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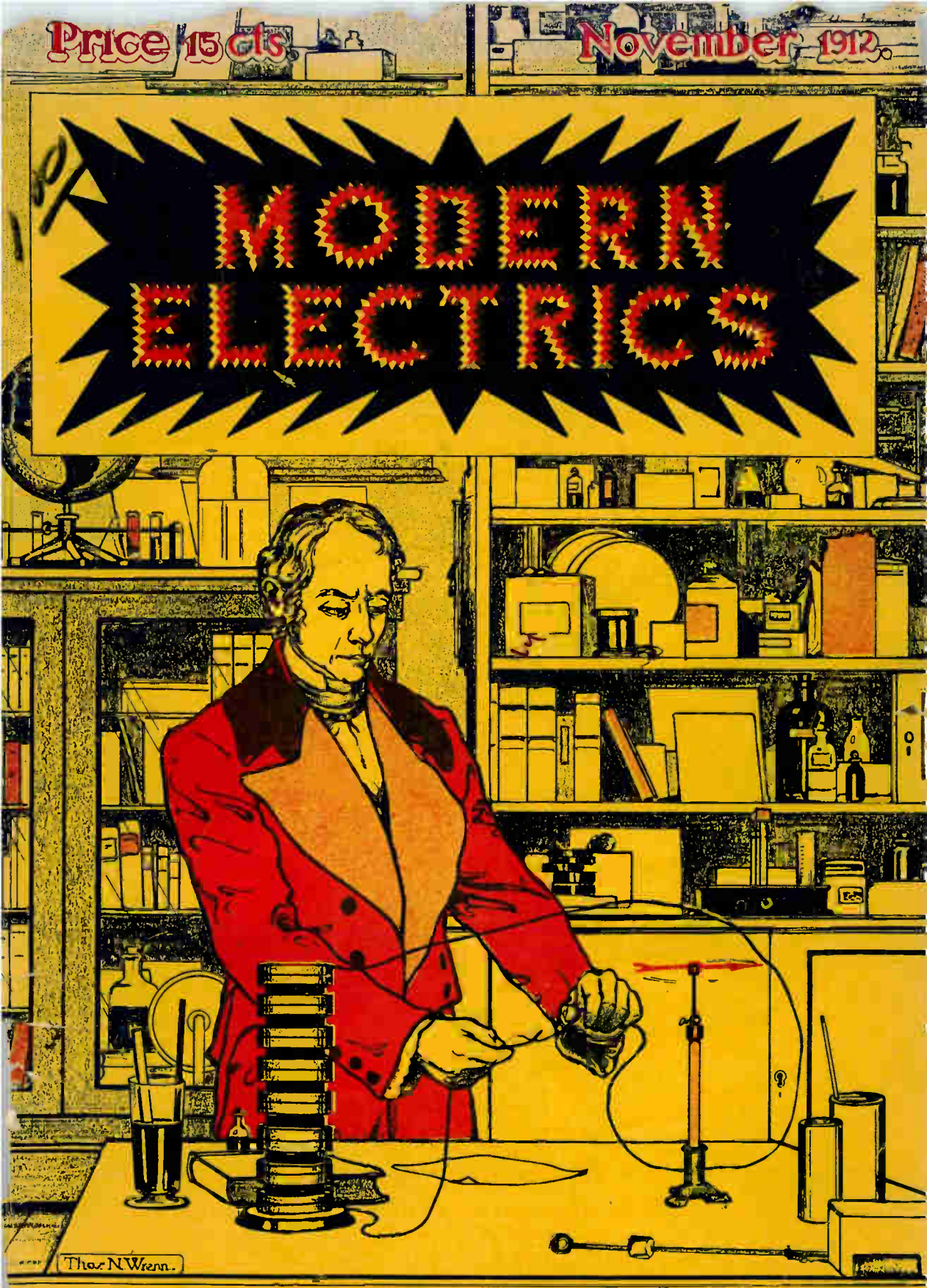

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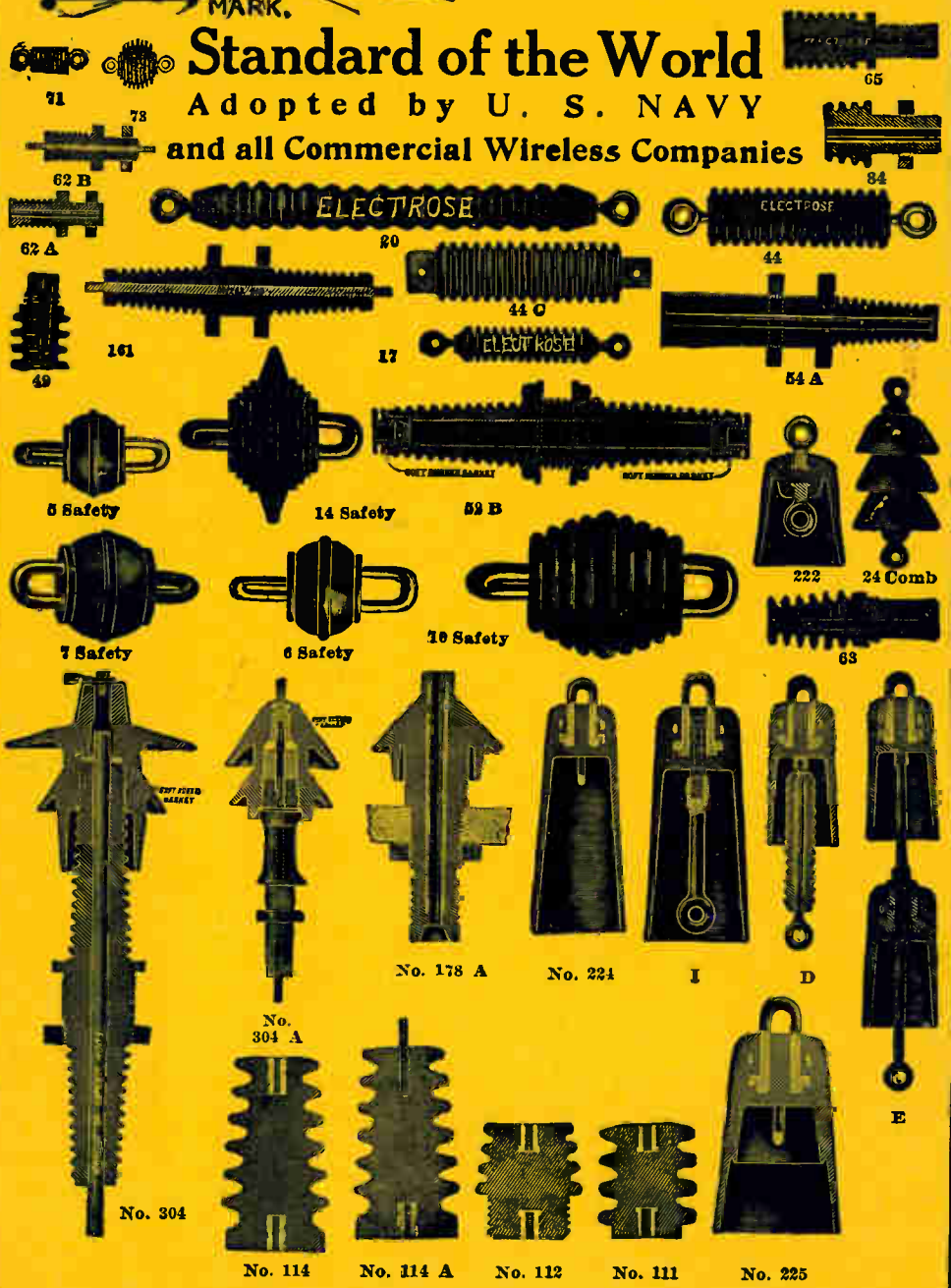

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"THE ELECTRICAL MAGAZINE FOR EVERYBODY"

Edited by H. Gernsback

Volume V NOVEMBER, 1912 No. 8

CONTENTS

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H. Gernsback, President and Secretary. O. J. Ridenour, Vice-President and Treasurer

Trade Mark Registered June 21st, 1910.

Entered at the New York Post Office as Second Class Matter.

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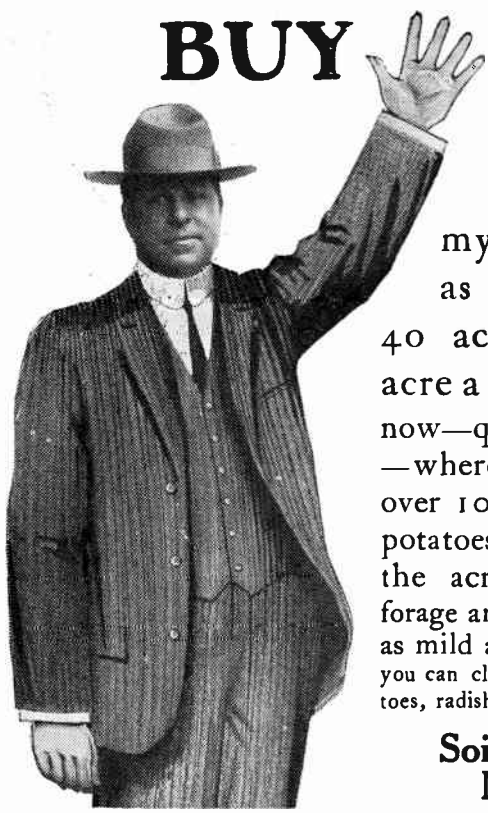

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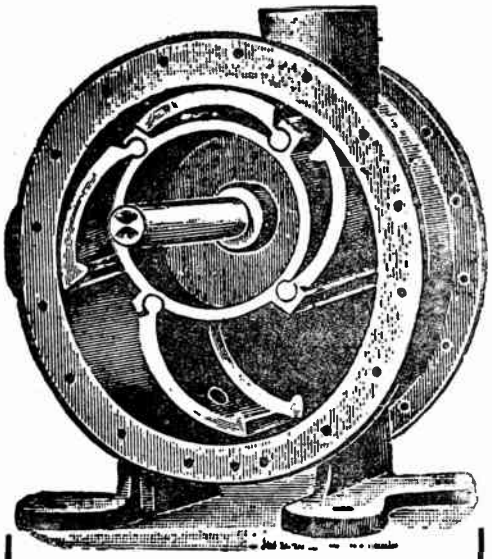

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No. 123 Dark Oak	*No. 128 Light Mahogany*	*No. 131 Brown Weathered*	*No. 172 Flemish Oak*
No. 125 Mission Oak	*No. 127 Ex. Dark Mahogany*	*No. 132 Green Weathered*	*No. 178 Brown Flemish*
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World Radio History

Modern Electrics

VOL. V. NOVEMBER, 1912 No. 8

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)

96. Swan Lamps

THE German patent records give some information on this lamp, which in its time was used quite a good deal, and represents one of the best lamps made in Europe at that time.

A cotton thread before being carbonized is first parchmented, *i. e.*, through the action of sulphuric acid it is brought almost to disintegration. The filament thus constructed is in the form of a loop and the filament itself is somewhat twisted like a corkscrew. This incandescent filament in order to give it uniform density and thickness is then heated by means of the electric current in an atmosphere of some hydrocarbon gas, this process building up the thin spots by depositing carbon on them.

The carbon filament is then connected with thin platinum wires and the air is then drawn from the bulb in the various stages as shown in our Fig. 153. The connection with the platinum wires is made as follows:

The platinum wires are flattened out as much as possible and are then rolled up in the form of a tube. In these fine tubular openings the filament is placed and this contact is sufficient for ordinary work. However, in some cases where the connections are made between the platinum wires and the carbon, the filaments are dipped in some carbon compound which gives still better contact and is better than a purely mechanical contact.

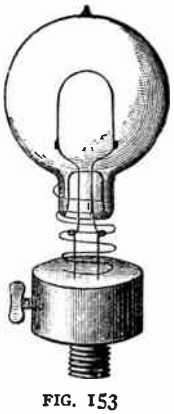

FIG. 153

The Cruto lamp is shown in our Fig. 153, and was used quite a good deal before the Edison Screw Base lamp came into general use. The method of making the filament itself is quite interesting.

A fine platinum wire is covered with a thick coating of silver and is then drawn through dies until it has about 0.039 inch in diameter; then the silver is dissolved by means of nitric acid, and we now have a very fine platinum wire of a diameter of 0.00039 inch. The filaments as shown in our Fig. 153 are

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cemented to the platinum wires by means of a moist cement of carbon and sugar.

These pieces are then placed in the respective glass bulbs, containing hydrocarbon gases, and the filament is made red hot, by means of an electric current. After a few hours a heavy deposit of carbon is deposited on the filament and after this the air is extracted or is pumped from the bulb and the bulb itself is sealed with the oxy-hydrogen flame. Now the current is increased a great deal and this melts the fine platinum wires in the inside of the filament, leaving only the carbon filament, and the lamp is now ready for use.

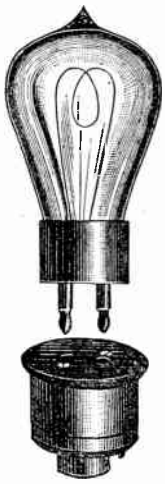

FIG. 154

The Cruto lamp, as will be seen, had no screw base but had only platinum loop wires extending from the glass with which contact was made—a very crude arrangement at best.

The Siemens & Halske Lamp

This form of carbon lamp is used quite a good deal, even to-day when we have such excellent lamps as the tungsten and it is made as follows:

Collodion is spread in a very thin filament on a very even and smooth sheet of glass and after it has dried, it is cut in extremely fine strips by a specially constructed machine. These fine strips are then carbonized, much the same as the Cruto filament, but these filaments have the advantage that they are tough and can stand a lot of abuse.

The German General Electric Company presses cellulose through dies having the diameter of the final filament and the ensuing thread is collected on spools and afterwards made into filaments.

The air pressure in a good electric lamp must be less than 0.2 mm. of mercury; otherwise the luminosity of the lamp decreases quickly as shown in the following table:

Pressure	0.0	0.2	0.3	0.4	0.6	0.9 mm
Luminosity ...	16.87	16.40	15.85	15.16	13.68	11.47c.p.

As soon as the lamps are ready they are tested by means of the photometer, *i e.*, they are compared with a standard lamp having a known candle-power. After the lamps have thus been tested they are sorted according to amperage and voltage and are packed ready for the market.

The temperature of a lamp at 100 volts, according to H. F. Wever, amounts to 1,270° C. The limit at which the carbon filament may be worked before volatalization is about 1,330° C. To produce a cheap light Nernst replaces the carbon filament by a fine rod of magnesia which is brought to a pure white incandescence by means of the electric current. Such a lamp gives a brilliant white light which is very steady. This lamp, however, has the great fault that magnesia is not conductive, to the electric current, until it is heated. Therefore, a heater, controlled by an electromagnetic device is used to heat the magnesia rod, the heating current being cut off as soon as the lamp really burns. The Nernst lamp does not require a vacuum but burns in the open air.

97. Lamp Connections

When the first lamps were invented, it soon became apparent that inasmuch as an incandescent lamp is not permanent, *i. e.*, it must be changed when it burns out, there should be some means of quickly making this change without having recourse to twisting wires, binding posts and the like. The old Edison screw socket has never been eclipsed or improved upon by later inventions and it is so well known to-day that it hardly requires any special mention.

FIG. 155

However, we show in our Fig. 154 an old wire socket which is very simple, and also effective, but somehow never came into extensive use, probably because the two prongs sticking out from the base of the lamp itself were considered more or less objectionable. This lamp was connected simply by pushing the prongs into the two brass tubes which had springs inside to hold the prongs in place.

98. Testing the Incandescent Lamp

The incandescent lamp business is a very difficult one and it takes much experience not only to manufacture the lamps, but also to test them.

The ordinary tests, especially with carbon lamps, are as follows:

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The filaments must be observed while burning. Weak spots are easily recognized as they glow more at such spots.

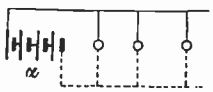


FIG. 156

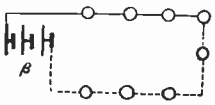


FIG. 157

Bad preparation of the filament is shown by "Scaling" or the blackening of the filament and the walls of the globe.

Another important test is the one for vacuum.

A poor vacuum is easily recognized

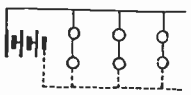


FIG. 158

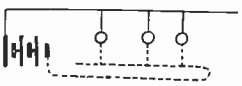


FIG. 159

when the filament, after it has been shaken, comes to rest quickly. Much better is the test in connection with induction coils. This test is made as follows:

Take the lamp by its glass bulb and hold its base to one pole of the induction coil while the other pole of the induction coil is connected with the ground. The following will be observed:

Lamp containing air, no light glow can be seen inside the bulb.

Bad vacuum (imperfect vacuum), shows intensive glowing as that of geissler tubes.

Good vacuum shows little prosphorescence of the glass walls.

The next test is that to find out the current consumption at normal voltage.

Next comes the measuring of the resistance; then the measuring for luminosity with the photometer and lastly the estimate of the probable life of the lamp.

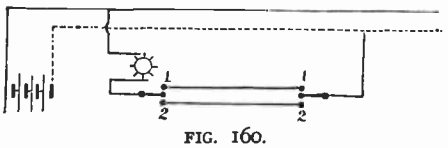


FIG. 160.

99. Incandescent Lamp for the Experimenter

A fairly good lamp can be made by the young experimenter as shown in Fig. 155. While this does not represent by any means, a good lamp it shows the principles and is instructive to the student.

At the same time the barometric principle can be studied.

In a strong glass tube about 3¼ feet long, with a diameter of about ¼ inch or a little more for the bore, the rubber cork as shown in our illustration is inserted, to close the upper end. Through this cork two copper wires are fitted in such a manner that no air will pass. The two copper wires are then connected together by means of a carbon filament which can be taken from a defective carbon lamp.

The tube is then filled entirely with mercury, from the bottom, and then turned upside down in another vessel containing some mercury, as shown. It will be observed that the mercury drops for a certain distance and will not flow

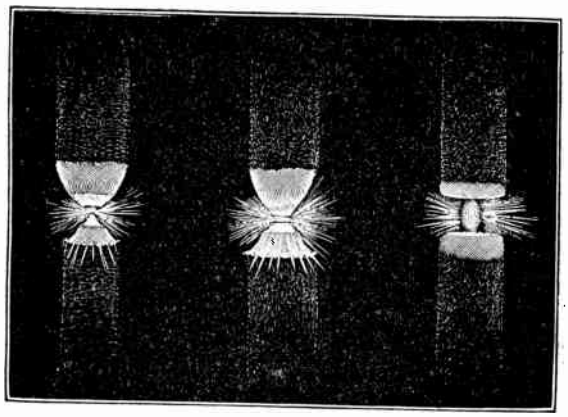


FIG. 161 FIG. 162 FIG. 163

out of the tube after this point has been reached. The space between the surface of the mercury and the lower surface of the cork, now has a good vacuum and our small lamp can be lighted by means of a battery and will do good service for some time.

100. Distribution of Current

In Figs. 156 and 157 we see the two principal systems of connecting lamps.

Fig. 156 shows parallel connections: a, being the battery, all the lamps having the same voltage being connected in multiple. From this it will be seen that one branch is positive while the other is negative, each lamp getting its current without regard to the other and if one burns

World Radio History

out or is disconnected the other lamps are not affected.

It is different in the series connection as shown in Fig. 157.

In such a circuit we require less wire and the installation is a great deal easier; but as soon as one lamp is placed out of circuit all the rest are extinguished also.

Fig. 158 shows mixed circuits and this scheme is usually employed to do away with rheostats if the voltage of the lamps is too low for them to be burned directly from the current supply.

An interesting connection is shown in Fig. 159 and the explanation of same is as follows:

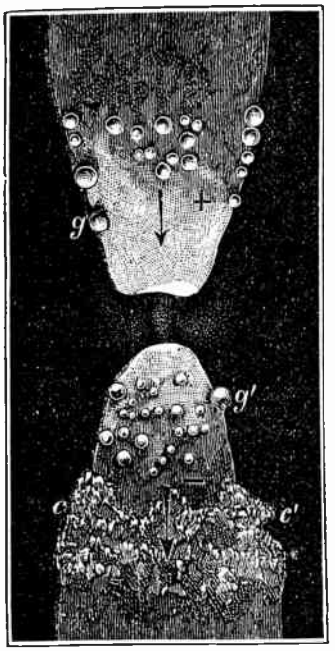


FIG. 164.

It is well known that the farther the lamps are from the source of current the dimmer they will burn, inasmuch as the resistance of the line increases with the distance from the supply. Therefore, to give the same resistance at all points a loop is carried backwards as shown in our illustration and while this remedies the evil it is expensive on account of the extra amount of wire needed.

101. A Two Way Connection

Our Fig. 160 shows a connection such as it often used in houses, especially for stair work. Thus it is often desired that when a person enters a house a switch could be turned on to light a lamp at the head of the stairs, and when the person arrives upstairs, there should be another switch to turn off the current. The same is often desirable in a room where the light might be turned on somewhere near the door when entering, and turned off while lying in bed. The arrangement is shown clearly in our illustration and is effected by means of two point switches.

102. The Arc Light

The arc light was discovered in the year 1810 by H. Davy. He used a battery of 50 Daniell cells and obtained a strong electric arc between two carbon points.

An electric arc is formed between two pointed carbon rods if the two rods are brought into contact and then pulled apart a short distance.

The carbon connected with the positive pole of the battery is termed the positive carbon, the other one the negative carbon.

According to the theory of Lenard the arc light always consists of two flames each of which comes from one of the carbons and combine to form the arc.

A steady arc cannot be produced unless there is a tension of about 40 volts. The arc light is extremely powerful and one should not gaze directly into the arc as the ultra violet rays will injure the eye.

In order to study arc lights it is recommended that a picture of the arc itself be thrown by means of a strong lens on to a white screen. In this case the room must be totally dark to get good results.

With the same current intensity a very faint arc is produced between platinum points.

Between zinc electrodes a strong arc is formed, and between mercury electrodes a very powerful arc is produced. This arc is sometimes used in the mercury-arc lamp for certain purposes.

In Fig. 161 to 163 we have several views of the arc.

The most intensive light is obtained between carbons glowing at a white heat, and the positive carbon thereby volatilizes between 3,500° and 3,600° C. The positive carbon gradually loses its point and takes on a crater-like hole while the negative carbon, providing direct current is used, at a temperature of 2,400° C., takes on a round pointed form as shown in Fig. 161. Between the two electrodes small glowing pieces are thrown to all sides continuously. When the carbon is not very pure one sees small ball-like objects moving on the surface of the carbon, Fig. 164. These small balls represent the melting impurities and are never observed in perfectly pure carbon.

(*Continued on page* 827.)

World Radio History

The Average Ship's Wireless

By Stanley E. Hyde

In the accompanying photographs is shown the type of wireless apparatus installed on Pacific coastwise ships by the United Wireless Co. (recently absorbed by the Marconi Wireless Telegraph Company of America). These stations are of the "average type" as they do not necessitate the use of the more elaborate equipment such as is used on the Trans-Pacific steamers that ply between the Orient and the Pacific Coast, and are always good for at least 100 miles in the day time, and at night, under good conditions, 1,000 or more miles are frequently covered. As the ships that run between coast ports are always more or less close to land they are constantly in communication with either the commercial or Government stations.

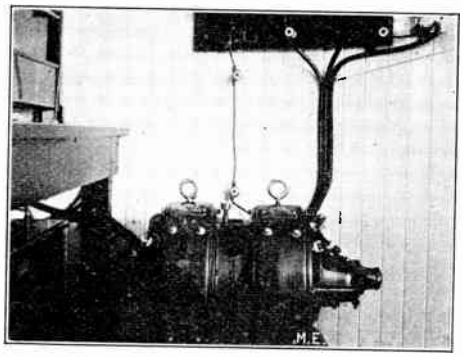


FIG. 1

In Fig. 1 is shown the motor generator which operates from the ship's dynamo and supplies the alternating current at 110 volts to the step-up transformer. These machines are built very substantially and requires very little care. Complete wiring diagram for the same is shown in Fig. 4. Above the motor-generator set are the starting rheostat for the motor and the rheostat used to regulate the alternator field; this also controlling the current flow in the transformer circuit. The transformer is shown under the table, at the left, in Fig. 1.

Fig. 2 shows the condenser of leyden jars, sending inductance, fixed and rotating spark gaps and the antenna switch. Although leyden jars are very old fashioned and antiquated, they are nevertheless very efficient when compared with the glass plate condenser, as the latter

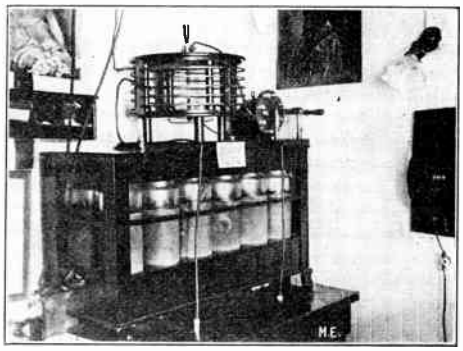


FIG. 2

are constantly brushing and cracking from disruptive discharges that jump around the edges of the plate. Jars, as now supplied, are copper plated and seldom or ever cause trouble.

The receiving set, as shown in Fig. 3, is mounted in a compact box, and consists of two tuning inductances, carborundum detector, potentiometer and shunt switch.

It might be well to note that operators as a rule use some pet detector of their own, usually silicon, after they are well away from port and the spying eyes of

FIG. 3

officials are not present. Of course, when the ship arrives in port again the silicon has disappeared and a piece of carborundum takes its place.

These stations are always on the job

World Radio History

for the simple reason that they are simplicity itself, and the connections and

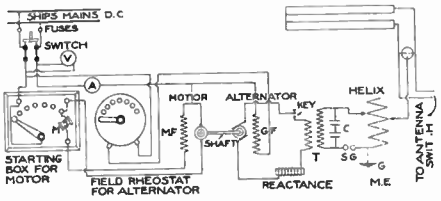


FIG. 4

wiring are as short as possible, thus making the resistance low, which is a great factor in high frequency currents.

THE HELSBY WIRELESS DETECTOR

By Frank C. Perkins

The accompanying illustration, Fig. 1, and drawing, Fig. 2, show the design and construction of an English wireless detector of the Helsby type developed at Liverpool, England.

This wireless crystal detector was designed to meet the demand for a thoroughly robust telegraphic instrument, reliable and constant in action, capable of easy and delicate adjustment, and suitable for station requirements or laboratory use and is usually provided with

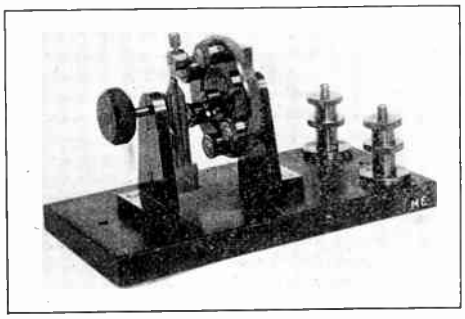


FIG. 1

specially selected crystals of galena (PbS). A particular granular formation of this substance has been found which is exceedingly sensitive and more uniform from point to point than any other crystal known.

