful. Would like to trade for 2000 or 3000 ohm. doublt head set or Ferron detector. Homer Clayton, 922 Prospect St., Indianaplis, Ind.

WANTED—2 TO 3-INCH COIL FOR TROMbone (B6); have 1 pair 2000 receivers for Ferron or perikon detector, 2 relays, sounder, and keys for wireless or camera, or what have you? Frank V. Worden, Delevan, N. Y.

WILL TRADE FIRST CLASS POST CARD PROjector, operated on 110 volts or relay wound to 20 ohm, and telegraph key, in excellent condition, for loose coupler, 1000 ohm receiver, spark coil not under ½ inch, or what have you? Charles S. Smith, P. O. Box No. 50, Victory Mills, N. Y., Sara Co.



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MODERN ELECTRICS, BOOK DEPARTMENT **231 Fulton Street, New York**

When writing, please mention "Modern Electrics."

When writing, please mention "Modern Electrics."

What and Why Is the Internal Bath?

By C. Gilbert Percival, M. D.

Much has been said and written about the present generation living unnatural lives and being, for that reason, only half as energetic, enthusiastic, ambitious or even healthy as it should be—

And this is so—

The confined lives that we live, the lack of constant exercise (for it must be constant to be effective), and the strenuous requirements of our business or social duties, directly bring on a condition, to which little attention has been paid in the past, though it does more to rob us of power, spirit and ambition than any other one thing known to Medicine.

But Nature has provided, as in so many other cases, an immediate and perfectly natural relief for this condition, and over five hundred thousand Americans are already taking advantage of it.

When you are ill and a physician is called, the first step that he takes, *no matter what is the matter with you,* is to clean out the colon (large intestine).

There are two reasons for this:

One is that no medicine can possibly take effect while there is waste matter in the Colon—

The other and *most significant reason* is that if the Colon did not contain this waste, it is safe to say that you *would not have been ill at all.*

The penalty for the lives we live is agreed on by all Physicians to be the clogging up of our colons with waste matter which the system does not voluntarily carry off—

This waste is extremely poisonous; the blood circulation comes in sufficiently close contact with this waste to take up these poisons by absorption and distribute them throughout the body—

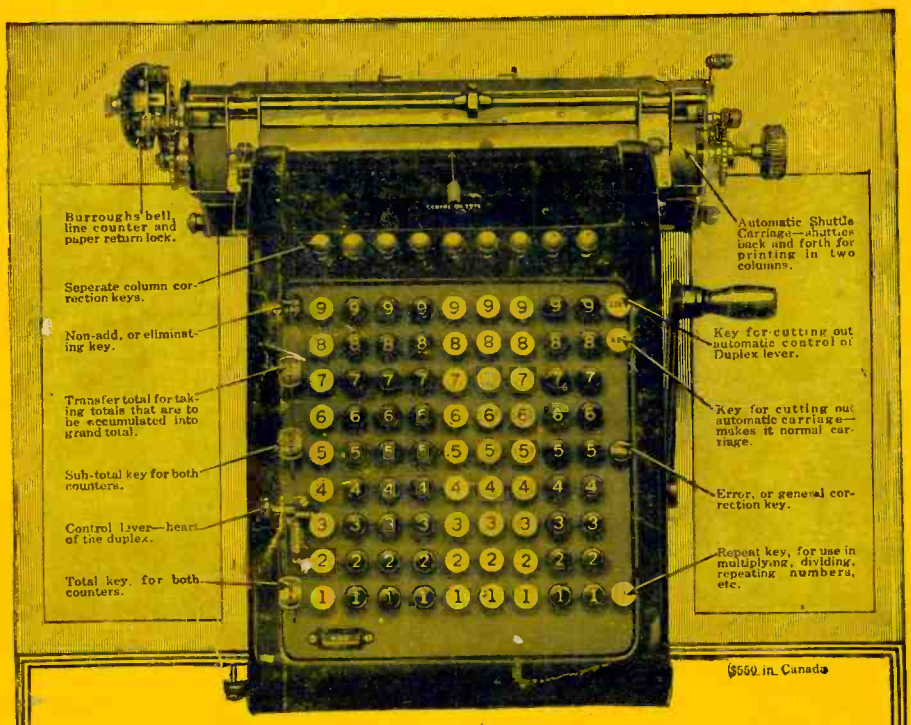
The result is a gradual weakening of the blood forces; the liver becomes sluggish; biliousness asserts itself; we become heavy, dull, and develop a more or less nervous fear of anything we undertake—the more this waste accumulates, the more we are affected, until at last we *become really ill* and incapacitated.

Now the Internal Bath is the one process with the assistance of simple warm water, properly introduced in a new and natural way, that will keep the colon as clean and sweet and pure as Nature demands it to be for perfect health.

Enlightened physicians by thousands are prescribing this new method which is fully explained in "The What, The Why, The Way" of Internal Bathing, by Chas. A. Tyrrell, M. D., of 134 West 65th Street, New York City. This he will send on request if you mention *Modern Electrics.*

It explains just why this method has proven superior to any other, (including drugs), for removing this troublesome waste; it also contains many other interesting facts and statistics which cannot be touched on here.

So if you are nearly well and want to get really up to "concert pitch"; if you want to feel consistently bright, confident, ambitious and enthusiastic—In fact, no matter what your condition, sick or well, the experience of other hundreds of thousands would prove it worth your while to at least send for the book, and look further into this method and its history.



$550 in Canada

This Burroughs at $500

Does the Work of Two $375 Machines

This Burroughs Duplex is the equivalent of two separate adding machines interworking under one keyboard—"one machine that works like two."

With its automatic "shuttle" carriage, controlling its extra adding section, this machine is capable of all that the regular Burroughs does—*and many things no other adding machine can do.*

With it you can list and add any number of groups of items, print the total of each group and the grand total of all the groups without re-adding.

Or two separate classes of items, like debits and credits, can be added on this machine in one column—or in separate columns—each to $9,999,999.99.

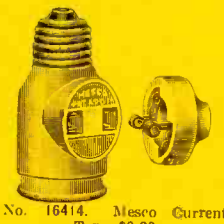
The range of usefulness for this machine is so wide that we have published special bulletins for each of a large number of lines of business, showing the many ways of using the machine in each line. May we send you a copy of the Bulletin published for your line of business, free, and have our branch office near you place one of these machines on trial in your office and show you how it may be applied to your work?

Burroughs Adding Machine Company

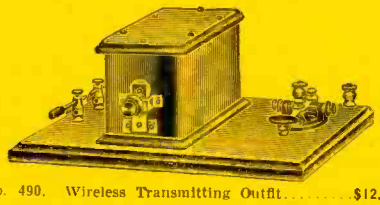
European Headquarters, 76 Cannon Street, London, E. C., England

12 Burroughs Block, Detroit, Michigan

Makers of adding and listing machines: listing and non-listing calculating machines: low keyboard visible-printing adding machines—86 different models in 492 combinations of features—$150 to $950



No. 16414. Mesco Current Tap. $0.30



No. 490. Wireless Transmitting Outfit.....$12.00

No. 1758. Call Bell Outfit.....$2.50

No. 1561. Battery Telephone for lines up to 500 ft. in length, per station.....$2.50

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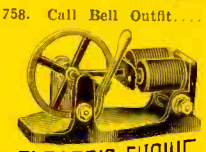

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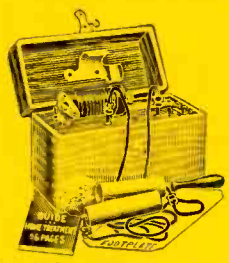

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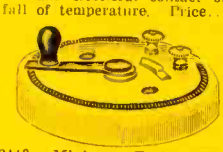

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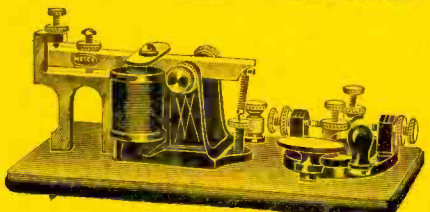

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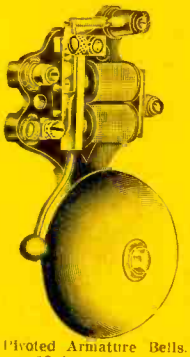

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