From drawing, Fig. 2, it will be seen that there are six crystal cups, C, mounted upon a movable brass disc with a large hole drilled in its center. This disc is held in position by the pressure of the spring, D, against the face of the flanged nut shown, and sufficient clearance is provided between the spindle and the disc to enable the latter to be moved sufficiently in any direction to permit contact with the pin, B, at any point upon the surface of the crystal. The contact pin is adjusted, in the manner shown, by means of A, and the arrangement of opposing springs allows the pressure of contact to be regulated with the utmost precision.

It is said to be important that in the case of the galena crystal the pressure of contact should be extremely light, and

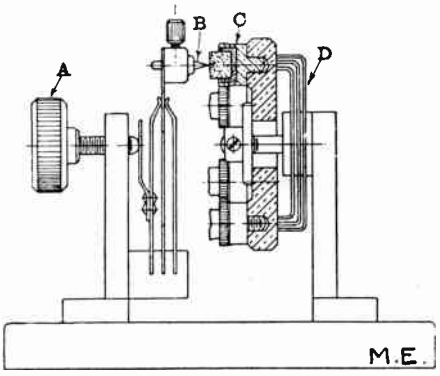


FIG. 2

the design of the instrument enables a light yet reliable pressure to be maintained.

SAYVILLE WIRELESS STATION OPEN

The new station at Sayville, which was mentioned in our October issue, is now in operation. This station has a small Telefunken outfit for local ship work and a high power set for long distance work, which will be used for the transmission of trans-Atlantic messages upon the completion of a similar station at Nauen near Berlin. At the present time only ship messages will be handled. The call letters are S. L. I. and the wave length about 2,500 metres. The Continental code is used.

FOND WISH

"There's one thing I want to see while I am in Europe."

"And that is?"

The Hungarian goulash in session."
—*Washington Herald.*

World Radio History

The Scientific Adventures of Mr. Fosdick

By Jacque Morgan

Mr. Fosdick Invents the "Seidlitzmobile"

"Pardon me."

Mr. Hiram Snodgrass did not look up from his desk. It was Saturday and nearly noon and the automobile was panting outside to take him out to the country club where he had a golf game on with his son-in-law.

"Pardon me."

The president of the Ajax Manufacturing Company only dipped his pen again in the violet ink and scribbled the faster. A half hundred letters still remained to be signed and Mr. Snodgrass figured that even with the simplest of luncheons he would be an hour late upon the green. And this afternoon he purposed having his revenge, for the Saturday before the husband of his offspring had stung him to the tune of eight up.

"Pardon me."

Mr. Snodgrass swung in his chair. "Well, what is it?" The inquiry came explosively and with a fierce sudden heat like the momentary opening of a furnace door. It was Mr. Snodgrass' way—a manner that none in the office ever paid the slightest heed.

"You are Mr. Snodgrass?"

"Yes, I am," snapped that individual. "What of it?"

The stranger, a man with mild blue eyes and vague, rambling whiskers, seated himself. "Did you ever," he began, "take first the blue and then the white of a common, ordinary seidlitz powder?"

Mr. Snodgrass threw his head back aghast at the query. "No, I have not," he bellowed.

The stranger was unperturbed. "Well, then try it," and drawing from his pocket one of the powders in question walked coolly over to the water filter and filling the glass dropped in the blue powder which he stirred with a long index finger. "The result will surprise you."

"I'll do nothing of the dashed kind," roared Mr. Snodgrass. "And say," he demanded, as he caught the stenographer tittering behind her note book, "who the devil are you and how did you get in here?"

For answer the stranger laid upon the president's desk a card:

JASON Q. FOSDICK
INVENTOR

Mr. Snodgrass' features experienced a sudden transformation: the belligerent expression faded away and a smile of genuine pleasure suffused all of the countenance visible above and in front of the mutton-chop whiskers. "My dear Mr. Fosdick, I am delighted to meet you!" he ejaculated. "I suppose you dropped in to see how the nut-crackers are getting along. The device was an utter failure as a curling iron—but as a nut-cracker it has been an unqualified success. It is going to make you a rich man, Mr. Fosdick. Your royalties are now amounting to over a hundred dollars a week."

Mr. Fosdick shook his head. "No, I am not here on that account. I have a new invention that I want to interest you in."

"And the nature of it is what?" inquired Mr. Snodgrass.

"An automobile run by these," and the inventor held up a seidlitz powder. "There is a wonderful lot of power in a seidlitz powder, Mr. Snodgrass. Just take first the blue and then the white," he said, offering the glass and at the same time unfolding the white paper containing the other half of the powder.

There is power enough here to run my Seidlitz mobile eleven and two-tenths miles. Just feel the pressure.

Mr. Snodgrass drew back in some alarm. "No, I'll take your word for it."

"Please take it," insisted Mr. Fosdick. "It's a beautiful experiment. It gives a pressure of ten atmospheres—one hundred and fifty pounds."

"Damn it, man, I'm not built for a hundred and fifty pounds. I couldn't stand it—I'd blow up—I haven't any safety valve."

The inventor shook his head solemnly. "In that, Mr. Snodgrass, you are mistaken. The human diaphragm will stand one hundred and sixty pounds. You see, there is a margin of safety of ten pounds—the experiment is perfectly safe."

"I tell you I won't," cried Mr. Snodgrass, overcome by a sudden fear that he might be persuaded into such a rash adventure. "I won't, I tell you."

"Then I will," said Mr. Fosdick, calmly lifting the glass. "Just watch."

"Here, stop that!" cried the horrified Mr. Snodgrass. "Don't do that in here. Go down into the engine room where we have boiler insurance."

But the inventor was not to be thwarted. With cool deliberation he quaffed off first the one powder and then the other. "Right here,"

World Radio History

he said, after a minute's wait, "there is power enough to run my Seidlitzmobile eleven and two-tenths miles, if my calculations are not wrong," and he placed his hand upon the pit of his stomach. "Just feel the pressure."

Mr. Snodgrass extended his arm and gingerly prodded the compelling stranger under the ribs.

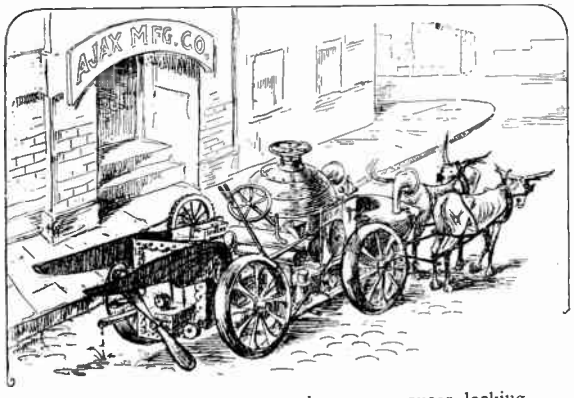
"Not hard," said the inventor warningly. "Remember, the margin of safety is only ten pounds."

Mr. Snodgrass withdrew his hand with lightning-like rapidity and the perspiration broke out upon his forehead. "Couldn't you go outside and sit around for awhile?" he inquired with some trepidation. "Our building is not very strong and an accident would doubtlessly maim many of our clerks."

"I usually don't stir," replied Mr. Fosdick solemnly. "If I should walk about and stumble—or if I should even cough or sneeze, why then——"

"Yes, yes," interrupted Mr. Snodgrass. "Just sit perfectly still," he said, turning off the electric fan. "Keep out of all draughts and please try not to cough. I'll telephone the fire department and the police as a precaution."

"Not necessary," said the inventor. "The pressure will sink to forty pounds in ten minutes."



One month later a team drew up a queer looking vehicle in front of the Ajax Manufacturing Company.

It was a harrowing ten minutes for the president of the Ajax Manufacturing Company. When one has reached the mature age of sixty years and has a large family, even to grandchildren, the staking of one's life against the mere sneeze or cough of an utter stranger is an unnerving thing and the shock and suspense of it all is more than apt to leave the faculties in a numb and dazed condition. At any rate, when Mr. Fosdick left the office a few minutes after the ordeal, he had in his pocket Mr. Snodgrass' check for one thousand dollars for the building of the first Seidlitzmobile.

* * * *

One month later a team drew up a queer looking vehicle in front of the Ajax Manufacturing Company and unhitched.

"I brought it over here from the shop by mule-power," explained Mr. Fosdick, "as I wanted you to take the very first ride in the Seidlitzmobile under its own steam—or gas, rather."

Mr. Snodgrass looked the machine over dubiously. "It looks like a fire extinguisher," he ventured.

"That's the very principle that it works on," said the inventor. "You see this reservoir," and he pointed to a large burnished brass cylinder under the hood, "is the mixing chamber—the stomach of the machine, as it were. In it the powders are dropped and the carbonic acid gas actuates the two cylinder engine geared to the back axle. This link motion controls the cut-off and the reverse, and the throttle here permits you to give the engine any head of gas. But climb in," he added, "and we'll be off."

Mr. Snodgrass with some reluctance stepped into the machine and seated himself. Mr. Fosdick followed him and then fishing out of his pocket a seidlitz powder he unscrewed a brass cap from a tube that protruded from the floor of the machine, dropped the powder through, tooted the horn, released the brakes, and they were off. It was a down-hill road and for two miles—in fact for the entire length of the hill—the Seidlitzmobile behaved splendidly.

Mr. Snodgrass became enthusiastic. "It's the most silent machine I ever rode in!" he ejaculated. "It's as quiet as an electric."

"And just think," put in Mr. Fosdick, "the machine can be retailed at two hundred dollars. It will make us millions! All there is to it is a ten dollar engine, a brass cylinder, four wheels, and a seidlitz powder. The horse is bound to become as extinct as the dodo. Every family in the land will possess one. It will be a convenience to the rich, a blessing to the poor, a——" They had reached the bottom of the hill and the machine stopped.

"What's the matter?" demanded Mr. Snodgrass, his vision of riches suddenly fading away.

Mr. Fosdick got out and looked the machine over wisely. "I think the engine has slipped an eccentric," he remarked after a few moments of profound study.

"Why, man, you've no pressure!" exclaimed the passenger. "Look at the gage."

It was true. The gage registered not a single pound.

Mr. Fosdick fumbled in his pockets, but could not find another powder.

"I guess that last powder must have been a weak one," he said. "But see, there is a drugstore—and every drugstore carries seidlitz powders. As long as you keep near the drugstores you need never run out of power."

Mr. Snodgrass' spirits rose. "We can turn that remark into profit," he said. We will copyright it. The very first thing we will do will be to spend one million dollars in advertising this sentence throughout the entire world: 'The Seidlitzmobile—the machine that can get its power at any drugstore.'"

World Radio History

Together the two men walked into the drug shop.

"A seidlitz powder, if you please," said Mr. Fosdick, laying ten cents upon the soda counter.

The apothecary dived back into the mysterious region behind the prescription case and hibernated. An hour later he emerged and pleasantly inquired what was wanted.

"A seidlitz powder, please," reiterated Mr. Fosdick, pointing to the dime.

The druggist rubbed his hands unctuously. "I'm sorry that we're out of seidlitz powders," he said, "but we have something just as good. We have——"

"Nothing but seidlitz," roared Mr. Snodgrass, giving way to one of his sudden outbursts.

The druggist smiled blandly. "How old is the patient?" he asked.

"It's a machine," cried Mr. Snodgrass.

"Ah, indeed," remarked the druggist, looking at Mr. Snodgrass queerly. "And may I ask what is the matter with it?"

"It won't go!" bellowed Mr. Snodgrass.

"Yes, yes," agreed the druggist, "it won't go," and he backed behind the counter and reached for the telephone. "I'll have a nice man in a pretty blue suit with bright brass buttons here in just a few minutes, and he will make your head stop aching," he promised them soothingly.

"You think we are crazy," accused Mr. Snodgrass.

"Oh, not at all," reassured the clerk. "You are just merely overheated."

Mr. Fosdick intervened: "The machine is an automobile run by carbonic acid gas," he explained, "and that's why we wanted the seidlitz powder."

A sigh of relief escaped the druggist. "Why didn't you say so at first?" he said. "I haven't had such a scare in years."

Mr. Fosdick explained the principle of the machine. Mr. Snodgrass bought a handful of cigars and gave the druggist one, who immediately put it back in stock and abstracted a dime out of the cash register, and good feeling was restored.

"As I understand it," said the druggist, "your machine generates gas in the same manner as a fire extinguisher or a soda-water charger."

"Precisely," agreed Mr. Fosdick.

"In that case," said the druggist, "you should use bicarbonate of soda and sulphuric acid."

Mr. Fosdick, with the invariable reluctance of all inventors to adopt the suggestions of outsiders, demurred. "It spoils the name of the machine," he said, "and the name is worth a million in itself."

But the druggist had caught the contagion of his own idea. Diving back again behind the prescription case he emerged with a carboy of acid and a large sack of bicarbonate. "Come on," he said, enthusiastically, "we'll give it a good dose."

Before Mr. Fosdick could remonstrate further the druggist had emptied a peck of the alkali into the mixing chamber and stood ready with the carboy of acid. "Get in the machine and get all ready to pull out," he said cheerfully, "for when I pour in the sulphuric the pressure will generate very quickly."

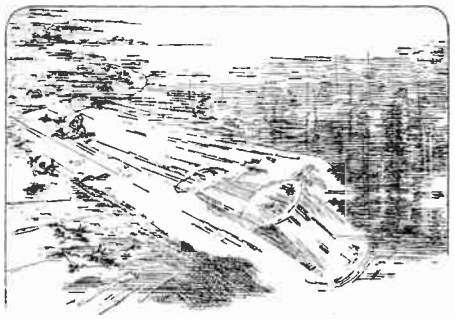
Mr. Snodgrass looked at Mr. Fosdick and Mr. Fosdick looked at Mr. Snodgrass.

"Hurry!" said the druggist.

There was a compelling ring in the apothecary's voice and slowly and with the greatest of reluctance the men climbed into the machine.

"I hope nothing happens," groaned Mr. Snodgrass.

Mr. Fosdick made no reply. Although his face was pale there was a set to his jaw that expressed a determination to stay with his machine to the end.



In seven of the nine towns it passed through it was reported as a comet.

No sooner were they seated than the druggist eagerly poured five gallons of acid and then quickly screwed down the cap.

There was a sudden click of the pressure gage and the hand flew around to the extreme limit.

"My God!" ejaculated Mr. Snodgrass. "The index shows the limit of the gage—six hunred pounds. At what point is your safety set?"

"There is no safety valve," confessed Mr. Fosdick weakly. "I didn't think it would be necessary."

"The pressure is fine!" exclaimed the druggist as his eye caught the gage. "And agitating the reservoir always increases the action of the acid," and catching hold of the wheel he gave the machine a vigorous shaking back and forth.

"Stop that!" screamed Mr. Fosdick. "Do you want to blow us up?"

The druggist suddenly stopped and scratched his chin. "I forgot something," he said cheerfully. "It is this: The acid will eat out your brass reservoir in a few minutes and will probably blow you into the next county."

"Here," yelled Mr. Snodgrass, "let me out," and he made a desperate effort to climb out of the machine.

But the frightened Mr. Fosdick knew there was but one thing to do and that was to reduce the pressure of the reservoir by exhausting the gas through the engine. With a sudden movement he threw the throttle wide open and then with the roar of a mogul engine the Seidlitzmobile took down the dusty road at better than a hundred mile an hour clip.

Never has there been such a ride chronicled in the annals of automobiling as the

World Radio History

maiden effort of the Seidlitzmobile. It made the ninety-three miles between Jonesboro and Smith's Corners in twenty-seven minutes, and in seven of the nine towns it passed through it was reported as a comet; the other two wired the weather bureau the visitation of that most unusual phenomenon of nature, a dry cloud-burst. As the machine tore its way across the state, spouting carbonic acid gas from its exhaust pipes, it asphyxiated thirty-seven dogs that endeavored to pursue it and killed all vegetation on both sides of the road for a distance of two hundred yards. Goose Creek, which paralleled the road for forty miles, ran pure soda-water for two weeks afterwards, and it cost Mr. Snodgrass seven thousand dollars to have the oxygen replaced in forty-three townships, which he did only after suit had been filed.

How far the machine would have traveled is difficult to determine, although old Prof. Snooks, Mr. Fosdick's implacable enemy, calculated that the Seidlitzmobile would have gone three and a fraction times around the earth before becoming winded. But as a matter of history it did not go this distance; it made one hundred and eleven miles before the druggist's prediction came true. At Smither's Junction the reservoir exploded. It wrecked a train of fifty-three box cars and changed the course of Wild Cat run. The concussion was felt in nine states and the seismograph at the University of Tokio reported an earthquake somewhere in the Aleutian Islands.

"No," replied the genius, "I have just thought of a new invention."

Mr. Snodgrass and Mr. Fosdick finally came to earth on a haystack in an adjoining township after having made an ascent of two hours and fifteen minutes, missing luncheon *en route*. The Aero Club of France, which sent a special representative to the spot, calculated their flight at something over two million kilometers and presented both men with a pilot's license and an honorary membership to the club and which, it must be told, they both refused, saying that their flight was unpremeditated and that they could not honorably accept.

When Mr. Snodgrass alighted upon the haystack he found that Mr. Fosdick had preceded him by some minutes. There was a dazed, dreamy look upon Mr. Fosdick's face that somewhat alarmed his companion.

"What's the matter, Fosdick?" he inquired, shaking him. "Are you unconscious?"

"No," replied the genius, coming out of his musing with an appreciable effort, "I have just thought of a new invention."

"Well, you can leave me out," retorted Mr. Snodgrass, sourly.

ELECTRIC HYGROMETER

On the surface of ordinary glass there is formed a liquid film that can be removed only by heating in vacuum. The reason for this formation seems to be in the chemical composition of the glass, which contains a hygroscopic material, or, in other words, material that attracts and holds moisture. The thickness of this liquid film varies with the percentage of moisture in the air.

This film is the reason that the charging of leyden jars or condenser plates can not be carried so far as the dielectric characteristic of the glass would seem to warrant; as there is passage of current from one coating to the other, over the glass, and the more so when the surrounding air is very damp. This fact has long been known, and based thereon there has been constructed a very simple hygrometer or hygroscope—that of Pionchon. As described in the *Central Zeitung für Optik und Mechanik*," it consists of a pane of common window glass covered all over with tin foil, except a strip in the middle, which is made chemically clean. Each edge of the foil-covered areas, is covered with a copper strip to facilitate electric connection. This apparatus is put in a 110-volt electric circuit in which there is also a galvanometer. The more moisture there is in the air, the more current will flow across the space between the strips. The galvanometer readings may be compared with the percentage indications of a standard hygrometer, and a table made; or the galvanometer may be graduated in percentages to correspond with the standard hygrometer.

NOT NEEDED

"Now they are trying to make the cactus edible."

"I don't think we need a vegetable shad."—*Washington Herald.*

World Radio History

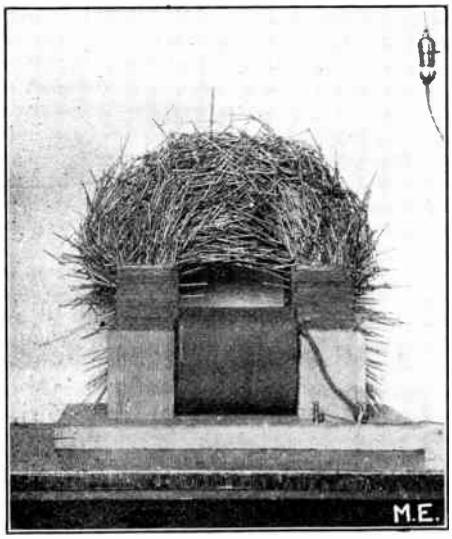
New Yorks Sky Line From Uptown

Photo N. Y. Edison Co.

Powerful Laboratory Electro-Magnet

By Stanley E. Hyde.

The two photographs herewith shown are of a laboratory electro-magnet which was constructed for experimental purposes. It is constructed of laminations of soft transformer iron and bolted together at the corners. On the leg was wound a large number of turns of No. 22 copper wire; it being designed to operate on 110 volts direct current. Fig. 1 shows the effect when half a keg of nails were dumped on to the pole pieces as the current was circulating through the magnet windings. This is a good example of the path taken by the lines of force as they flow from one pole to the other. Fig. 2 shows what happened when the current was suddenly switched off.



WITH CURRENT ON

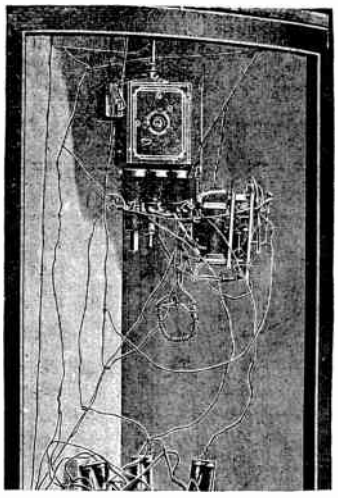
WITH CURRENT OFF

World Radio History

THE KLEPTOGRAPH OR ELECTRICAL THIEF CATCHER

By Robert Grimshaw

An Italian bank director, Signor Camusso in Pinerola, has invented what he calls a "Kleptograph," or thief-recorder, and which is here illustrated as it appears attached to the door of a safe. The illustration shows a photographic camera with a network of wires and subsidiary—or unsubsidiary—parts forming together an electric puzzle, calculated to distract even the elect. There is something diabolical in the appearance and performance of the apparatus. Everywhere that an intruder is likely to come,



the web of this spider lies. The burglar or sneak thief touches one of the numerous electric contacts, either unwillingly, or with the purpose of putting it out of operation—when *Presto!* the apparatus points its lens towards the spot where the disturbance of the wires has taken place, a magnesium flashlight illuminates the room, and the intruder's picture is impressed on the negative plate in the camera. The result is four-fold—the treasures are apt to remain undisturbed, the thief takes to flight, the later-developed portrait enables his detection and capture—and his punishment for the uncompleted crime is lighter than if he had been able to carry out fully his original intention.

X-RAY TUBE FOR HEAVY CURRENT WORK

In our October number in connection with Mr. Roeder's article, we showed a cut of an X-ray tube, having a platinum target attached to a heavy copper rod inside the bulb and which tended to conduct the heat away from the target and keep it cool to a certain extent.

We present herewith two cuts of a

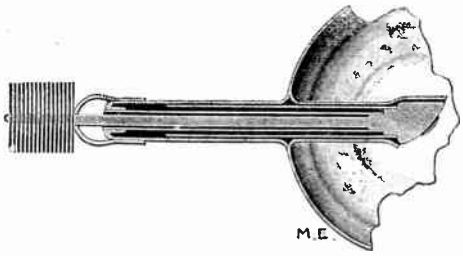


FIG. 1

new tube which has a tungsten target attached to a metal rod which is brought out through the neck of the tube and provided with radiators. Anyone familiar with the subject, will at once recognize the advantage of the new construction, for with the old arrangement, the heat had to be radiated through the glass forming the neck of the bulb, while in the present arrangement the heat is conducted directly to the outside air and the

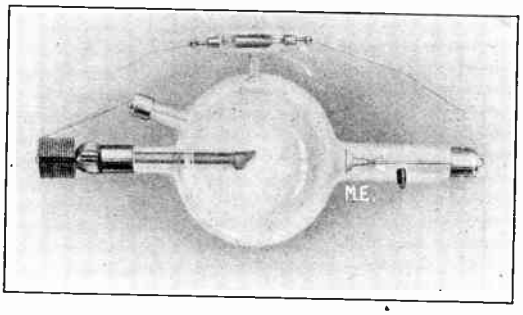


FIG. 2.

cooling is therefore much more effective. Fig. 1 shows a cross section of the new arrangement, while Fig. 2 shows the complete tube.

SAW HIM TOO

"Is Miss Browne in?"

Maid—"No, professor."

"But I just saw her at the window."

"Yes, and she saw you."—*Fliegende Blaetter.*

World Radio History

This Month's Cover

HANS CHRISTIAN OERSTED was born August 14, 1777, at Rudkjoebing, on the Danish Island, Langeland, where his father had a pharmacy.

Beginning with the year 1794 Oersted studied medicine at the University of Copenhagen and in the year 1799 he was promoted to doctor of philosophy. After he had traveled in the years 1801 to 1803 in France, Germany and Holland, he took up chemical and physical studies in earnest and in the year 1806 he was made professor of physics.

In the years 1813 and 1814 we find him on a second journey to Germany and during his stay in Berlin at that time he published an important work with the title "Views on the Chemical Natural Laws." This work, with the help of Marcel De Serres, was re-written and published in French, under the title of "Researches on the Identity of the Electric and Chemical Forces."

HANS CHRISTIAN OERSTED.

After this first step he came to England and after his return, in the year 1824, to Copenhagen, founded a society for spreading the study of natural history. Five years after this he accepted the position of director at the Polytechnic Institute.

His most brilliant discovery, that of electromagnetism was made in the year 1819.

It is said that Oersted made this discovery purely by chance. It has been ascertained that Oersted had been working with a Galvanic pile while, at the same time there was a magnetic needle on the table, and as often as the current was sent through the wire, the needle was deflected from its original position. While this was, perhaps, pure chance, and while the experiment had not been made purposely, Oersted's work, just the same, has the greatest merit, inasmuch as he himself had long thought, in connection with Whewell, that there must be a certain relation between electricity and magnetism. Oertsed had worked long and hard on the problem and perhaps more so than any other man in Europe.

This is proven by the fact that in the year 1807 he had published a paper in which he said, "That for a long time he had believed that electricity in a certain shape or manner, would perhaps have an action on the magnet." Therefore, his discovery is the natural result of his work and it is almost certain that had he not made the discovery by chance, he would, no doubt have invented electromagnetism sooner or later, by cold reasoning.

From 1824 until his death, October 9, 1851, Oersted was a member of the Paris Academy. Contrary to most of the great natural philosophers, he was a very cultured man, which perhaps might be attributed to the beneficial influence of his friend Oehlenschlaeger.

Thus he published many papers on the relation of the natural sciences to poetic art and religion, speeches, poetry, etc.

World Radio History

MODERN ELECTRICS

A Magazine devoted entirely to the Electrical Arts.

H. GERNSBACK, Editor

C. A. LeQUESNE, Jr., Assistant Editor

O. J. RIDENOUR, Business Manager

Subscription Price: For U. S. and Mexico $1.50 per year, payable in advance.

New York City and Canada, $1.85.
Foreign Countries, $2.00 in Gold.

Checks on out of town Banks cannot be accepted unless the usual exchange is added.

SINGLE COPY, 15 CENTS

Forms close the 1st of the month preceding date of publication. Advertising rates on application.

The Editor will be pleased to receive original contributions of timely interest pertaining to the electrical and the affiliated arts. Articles with good drawings and clear photographs especially desired. If accepted, such articles will be paid for on publication, at regular rates.

No manuscripts will be returned unless return postage is enclosed.

Address all communications to:

MODERN PUBLISHING CO.
231 Fulton Street, New York, N. Y.

Chicago Office: 1106 Trude Bldg.
Paris Office: 12 Boulevard Arago
Brussels Office: 23 Rue Henri Maus

MODERN ELECTRICS may be had at all news stands in the United States and Canada, also at Brentano's, 37 Avenue de l'Opera, Paris.

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H. GERNSBACK - - President and Secretary
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Entered as second class matter March 31, 1908, at the New York Post Office, under the Act of Congress of March 3, 1879.

Vol. V. NOVEMBER No. 8

EDITORIAL

ELSEWHERE we print a letter from one of our readers and we are publishing the letter in full, as it is one of the most interesting that has reached us for some time.

Through letters of this sort we are enabled to give our readers a better magazine, as we naturally do not know what the majority wishes to read, unless our readers tell us their likes and dislikes themselves.

We think that the points covered in our reader's letter are well taken and in most points cover our own ideas. We would, however, like to hear from more of our friends, as we have striven hard to satisfy everybody, and think we can do so with the proper co-operation of the majority. It costs very little to write us a letter giving us your views, and the benefits which you will derive therefrom are incalculable to yourself, as the Editors when groping in the dark can naturally not do as good work as if they work with their eyes open, having a guide to go by, as to what to print and what not to print.

In 1908 when this magazine was started the Editor adopted the motto:

"Print what readers want, not merely what strikes the Editor's fancy." This policy we have pursued all these years, and we think we have been more or less successful. However, as the case stands, it seems the tastes of the readers are changing more or less, and, for this reason, only by hearing continuously from our readers themselves, can we hope to fully satisfy them in all respects.

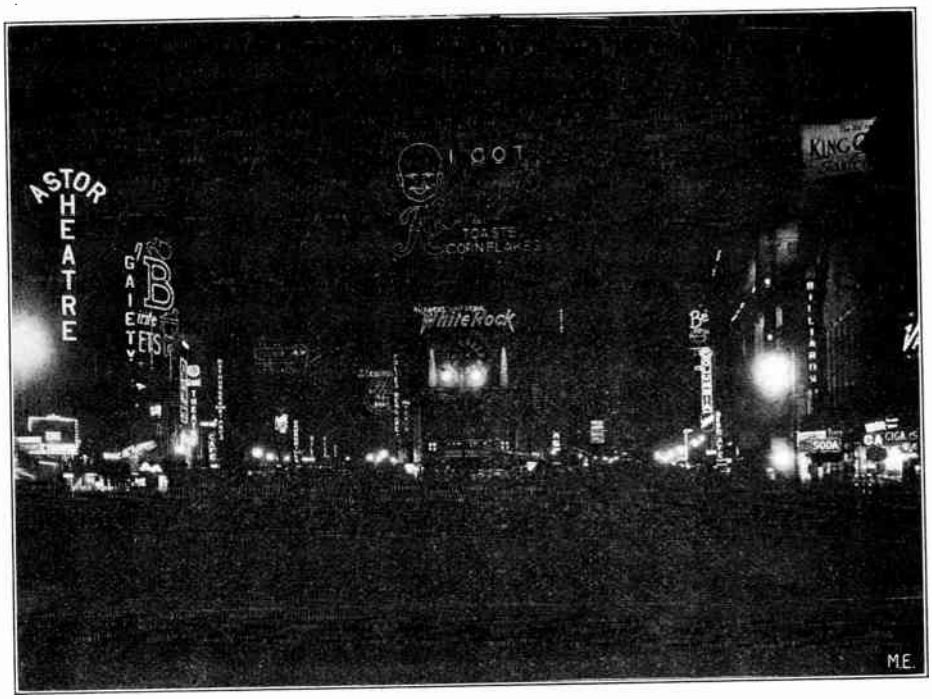
Of course, it is impossible to please everybody, but in a magazine of the size of *Modern Electrics* it is easy enough to have various departments so that when two readers of diametrically opposed views on certain subjects pick up the same issue, both will be surely satisfied, as each will find material enough in the magazine that ought to satisfy them.

We think we have a happy medium just now, and think that the many departments which we offer should satisfy the most exacting. At the same time, we would like to hear more from our readers and shall be only too pleased to receive more letters, such as the one we are publishing, as they can only help to make *Modern Electrics* a greater magazine.

If you have not the time to write a long letter, a postal card will do.

World Radio History

Along The Great White Way



When we wrote for a photograph of the Kellogg Toasted Corn Flake sign, we did not expect to get a picture of most of the Great White Way, but such seems to be the case and here it is.

In addition to the Kellogg sign will be seen the Spearmint Chewing Gum sign, which we showed last month, as well as a number of others, but the following description refers exclusively to the Kellogg sign:

The sign itself is 85 feet high by 106 feet long; the baby's head is 40 feet high, as is also the letter, K, in Kellogg; the l and g are each 32 feet high, and the e, o and s, each 18 feet high. The total number of lamps is 4,050 and the complete sign and its framework weigh 80 tons. Six mammoth trusses were necessary to distribute the weight and the wind stresses over the main girders and roof supports of the building.

In action the sign shows first the baby crying with the mouth making spasmodic movements and tears running down his face. At the same time the words, "I want Kellogg's Toasted Corn Flakes" appears. The sign then changes, the baby smiles and the words "I want" change to "I got," as shown in the photograph.

This sign is located on the top of the Mecca Building, at 48th street and Broadway, and can be seen for blocks and blocks downtown.

This is said to be the largest electric sign in existence at the present time.

KNAPSACK WIRLESS KITS

One of the latest developments in radio-communication is a complete wireless installation which can be carried in the knapsacks of four men, as adopted by the British army. The portable tubular mast is about 30 ft. in height and is made chiefly of aluminum to reduce its weight. The knapsack stations have a range of about 10 miles.

World Radio History

Simple Experiments in Alternating Currents

(Continued)

By P. Mertz

Mercury Arc Rectifier

22. When a greater amount of A. C. is required to be rectified than the electrolytic rectifier can safely withstand, the *mercury-arc rectifier (sometimes known as mercury-vapor converter)* is used.

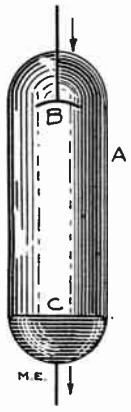


FIG. 42

FIG. 43

On account of the necessity of using full-sized apparatus, together with a corresponding amount of electric current to be able to perform experiments with this device, these are very difficult and beyond the scope of this article; consequently none will be described. However, the mercury-arc rectifier is too important a piece of apparatus to pass by here without explaining its construction and operation. The principle on which it is based is as follows:

Suppose we have an evacuated glass tube, A, Fig. 42, in which at one end is sealed an iron electrode, B; while at the other end is a mercury electrode, C, connected in some manner to an outside wire. If we connect the two wires to a source of low voltage current, the circuit will, of course, be open. However, when we tilt the tube, A, so that the mercury, C, makes contact with, B; and then straighten it again, an arc will be formed, provided the current flows in the direction of the arrows. If it tries to flow in the opposite direction, there will be no arc formed; and, if at any time the current decreases to zero (as would an alternating current at every alternation) the arc will be extinguished. The former property is analogous to that of asymmetry in aluminum (except that in this case the electrolyte is a vapor instead of a liquid) and would enable us to use the device as a rectifier in this simple form, were it not for the second property. To overcome the latter, the shape of the tube, A, must be altered and two mercury electrodes used, as shown in Fig. 43, the arc being formed between them when starting. One of these need not be made as large as the other, as it does not carry the line current in addition to that used for maintaining the arc; it is usually known as the *supplementary starting electrode.*

It will be remarked that when arranged thus, the rectifier uses only half each cycle of the alternating current and

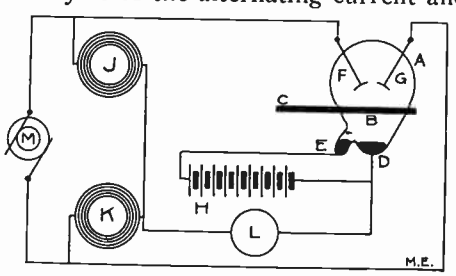


FIG 44

thus cannot have an efficiency of over 50 per cent. This can be overcome by using four cells as was described with the electrolytic rectifier,* but a much simpler method is shown in Fig. 44. Here the glass containing vessel is in the form of a bulb, A, pivoted at B, and arranged so that it can be tilted by an arm, C. Two iron (or, if the current to be rectified is over ten amperes, carbon) electrodes, F and G, are used instead of one as before. D, and E, are the mercury electrodes, H is the battery or D. C. dynamo for keeping up the arc, J and K are choke coils, having a high self-induction with low resistance, M is the A. C. generator, while L is the apparatus to be supplied

* See p 700, October issue.

World Radio History

with direct current. The operation of the rectifier is as follows:

When the bulb, A, is tilted, the circuit *H E D H* is completed between the electrodes D and E. When the bulb is righted again, an arc is formed between D and E, keeping the circuit *H E D H* closed, but also giving off some mercury vapor.

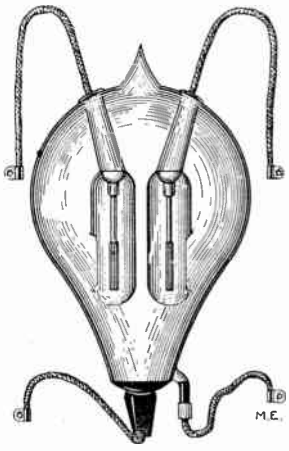


FIG. 45

This starts an arc with the upper electrodes, and completes either of circuits *MGDLJM* or *MFDLKM*, depending on which part of the A. C. cycle is being generated, by M, at that particular moment. In either case current flows through L in the same direction. It therefore follows that the current always flows through L in that direction, since it does so at any part of any cycle.

It might, at first thought, be believed that the current would take the path *MJKM*, instead of flowing through the arc, but, if it should flow through that path, it would not be rectified, and hence would still be alternating; so that the high inductance of J and K would choke it back and practically open the circuit. On the other hand, when flowing through the arc, it is rectified to direct current, so that it has no difficult in flowing through either choke-coil.

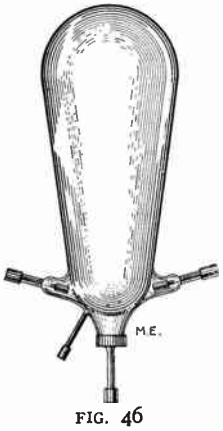


FIG. 46

The arm, C, is generally attached to the core of a solenoid, so that the bulb can be automatically tilted by means of a switch. In Fig. 45 is shown a perspective view of the bulb without its attachments. The iron (or carbon) electrodes are arranged in bottle-shaped glass vessels to prevent any possibility of an arc being formed between them; a hole is left in the vessels, however, in order not to stop the arc between the iron and the mercury electrodes. When the current to be handled is not very strong, the bulb is often made of the shape shown in Fig. 46, and no bottle-shaped vessels are placed over the electrodes.

The advantage of the mercury arc rectifier over the rotary converter is that, for currents of ordinary stength, the efficiency is higher, besides, there are no moving parts, costly windings of field and armature, etc. Its advantage over the electrolytic rectifier is that it can handle a much larger current without overheating because the greater the heat, the greater the quantity of mercury vapor generated and therefore the greater the carrying capacity.

23. It might now be interesting to compare the nature of the direct current

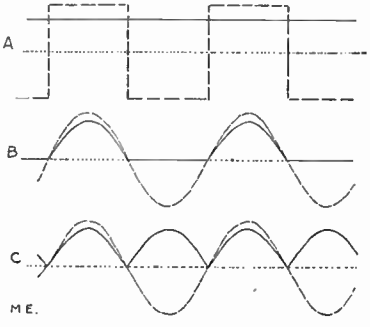


FIG. 47

given by the rectifiers just described. The rotary converter* gives a current curve about like that shown by the full lines at A, Fig. 47, if the alternating current supplied to it is as represented by the dashed lines (the mechanical converter,† which was used with the experiment, gives that curve). The converter acts somewhat like a reversing switch, which reverses every time the current reverses. For this reason, if the A. C. supplied to it has a true sine curve (dashed lines, B, Fig. 47), the D. C. curve will be more wavy than the one shown. The waviness disappears, however, in proportion to the number of segments on the commutator of the rotary converter.

The direct current curve given by a

† See p. 155, May issue.

* See p. 698, October issue.

World Radio History

single cell electrolytic rectifier* is shown by the full lines at B. The current flowing through the rectifier at each instant is proportional to the current fed in (the difference being due to losses through resistance) during the positive portion of the cycle, but remains at zero during the whole negative half-cycle.

With the four-cell electrolytic, or mercury-arc rectifier the curve (C, Fig. 47) is the same as before for the positive half-cycle, but does not stay at zero dur-

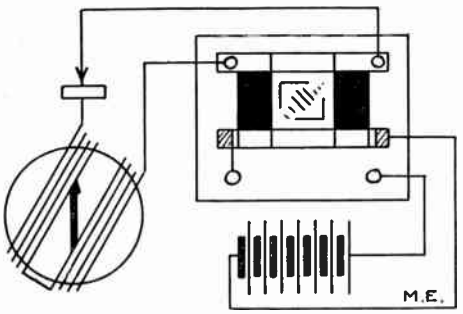


FIG. 48

ing the negative half-cycle. Instead, it forms a curve equal to and on the same side of the zero line as the positive half-cycle curve. Thus a pulsating direct current is produced, the pulsation being twice as frequent as when the single cell electrolytic rectifier is used.

The actual per cent. of efficiency in each of the above curves can be found by the formula

$$e = \frac{100\,a}{A}$$

where e equals the per cent. efficiency; a, equals the sum of the areas (in a given number of cycles) enclosed by the full and dotted lines; and A, equals the sum of the areas (in the same number of cycles) enclosed by the dashed and dotted lines.

You will see from what has just been said that the single cell electrolytic rectifier is the least efficient of all, besides giving a pulsating current; the rotary converter is not so efficient as the four-cell electrolytic or mercury-arc rectifier (that is, for small current; for large currents it is more efficient) but gives a steadier current.

24. Besides being used for power purposes, rectifiers are used as detectors in wireless telegraphy. Those that have been described up to this time in this article are not, however, suitable for this kind of work. Instead a device consisting of a piece of one of a certain class of minerals in the crystallized form held between two electrodes is used. One of the electrodes has a very large area of contact, while the other has a very small one. This combination has been found to act better as a rectifier, when the small electrode is on some points of the mineral than on others.

In order to prove that a detector of this type is really a rectifier, you can connect it in place of the electrolytic rectifier in the experiment described with the latter.† The connections for convenience, are repeated in Fig. 48. You will see that the same thing will happen as did with the electrolytic rectifier; except that the resistance of the detector being very high, a good number of cells of battery must be used to affect the compass. The part played by a rectifying detector in the reception of wireless signals is as follows:

The signals are received from the antenna in the form of high frequency oscillations. These, on account of the high self-induction of the telephone receivers (or any other apparatus that may be used), are unable to flow through them.

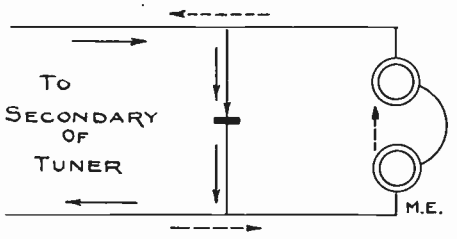


FIG. 49

If, however, we put a rectifer (the detector) in series with the receivers, the oscillations are rectified to a pulsating direct current. Inasmuch as direct current, even when pulsating, cannot be entirely choked back by mere self-induction, it is now able to produce a sound in the telephone receivers.

This method of connecting the detector is not very good, because the latter has a very high resistance. By connecting it in series we, therefore, diminish the already very weak current, which in turn decreases the receiving radius. If,

* See p. 699, October issue.

† See p. 699, October issue.

(*Continued on page* 835.)

World Radio History

The Automatic Telephone System

H. Winfield Secor

After the invention of the telephone by Alexander Graham Bell and its introduction to the public in 1876, at the Centennial Exposition in Philadelphia, the problem which presented itself was how to arrange the various stations of a system, so that any subscriber could readily talk to any other subscriber. The most feasible manner of accomplishing this end, appeared to be that of bringing the two wires from each subscriber's station to some central point, later termed an exchange. At the exchange flexible wires or cords enabled any two parties to be connected together, the operation of connecting the necessary circuits being done manually, as is still the case in most of the highly perfected central exchanges at the present time.

In the early exchanges the operators were boys, and due to the type of switchboards then in use, it was necessary for the boy receiving the desired number from the calling subscriber, to shout the number across the room to another boy, who then plugged the tie cable of the exchange into the jack of the desired subscriber. As will be apparent, this state of affairs did not prove conducive to the smoothest running of the exchange or in the service rendered. The exchange, in those palmy days, was nothing else but a perfect bedlam of noise and confusion, whereas the present central office, is a perfect model of cleanliness, quietness, and good manners. All this difference was brought about by substituting girls for boys, and it must be said that the girl and the telephone seemed to harmonize wonderfully well from the start. This is made more forcefully evident, when it is cited that a call is now put through in 15 seconds, coupled with "Number, please?" whereas, in the age of boy centrals, it meant about 14 cuss words and 300 seconds. A common retort of the boys to an irritable subscriber was, "Ah, keep your shirt on," or some similar slang phrase. Yes, the girl central of today, seems about as near perfect as a human being can be, in view of the fact that she answers our call signal in 3½ seconds, and connects us with the desired party in from 10 to 15 seconds. In the busy exchanges of large cities, the connection is often put through in 5 to 6 seconds. Long distance calls, requiring to be relayed through several exchanges, as for instance, a call from Boston to

FIG. I.—THE SUBSCRIBER'S INSTRUMENT

Denver, Colo., requires a longer period of time. This distance is about as far as telephone talk can be carried now, and is only made possible by the use of "Pupin coils," invented by Prof. Michael I. Pupin, of Columbia University.

Notwithstanding all the good points of the modified and perfected telephone exchange, that have constantly multiplied themselves, year by year, there were a few engineers and inventors who maintained that the best and most practical form of telephone exchange was that void of any human element in its operation; in other words, a mechanical and electrical device, which should automatically make the necessary connections whenever a subscriber actuated his instrument.

Only three years after the demonstra-

World Radio History

tion of the telephone by Bell, in 1876, a patent on an automatic telephone switchboard was granted to Messrs. M. D. Connolly, of Philadelphia; T. A. Connolly, of Washington, D. C., and T. J. McTighe, of Pittsburgh, Pa. Their apparatus, however, did not prove a success commercially. Several other undaunted inventors worked along this line, with the

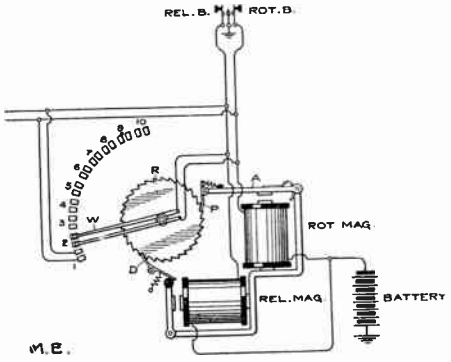


FIG. 2

consequence that there are at present several automatic telephone systems on the market, but it may be said that only one has attained any degree of commercial prominence. This is the full automatic system, invented by A. B. Strowger, who was an undertaker in Kansas City, Mo. The company manufacturing and installing this system is known as The Automatic Electric Company, of Chicago, Ill., and although it is not generally known, the city of Chicago, herself, has a competitor to the Bell company in the automatic telephone. The automatic system has been adopted after exhaustive tests, in some of the leading cities of this country and abroad. Among some of the larger successful automatic exchanges in use, are those at Los Angeles, Cal.; Portland, Ore.; Oakland, Cal.; Omaha, Neb.; Grand Rapids, Mich.; Sioux City, Ia.; Columbus, Ohio; Dayton, Ohio; Wilmington, Del.

While to the layman the automatic telephone switchboard may appear to be about the most complicated contraption ever invented, it is not, and in the perfected type now on the market, its functions are performed with marvelous precision and accuracy.

As is generally understood, in the present exchange, there is a pair of copper wires running to each subscriber, either directly or indirectly, and connection between any two parties is effected by joining the individual circuits, and promptly separating or breaking them at the end of the conversation. Of course, the subscriber has nothing to do in this matter, but to give the desired number to central, who effects the connection.

The automatic system, as might be supposed, must have some arrangement at the subscriber's end of the line, by which he can call the party desired. This formerly took the shape of special push buttons, but a very much more satisfactory and positive device now does the calling. This is shown, as a numbered dial, secured to the base of the desk telephone in Fig. 1. The numbers around the edge of the dial range from 0 to 9, thus enabling any combination of figures to be selected. The neat dial on the front of the telephone is all that the subscriber sees, but quite a wonderful mechanism is attached to that little dial, which is hidden inside the instrument. At the edge of the dial, as seen, there is a little fixed hook or protruding finger stop. In calling a number, the finger is placed in one of the openings in the perforated upper dial, directly above the specific number; then the dial is rotated in the clockwise direction toward the fixed stop

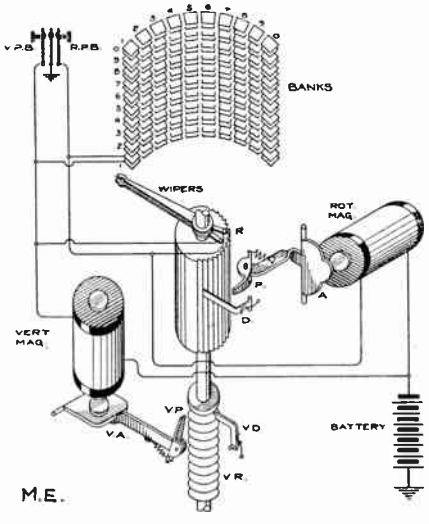


FIG. 3

aforementioned, when the finger is removed. Then the dial, propelled by a spring mechanism, flies back to its nor-

World Radio History

mal position, but in so doing a toothed segment, rotating with the dial, makes a certain number of electrical contacts, corresponding to the number at which the dial was released. Thus, if the dial was released with the finger in hole number 7, then when it turned back its segment and contacts would send 7 distinct electrical impulses over the line to the central exchange, where a special electromagnetic selecting device moves contacting fingers over certain contacts suitably arranged, making the connection to the desired circuit. The calling of any number made up of more than one digit, is accomplished by inserting the finger in the dial, rotating it to the fixed stop, and releasing it, for each number in succession.

The details of the automatic selector at the exchange will be understood from the following: In the drawing, Fig. 2, is represented a simple selector or circuit finder, for an exchange of 10 subscribers. The 10 subscribers' lines or circuits terminate in the 10 pairs of metal plates or "bank contacts," arranged in the arc of a circle, and numbered from 1 to 10, respectively. A ratchet wheel, R, is arranged with its center at the center of

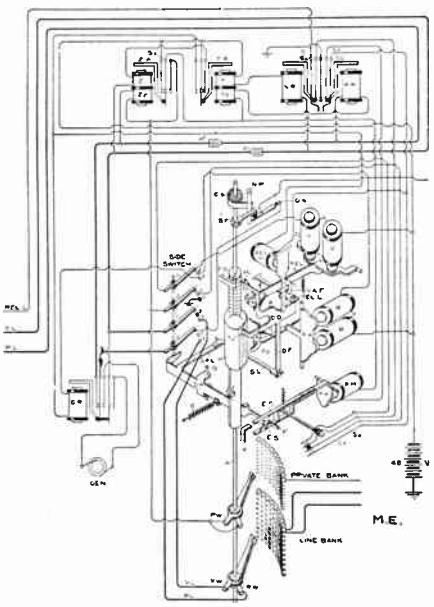


FIG. 4

this arc of contacts, and carries a pair of springs, W, technically termed a wiper. The line of subscriber No. 1, for instance, by whom it is supposed that this machine is used, is represented as being connected not only to the first pair

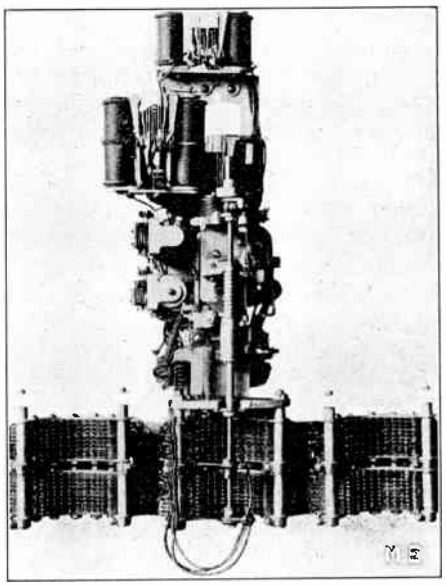


FIG. 5.—THE AUTOMATIC "OPERATOR"

of "bank contacts," but also to the wiper, W; to the rotary magnets, and to the release and rotary push buttons.

Now suppose that subscriber No. 1 wishes to connect to line No. 2. To do this, he presses twice (theoretically speaking), the rotary push button (Rot. B, in drawing), located at his telephone. This closes a circuit from the battery through the rotary magnet. Each time that this circuit is completed the rotary magnet is energized and attracts its armature, A. This armature, in turn, carries at the end of its arm, the pawl or finger, P, which engages the ratchet wheel, R, and moves it, and with it the wiper, W, one step each time that the armature is attracted. Consequently, when A has been attracted and released twice in succession, the wiper, W, will have been moved from its normal position at the left of the first pair of contacts, and will rest upon pair No. 2, of the "bank contacts," thereby bridging the gap between the terminals of line No. 1 and line No. 2. By means not shown in this diagram, subscriber No. 2 will be signaled and called to answer his telephone.

The arrangement of the apparatus is such that when the conversation is fin-

World Radio History

ished, and calling subscriber No. 1, hangs up his receiver, the release magnet (Rel. Mag. in cut), will be momentarily energized, and so attract its armature, thus pulling the retaining dog, D, out of engagement with the ratchet-wheel, which is then instantaneously returned to its normal position by means of a clock-spring. This release is here shown as if actuated by the push button, Rel. B. In a similar manner, subscriber No. 1 could readily call any of the ten subscribers on the system, also any of the other parties could, by using their own machine call line No. 1. This explanation, though simple, shows the principle upon which the more complicated selectors or electromagnetic switches in the larger exchanges operate. The proper sequence of electrical impulses for the actuating of the rotary control magnet, is automatically sent by the spring propelled drum and dial at the subscriber's instrument.

Of course, in commercial automatic telephony, no such simple selector for picking out the connections, is used, although the basic principle remains the same. We can next tackle a selector switch similar to that actually used, for a 100 subscriber exchange. The details of the selector mechanism are illustrated in Fig. 3. The line terminals, to the number of 100, will now fill ten "bank rows," with ten pairs of contacts in each horizontal row. These are represented by *Banks,* in diagram. The ten rows are superimposed one above the other. The number of the line connected to the first pair of contacts in the first or lower row, would be 11; the number of the line connected to the second contact in this row would be 12; the next 13, etc. The number of the line connected to the second pair of

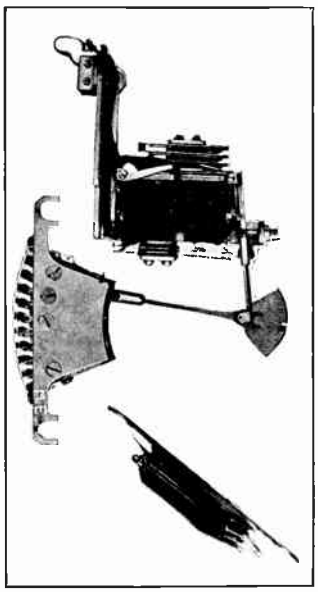


FIG. 6

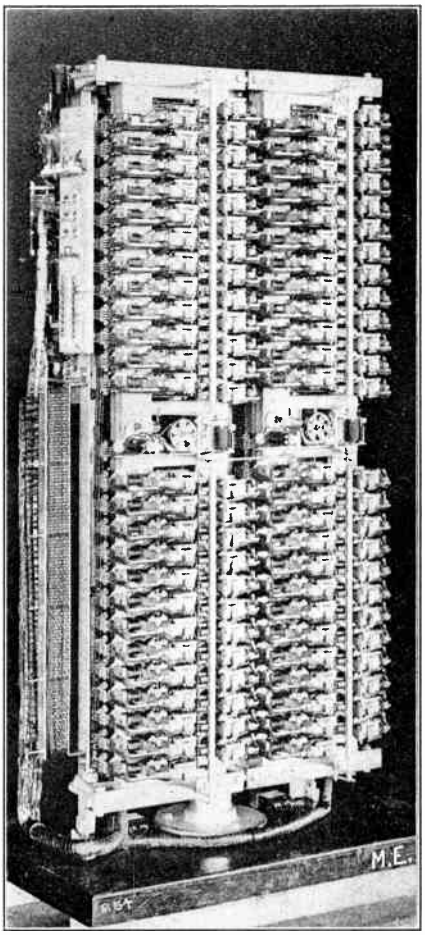


FIG. 7

contacts in the second row from the bottom would be 22, etc. It is evident from this arrangement, that in a system of 100 lines every subscriber's number would contain two digits; the first digit would indicate in which horizontal row of bank contacts his line terminal could be found, and the second digit indicating the exact pair of contacts in this row.

An idea of the method pursued in obtaining a certain connection in a system of this capacity (100 subscribers), may be gleaned by considering that each subscriber's circuit or line of two wires is connected to a pair of "bank contacts," and to a connecting machine, technically termed a "connector switch,"

World Radio History

somewhat after the fashion depicted in the cut, mentioned above, which shows the connections for station No. 11. The important feature of the connector switch is the ratchet-wheel or hub, R, which carries the wiper, W, already mentioned in the first diagram.

The actuating rotary magnet is represented as Rot. Mag., with its armature at A, and pawl, P; also the dog, D, for the retention of the ratchet after each rotary step. The shaft upon which the ratchet, R, is mounted, is extended and carries another ratchet, V R, called the "vertical ratchet." The vertical magnet is adapted to attract the vertical armature, V A, which carries on its end the pawl, V P, arranged to engage the vertical ratchet, and to raise the shaft. By means of it, the wiper is raised automatically one step, whenever the magnet attracts its armature. The vertical dog, V D, is adapted to drop into place each time the ratchet is raised one step and thus retain the wiper in position.

It is thus seen, that by means of the vertical pawl and ratchet, the wiper may be raised to a point opposite any one of the ten horizontal rows of "bank contact pairs." Then, by actuating the rotary pawl and ratchet the shaft may be rotated until the wiper rests on any desired pair of bank contacts in that horizontal row. Thus, if the vertical magnet should be intermittently energized three times and the rotary magnet five times, the wiper would be raised to the third row of bank contacts and rotated five steps, in this manner connecting line No. 11 to line No. 35. The apparatus, of course, is so arranged that subscriber No. 11 may intermittently energize the vertical and rotary magnets and control the movements of the wiper, by turning the dial on his telephone, as has already been explained.

The subscriber is, therefore, in a position to operate his connector switch, so as to place the wiper on the bank contacts of any one of the 100 lines terminating in the group. In addition to the mech-

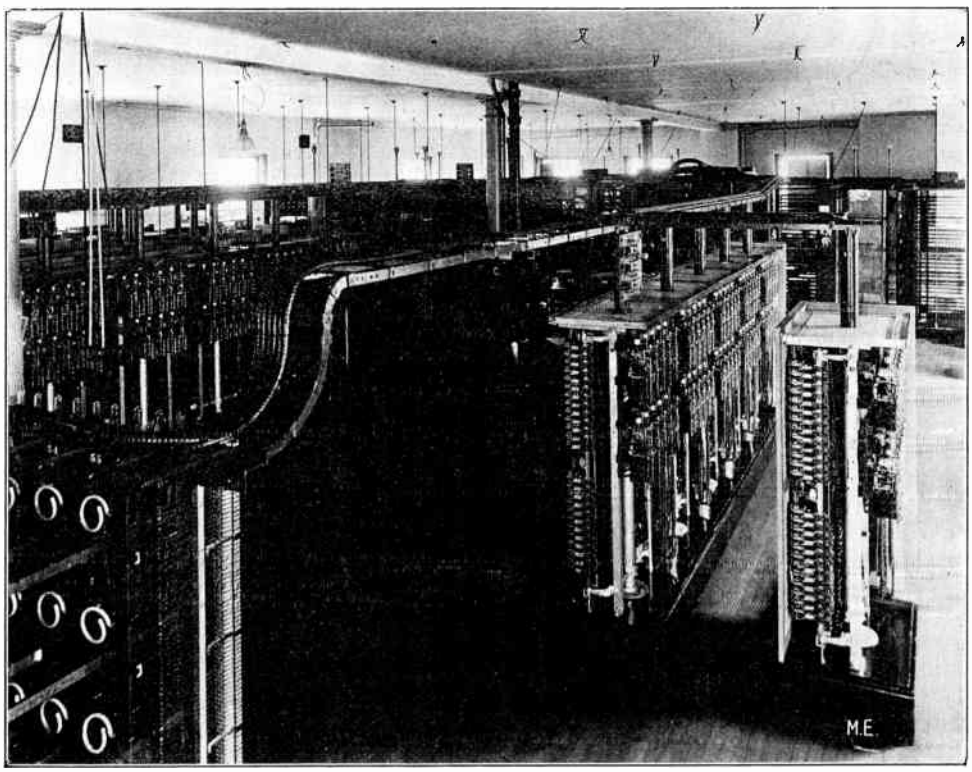


FIG. 8.—AUTOMATIC TELEPHONE EXCHANGE AT HURON, SOUTH DAKOTA "NOT A GIRL IN SIGHT"

World Radio History

anism depicted in the drawing, means are also provided for the subscriber to signal any other subscriber, with whom he connects and talk with him. Besides, this there are also provided means, so that when a conversation is completed and the subscriber restores his receiver to the switch-hook, the dogs, V D, and D, will be withdrawn, and the shaft carrying the wiper and ratchets will be returned to its normal position by the action of a clock spring and gravity.

In reality, however, the circuits and mechanism of the connector switch are more complex than those shown here, but these are sufficient for explanatory purposes. A drawing of the mechanical parts and actual circuits of a connector switch commonly employed is shown in Fig. 4. The half tone cut of same is seen in Fig. 5, which shows two banks of contacts, and two wipers on the vertical shaft. This arrangement is made for several reasons which are not necessary to explain here. It works the same as the single bank type.

In the commercial automatic exchange there is not simply one connector switch to a subscriber, but several of them, the operation of one being interdependent upon the preceeding one. The time taken in the selection and ringing up of the desired party through the medium of line switch, first selector, second selector and connector, four in all, was found to be between 8 and 9 seconds, in a recent test made by the author, which compares favorably with manual exchange performance.

In this case, also, the subscriber calling, first actuates by means of his dial switch, a special "line switch," designed and perfected by Mr. A. E. Keith, chief electrical engineer for the Automatic Electric Company. The appearance of this line switch, which is the first selector actuated in making a call, is shown in Fig. 6; while Fig. 7 shows a Keith 100 subscriber automatic switchboard unit complete with line switches and connector switches, the latter being secured to the rear of the board and are thus not visible in the photograph.

In general, it may be said that in the automatic telephone exchange, it is not necessary to have connector switches for every subscriber, but just sufficient to handle the calls at the busiest period of the day. Usually 10 per cent. of the total number of subscribers, is taken as the proper number of connector switches to employ, but these may be augmented so that the ratio is 20 per cent. or more. In the first case, 10 per cent. of all the subscribers could talk at once and in the latter case, 20 per cent. of them could converse at the same time.

A view of a large full automatic telephone exchange, that at Huron, South Dakota, is illustrated in Fig. 8, and it is perceived at a glance just what it means. An exchange of the size shown, capable of caring for several thousand subscribers, requires not more than two men to watch it, in case of trouble, and no girl operators are in evidence. Hence, the successful operation of the automatic telephone exchange means that in a few years possibly, the *"central"* with the gentle voice, will be no more. Many of us will undoubtedly bless the growth of the automatic, for then there will be no cause to growl, "Central, get off that line"!! and no wrong numbers, either, for this wonder of modern science knows not the word mistake.

EQUIPMENT FOR NEW WIRELESS STATIONS

The Marconi Wireless Telegraph Company of America is building three 50-kw. radio-telegraphic sets for the United Fruit Company for the stations at Santa Marta, Swan Island, and New Orleans. Each station will have four hollow steel masts 300 feet high with a 10-foot wood mast at the top. The masts are of pressed steel. Each section is 10 feet long made up of two half cylinders bolted together. The bolt flanges of each section are at right angles to the flanges of the adjacent sections.

The parts are cut to fit so the erection consists in pulling up the half cylinders with a hoist, the men in the platform easily swing them in place and bolt them fast.

Five hundred cycle alternating current and a rotary spark gap will be used in an endeavor to provide a note that will not be interfered with by tropical atmospheric discharges. These stations are intended for day and night service the year around.

World Radio History

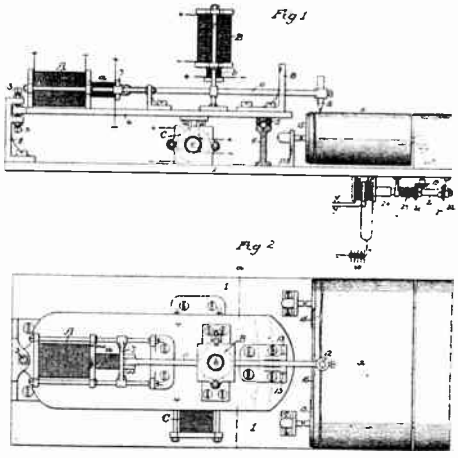
ROBERT T. FRAZIER, JR., OF WASHINGTON, D. C., HAS BEEN GRANTED PATENT NO. 1,035,568 FOR A TELAUTOGRAPH.

This invention relates to a new telautograph which is an instrument to write or draw at a distance. Although there have been several such instruments patented, we believe the present invention to have some unusual merits and will probably be adopted at a not too distant date.

In the language of the inventor we quote as follows:

"My invention consists of a simple and accurate form of telautograph, the operation of which is based upon the principle that a current of electricity will be induced in a hollow coil of wire by a solenoid magnet in direct proportion to the depth of penetration of the latter into the bore of the former, and upon the further principle that any known character or combination of lines can be produced by three motions, which may, for convenience, be termed longitudinal, corresponding to the motion from top to bottom of the character, lateral, corresponding to motion from side to side of the character, and vertical, corresponding to the motion whereby the pen, pencil, stylus, or other inscribing instrument is lifted from the paper or other surface upon which the character is being formed. In adapting these principles to the purposes of a telautograph I connect the stylus of the transmitting instrument to three primary magnets, susceptible, respectively, of longitudinal, lateral and vertical movement, each movement of the stylus varying the relation of the corresponding primary magnet in respect to a secondary magnet and consequently varying the strength of the current induced in the latter. These secondary currents are transmitted to magnets at the receiving station, these magnets having armatures which are connected to the reproducing stylus in the same manner that the primary magnets are connected to the inscribing stylus of the transmitting instrument, and said armatures being attracted by the magnets of the receiving instrument in direct ratio to the strength of the secondary current induced in the corresponding magnet of the transmitting instrument, whereby the movements of both transmitting and receiving styluses will be precisely alike."

From our illustrations it will be seen that there are three coils, a, b, c, which are connected together mechanically by means of a lever, 11, which moves the solenoids, a, b, c. From our illustrations, which are quite clear, it will be seen that any movement of the stylus, 12, will be transmitted to one or more of the three solenoids, which, in turn, change the current, in the magnetic spools, A, B, C. The receiving apparatus is almost identical with the sending apparatus, and it



is obvious that any movement of the stylus, 12, will be reproduced on the receiving instrument in the same manner as the stylus, 12, moves in the transmitting apparatus.

The patent specification makes good reading to people interested in this device, and they should get a copy of the patent by all means.

WILLIAM A. SPIEGEL, OF NEW YORK, HAS BEEN GRANTED PATENT NO. 1,038,506, FOR APPARATUS FOR AERIAL SIGNALING AND SIMILAR PURPOSES.

The present invention relates to signaling device for use in the upper atmosphere and means for supporting the same.

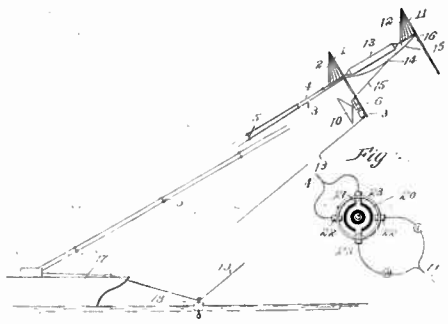
We quote:

"In view of the perfection of flying machines and their proposed use in warfare, it becomes important to devise means for obtaining information of the approach of such machines at night time and of destroying the same. As it is well known that sounds travel far in the quiet rarefied regions of the atmosphere, I propose to mount a tele-

World Radio History

phone transmitter on a kite or kites, and connect same with the ship or fortification below, so that the noise of the motor of an approaching aeroplane can be heard at a great distance and its position located and means for destroying it put into operation.

To the parachute kite may also be attached the antennae of a wireless telegraph apparatus, so obtaining an unusual height of exposure of such antennae. Such an apparatus is illustrated in Fig. 3, where 11 is a second kite having its parachute 12 connected to kite 1, by the antennae 13. The cord 3 of the first kite passes through it



and has a button 14 on the other side. From the point 14 the cord 3 continues as a conductor 15 passing through a block or ring 16 on kite 11, back to the parachute 12. The conductor 15 continues to the ground, or ship 17, as shown at 19. If used in connection with a ship 17, it is preferably passed through a float 18 to prevent its fouling the ship's rigging. The telephone transmitter 6 and dynamite cartridge 9 may then be mounted on kite 1 as before and connected to conductor 15—19. Cord 4 which is connected direct to parachute 2, and through antennae 13 to parachute 12, is made of conducting material.

In operating this apparatus both parachutes are collapsed when the tension is on cord 3, and said parachutes are opened when the tension is on cord 4. When the circuit from the wireless sending apparatus on the ship is put in circuit with conductors 4 and 15, the wireless apparatus can be used. When this circuit is opened and a telephone receiver on the ship is put in circuit with wires 4 and 15 the telephonic circuit is complete."

Our illustration shows the device where 10 is a horn or sound collector, collecting the sound waves in one direction to concentrate them on the diaphragm. It is claimed that with this device the operator on the ground can listen for the sound of a flying machine motor and judge of its distance from the kite. This the inventor thinks would be particularly useful at night.

When the sound indicates that the machine is near enough to the telephone a current sent through strands 3 and 4 will detonate the dynamite cartridge 9 and destroy the flying machine.

PATENT NO. 1,037,732, FOR NON-VIBRATOR IGNITION APPARATUS FOR INTERNAL COMBUSTION ENGINES, HAS BEEN GRANTED TO MARK B. CRIST, OF PITTSBURG, AND MERRITT R. WELL, OF WILKINSBURG, PENNSYLVANIA.

This invention relates to non-vibrator ignition apparatus for internal combustion engines, and we present it to our readers for the novelty of the idea.

Part of this specification reads as follows: "In non-vibrator ignition systems for internal combustion engines the spark plug is connected to the terminal of the secondary coil of a transformer, the primary coil of which is connected to a battery, or some other source of direct current and the primary circuit of the system is provided with a circuit breaker across the terminals of which a condenser is connected.

The high voltage spark across the terminals of the secondary coil; that is in the spark plug of the engine, jumps at the time of breaking the primary circuit and is rendered more effective by the condenser which at the time of breaking the circuit sends an accumulated charge through the primary circuit.

Considerable difficulty has been encountered with the circuit breakers of such apparatus because of the oxidation and burning away of the contact points which thereby render the circuit breaker ineffective in operation.

The object of this invention has been the production of a simple and effective circuit

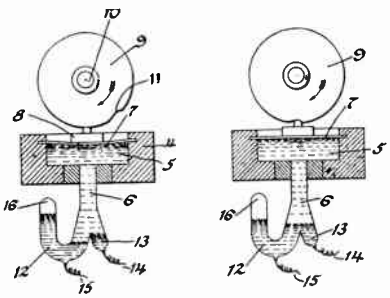
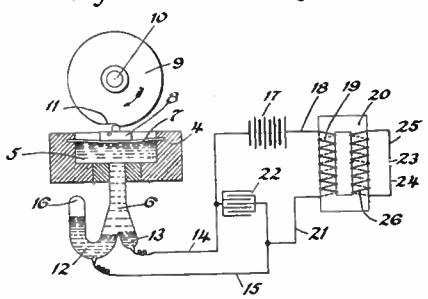


Fig. 2. Fig. 3.



breaker in which effective means are utilized for overcoming the tendency of the contact points to oxidize. This and other objects we attain in an apparatus described and illustrated in the accompanying drawings, throughout the several views of which

World Radio History

like parts are denoted by corresponding numerals.

Fig. 1 shows the wiring of the arrangement, and by studying Fig. 2 we find a diaphragm, 7, which presses upon a quantity of liquid, 5, contained in the chamber, 4. It will be seen as the wheel, 9, revolves the cam, 7, depresses the piece, 8, resting upon the diaphragm, 7, more or less, as is also shown in Fig. 3. Therefore, the column of liquid, 6, as shown in Fig. 2, will be depressed more or less, together with the mercury, 12 and 12, which, originally level in the ends of the tubes, 12 and 13, in Fig. 3, disrupts the mercury in the tube, 12, rising in the upper part, 16.

By studying the illustration the working of this apparatus is clearly shown.

While this idea is a good one as far as it goes, we are very much afraid that the manufacture of the glass tubes containing the mercury is not an easy matter, and we think it is far too sensitive to give good results for continued service.

We never liked the idea of enclosing mercury in a glass tube, especially if the apparatus is to be shipped, and the idea of using such a device in connection with an engine, to our minds, is somewhat risky. However, if the inventor can substitute some other material for the glass, which, by the way, we doubt, the apparatus may become commercially practicable.

FRANCIS M. DUNCAN AND WILLIAM S. EISENBERG, OF CALIFORNIA, HAVE BEEN GRANTED PATENT NO. 1,037,744, FOR APPARATUS FOR A PROCESS OF FUMIGATION.

The present invention shows an apparatus for fumigation of trees, for the destruction of orchard pests, buildings, etc., by use of hydrocyanic acid gas.

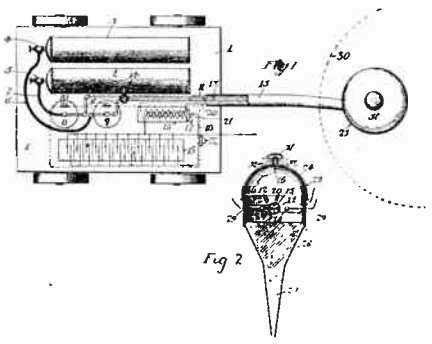
In the language of the inventor the main object of the invention is to provide an apparatus which will carry out a continuous process for producing and delivering the hydrocyanic acid gas in a more economical, safe and convenient manner than is possible with the usual apparatus employed in such process.

The apparatus utilized in the usual process of producing hydrocyanic acid gas for the purpose of fumigation, by the use of potassium cyanid and sulphuric acid, is expensive and involves considerable inconvenience, labor and danger in depositing the pots and in collecting the same after the operation is over.

Our present invention provides an apparatus for production of the hydrocyanic acid gas in such manner that there is no danger of the operator being brought in contact with the fumes and all handling of pots or similar utensils is dispensed with.

The method of operation of the apparatus consists essentially in bringing nitrogen and acetylene gases into contact in a continuous manner, subjecting the said gases to the action of an electric discharge while they are thus brought into contact, thereby producing hydrocyanic acid gas and delivering the hydrocyanic acid gas as produced, to the object to be fumigated. By such method of operation, the hydrocyanic acid gas is carried away and applied as rapidly as it is produced and the materials, namely, nitrogen and acetylene, which are used, are innocuous, so that there is little danger incident to the operation.

The operation is carried out as follows: The gases in combining proportion are admitted into the respective reservoirs 8 and 9, the amount admitted depending on the space to be fumigated, it being possible by means of the pressure gages to control the amount of gas in accordance with the size of the tree or room to be fumigated, or, if desired, a uniform amount may be admitted corresponding to the maximum size of tree in a given orchard. The apparatus is



brought to the location where fumigation is required and the combining device 23 is placed within the inclosure indicated by dotted lines at 30 in Fig. 1, representing, for example, a tent around a tree. Valve 14 controlling the discharg from tanks 8 and 9 is then opened and the gases are allowed to stream into the combinator 23 through the pipes 11 and 12, the outlet of said pipes being located adjacent or opposite to the space between the electrodes 28 in said combining device and the discharge current being caused to pass between said electrodes by the operation of the induction coil 16, so that the gases issuing from the pipes 11 and 12 are combined to form hydrocyanic acid gas as fast as they enter the case, sufficient electric energy being furnished for this purpose. The hydrocyanic acid gas so formed passes out in a continuous stream through the outlet 25 at the top of the case and into the space within the inclosure 30 where it operates to effect the fumigation. When the contents of the tanks 8 and 9 have become exhausted, the combinator is withdrawn from the inclosure and placed within the next inclosure to be fumigated and the operation repeated. a new supply of nitrogen and acetylene being admitted to the auxiliary or measuring tanks 8 and 9.

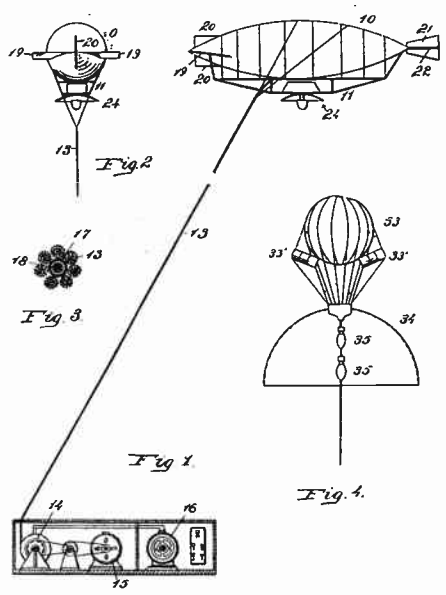
ARCHIBALD J. AUSTIN, OF CALIFORNIA, HAS BEEN GRANTED PATENT NO. 1,039,476, FOR AERIAL ILLUMINATING MECHANISM.

This invention pertains to lighting sys-

World Radio History

tems and according to the inventor it has particular reference to means for illuminating cities.

The invention provides a balloon or other suspensional means for holding or carrying a powerful searchlight and reflectors whereby the light produced will be disseminated in all directions downwardly, and it also comprises means for holding the gas field in a stable position, and suitable mechanism for elevating and holding the suspensional means, as will now be set forth in detail.



In the accompanying drawing, Fig. 1, is a view of a dirigible type of balloon, moored to suitable mechanism, and carrying a light and reflecting apparatus. Fig. 2 is an end view of the balloon. Fig. 3 is a section of the cable employed. Fig. 4 is a view of a spherical type of balloon, with a modified type of lighting and reflecting apparatus.

Our illustrations are self-explanatory, and it will also be seen that the inventor has gone to the trouble of constructing a special cable, 13, which not alone serves to hold the balloon fast, but also carries the electric current to same.

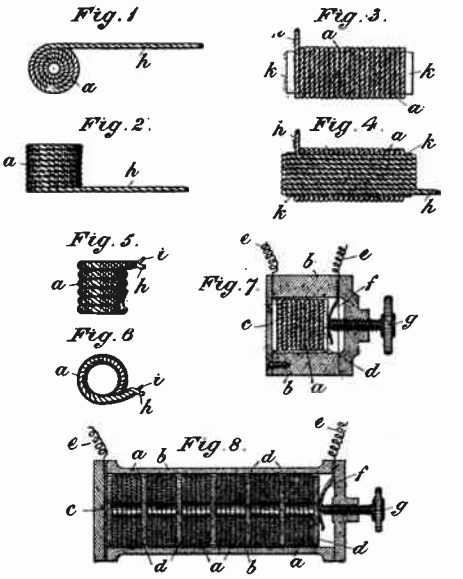
We do not quite see the necessity of this invention and entertain grave doubt whether any city will ever adopt it. At best such a scheme is very hazardous, and the first real good thunder storm coming up unexpectedly will bring down the balloon with its lighting attachment almost as quickly as the lightning itself. This, however, would not be so bad, but an arrangement of this sort, which is at best unstable, moving around all the time, is certainly not well equipped to light up the streets or even a square.

WILLIAM SUMNER, OF LIVERPOOL, ENGLAND, HAS BEEN GRANTED PATENT NO. 1,037,683, FOR CURRENT REGULATING DEVICE OR RESISTANCE APPLICABLE FOR ELECTRIC LIGHTING OR HEATING.

This is a new idea in rheostats and we quote herewith an extract of the patent specification:

This invention relates to improvements in electric current regulating devices or resistances and is especially applicable for use in connection with incandescent lamps whereby the current supplied to the lamp may be regulated as required to any minimum and the luminosity of the lamp filament varied accordingly, or the device may be used as an electric heater.

Resistance devices or "dimmers" for electric lamps are known in which the medium of which the resistance is composed consists of a loose mixture of powdered mica, sand and graphite, the resistability of the medium being varied according to the degree of compression applied thereto. Such a resistance is however unsatisfactory inasmuch as there is not sufficient elasticity in the composition to cause it to restore itself to its normal condition when released from compression, and further, the several constituents of the mixture, even if intimately intermixed in the first instance, are apt in course of time owing to vibration or the continued operation of compressing and releasing, to separate themselves and thus destroy the homogeneous character or evenness of the mixture, thereby causing the effectiveness of the resistance to be impaired. Resistances of this class are also known comprising a mixture of asbestos and carbon in the form of a pad adapted to be compressed for the purpose of varying the resistance. Such a preparation is, however, unsatisfactory owing to the fact that the small percentage of carbon which is requisite to effect the desired control of



the comparatively small current passing through an incandescent lamp, cannot, by commercial methods, be evenly incorporated with the asbestos. Unless the carbon is

World Radio History

very evenly distributed throughout the mixture composing the resistance it is impossible to obtain the nicety of or minute control of the current necessary to effect, say, a gradual dimming of the luminosity of an electric incandescent lamp as when pressure is applied to the resistance a possible localization of the path of the current through the resistance may be set up, in which case a faint glow of the filament of the lamp would be impossible so long as any pressure was maintained and on the removal of the pressure arcing may result.

In the making of electric resistances from a series of sheets of fibrous material it has been proposed to coat the fibrous material on each side with coal tar, the sheets being subsequently heated to carbonize the fiber, but in this my invention the resistances after impregnation with the mixture hereinafter described are heated to increase the resiliency of the said resistances.

The present invention is directed to obtaining a resistance pad or the like which shall be characterized by an even and comparatively rare distribution of the carbon particles throughout a fibrous body or support, and which shall have a considerable elasticity. To effect this, I make a mixture of finely ground plumbago or analogous preparation of carbon reduced to the condition of an impalpable powder, and finely powdered chalk or the like insulating medium in the proportion of about 25 per cent. of plumbago to 75 per cent. of chalk by weight. This mixture is then intimately incorporated with the fibrous material, preferably asbestos flax, in any suitable manner, say by revolving them together in a receptacle, or treating them in a mixer until the asbestos is thoroughly impregnated with the mixture. Any excess of the plumbago and chalk is then shaken out. Such a method of treating the asbestos with a mixture of plumbago and chalk insures a very even and comparatively rare distribution of the particles of plumbago throughout the asbestos to be effected in a manner practicable on a commercial scale. The asbestos so prepared is then spun into yarn and coiled, wound or otherwise made up into pads or the like which, in a suitable construction, may be mounted within an asbestos, fiber or other fireproof shell or casing closed at one end by a contact plate or the like connected to one end of the electrical conductor of the circuit to be controlled.

The accompanying drawings show by way of example several methods of preparing a resistance pad from coiled or wound yarn and of mounting it within a box or casing.

Our illustration shows several applications of this idea. Fig. 7, especially, shows a longitudinal section with a single pad mounted in a box or casing and having a controlling screw to form a regulating device suitable for an ordinary incandescent lamp.

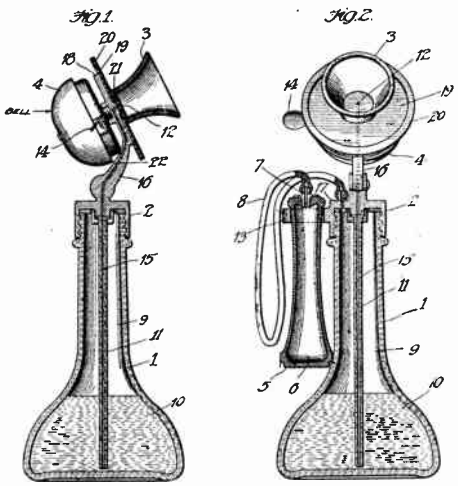
Fig. 8 is a longitudinal section showing how several pads may be assembled to provide a resistance of large capacity.

The foregoing is a very good idea and covers a real demand for a sensitive rheostat.

We have no doubt that such a device in some shape or other will in time be adopted.

ALEXANDER E. REDLICH, OF CHICAGO, ILL., HAS BEEN GRANTED PATENT NO. 1,037,532 FOR A TOY TELEPHONE.

No, this is not a new water cooled transmitter for use in wireless telephony, al-



though it looks as though it might be. It is nothing but a clever toy. There is nothing electrical at all about it, save that it looks like a telephone, and we only illustrate it herewith to show busy inventors that there is sometimes money in a device that imitates some universal commodity.

The device, as shown in our illustration, has rubber bulb 5, which imitates a telephone receiver, and which is connected with the bottle 1 by means of a soft rubber tube 8. By pressing the bulb 5, the air in the bulb will be pressed through the flexible rubber tube 8, and the air in 9 will press upon the water 10, which, rising through the tube 11, will squirt out of the transmitter 12 through a fine hole, supposedly into the face of the operator, as soon as he presses the bulb 5.

PATENT NO. 1,037,603, FOR ELECTRICAL MUSICAL INSTRUMENTS, HAS BEEN GRANTED TO HALLIE R. DICKS, OF MINNESOTA.

This invention relates to the art of musical instruments, and particularly pertains to a new and useful electrical musical apparatus of that class, embracing a number of electromagnetic bells and keys electrically connected to the bells for operating them.

The main object of the invention is to provide an improved device of this design by which the harmony and the purity of the tone obtained from the bells are greatly increased.

Our illustration is self-explanatory. The device is made up like an ordinary piano and each key controls an electric bell hav-

World Radio History

ing an attuned gong. The key B, when depressed, makes contact between 6 and 10, and the circuit is closed through the battery 13, thereby ringing the bell 17.

It is evident that in a device of this kind as long as the keys are depressed the bells must sound contrary to the working of an ordinary piano where sound lasts only as long as the strings vibrate after they have been struck.

Of course there is absolutely nothing new about this invention, and the idea is so plausible, and so old, that we are amazed that the Patent Office should have granted a patent on same. The writer of this article while a boy, some fifteen years ago, had a device of this sort; but instead of using bells with the gongs, the clapper of the bell struck against a wine bottle which was filled, more or less, with water, to get the right sound. This device proved quite satisfactory and on account of the obvious features no patent was ever thought worth while. As a matter of fact, there are quite a few German manufacturers to-day selling

Fig. 1.

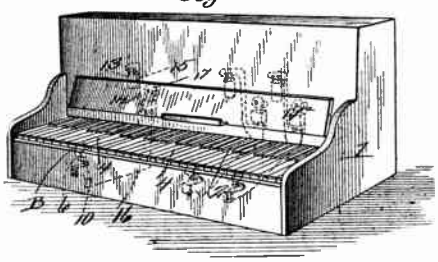
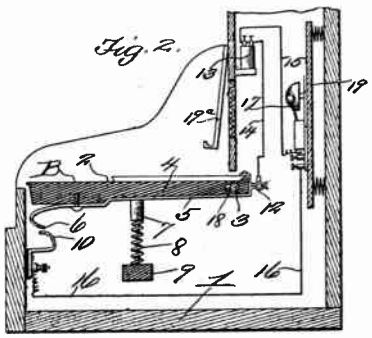


Fig. 2.



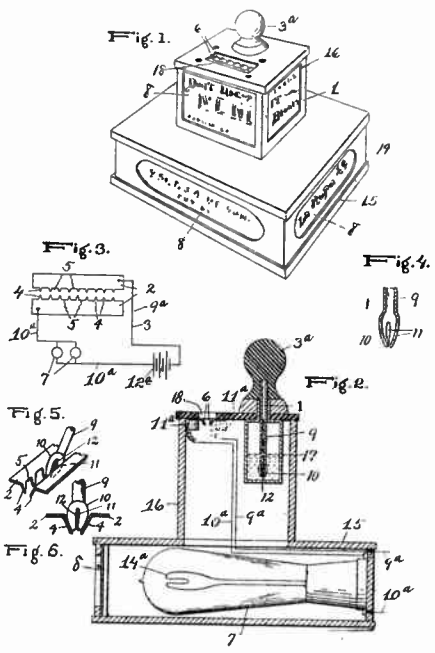
tuned electric bells for identically the same purpose set forth in Mr. Dick's patent.

PATENT NO. 1,039,553, FOR ELECTRIC CIGAR LIGHTER, HAS BEEN GRANTED TO JOSEPH LEVEEN AND MIFFLIN L. ASHBAUGH, OF INDIANA.

The present invention shows an electric cigar lighter of a novel construction and the excellent features of this invention will surely see it adopted before long.

This again is one of these little things that are so simple that one may ask oneself why it has not been thought of a long time ago. In this respect it is very much like the egg of Columbus.

The strange part of it is that this cigar lighter is very much like other cigar lighters in appearance, and as far as the



working goes, but—and here the important point comes in—this cigar lighter does not work with the ubiquitous battery, which at best always gives trouble and is a constant source of annoyance to the owner of the cigar lighter. The inventors, therefore, place one or more lamps at the bottom of the cigar lighter, in series with the plates, 2, Fig. 3, and when the brush, 10, saturated with alcohol or other inflammable liquid, is carried over the plate, 6, Fig. 1 and Fig. 2, the inflammable liquid will be made to burn immediately, due to the sparks set up at 6, from the contacting of the metal part 10.

While this in itself is a good idea, the inventors have had the lucky thought to provide the case, 14, with transparency, 8, and therefore every time someone uses this lighter, the lamp, or lamps, 7, will light up the advertising transparency, therefore giving the apparatus a double use which is very likely to appeal to the merchant who buys such an article.

PATENT NO. 1,037,470, FOR MAIL-BOX ALARM, HAS BEEN GRANTED TO MONROE WOODWARD GRINDLE, OF SANTA ROSA, CAL.

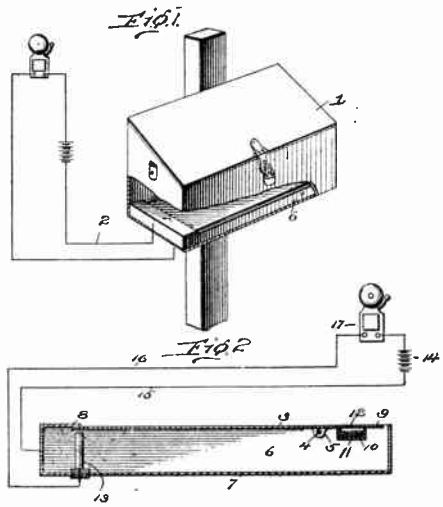
This invention relates to a new and useful improvement in mail box alarms, and the primary object of the invention is to provide an arrangement for ordinary mail boxes, and especially those used on rural routes, for sounding an alarm when a letter, postal card or other mail matter is deposited in the box. Our illustration describes this device clearly.

World Radio History

In the box at the bottom, 1, there is provided an apparatus having a platform, 3, pivoted at 4, and balanced by means of a small box containing shot, 11, in such a manner that even by dropping a postal card in the box the bottom, 3, makes contact with 13, thereby ringing the bell, 17, notifying the owner of the box that mail has been deposited.

A device of this kind is all right and looks quite nice on paper, but any device as sensitive as the one described in the present patent is always subject to a lot of trouble, and has a good many faults. For instance, the slightest jar will close the contact, and if the box is not absolutely air tight a fairly strong wind will cause the contact to be closed.

Another bad feature is also found in the fact that the bottom 3 is naturally subject to the temperature changes and will there-



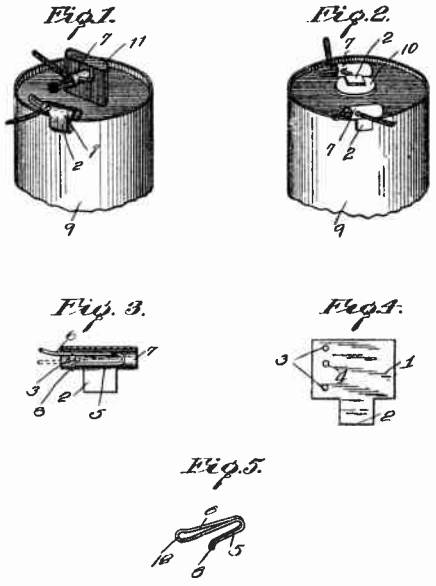
fore curve more or less in cold or hot weather, thereby closing the contact.

PATENT NO. 1,039,424, FOR CONNECTOR FOR ELECTRIC CONDUCTORS, HAS BEEN GRANTED TO HOSEA F. MAXIM, OF NORFOLK, VA.

The present invention shows improvements in electrical terminals. and in particular to those adapted to be fastened to the poles of a battery to receive the ends of connecting wires. The structure of the terminal is very simple, being made up of a single stamped sheet of metal as shown in Fig. 4. Fig. 3 shows the piece rolled in the form of a tube with a spring, shown in Fig. 5, inserted in the tube. The wire is inserted in the hole, 3, Fig. 3, and the spring, 6, holds the wire that is to make contact with the binding post.

While the idea as shown is no doubt good and while we are sure that it works satisfactory, the entire apparatus is too crude and too cheap in our opinion.

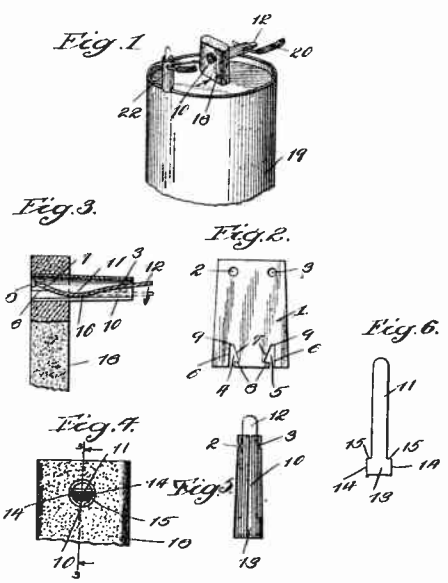
The ends of the wire loop, 12, extending from the binding post, is a very undesirable feature and does not help much towards improving the appearance of the post. We have no doubt that sooner or later a real good spring post will be invented by someone if the designer will only bear in mind



that a post must not only be good, but it should look attractive enough for a manufacturer to adopt it on his goods.

HOSEA G. MAXIM, OF NORFOLK, VA., HAS BEEN GRANTED PATENT NO. 1,039,423, FOR CONNECTOR FOR ELECTRIC CONDUCTORS.

This shows another binding post of the same inventor as the preceding one, and has all the bad features of the other one and



perhaps more. The working of this binding post is identically the same, the spring, 12, being depressed in order to uncover the hole, 3, Fig. 3, which breaks the connecting wire, 20, Fig. 1.

World Radio History

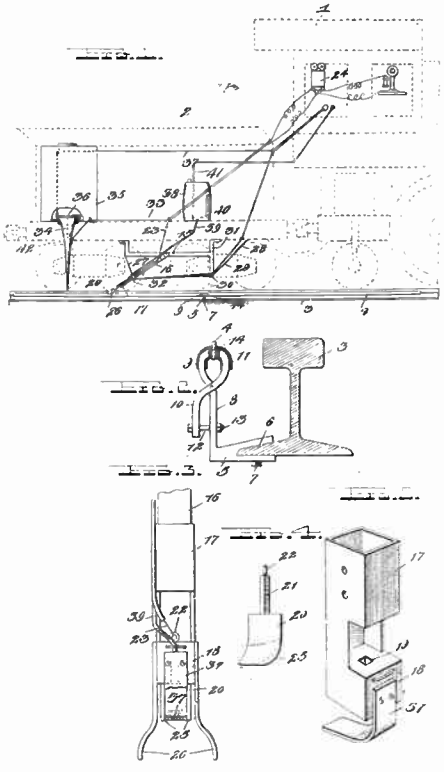
The trouble with the present post is that it is too stiff and unwieldy and also looks dangerous on account of the sharp points.

PATENT NO. 1,038,832, FOR RAILWAY - TELEPHONE, HAS BEEN GRANTED TO DENNIS D. BIGGERS, OF OKLAHOMA.

This invention relates to a new and useful improvement in telephone systems, more particularly to a railway telephone; and the object is to provide means of connecting with a moving train whereby the same may have communication with another train or station.

Another object resides in providing a device, adapted for connection with a locomotive tender, whereby operators of the locomotive may use the system for signaling purposes.

We give herewith an extract from this specification. The inventor says as follows:



"One indicates locomotive cab and 2 the tender for the locomotive, said locomotive and tender being run on the usual or any preferred form of rail 3. Extending longitudinally the full length of the rail, or any desired distance, is a current conductor 4 which may comprise a rod or flat wire, which is held in position and secured to the rail by means of an improved clamping device. This clamping device comprises the bifurcated member 5, the arms of which are adapted to be engaged with the upper and lower faces of the base flange 6 of said rail, and one of said arms is provided with a locking bolt 7 which is adapted to be turned into engagement with said base flange, whereby said member may be securely held to the rail. The member 5 is provided with a substantially vertical arm 8 and the upper portion is bent out of alinement with the general trend thereof to form a jaw or the like 9, and pivotally engaged with said arm 8 is an additional cross arm 10 designed similarly to the arm 8 and is also provided with a jaw 11 at the upper end thereof.

The arms 8 and 10 are provided with openings which, when said arm 10 is positioned so that the jaws 9 and 11 are substantially closed, are aligning, and adapted to extend through the aligning openings, is a bolt 12, the outer end of which is threaded to receive a nut 13, so that when said nut is properly positioned on the bolt 12, the jaws 9 and 11 of the arms will be closed to securely lock the current conductor therebetween. In this manner, said conductor may be carried throughout the length of the rails or for any distance desired, and in order to prevent the grounding of the circuit, an insulation 14 of rubber or any desired material is provided on the effective faces of the jaws 9 and 11 to engage the conductor 4.

Secured to the bottom of the tender 2 in any desired manner is a metallic frame 15, to which is pivotally engaged the upper end of a lever or arm 16, and to the lower end of said lever or arm 16 is secured an insulated sleeve 17. This sleeve has a portion of one wall thereof cut away, and the lower portion of said sleeve is formed solid, as shown at 18, through which solid portion extends an opening 19, and a current collector 20 has an upwardly extending stem 21 formed on the upper portion thereof which extends through the opening 19 in the solid portion 18 of said sleeve. The stem 21 is provided on its free end with an eye 22 which is engaged by one end of a wire 23, which wire extends upwardly along the side of said lever 16 and connects with the usual or any preferred form of phone box 24 mounted as I have shown, in the drawings, in the cab 1 of the locomotive, but it will be understood that said box may be mounted in any desired place on the train. The wire 23 has its exposed portion covered with the usual form of insulation, and as said wire is drawn somewhat taut, the current collector 20 will be held in position adjacent the solid portion 18 on the sleeve 17. This current conductor 20 has its effective or engaging face somewhat convexed, and the sides thereof are provided with the lugs 25 to prevent the collector from jumping the conductor 4 in case of any lateral movement and secured to the side walls of the sleeve 17 are the insulated guards or finders 26 which depend to opposite sides of the conductor 4 and prevent any appreciable lateral movement of the lever. The frame 15 has also engaged therewith one end of a coil spring 27, the opposite end of said spring being engaged with said lever 16, so that said lever is held normally in upward position and out of engagement with the current conductor 4, but I have provided means for manually disposing said lever in

(*Continued on page 892.*)

World Radio History

Simple Experiments in Chemistry

By Philip Edelman

8. Sulphur

Sulphur is a very important element and is found in abundant quantities, both free and combined. The chief deposits in the United States are in Louisiana. The sulphur is obtained from the Louisiana beds by a hydraulic method. The sulphur is melted in the beds by means of hot water introduced through a pipe and rises part of the way up into another pipe. It is then brought to the surface by means of air pumps.

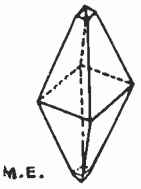
There are three known forms of sulphur, which have different properties, and which can be changed from one form to the other. Roll sulphur will do for most of the following experiments.

The ordinary roll sulphur is a brittle yellow solid. It is a non-conductor of heat and electricity. It is one of the best insulators but is not suited to most electrical requirements on account of its brittle and inflammable properties. The warmth of the hand alone is sufficient to make a piece of sulphur crackle or break from the resulting unequal expansion.

Experiment. Fill a test tube one-third full of sulphur and heat the tube gently. The sulphur will melt but the color should not change. The liquid should be thin. Now continue the heating and note that the sulphur becomes sticky, thick and darker. Now heat until the sulphur boils, becomes black, and a brown vapor forms. Now hold the test tube in a slanting position and let the vapor fall upon some water in an open vessel. The fine yellow powder produced is called *flowers of sulphur.* Now remove the scum and pour the boiling sulphur into the water. Turn the test tube quickly back into the vertical position. *Result.* The remaining sulphur in the tube changes to a yellow solid again and the sulphur which was poured into the water is brown and plastic. The latter is a plastic form of sulphur and can be pulled and worked like rubber. It soon crystallizes and changes to the brittle yellow form. This cycle of changes is quite remarkable.

Monoclinic Crystal Formation
FIG. 1

Experiment. Use the same test tube used in the preceding experiment and again melt a third of the tube full of sulphur. Have ready a filter, prepared as follows: Fold two pieces of round filter paper, first in halves and then in quarters, and put one piece inside of the other so that you have a cone with four thicknesses of paper on all of the sides. Place the paper in a funnel and when the sulphur is melted pour it into this funnel. Allow to cool and as soon as crystals begin to shoot across the surface pour the remaining liquid sulphur out of the funnel. When the sulphur in the funnel has completely cooled, unfold the paper. The crystals should be needle like and a brown yellow color. (See illustration.) The crystals will become yellow after a time. This form of sulphur is called the *monoclinic* crystals of sulphur.



Orthorhombic Formation
FIG. 2

Experiment. Grind one-eighth of a teaspoonful of roll sulphur and put it into a test tube. Pour one inch of carbon disulphide over it and shake well. Filter through filter paper and allow to stand. After some time the carbon disulphide solution will deposit another form of crystalline sulphur called othorhombic crystals. (See illustration.) Carbon disulphide is very inflammable and care should be taken in handling it.

Experiment. Heat a mixture of iron filings and flowers, of sulphur in a test tube. As soon as the reaction starts it spreads through the mixture and causes it to glow. The product is iron sulphide and contains equal parts of iron and sulphur. The tube should be broken and the sulphide saved for another experiment.

Experiment. Melt some sulphur in a test tube and heat a spiral of copper wire at the same time. The copper spiral is made by winding about a foot of No. 20 wire around a pencil a few times and leaving a straight portion about 5 inches

World Radio History

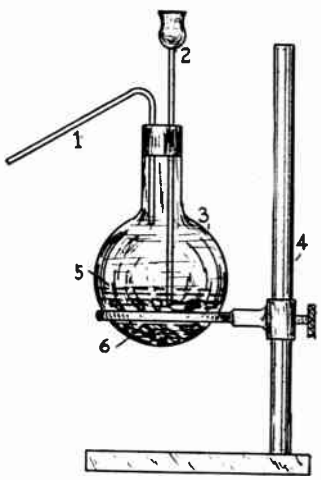
long for a handle. Drop the heated copper into the test tube. The copper combines with the sulphur to form copper sulphide and the spiral is coated with the latter compound. If the sulphide is broken away, the copper wire will be found to be much thinner.

Experiment. Mix some flowers of sulphur and zinc dust together. (About one-half teaspoonful of each.) Place the mixture upon a piece of brick and ignite in some place where the violent action will do no harm. The action is very strong and brilliant and a fine powder (zinc sulphide) results. It is remarkable that oxygen does not enter into consideration in this experiment.

Hydrogen Sulphide Experiments

As the name indicates, hydrogen sulphide is a compound of sulphur and hydrogen. There are two parts of hydrogen to one of sulphur. It is a very disagreeable gas and has the odor of rotten eggs. It is the same gas that is noticed near sewers.

Experiment. Set up an apparatus as shown in Fig. 3, using the iron sulphide previously prepared and dilute hydrochloric or sulphuric acid. Fill a test tube full of the gas by downward displacement, and use it for the fountain experiment as in the case of ammonia and hydrochloric acid. This shows that it is very soluble in water.



1—Delivery Tube. 2—Thistle Tube. 3—Flask. 4—Stand. 5—Level of Acid. 6—Copper Strips and Sulphuric Acid

FIG. 4

Experiment. Fill another tube full of the gas and bring it to a flame. It should burn with a blue flame, and the odor of burning sulphur should be noticed. Sulphur will be deposited in the tube. When not in use the generator should be placed so that the delivery tube is in water, to prevent the gas from escaping into the room.

Experiment. Bubble the gas through a solution of blue litmus and watch the cycle of changes. Allow the solution to stand and look for free sulphur on the surface of the liquid.

Experiment. Prepare solutions of the following compounds in separate test tubes, by dissolving small portions in water: 1. Potassium Nitrate. 2. Copper Sulphate. 3. Potassium nitrate and copper sulphate.

Now pass the hydrogen sulphide gas through each tube. In case the generator works too slow, clean it out and add more acid to the sulphide.

Result. There should be no precipitate in the first tube and black precipitates in the other two. Copper sulphide forms in the second and third tubes but the potassium remains unchanged. This illustrates the reducing power of hydrogen sulphide and its use in separating metals. If the liquid in the last tube be filtered the copper remains as a precipitate on the paper and the potassium nitrate passes through the paper.

Similar effects are produced when silver spoons are blackened by contact with eggs, and when other silverware is exposed to the action of hydrogen sulphide which is present in illuminating gas.

Sulphur Dioxide Experiments

Sulphur dioxide is a compound in which there are two parts of oxygen and one part of sulphur. Its chief use is found in the manufacture of sulphuric acid. It is also used to fumigate clothing and rooms, to preserve meats and wines, as a refrigerant, and for several other purposes.

Experiment. Burn a small piece of sulphur. The peculiar odor of burning sulphur is due to the sulphur dioxide which forms.

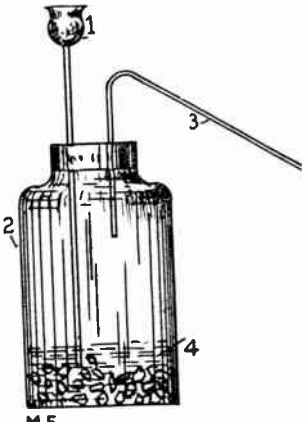
Experiment. Arrange apparatus as shown in Fig. 4, using a few strips of sheet copper and concentrated sulphuric acid, heat carefully. The sulphur dioxide is obtained from the acid which is used.

Experiment. Try the fountain experiment used for the hydrogen sulphide gas. It is necessary to put a little water into the test tube before collecting the sulphur dioxide in it.

World Radio History

Sulphur dioxide is colorless, heavier than air and has a disagreeable odor which is suffocating. The gas will not burn in air.

Experiment. Collect a tube or bottle of the gas and insert a lighted candle into it. It goes out because the gas will not support this kind of combustion. The gas is best collected by downward displacement.



M.E.
1—Thistle Tube. 2—Bottle. 3—Delivery Tube. 4—Iron Sulphide and Acid.
FIG. 3

Sulphur dioxide has some properties which are similar to chlorine. Thus it can be liquefied, is soluble in water, and has the power to bleach when in a moist condition. It can be solidified by cold and pressure, and when it evaporates heat is absorbed as in the case of other liquefied gases.

Experiment. Bubble the gas through a vessel containing blue litmus water. It turns the solution red, indicating the formation of an acid and bleaches. The acid which forms is sulphuric acid.

Experiment. Put a little sodium hydroxide solution (common lye dissolved in water), into a test tube. Now add a little litmus water and bubble the gas through the liquid until the color changes. Pour the liquid into an open dish and evaporate it until all of the liquid is boiled away. The residue is a new compound, sodium sulphite, and is made up of sodium sulphur and oxygen. Pour some dilute sulphuric acid over the sodium sulphite which has formed. *Result.* Bubbles should appear and an odor of sulphur dioxide should be noticed. The sodium sulphite is decomposed and re-combined, sulphur dioxide being one new compound that is formed.

Experiment. Red or purple flowers can be bleached to a colorless flower by treating with moist sulphur dioxide. Pour a little water into a vessel before filling it with the gas for this purpose. Sulphur dioxide is used to treat substances which cannot be treated with chlorine on account of the great activity of the latter which is injurious to many delicate materials.

The main properties of sulphur and its chief single compounds with oxygen and hydrogen have been considered. The utility of sulphur in fireworks, gunpowder, matches, and for vulcanizing rubber is worthy of mention. If a spark coil is at hand, the value of sulphur as an insulator can be ascertained.

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THE PRACTICAL ELECTRICIAN

(*Continued from page 796.*)

From the heat of the arc the carbons are consumed rather quickly, especially in the open air, and the distance between the two points increases continually until finally the arc extinguishes, if we do not keep the carbons at the right distance by some mechanical contrivance.

The positive carbon gives about 85 per cent., the negative carbon 10 per cent. and the arc itself 5 per cent., or the total quanity of light. The main part, therefore, is obtained from the positive carbon. When using alternating current the two carbons burn away at the same rate and are both pointed.

The frequency of 100 or 50 cycles per second suffice to give a steady arc.

From Ohm's Law, the resistance of the arc equals the tension at the carbon points, divided by the current intensity in the lamp.

(*To be continued.*)

LONG DISTANCE COMMUNICATION FROM SHIPS

It is reported from Berlin that the Hamburg-American Line steamship *Cordova,* while on a recent trip to Central America, remained in constant communication with the German wireless station at Norddeich for thirteen days. The maximum distance covered was 2,400 miles.

ONE DID IT

"You can't tell me there is no honesty in the world."

"How now?"

"I left a box of cigars somewhere the other day. Somebody found it, smoked one, and returned the rest."—*Kansas City Journal.*

World Radio History

MARCONI STATION AT SAN FRANCISCO

The Marconi Wireless Telegraph Company has secured 1,750 acres at Bolinas and Tomales Bay, about ten miles from San Francisco, for two wireless stations on which will be erected receiving apparatus and transmitting mechanism of 500 kilowatts capacity. The stations will be operated simultaneously or in duplex. The total expenditures for land and stations will be $500,000.

At both transmitting and receiving stations will be 12 steel towers 350 feet high in addition to buildings for housing the operating apparatus and power plants. When completed the San Francisco stations will communicate direct with a station to be erected at Manila, carrying messages almost 7,000 miles.

STATION IN HONOLULU FOR MARCONI CO.

The Marconi company has acquired land for two wireless stations at Honolulu and structural work has already been begun. These stations will be similar to those to be erected at San Francisco, Cal.

When the San Francisco and Honolulu stations are completed there will be constant communication by wireless between these two widely separated points night and day.

The Honolulu station is the connecting link of the Marconi wireless globe girdling scheme. Messages will then be possible from San Francisco to Honolulu, to Manila, Singapore and Bangalore, to Aden, thence through Egypt to London and New York.

"FIPS" IS SICK

Our readers will note that the Wireless Screech this month is missing. Our poor Editor of the screech has had a terrible brain storm for the last three weeks and has indigestion of the hair.

This brings us face to face with the problem of asking our readers if they want more "Screech" or less.

We profess that we are puzzled. Some readers want it and quite a few do not care for it. If you wish more Screech we must hear from you. Suppose you sit down and write us a postal telling us what you think. We are sure that "Fips" will appreciate the kindness.

ROCKLAND COUNTY RADIO WIRELESS ASSOCIATION.

The Rockland County Radio Wireless Association has been reorganized and the following officers elected: M. V. Bryant, President; P. Haeselbarth, Secretary; H. I. Sprott, Treasurer.

Any amateur in Rockland County is invited to be present at the meetings and requested to apply for membership.

Meetings are held every Thursday night at 8 P. M., at the residence of the president, 6 S. Highland avenue, Nyack, N. Y.

ZANESVILLE WIRELESS ASSOCIATION

The Zanesville Wireless Association has been in existence for over a year. It was organized for the purpose of studying and experimenting with wireless telegraphy and telephony. The president is Charles S. Shryock. All correspondence should be addressed to the secretary, Rudolph C. Kamphausen, 105 South Seventh street, Zanesville, Ohio.

TRI-COUNTRY WIRELESS ASSOCIATION

The Tri-County Wireless Association was recently organized at Greenfield, Ohio, and the following officers elected: Charles B. Upp, president; Louis Eckert, secretary; Dwight Massey, treasurer.

The Chained Monarch

Hundreds and thousands of years ago;
From summer sky and clouds of snow,
Unchained, unhampered, stretching low,
People and trees in the world below,
King Lightning reigned supreme!
Flashing, crashing, left and right,
Morn and noon, and eve and night,
Boasting his power, his awful might,
To fill all things with hopeless fright,
By mountain and wooded stream.
But Lightning now is a piteous slave,
With the Heavens vast for his lonely grave,
And only the stars to hear him rave,
Against the power which holds him slave—
The power that chained his hands!
And round the world the wireless rings,
The dynamo hums, the engine sings,
The arc-lamps shine and the flare flame flings
Light to the world, to light all things—
For Lightning shackled stands.

Edmund Leamy.

World Radio History

The Wireless Law

[Public—No. 264]
[S. 6412]

An Act to regulate radio communication

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That a person, company, or corporation within the jurisdiction of the United States shall not use or operate any apparatus for radio communication as a means of commercial intercourse among the several States, or with foreign nations, or upon any vessel of the United States engaged in interstate or foreign commerce, or for the transmission of radiograms or signals the effect of which extends beyond the jurisdiction of the State or Territory in which the same are made, or where interference would be caused thereby, with the receipt of messages or signals from beyond the jurisdiction of the said State or Territory, except under and in accordance with a license, revocable for cause, in that behalf granted by the Secretary of Commerce and Labor upon application therefor; but nothing in this Act shall be construed to apply to the transmission and exchange of radiograms or signals between points situated in the same State: *Provided,* That the effect thereof shall not extend beyond the jurisdiction of the said state or interfere with the reception of radiograms or signals from beyond said jurisdiction; and a license shall not be required for the transmission or exchange of radiograms or signals by or on behalf of the Government of the United States, but every Government station on land or sea shall have special call letters designated and published in the list of radio stations of the United States by the Department of Commerce and Labor. Any person, company, or corporation that shall use or operate any apparatus for radio communication in violation of this section, or knowingly aid or abet another person, company, or corporation in so doing, shall be deemed guilty of a misdemeanor, and on conviction thereof shall be punished by a fine not exceeding five hundred dollars, and the apparatus or device so unlawfully used and operated may be adjudged forfeited to the United States.

SEC. 2. That every such license shall be in such form as the Secretary of Commerce and Labor shall determine and shall contain the restrictions, pursuant to this Act, on and subject to which the license is granted; that every such license shall be issued only to citizens of the United States or Porto Rico or to a company incorporated under the laws of some State or Territory or of the United States or Porto Rico, and shall specify the ownership and location of the station in which said apparatus shall be used and other particulars for its identification and to enable its range to be estimated; shall state the purpose of the station, and, in case of a station in actual operation at the date of passage of this Act, shall contain the statement that satisfactory proof has been furnished that it was actually operating on the above-mentioned date; shall state the wave length or the wave lengths authorized for use by the station for the prevention of interference and the hours for which the station is licensed for work; and shall not be construed to authorize the use of any apparatus for radio communication in any other station than that specified. Every such license shall be subject to the regulations contained herein, and such regulations as may be established from time to time by authority of this Act or subsequent Acts and treaties of the United States. Every such license shall provide that the President of the United States in time of war or public peril or disaster may cause the closing of any station for radio communication and the removal therefrom of all radio apparatus, or may authorize the use or control of any such station or apparatus by any department of the Government, upon just compensation to the owners.

SEC. 3. That every such apparatus shall at all times while in use and operation as aforesaid be in charge or under the supervision of a person or persons licensed for that purpose by the Secretary of Commerce and Labor. Every person so licensed who in the operation of any radio apparatus shall fail to observe and obey regulations contained in or made pursuant to this Act or subsequent Acts or treaties of the United States, or any one of them, or who shall fail to enforce obedience thereto by an unlicensed person while serving under his supervision, in addition to the punishments and penalties herein prescribed, may suffer the suspension of the said license for a period to be fixed by the Secretary of Commerce and Labor not exceeding one year. It shall be unlawful to employ any unlicensed person or for any unlicensed person to serve in charge or in supervision of the use and operation of such apparatus, and any person violating this provision shall be guilty of a misdemeanor, and on conviction thereof shall be punished by a fine of not more than one hundred dollars or imprisonment for not more than two months, or both, in the discretion of the court, for each and every such offense: *Provided,* That in case of emergency the Secretary of Commerce and Labor may authorize a collector of customs to issue a temporary permit, in lieu of a license, to the operator on a vessel subject to the radio ship Act of June twenty-fourth, nineteen hundred and ten.

SEC. 4. That for the purpose of preventing or minimizing interference with communication between stations in which such apparatus is operated, to facilitate radio communication, and to further the prompt receipt of distress signals, said private and commercial stations shall be subject to the regulations of this section. These regulations shall be enforced by

World Radio History

the Secretary of Commerce and Labor through the collectors of customs and other officers of the Government as other regulations herein provided for.

The Secretary of Commerce and Labor may, in his discretion, waive the provisions of any or all of these regulations when no interference of the character above mentioned can ensue.

The Secretary of Commerce and Labor may grant special temporary licenses to stations actually engaged in conducting experiments for the development of the science of radio communication, or the apparatus pertaining thereto, to carry on special tests, using any amount of power or any wave lengths, at such hours and under such conditions as will insure the least interference with the sending or receipt of commercial or Government radiograms, of distress signals and radiograms, or with the work of other stations.

In these regulations the naval and military stations shall be understood to be stations on land.

REGULATIONS

NORMAL WAVE LENGTH

First. Every station shall be required to designate a certain definite wave length as the normal sending and receiving wave length of the station. This wave length shall not exceed six hundred meters or it shall exceed one thousand six hundred meters. Every coastal station open to general public service shall at all times be ready to receive messages of such wave lengths as are required by the Berlin convention. Every ship station, except as hereinafter provided, and every coast station open to general public service shall be prepared to use two sending wave lengths, one of three hundred meters and one of six hundred meters, as required by the international convention in force: *Provided,* That the Secretary of Commerce and Labor may, in his discretion, change the limit of wave length reservation made by regulations first and second to accord with any international agreement to which the United States is a party.

OTHER WAVE LENGTHS

Second. In addition to the normal sending wave length all stations, except as provided hereinafter in these regulations, may use other sending wave lengths: *Provided,* That they do not exceed six hundred meters or that they do exceed one thousand six hundred meters: *Provided further,* That the character of the waves emitted conforms to the requirements of regulations third and fourth following.

USE OF A "PURE WAVE"

Third. At all stations if the sending apparatus, to be referred to hereinafter as the "transmitter," is of such a character that the energy is radiated in two or more wave lengths, more or less sharply defined, as indicated by a sensitive wave meter, the energy in no one of the lesser waves shall exceed ten per centum of that in the greatest.

USE OF A "SHARP WAVE"

Fourth. At all stations the logarithmic decrement per complete oscillation in the wave trains emitted by the transmitter shall not exceed two-tenths, except when sending distress signals or signals and messages relating thereto.

USE OF "STANDARD DISTRESS WAVE"

Fifth. Every station on shipboard shall be prepared to send distress calls on the normal wave length designated by the international convention in force, except on vessels of small tonnage unable to have plants insuring that wave length.

SIGNAL OF DISTRESS

Sixth. The distress call used shall be the international signal of distress . . . — — — . . .

USE OF "BROAD INTERFERING WAVE" FOR DISTRESS SIGNALS

Seventh. When sending distress signals, the transmitter of a station on shipboard may be tuned in such a manner as to create a maximum of interference with a maximum of radiation.

DISTANCE REQUIREMENT FOR DISTRESS SIGNALS

Eighth. Every station on shipboard, wherever practicable, shall be prepared to send distress signals of the character specified in regulations fifth and sixth with sufficient power to enable them to be received by day over sea a distance of one hundred nautical miles by a shipboard station equipped with apparatus for both sending and receiving equal in all essential particulars to that of the station first mentioned.

"RIGHT OF WAY" FOR DISTRESS SIGNALS

Ninth. All stations are required to give absolute priority to signals and radiograms relating to ships in distress; to cease all sending on hearing a distress signal; and, except when engaged in answering or aiding the ship in distress, to refrain from sending until all signals and radiograms relating thereto are completed.

REDUCED POWER FOR SHIPS NEAR A GOVERNMENT STATION

Tenth. No station on shipboard, when within fifteen nautical miles of a naval or military station, shall use a transformer input exceeding one kilowatt, nor when within five nautical miles of such a station, a transformer input exceeding one-half kilowatt, except for sending signals of distress, or signals or radiograms relating thereto.

INTERCOMMUNICATION

Eleventh. Each shore station open to general public service between the coast and vessels at sea shall be bound to exchange radiograms with any similar shore station and with any ship station without distinction of the radio systems adopted by such stations, respectively, and each station on shipboard shall be bound to exchange radiograms with any other station on shipboard without distinction of the radio systems adopted by each station, respectively.

It shall be the duty of each such shore station, during the hours it is in operation, to listen in at intervals of not less than fifteen minutes and for a period not less than two minutes, with the receiver tuned to receive messages of three hundred meter wave lengths.

DIVISION OF TIME

Twelfth. At important seaports and at all other places where naval or military and private or commercial shore stations operate in

World Radio History

such close proximity that interference with the work of naval and military stations can not be avoided by the enforcement of the regulations contained in the foregoing regulations concerning wave lengths and character of signals emitted, such private or commercial shore stations as do interfere with the reception of signals by the naval and military stations concerned shall not use their transmitters during the first fiftcen minutes of each hour, local standard time. The Secretary of Commerce and Labor may, on the recommendation of the department concerned, designate the station or stations which may be required to observe this division of time.

GOVERNMENT STATIONS TO OBSERVE DIVISION OF TIME

Thirteenth. The naval or military stations for which the above-mentioned division of time may be established shall transmit signals or radiograms only during the first fifteen minutes of each hour, local standard time, except in case of signals or radiograms relating to vessels in distress, as hereinbefore provided.

USE OF UNNECESSARY POWER

Fourteenth. In all circumstances, except in case of signals or radiograms relating to vessels in distress, all stations shall use the minimum amount of energy necessary to carry out any communication desired.

GENERAL RESTRICTIONS ON PRIVATE STATIONS

Fifteenth. No private or commercial station not engaged in the transaction of bona fide commercial business by radio communication or in experimentation in connection with the development and manufacture of radio apparatus for commercial purposes 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: Provided, That the owner or operator of a station of the character mentioned in this regulation shall not be liable for a violation of the requirements of the third or fourth regulations to the penalties of one hundred dollars or twenty-five dollars, respectively, provided in this section unless the person maintaining or operating such station shall have been notified in writing that the said transmitter has been found, upon tests conducted by the Government, to be so adjusted as to violate the said third and fourth regulations, and opportunity has been given to said owner or operator to adjust said transmitter in conformity with said regulations.

SPECIAL RESTRICTIONS IN THE VICINITIES OF GOVERNMENT STATIONS

Sixteenth. No station of the character mentioned in regulation fifteenth situated within five nautical miles of a naval or military station shall use a transmitting wave length exceeding two hundred meters or a transformer input exceeding one-half kilowatt.

SHIP STATIONS TO COMMUNICATE WITH NEAREST SHORE STATIONS

Seventeenth. In general, the shipboard stations shall transmit their radiograms to the nearest shore station. A sender on board a vessel shall, however, have the right to designate the shore station through which he desires to have his radiograms transmitted. If this can not be done, the wishes of the sender are to be complied with only if the transmission can be effected without interfering with the service of other stations.

LIMITATIONS FOR FUTURE INSTALLATIONS IN VICINITIES OF GOVERNMENT STATIONS

Eighteenth. No station on shore not in actual operation at the date of the passage of this Act shall be licensed for the transaction of commercial business by radio communication within fifteen nautical miles of the following naval or military stations, to wit: Arlington, Virginia; Key West, Florida; San Juan, Porto Rico; North Head and Tatoosh Island, Washington; San Diego, California; and those established or which may be established in Alaska and in the Canal Zone; and the head of the department having control of such Government stations shall, so far as is consistent with the transaction of governmental business, arrange for the transmission and receipt of commercial radiograms under the provisions of the Berlin convention of nineteen hundred and six and future international conventions or treaties to which the United States may be a party, at each of the stations above referred to, and shall fix the rates therefor, subject to control of such rates by Congress. At such stations and wherever and whenever shore stations open for general public business between the coast and vessels at sea under the provisions of the Berlin convention of nineteen hundred and six and future international conventions and treaties to which the United States may be a party shall not be so established as to insure a constant service day and night without interruption, and in all localities wherever or whenever such service shall not be maintained by a commercial shore station within one hundred nautical miles of a naval radio station, the Secretary of the Navy shall, so far as is consistent with the transaction of governmental business, open naval radio stations to the general public business described above, and shall fix rates for such service, subject to control of such rates by Congress. The receipts from such radiograms shall be covered into the Treasury as miscellaneous receipts.

SECRECY OF MESSAGES

Nineteenth. No person or persons engaged in or having knowledge of the operation of any station or stations, shall divulge or publish the contents of any messages transmitted or received by such station, except to the person or persons to whom the same may be directed, or their authorized agent, or to another station employed to forward such message to its destination, unless legally required so to do by the court of competent jurisdiction or other competent authority. Any person guilty of divulging or publishing any message, except as herein provided, shall, on conviction thereof, be punishable by a fine of not more than two hundred and fifty dollars or imprisonment for a period of not exceeding three months, or both fine and imprisonment, in the discretion of the court.

World Radio History

PENALTIES

For violation of any of these regulations, subject to which a license under sections one and two of this Act may be issued, the owner of the apparatus shall be liable to a penalty of one hundred dollars, which may be reduced or remitted by the Secretary of Commerce and Labor, and for repeated violations of any of such regulations, the license may be revoked.

For violation of any of these regulations, except as provided in regulation nineteenth, subject to which a license under section three of this Act may be issued, the operator shall be subject to a penalty of twenty-five dollars, which may be reduced or remitted by the Secretary of Commerce and Labor, and for repeated violations of any such regulations, the license shall be suspended or revoked.

SEC. 5. That every license granted under the provisions of this Act for the operation or use of apparatus for radio communication shall prescribe that the operator thereof shall not wilfully or maliciously interfere with any other radio communication. Such interference shall be deemed a misdemeanor, and upon conviction thereof the owner or operator, or both, shall be punishable by a fine of not to exceed five hundred dollars or imprisonment for not to exceed one year, or both.

SEC. 6. That the expression "radio communication" as used in this Act means any system of electrical communication by telegraphy or telephony without the aid of any wire connecting the points from and at which the radiograms, signals, or other communications are sent or received.

SEC. 7. That a person, company, or corporation within the jurisdiction of the United States shall not knowingly utter or transmit, or cause to be uttered or transmitted, any false or fraudulent distress signal or call, or false or fraudulent signal, call, or other radiogram of any kind. The penalty for so uttering or transmitting a false or fraudulent distress signal or call shall be a fine of not more than two thousand five hundred dollars or imprisonment for not more than five years, or both, in the discretion of the court, for each and every such offense, and the penalty for so uttering or transmitting, or causing to be uttered or transmitted, any other false or fraudulent signal, call, or other radiogram shall be a fine of not more than one thousand dollars or imprisonment for not more than two years, or both, in the discretion of the court, for each and every such offense.

SEC. 8. That a person, company, or corporation shall not use or operate any apparatus for radio communication on a foreign ship in territorial waters of the United States otherwise than in accordance with the provisions of sections four and seven of this Act and so much of section five as imposes a penalty for interference. Save as aforesaid, nothing in this Act shall apply to apparatus for radio communication on any foreign ship.

SEC. 9. That the trial of any offense under this Act shall be in the district in which it is committed, or if the offense is committed upon the high seas or out of the jurisdiction of any particular State or district the trial shall be in the district where the offender may be found or into which he shall be first brought.

SEC. 10. That this Act shall not apply to the Philippine Islands.

SEC. 11. That this Act shall take effect and be in force on and after four months from its passage.

Approved, August 13, 1912.

CANADIAN RULES AND REGULATIONS TO BE OBSERVED IN CONNECTION WITH THE OPERATION OF AN AMATEUR STATION

1. The power absorbed by primary of transmitter must not exceed ¼ kw.

2. The length of aerial must not exceed 30 feet, and the wave length must not exceed 50 metres.

3. The coupling of the transmitting circuits must not exceed 10 per cent.

4. The call letters "—" have been assigned to your station and when signaling the same must be used at the end of each communication.

5. The station must take every precaution to avoid interference with commercial stations.

6. The station when working must listen for the signal "STP" which will indicate the amateur experimental station is interfering with commercial business. The signal will only be used by certain authorized Government stations which will act as controlling stations and will not be used unless absolutely necessary. The letters will be followed by the call sign of the station issuing the signal and will, whenever practicable, be preceeded by the call sign of the station to which the interference is attributed. On receipt of the signad the amateur experimental station must cease to work until the controlling station gives the signal "Cancel STP."

7. The controlling station, whose instructions must be implicitly obeyed are the Government Wireless Station, at Point Grey, B. C., call letter PGD, Government Wireless Station, Victoria. B. C., call letters VSD, Government Wireless Station, Cape Lazo, B. C., call letters SKD.

By Order of the Deputy Minister,
C. P. EDWARDS,
Gen. Supt. Gov't. Wireless.

Supt of Wireless,
Dept. of Naval Service,
October 14, 1911.

World Radio History

Correspondence

SOME FRANK COMMENTS UPON MODERN ELECTRICS

The Editor "Modern Electrics."

Dear Sir:—I am going to make some pretty frank criticisms about *"Modern Electrics,"* and I expect you not to take offence. If I thought you would take this letter as anything more than a word from a friend interested in your magazine, it would not have been written. It may be of help to you, and it may not.

Your magazine is being lowered every month, instead of improving, as you are supposing. It has taken the same road that your Chicago contemporary took years ago, and still is taking. It is for you to decide what the results will be.

The Chicago magazine, when I first became acquainted with it (and subscribing at once) was a good magazine, I thought, and think still. That was four years ago, and it's price was still ten cents per copy, one dollar a year. At that time I was just breaking into the amateur-wireless world, and this magazine came at an opportune time. I received great help from it. Then came the announcement that they were going to make a change of price, for the purpose of providing a "better and broader" magazine, or something to that effect. But as they went with their triumphal march of progress, they were killing themselves to a certain class of readers, the struggling amateurs. I don't believe there are many of these struggling amateurs today that are willing to part with their fifteen cents every month to buy it. It is larger, has many more illustrations than formerly, articles that the publishers pay good prices for—but what is there in it to interest the amateur? It isn't worth it to him. He takes his money and buys some ¼-inch square brass rod for his tuning coil, or gets a can of mahogany stain to paint his instruments. I am here quoting my own experiences, and if investigated, I think you will find the experiences of other amateurs of humble means in this country. I rarely read one of these magazines any more, and if I do, its at the Public Library—I don't buy it.

Yet, your Chicago contemporary, to all outside appearances, has prospered, is prospering today, and will be prospering tomorrow. And I wish it understood that I am not condemning it, because it is a good magazine—*in its own field.* But it has departed somewhat from its original policy in its expansion, and also gaining a different class of readers, from the first. I mean that it is now the layman, not a practical experimenter, the person merely interested in the subject of Electricity, or individuals wishing to keep up on the latest development upon electrical contrivances, and the rich amateur who can afford Murdock apparatus throughout, and who has every wireless luxury. There is not fifteen cents worth of material in it to suit any amateur.

I have given this lengthy discussion upon the case of this periodical to explain my meaning when I say that *"Modern Electrics"* is taking the same path. But I believe that it will never be outrivaled by your Chicago contemporary, even if it goes on. It may be that the publishers of the latter never had the idea of having a paper to be of practical help to experimenters, but in the beginning it looked as if that was the case, and it received much support from these persons. I was disappointed with it and I do not want to see *"Modern Electrics"* go the same way. That is why I am writing this letter, and I am hoping that it will be time well spent, or at least appreciated.

You are well aware of the enormous number of wireless experimenters in this country. And perhaps you know that a very large per cent. of them have extremely simple and inexpensive stations. Wireless experimenting is costly, and most boys have not the means to put much money into it. You do not receive the pictures of *all* the wireless stations in your Wireless Contest. You only get the pictures of the best, boys owning the poor and simple ones, thinking there is no chance of winning a prize. I never could quite grasp your reasons for awarding the prizes in that contest. Sometimes it looked as if you liked the pictures of the best equipped stations, sometimes the clearest pictures, and again those having the greatest number of instruments bought from the Electro Importing Co. To get back to the subject: you do not get views of the simplest stations. I have seen some that might surprise you. A discarded telephone receiver with a bent diaphragm, a detector made from a rusty iron strip taken from a barrel, and a pitiful-looking tuning coil that the set would be more efficient without, for receiving; and a glass of salt water with two wires supplied with 110 volt current, just touching the surface of the water, for transmitting. And a three-wire aerial, twenty-five feet long, fifteen feet from the ground. The strangest fact of all is that most of them work—maybe not all the time, but once in a while, and the owner of such a station is usually willing to sit up half the night, listening to the arc lights. This picture is a true one, a friend of mine having such a station at first. I have had some of these hardships myself, but not so bad as my friend. This friend now owns a good station, and is improving it all the time. He did not pay a cent for the first station, having borrowed the receiver from another amateur, who also gave him the piece of silicon he used. These are the kind of amateurs who, faithful over little things, are some day made master over great things, the successful men of tomorrow.

It is these amateurs, too, that have bought your magazine, because it was full of the knowledge they were wanting, and the suggestions of how to make instruments, and how to improve their stations at a small cost. These are the things that have made your magazine so popular, I believe; you have given them their money's worth in every issue, and helped them in the betterment of their station, the predominant desire in every amateur's heart. But, it seems that you have overlooked this truth, or did not recognize it in trying to give us something better. At any rate, it does not appear that you have given it as much notice as it deserves. Yet, still, there may be another reason. You may have in mind the making of a magazine to satisfy the whole reading public, and one not for the amateurs, as it has been in the past. If so, I have an appeal to make.

Don't leave the amateur. There has not been another periodical in the United States that has had his interests so at heart, as yours, and if you take the road that your Chicago contemporary and the one published in Boston, too, there will be none left. In that case, I see a good opportunity for a new magazine, devoted exclusively to the needs of the amateur. Why not make yours such? Give the amateurs what they want, and what you used to give them, and they will give you loyal support. Don't make the mistake that the others have made in this "improvement" business. It wouldn't be so serious if the price didn't have to be changed to

World Radio History

meet the expense of these "improvements." An amateur don't care so much for fine cover designs, supplements, extra pages, unless it all is for his good. As I said before his one idea is to better his station, and also to increase his knowledge of the art he experiments in. What's on the front of the book does not help the student in his studies—*its what's in the book.* That there is such a thing as a magnetic chuck, or that there is a loud speaking annunciator on an automobile, does not interest him because he will probably never want to make either of these, and if he wants imformation upon these, he can turn to your Chicago contemporary which is excellent upon these subjects. Specialize upon practical articles, and, believe me, you'll get enough subscribers. Don't make *"Modern Electrics"* a journal of events, but every issue a live, up-to-date, and "how-to-make" book, as it first was.

I never read the "Practical Electrician," but I believe it is good. It gives the experimenter a good idea on the subject, but I would never print it if I had a bunch of good articles on how to make a wireless transformer for six dollars. or an efficient, but cheaply made receiving set for a beginner in the art. Your article on Galvani I thought fairly good. But the best thing you had in the September issue was "Experiments with the Musical Arc." That is what we want from you. You don't realize how wireless telephony is interesting "Young Wireless America" today; they are only waiting for the chance to start in on this new art. Give them all there is to know about it, and let them go ahead with it, and I bet they would develop a system that would work. The trouble is: they don't know even what there is to be known. There's your cue. Cut out that "Simple Experiments in Alternating Currents." That isn't practical with the wireless or electrical experimenter. The time, work, and money put into thos experiments would no doubt afford an amateur with a good pair of receivers, or the beginning of a wireless telephone. The Experimental Department is good for two reasons: It stimulates the experimenter to write up his experiments for the benefit of others, with the hope of winning some prize money, and the money to him who wins it, is helping him further along. But I think it a little overdone. There are too many simple things that are of no use to anybody. Cut it down to only the best, if you only give three pages to it. I would pay fifteen cents for a magazine if it only had five pages, if those pages contained exactly what I wanted, and what I needed. That 50-Watt Step-Down Transformer article is good. Some amateurs will keep the September issue because some time they will want to make a transformer of this kind, and here they will have all the data. The Experiments in Chemistry will be liked by some, but still there is the cost of apparatus to make these, as is the case with the Alternating Current Experiments. I wont say a word about "The Wireless Screech." But I do say: *cut out the Aeronautic Department.* If some of your readers want to keep up on this subject, they can subscribe to a special aeronautic paper, and they will get better articles than you give. The only good thing about the Wireless Telegraph Contest is: there is the chance for some amateur to get three dollars every month to help him along. And I don't think you should award the prize to the boy who has the best equipped station, either; he has enough money to run his station, and it is the poor amateur that needs it to build up his. I think you give it too much space. "With the Inventor," "Advice on Patents," and "The Oracle" are three of your best features.

You may think me staid, unprogressive, but you do me wrong. I *am* progressive, and I admired the step you took to better your magazine, but I think you started out on the wrong path if you were planning to better it for the amateur. I have freely given you my opinion on the September number. I do not know how a magazine is run, but I know what the reader thinks of yours, and it is usually made to please the reader. A number of my amateur friends in this city think the same as I do, and that is one of the reasons I decided to write this letter. I believe you might find some more in other parts of the country, if you looked for them. Put it up to your readers if they are all entirely satisfied with the improving of *"Modern Electrics."* You may publish my letter, or parts of it, if you like.

As to the price: If you can give us fifteen cents worth of benefit in improving our stations, let the price remain as it is. If you can't, I advise you to go back to the old price. I am a subscriber, have been for two years, but when my subscription expires next January, I do not think I will renew it. There are too many other magazines that I want that I can get for a dollar and a half.

I have not written this letter in any spirit of meanness, but to give you a good idea of what one of your readers thinks of the change you have made, and I think it will be taken as such. I want to see *"Modern Electrics"* grow, but grow into the needs of every amateur in the United States. I have tried to keep as much of my personal tastes as possible out of this matter, and represent the wireless amateurs who are your readers, and I hope that I have succeeded.

Long live *"Modern Electrics"!*

Yours sincerely,

PERRY DILLEY.

Los Angeles, Cal., September 16, 1912.

PROFESSOR R. H. BELL SUGGESTS NEW WIRELESS SYSTEM

Editor, *Modern Electrics:*

Dear Sir:—I have been using a system of "Wireless" here for over a year and a half, a description of which may be of interest to the readers of your magazine. The system may seem at variance with received principles, yet on theoretical grounds I was led to adopt it and experience seems to confirm the theory. The great rôle played by the earth in sending and receiving finds, in this system, a beautiful verification.

For sending, take for example a close-coupled oscillating circuit, *grounded* through the tuning coil. Join the aerial through a hot-wire ammeter as usual.

The aerial used in my experiments here consists of twelve wires stretched horizontally (about 3 feet apart) over a distance of 500 feet and then *grounded.* In other words, the main feature of the system consists of an aerial grounded at both ends. For receiving, one end of the aerial is grounded through the receiving instruments, the other end being grounded as described for sending.

The aerial just mentioned is 100 feet in height and runs northeast and southwest. In such a system, extremely satisfactory results are obtained, both in sending and receiving, as I prove in my practice here: What relation the height of aerial should bear to the earth for maximum effect I have not had any op-

World Radio History

portunity of solving. My experience points out that far finer results are obtained with such an aerial doubly grounded than with an ordinary aerial of the same height. This gives us then a decided advantage of diminished aerial height, everything else being equal.

The whole system forms a completed circuit and indicates, according to my mind, that natural earth currents are playing an important part in this scheme.

As all know, there are earth currents circulating in the earth whose general normal flow is northeast and southwest, as may be seen by reference to the investigations of experimenters as given in some splendid articles in the "Smithsonian Reports." These natural currents are varying, but at times are quite regular and strong as I have proved by experiments carried on years ago in districts far removed from any local electric disturbances. And by way of parenthesis I might remark that it will repay any one who wishes to experiment in this direction, to stretch a long wire insulated from the earth and having grounded both ends (with the *same kind* of terminals to earth) through a low resistance galvanometer, say of the D'Arsonval type, to study the movements of the galvanometer coil, especially when the ends of such a wire are grounded in a direction northeast and southwest or thereabouts.

In the system of wireless receiving just described, I have noticed that at times the reception of signals is very much more intense than at other times, which I think I am justified in ascribing at least in part to the varying natural earth currents.

Of course, it is evident that what is termed the ionization of the air plays a great part, likewise, in explanation of the phenomenon just mentioned. However, I am persuaded that all is not to be ascribed to this cause.

The 12 wires stretched as described above 100 feet from the ground will act the same as any other aerial, while the ends being grounded gives us a return in the shape of a ground circuit.

In 1901 I used a long wire, grounded at both ends through condensers and stretched a little above the ground as an aerial device for sending wireless messages, and succeeded admirably for that time; wireless telegraphy being then in its infancy and as I had only a microphone detector invented by me and described afterwards in Maver's "Wireless Telegraphy."

I thought this contribution might be acceptable at this time and serve to promote interest as in one of the issues of the *Scientific American* of August of this year there is an account of the experiments of a certain professor in Berlin who used a long aerial stretched on telegraph posts (therefore close to the earth) and grounded at both ends; his sending apparatus being placed in the *center* of the stretched horizontal aerial.

While the professor's system is somewhat similar to the system I have been using, nevertheless there are a great number of points of difference in the two systems. If I mistake not, he grounds through condensers; I do not. His apparatus for sending is placed in the center, mine at the *end* of the aerial system. His apparatus is very close to the earth (about 20 feet probably), mine pretty far (100 feet), thus giving in my case a real true combination of the ordinary aerial together with the return through the earth, thus forming as it does one great loop.

I would kindly ask you to publish this article, on account of the benefit that may accrue to the art when many experimenters and observers may be incited to take up a study of what I have outlined, and perhaps push it to finer and more perfect conclusions for the benefit of men.

Yours very sincerely,

R. H. Bell,
Prof. Physics.

University of Santa Clara,
California,
Sept. 18th, 1912.

WOMAN WIRELESS OPERATOR LOSES HER JOB

Miss Mabel Kelso, who received lots of advertising as the first woman wireless telegrapher aboard ship on the Pacific Coast, has lost her job. Owners of the liner *Mariposa* on September 6th informed her that her position was vacant, basing their action upon an objection of the Department of Commerce and Labor to the employment of women wireless operators at sea. An attempt will be made to find a position for her in the office of the Government wireless inspector. This bears out our opinion on the field for women operators as expressed in answer to question 2169 in the Oracle Column in the October issue.

A Miss Packer, who was the first woman operator aboard ship, who sailed on the *Mohawk,* of the Clyde Line, lost her position after making only one or two trips.

SIMPLE EXPERIMENTS IN ALTERNATNG CURRENTS

(*Continued from page* 810.)

now, we put the detector in parallel with the receiver we decrease the resistance. The rectifying action will not be disturbed, for the detector will short-circuit the receivers when the current is flowing in one direction while it will let the latter flow through them when going in the opposite direction. This action can be better understood from the diagram in Fig 49, if you carefully study the latter.

World Radio History

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.

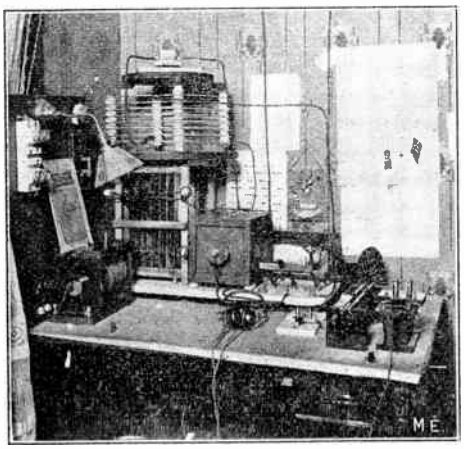
This competition is open freely to all who may desire to compete, without charge or consideration of any kind. Prospective contestants need not be subscribers for (the publication) in order to be entitled to compete for the prizes offered.

FIRST PRIZE THREE DOLLARS

Herewith please find photo of my wireless station.

Sending: ¼-kw. open core transformer, large helix, glass plate condenser, impedance coil, spark gap, rotary spark gap and heavy key.

Receiving: Double slide tuning coil, fixed and rotary variable condensers like the one described in *Modern Electrics*,



GROSS STATION

silicon and galena detectors and pair of Murdock 2,000-ohm receivers.

The large quick action switch throws in aerial, ground, and 110-A. C. current for sending, and aerial and ground for receiving. All instruments were made by myself except the 'phones.

The aerial is of four wires 200 feet long, on 10-foot spreaders, and 60 feet high. My call is W. G.

W. G. GROSS,
Illinois.

HONORABLE MENTION

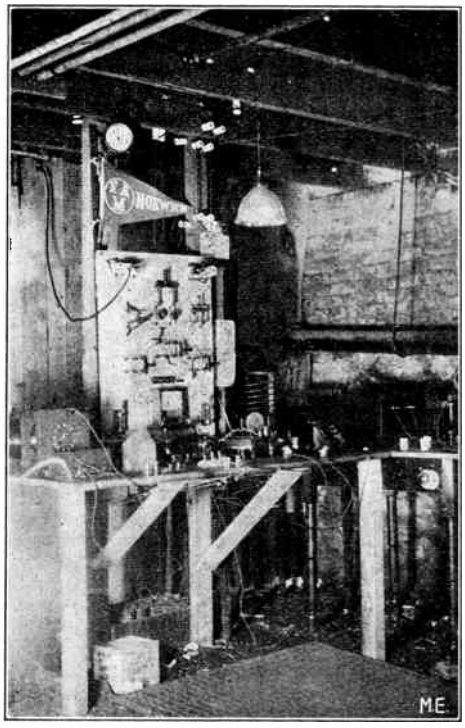
Herewith is a picture of my wireless station.

The sending set consists of a ½ kw. closed core transformer, which is operated on the city current, 110 volts, 60 cycles, through a magnet key which I constructed from a telegraph sounder. The transformer may be seen on the table at the right. The condenser is made up of three racks, each holding twelve (12) plates 7 x 9. These are in back of transformer and can be seen very plainly. I have two spark gaps, one adjustable and one rotary. The latter can be seen in front of the helix. The switch on the front side of the table is for the motor which runs the rotary gap. My other spark gap, which is of the E. I. Co. make, can be seen in back of the telephone. The helix which I made myself, is wound with No. 6 aluminum wire, the wood being of oak. The telephone is one extension set which I had the company put in.

Receiving: My receiving instruments are all on the table in front of the switchboard. I have two sets, one consisting of a three-slide tuner, silicon and galena detectors, fixed and variable condensers,

World Radio History

and a pair of navy type receivers, wound to 3,200 ohms. This set may be seen to the right on the table. The second set, which is to the left, is composed of receiving transformer and double slide tuner, either of which may be used separately or both together, by means of the switches on the board. The rest of the set consists of ferron detector, and a fixed condenser, also a variable condenser which can be switched in from the other set. I have a pair of E. I. Co. 2,000 ohm receivers for this set. All the



SOULES STATION

tuners and detectors, except the ferron are of my own make.

Power: For my transformer I use the city lighting current which is 110 volts, 60 cycles. For my buzzer set and rotary gap I use batteries. All the current is controlled by the switches on the switchboard, which is of marble, and of which I am especially proud. The middle double pole double throw switch is used as an aerial switch.

A curious thing connected with this picture is that somehow one of the wires under the bench broke and for the time I could not find out what the trouble was. not noticing the broken wire. Next day when I printed the picture I saw the wire and wondering what it was, investigated and found out that it had been pulled apart accidentally but was quickly fixed, the set working the same as usual.

With these instruments I have been able to pick up messages from "N. A. B." (Cape Elizabeth, Me.), down the coast as far as "H. A." (Cape Hatteras). I have talked with amateurs for a distance of forty miles.

I have an aerial made up of 6 aluminum wires three feet apart and 125 feet long. It is hung between a 50 foot pole and the top of the house, which is about 35 feet high. The pole is on a ledge which is about 40 feet above the street.

I have gained much knowledge of wireless from *Modern Electrics,* which seems to me the amateur's best friend in the wireless world.

NORMAN E. SOULES,
Connecticut.

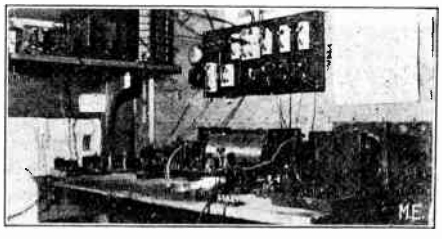
HONORABLE MENTION

Enclosed find flashlight of my wireless set. This outfit is mostly home-made, and good results are obtained from it.

The sending set consists of a helix, glass plate condenser, one-inch spark coil, spark gap, key and all necessary switches.

The receiving set consists of loose coupler, double slide tuner, two variable condensers, 1,000 ohm receiver and four detectors mounted on a fibre cabinet. The detectors are connected in by means of a plug switch. I also have a private telephone line with two other friends.

There are relays, keys and sounders seen at the left of the bench which are used for practicing the code.



DUNMIRE STATION

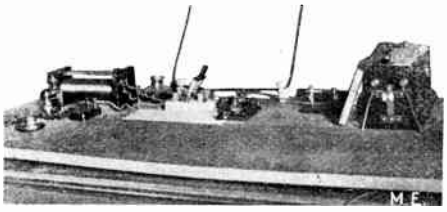
The aerial consists of five copper wires spaced three feet apart 45 feet high at one end and 35 feet at the other.

LOREN E. DUNMIRE,
Iowa.

World Radio History

HONORABLE MENTION

Enclosed find photo of my wireless outfit. My sending outfit, on the right, consists of 1-inch spark coil with the tinfoil and glass plate condenser on left of it,—next to the condenser is the spark gap. The key is on the right side of the D. P. D. T. aerial switch. The receiving outfit is on the left. It consists of an E. I. Co.'s Junior Tuner in front of which is E. I. Co.'s condenser, and Uni-



CONVERSE STATION

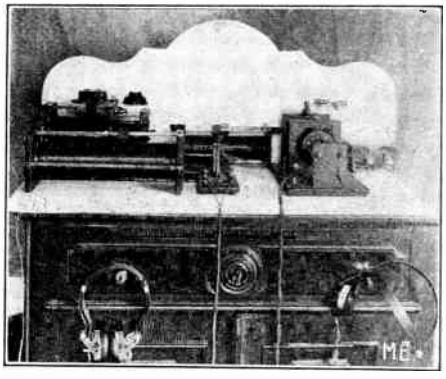
versal detector, and 75 ohm receiver. My aerial is composed of three wires, and is about 55 feet high at one end and 45 at the other end. It is about 45 feet long. With this outfit I can catch messages from boats on Lake Erie. I am a member of the W. A. O. A.

FRANK CONVERSE,
Ohio.

HONORABLE MENTION

Herewith is a photo of my wireless station which comprises the following instruments:

Receiving: Two loose-couplers, 3 fixed condensers, 1 galena and 1 silicon detector, 2 double-slide tuners, 1 pair



PYLE STATION

"Electro" amateur 'phones, 2,000 ohms, 1 Schmidt-Wilkes 1,800-ohm headband receiver, 1 variable condenser (in cabinet).

Sending: "Electro" ½-kw. transformer coil, sending condenser, spark gap (on the right hand shelf. This was knocked over when photo was taken), "Mesco" special wireless key, helix, pilot lamp.

A large D. P. D. T. switch is used to change from sending to receiving. This is mounted on inside of cabinet door.

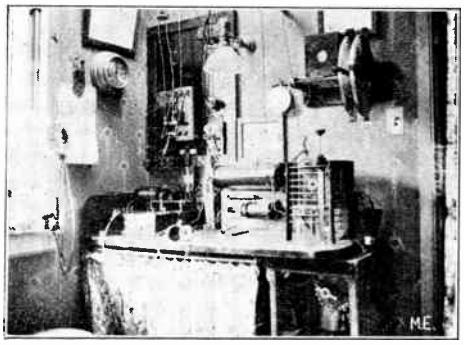
Coil, variable condenser, sending condenser, helix and electrolytic interrupter are mounted in cabinet.

The drawer contains about 30 copies of *Modern Electrics* which I find very helpful. This outfit can be mounted in a portable case in very little time for use in the "Boy Scouts" field work.

HOWARD S. PYLE,
New Jersey.

HONORABLE MENTION

I herewith enclose a flashlight photo of my wireless set and one of the poles. Both poles are the same height. My set



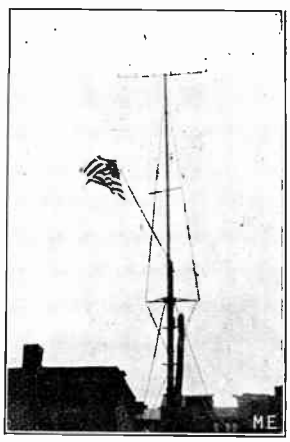
ELY STATION

is composed of the following: the sending side being ¼ kw. transformer submerged in oil, glass plate condenser, in oil, helix with straight spark gap muffled, and a Boston key. Then I have a 1½ inch spark coil made by myself with a home-made interrupter, a rotary spark gap, 22 taps on same, Marconi type, and oscillating helix made from drawing you were kind enough to send me with the June issue of *Modern Electrics* and which works fine. I can switch to either sending set. My receiving set is all home-made from simple directions from your magazine. One 12-point loose coupler with silicon detector and rotary variable condenser made of 11 plates, 1/16 inch apart. The tuning coil box and

World Radio History

heads are of black fibre. I also have a two-slide straight tuner, carborundum detector, with a slide condenser. Both sets work fine, thanks to you and your magazine.

The aerial is 55 feet high, 6 wires, phosphor bronze, 80 feet long. My father often hears me talking to my friends in town when he is 50 miles out on his ship. I can pick up H. A., N.



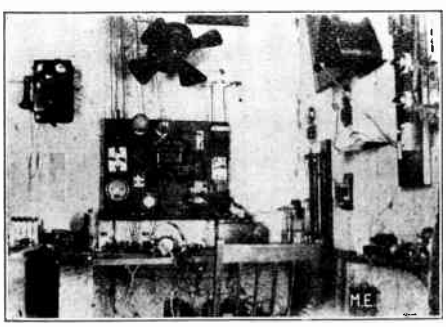
ELY AERIAL

A. M., Wellsfleet easily, but do much better in the winter. My call letters are H. E.

HARRY S. ELY,
Maryland.

HONORABLE MENTION

Enclosed find photo of my wireless station.



NUNN STATION

The sending set consists of a 1-inch coil, electrolytic interrupter, spark gap and key. It is operated on 110 volts, A. C.

Receiving set includes a double slide tuning coil (at the right of picture, mounted on the wall), ferron and peroxide of lead detectors, Brandes 1,000-ohm 'phone with head band and one variable and two fixed condensers.

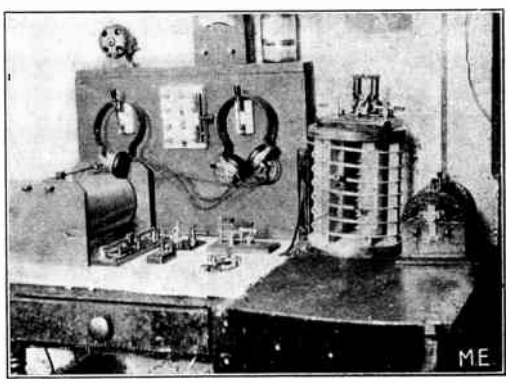
The switch at the extreme right on the large switchboard is for the aerial, while the one just below it to the left operates the primary circuit of the spark coil.

The various other switches shown in the picture, are for the other electrical devices around my station, including an arc light, fan, small step-down transformer, etc.

JAS. D. NUNN,
Texas.

HONORABLE MENTION

Enclosed please find a flashlight of my wireless apparatus. The sending instruments are 1-inch "Bull Dog" spark coil, key, rotary spark gap, hot wire meter, leyden jar and helix. The frame of the helix was turned in the shop at school and is wound with eight turns of No. 6 aluminum wire.



EARL STATION

The receiving instruments are 620 meter s. s. tuning coil, potentiometer, junior fixed condenser and 2,000 ohm amateur 'phones, ferron and silicon detectors, which may be changed by a two point switch. The extra 'phone hanging on the switch is used so that another person may "listen in." I use a 4 P. D. T. switch which, when on the sending side, cuts in the battery and shorts the detectors; and when on the receiving side, cuts out the battery. The wiring is concealed which looks much better than open connections. My aerial consists of 4 aluminum wires 55 feet high and 60 feet long, and ground is connected to the water pipes.

World Radio History

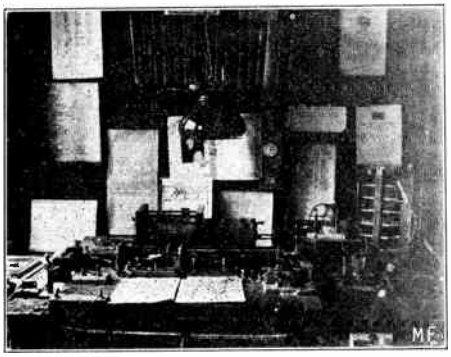
During the electrical show at Des Moines, I heard Des Moines talking to Omaha. I also talk with the amateurs in and about the city. During certain weather conditions I can hear people talking over the telephone very plainly as my aerial runs nearly parallel with the telephone wires. I have been a subscriber to *Modern Electrics* for over two years and anxiously wait its coming each month.

WILLIAM EARL,
Iowa.

HONORABLE MENTION

Enclosed find photograph of my wireless station.

My receiving set consists of loose coupler, fixed condenser, variable condensers, (tubular and plate), galena and silicon detectors, and Brandes Superior type receivers. By means of the D. P. D. T. switch at the lower right I can switch from loose coupler and galena detector to single slide tuners and silicon detector, the latter being used for short waved stations and the loose coupler for long wave-lengths. The aerial is 75 feet long and 35 feet high, of 4 wires on 8-foot spreaders. With this set I copy



BOGARDUS STATION

press from O H X and M C C every night and have heard N A M, H A, and F W H.

For sending I use an automobile coil which I rebuilt, bringing out both secondary terminals, zinc spark gap, leyden jar, speed key or regular key and twelve sal-ammoniac batteries. I find that this set works better without the helix shown in the picture. I have constructed all my instruments with the exception of the spark coil. Would be glad to hear from any amateurs in range. My call is H X B, Morse or Continental.

HENRY L. BOGARDUS,
New Jersey.

HONORABLE MENTION

Enclosed you will find a photo of my wireless set, which was constructed by myself, except the receivers, spark coil and rheostat. For receiving I use the Brandes 2,800 ohm receivers, silicon detector, two tuning coils, one loose coupler, fixed and two variable condensers and a D. P. S. T. switch.

THOMAS STATION

For sending I use a 1-inch coil, glass plate condenser, helix, and spark gap. I use four Edison primary cells to operate the sending and I use a rheostat and D. P. S. T. switch.

My aerial is 24 feet high, consists of four wires, No. 12, one foot apart. I transmit readily, with a chum who lives a few blocks away and have caught Kansas City, which is 55 miles away and has a 12 kw. station. I am a constant reader of *Modern Electrics*, from which I get many points on wireless.

LINCOLN THOMAS,
Missouri.

A CLEVER BUNCH

Gabe—Why do these Mexican rebels always have a battle every Sunday afternoon?

Steve—They know how scarce news is on Monday morning.—*Cincinnati Enquirer.*

World Radio History

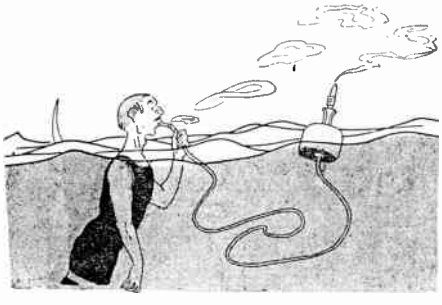
Flying Sparks

A GREAT INVENTION

The new "horizontal" mountain shoe, going up—

—and going down!

FOR INVETERATE SMOKERS



who even when swimming—

—can't be deprived of their little smoke.

REAL "FAN"

Edith—"That Mr. Phan is conversationally impossible."

Ethel—"Why so?"

Edith—"We were talking about the theatre, and when I inquired what was his favorite play he said if he had any favorite it was seeing a man steal second."—*Boston Transcript.*

SUSPENSE

"Muz, did you hear the stepladder when it tumbled over?"

"No, darling. I hope papa didn't fall."

"Not yet—he's still hanging onto the picture molding."—*London Opinion.*

PRECISION

The motto above the great editor's desk read: "Accuracy, Accuracy, Accuracy."

Therefore, the story turned in by the cub reporter contained this statement:

"Three thousand nine hundred and ninety-nine eyes were fixt upon the speaker."

"What means this fool statement?" asked the great editor, as he prepared to use the blue pencil.

"One man was blind in one eye," explained the cub.—*Tit-Bits.*

"DYNAMITE AND BOMBS"

The Burglar: "*Sapristi,* I guess I'd better beat it!"

The Old Miser: "Now for a little fun, counting my dear gold!!" —*Pêle-Mêle.*

World Radio History

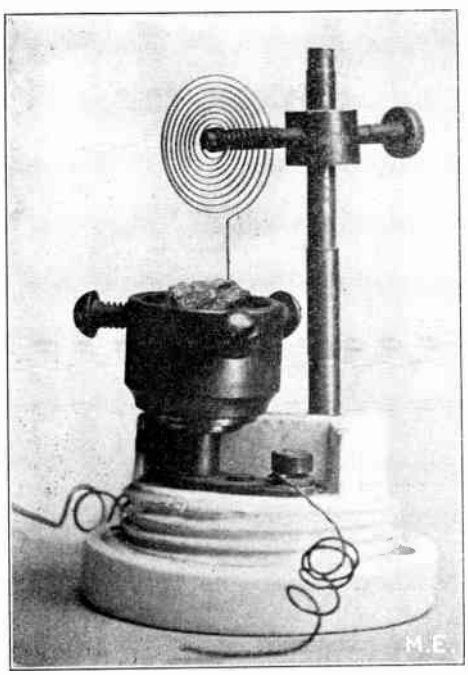
This department has been started with the idea to encourage the experimenter to bring out new ideas. Every reader is welcome to contribute to this department, and new ideas will be welcomed by the Editors. WHEN SENDING IN CONTRIBUTIONS IT IS NECESSARY THAT ONLY ONE SIDE OF THE SHEET IS USED. SKETCH MUST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

FIRST PRIZE TWO DOLLARS

A GALENA DETECTOR

Herewith is a photo of my detector. It works well, and needs no descriptive matter to work by.

The whole surface of the Crystal "Galena" can be easily searched, by gently lifting the spring with a match and letting it down again.



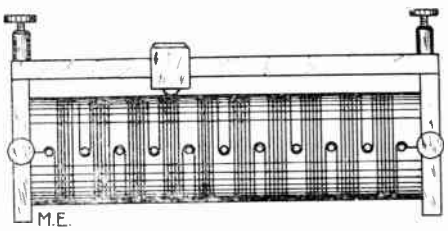
Modern Electrics has a good circulation in this colony, and is very popular.

Contributed by

W. F. HALL, Australia.

SECOND PRIZE ONE DOLLAR

NON-INDUCTIVE POTENTIOMETER



Enclosed you will find a sketch of a non-inductive potentiometer, which I constructed and use.

The core is made of well-seasoned pine, 5½ inches long and 1½ inches in diameter. Before winding, the core must be varnished and allowed to dry. Then a line is drawn parallel to the length of the core, and short brass screws driven into the wood at intervals of ½ inch. The wire (which is No. 30 or 36 bare German silver) is clamped under the first screw and then wound as closely as possible (thread being wound between each turn), until the second screw is reached. Here the wire is again clamped down and the direction of the windings is reversed and wire wound in same manner as before until the third screw is reached. The process mentioned is then repeated until the last screw is reached. The whole instrument is then thoroughly shellacked and set aside to dry.

The binding posts and slides are then attached. The sliders may be bought or made like those described in the July or August (1912) issues of this magazine.

As there is the same amount of wire in each section, one section neutralizes that next to it, so that when the slide is adjusted the inductance is so small as to amount to almost nothing.

Contributed by

J. BOLLINGER.

World Radio History

A COMBINATION TRANSFORMER SECTION WINDER AND HOLDER

In winding the secondaries of spark coils and transformers a great deal of trouble is often experienced, in many different ways, not to mention the time taken in immersing the sections in wax transferring them from the former to the bath, and in the leaving of a number of half dry sections to cool and dry. Moreover, after the coils have been treated in this manner, they must be handled with great care, must have additional insulation from each other on the coil, and cannot easily be unwound.

There are several different methods of winding the secondaries, and there are a number which under certain circumstances are as good as the one herein described, but for the average amateur who does not have access to machines for form and layer windings, and who wishes to save time in construction and still maintain a high standard of excellence, the section former and holder as explained below certainly is worth attempting.

The first requisite is a piece of very dry wood, two inches thick, and of sufficient length and breadth measurements to allow three-sixteenths of an inch over the size of a circle which shall represent the outside of the secondary.

A hole is bored in this piece the proper size to admit of its sliding over the primary of the coil, or wherever the secondary is to be placed. This hole should be bored in the middle of the largest face of the wood.

When this is done the piece should be slipped on a mandrel of wood, held in a lathe, and turned until it is the shape of a small wheel, three-eighths of an inch larger than the "secondary to be." The next step is to turn several deep grooves, three-sixteenths of an inch wide, and leaving walls one-eighth of an inch thick. These grooves should be cut to a uniform depth, which should be such as to leave an eighth inch of wood between the secondary wire and the primary insulation.

While this form is still in the lathe it should be shellacked, and after it has been treated thus two, or, better, three times, it may be wound. The wooden fins between the sections act as excellent insulators as well as holding the wire in place.

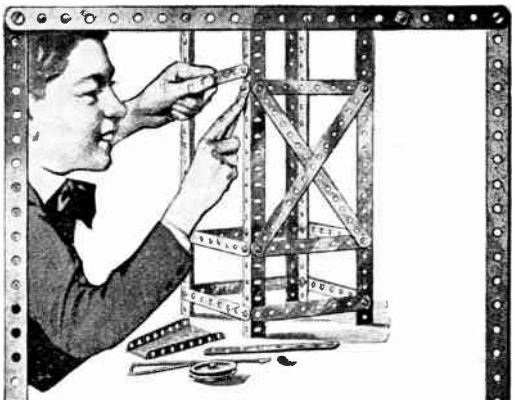
The correct number of these forms should be made for the coil in question, and it will be found that, with such a secondary, a high overload may be carried and no harm done.

Contributed by

RICHARD U. CLARK.

A SIMPLE MICROPHONE AMPLIFIER

This amplifier consists of two needles, which are placed upon the sharpened edges of three carbon blocks mounted upon a suitable base. The construction is plainly shown in the drawing. The magnets placed under the needles are connected in the detector circuit in the same position as the head phones. If now a message is coming in, the magnets pull down on the needles and diminish the ordinarily high resistance of the four contacts. This operates a relay and sounder. The relay,



GREAT MEN today are great builders—of railroads, bridges, huge buildings, giant machines—and they build with steel. With

MECCANO

you can build *working models* of drawbridges, cranes, derricks, signal towers and many other structures with working parts.

Meccano outfits contain everything you need—beams, girders, channel irons, pulleys, bolts—made mostly of plated steel and brass.

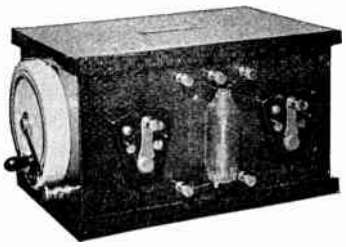
Write for Illustrated Catalog

and list of principal dealers in your section. This catalog describes not merely the outfit, but shows the things you can build. Look for the name Meccano.

Meccano is sold by leading toy and sporting goods stores. See a set.

The Embossing Co., 27 Church St., Albany, N. Y.

Makers of "Toys That Teach"



The Wallace Valve Detector

Price Complete $20.00

Consists of valve bulb, high and low (storage) voltage battery and necessary appurtenances mounted in a mahogany cabinet. Combines all the advantages of the Audion and Fleming Valve with an absence of their failings. The following are extracts from the logs of two of the ships equipped with our valve detectors:

3rd. HA, fine, 700 miles, daytime.
AX, fine, 900 miles, daytime.
4th. MSK, fair, 1,200 miles.
NY, great, 1,125 miles.
August, 1912.
9th. 12.30 a.m., copied press OHX, 695 miles.
10th. 10.00 p.m., worked TWT, heard OHX, 1000 miles.
13th. 2.00 a.m., worked TWT, 1,558 miles.
14th. 11.00 p.m. at dock at Colon, reading TWT in pretty good shape through moderate Static, 2,200 miles.

If you can't send your order today, send a 2c. stamp for descriptive illustrated literature.

WALLACE & CO., 59 Fifth Avenue, New York

World Radio History

Packard

"WIRELESS" TRANSFORMERS

also

INSULATING CLOTH TAPES, VARNISHES and HIGH TENSION -:- -:- CABLE -:- -:-

For the boy who desires to make his own instruments.

All goods guaranteed

The Packard Electric Co.
349 Dana Ave., Warren, Ohio

WIRELESS COURSE FREE

Complete in 20 Lessons

With each purchase of $1.00 worth of our Wireless Material we give you a Lesson, from 1 to 20.

Western Distributors for the Electro Importing Co.

SAME CATALOG SAME PRICES

Boys in Chicago and vicinity are invited to call and look over our line. We also carry a General Line of Electrical Supplies and Novelties.

Static Machine $4.00

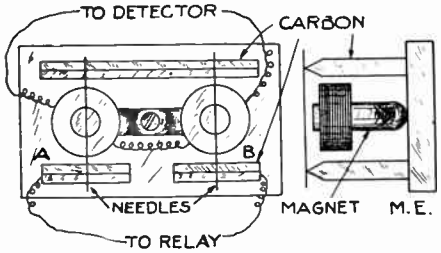
Anderson Light & Spec. Co.
134-6 No. La Salle Street, CHICAGO
Opposite City Hall

When writing, please mention "Modern Electrics."

which should be of the polarized type, is connected with five dry cells in series with the two carbons, *A* and *B*.

This instrument, in connection with a sensitive detector, will register messages from a distance that would not even affect the ordinary registering microphone amplifiers.

The instrument should be placed in a position comparatively free from vibration, as the



slightest shock will cause the relay to operate.

Contributed by

PAUL HORTON,

COPPER PLATING BATH

After experimenting some time with copper plating baths, I find that the one described below is simple, and will admirably answer the purpose of the experimenter.

The articles needed are: A ½-gallon glass jar, ½ ounce sulphuric acid, some lump bluestone and some copper wire.

Fill the jar about three-fourths full of rain water and dissolve in it all the bluestone the water will take up, and put several pieces on the bottom to act as a reserve supply.

Now put the sulphuric acid in and stir well.

Next take the copper wire and cut it into pieces about eight inches long. Fasten these around the edge of the jar, with wire, and connect them all together.

The object to be plated is suspended in the middle of the jar by a copper wire.

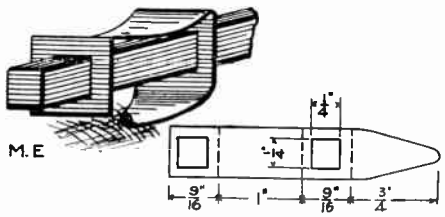
Connect battery or other source of current, so as to have the positive or + pole connected with the wires around the side, and the negative or — pole connected with the object to be copper plated.

Contributed by

DE WITT HOLDER, JR.

THE SIMPLEST SLIDER

I know your experimental department is swamped with sliders, but this one is so exceedingly simple, efficient and easy of con-



struction that I send it to you. It should be made of fairly substantial spring sheet brass.

Its best part is the curved back, which

World Radio History

:nakes firm contact and at the same time steadies the slider.

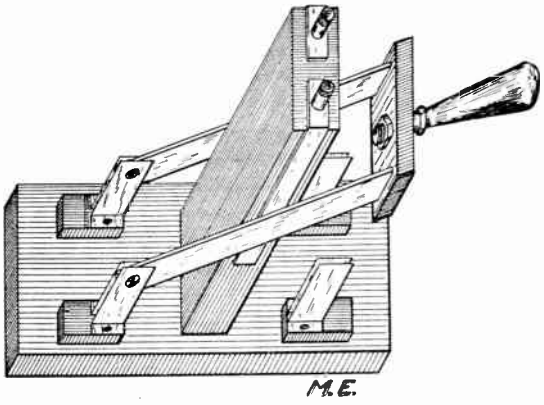
Contributed by

E. R. ANSCHUTZ.

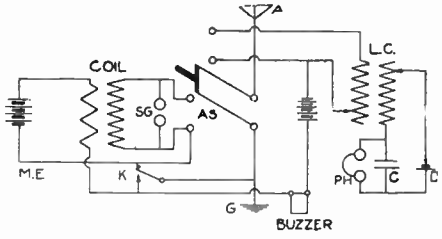
EASILY CONSTRUCTED AERIAL SWITCH

The aerial switch here described can be made from an old slate base D. P. S. T., 250 v., 50 A. knife switch and will work on sets up to 1 kw.

Drill two 3-16-inch holes in the base equidistant from the ends of the base and 1½ inches in from the sides. Insert screws in these holes to fasten the upright to the base. This upright consists of a piece of hard rubber 2 3-16 x 1 inches with two copper strips attached to the sides by means of screws in the top of the upright. Each strip has a binding post attached, for making connections.



This switch has been in use in my station now for over a year and has proved satisfactory in every respect. It is so simple that any amateur can make one. As will be seen only a throw of 30° is required to change



connections. Enclosed is also a diagram of connections.

Contributed by

ED. B. HATCH.

ROTARY SPARK GAP HINTS

If you are not using a transformer of more than 1 kw., close the two air gaps on each side of the revolving disk, so that the electrodes just miss touching. This will give an even note, and will tend to reduce the damping.

Don't run the motor too fast. A rotary is no improvement if it is not in synchronism

MURDOCK RECEIVERS

No. 50
2000 Ohms, Double, $7.50
3000 " " 8.50

PUT A PAIR

into your station, and get everything within range.

Built of the best materials, comfortable to wear, sensitive to the slightest energy, our receivers are recognized everywhere as the best at the prices.

Consider your purchase of a receiver equipment as an investment in service. Murdock 'phones deliver sure, sensitive, and sustained service, today, tomorrow, and up to the wearing out point.

No other 'phones on the market are covered by as liberal a guarantee. They must "make good" for you, in your station.

Seven years' sales, and not a pair returned is the record. They do make good.

Murdock Receivers are sold by progressive dealers in the larger cities, or may be obtained direct from us by mail prepaid. A trial will cost only the time.

ORDER NOW

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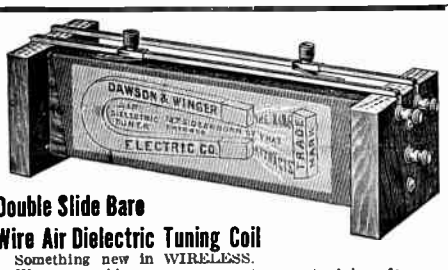


Double Slide Bare
Wire Air Dielectric Tuning Coil

Something new in WIRELESS.

We are making some very extravagant claims for our AIR DIELECTRIC TUNING COILS and there is a REASON. Our departure from the conventional cylindrical form of winding enables us to AIR SPACE the consecutive turns of the bare copper wire, with the result that moisture laden atmospheric dust cannot short the turns; a thing so common and so objectionable in other types of bare wire tuning coils. Each turn of wire touches the common supports (threaded rubber rod) at four points only and those conversant with the subject will appreciate what this means in the way of conservation of the little energy ordinarily available.

Through carelessness or inefficient receiving apparatus it is an easy matter for the listener to throw away what may practically represent one-fourth and even more of the initial energy of the sending station with which he may be endeavoring to get into touch. Such thoughtlessness reminds us of the story of "Darius Green and His Flying Machine." Darius, as you know, was so very confident in his ability to fly that the matter of a little extra weight was a "mere trifle," so in sheer braggadocio he donned an iron kettle for a hat and then made his ignominious plunge from the top of his father's barn.

We do not venture to infer that he could have flown had he not worn an iron kettle for a hat, but his humiliation would have been lessened somewhat had he not done so.

Carelessness regarding the insulation and selection of WIRELESS receiving apparatus is on par with the Iron Kettle episode of Darius.

Our NEW CATALOGUE "B" IS just out. Send stamp and you will receive copy by return mail. Is replete with things of interest to the experimenter in WIRELESS.

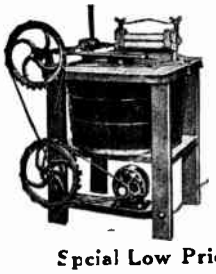
DAWSON & WINGER ELECTRIC CO.
727 South Dearborn St., Chicago, Ill.

COLUMBIA IGNITOR

Makes Your Gas Engine Fire Properly.

NATIONAL CARBON CO.
CLEVELAND, O.

A REAL POWER WASHER



Not a hand power machine with motor attached. Built for electric motor or gasoline engine from the ground up.

Tub is large, corrugated on inside and made of cedar, will last a life time.

Washer is shaft driven, wringer is gear driven, will run either way.

Special Low Price to Introduce.

White Block. BLUFFTON MFG. CO. Bluffton, O.

When writing, please mention "Modern Electrics."

with the A. C. Use a water rheostat to regulate the speed.

There are two methods of determining whether the motor is in synchronism or not. Start the motor running, press key, and note the movement of the studs or electrodes on the revolving disk. If the motor is in synchronism, the wheel will appear to be standing still. If, on the other hand, the studs are wavering back and forth, then the speed of the motor must be varied until the studs appear absolutely motionless. This may require a little patience, but you will be amply rewarded by the increased efficiency of your set.

The other method is to muffle the spark so that the only noise heard on pressing the key is the discharge of the condensers. The note of the condensers sounds slightly "flat" when the motor is not in synchronism, but when they emit a clear, distinct, ringing tone, then the motor is running at the correct speed.

With an induction motor it is, of course, impossible to regulate the speed. The only means available for regulating the spark tone is to vary the number of studs on the revolving disk. Battery motors are very unsatisfactory.

The insulation around the gap should be as nearly perfect as possible to prevent the high frequency surges from making their way into the motor. It is a good plan to shunt the motor with a grounded condenser to reduce the troublesome kick-back. Just because you haven't been troubled with kick-back so far, don't think you're immune. A little forethought may save a good motor later.

In oiling or refilling grease cups, don't be too generous with the lubricant on the bearing nearest the commutator, for obvious reasons. In cleaning the commutator (once in two weeks is often enough), use a little sandpaper, finishing up with a soft cloth. *Never* use emery paper, as little particles of emery lodging between the segments may result in a short circuited armature. Also the emery sticks to the copper segments and cuts out the brushes.

Do not clean the spark electrodes, neither stationary nor revolving. Doing so, will cause a spark tone to be emitted that, no matter how high pitched it may be, is not absolutely even and regular. The first time a rotary is used, a smooth tone is hardly ever obtained. The spark soon wears the plugs down, however, until they are in perfect alignment with each other, resulting in the emission of a pure, musical note.

Descriptions of excellent water rheostats and kick-back condensers may be found in previous editions of *Modern Electrics*. See that *your* motor is protected.

Contributed by

ELLERY W. STONE.

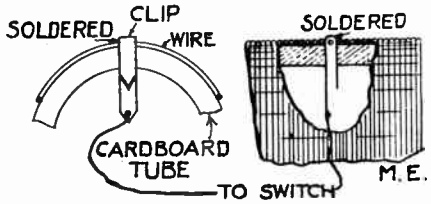
TAPS FOR LOOSE COUPLER WINDINGS

Straighten out ordinary paper fasteners (the kind without heads). Then solder a wire to one end of each. Next cut slits (one slit for each straightened fastener), at desired spots, through the cardboard secondary, large enough for a fastener to slide through.

Wind the insulated wire till you come to

World Radio History

the slit through which the thin piece of brass is protruding. Then scrape off the insulation (about one-eighth inch) and solder the wire to the fastener, leaving a quarter of an inch space beyond soldered spot. Be sure that the solder is applied thin, or if not, you will have trouble. Bend the end over the soldered spot and pull in the fastener till the wire is on the level with the rest of the winding. All of the ends of the wire are connected to a multi-



point switch. Perhaps the sketch will help to make it clearer.

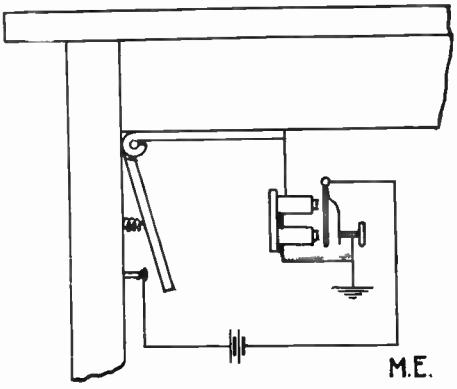
Contributed by

OTTO STACH.

BUZZER TEST KEY

I hope this little device will help other readers of *Modern Electrics* as much as it has helped me.

Take a hinge, solder on a good strong spring and then fasten it to the leg of your



wireless table like cut.

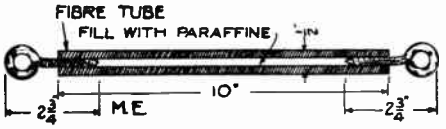
I use this "key" on my buzzer test circuit and when I am operating I have both hands free to work switches, etc. To operate the "key": sit near enough to the hinge to press it with your knee and close the circuit.

Contributed by

JOHN B. STARKWEATHER.

AERIAL INSULATOR.

I have not seen a good insulator for aerial use printed in the Experimental Department for some time. Here is one I have been using



on a ½ k.w. sending set, using 14 gauge aluminum wire 130 feet long. It consists of a heavy fibre tube with a heavy screw eye in each end. The tube is filled with melted

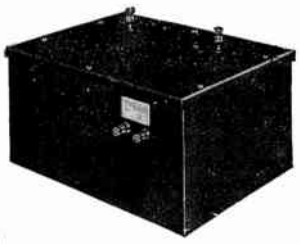
A COMBINATION THAT CAN'T BE BEAT

Where a clear, distance-reaching spark is desired, "W-M" Transformers and Condensers form an unparalleled combination.

They may be used equally well with the stationary or the rotary quenched gap.

½ K. W. Condenser $8.50

Fully guaranteed as to efficiency and service, "W-M" Apparatus has justly risen to a position of esteem in the minds of a host of operators throughout the world. A 2c stamp will bring our complete catalog.



½ K. W. Transformer $20.00

Worts-McKisson Mfg. Co., Dept. M., Toledo, Ohio

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Is what you have wanted ever since you became interested in Wireless Telegraphy, A First Class Receiving Set at a Moderate price. A card will bring descriptive matter.

WACHUSETT WIRELESS SUPPLY CO.

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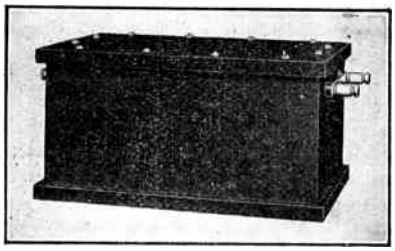
The Blitzen Transformer



¼ K.W. $15.00 ½ K.W. $22.00 1 K.W. $36.00

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paraffine and the insulator when completed is dipped in paraffine and given two coats of a good waterproof insulating varnish.

Contributed by

JOHN BURSON.

A SIMPLE METHOD OF ASCERTAINING YOUR AERIAL HEIGHT

Wireless amateurs, upon joining the various wireless associations are now asked to give the height of their aerial mast and other dimensions, so that their wave length may be figured out. Many amateurs have erected their masts without measuring the height, and, consequently, many dimensions sent in are merely "close guesses." If the length of the shadow of the mast on level ground can be measured, the following method eliminates all guess work.

First, drive a stake in a level piece of ground, anywhere, not necessarily by the mast; then, making sure that it is vertical, measure the length of the shadow, and immediately measure the length of the mast's shadow. Now, dividing the length of the stake by the length of its shadow gives a quantity which, multiplied by the length of the mast's shadow, gives the height of the mast above ground.

Example.—A stake 6 feet high produced a shadow 8 feet long, and $6 \div 8 = 0.75$.

The mast's shadow was 56 feet long, and $56 \times 0.75 = 42$ feet, the height of the mast.

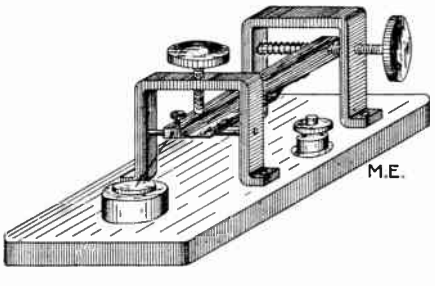
Contributed by

PAUL HORTON,

GALENA DETECTOR

The drawings herewith are intended to illustrate a detector I constructed recently, which, after testing, I think will be welcomed by the amateur who still adheres to the mineral type of detector.

One great fault I find with the average detector is that the up and down adjustment of the contact is not sufficient to find the sensitive spot in the mineral; and if the adjustment



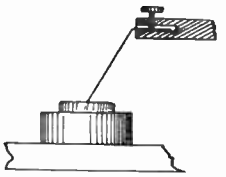
is made by sliding the cup around it is liable to get out of adjustment at the least jar.

The adjustment of my detector is very delicate; and to use it, first adjust vertical thumb screw until wire just touches mineral, then turn side thumb screw, drawing the contact wire sidewise over the mineral until a spot is found. If all goes well, and a good piece of

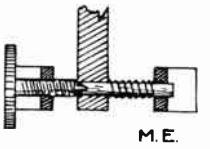
World Radio History

galena is used, a large station will come in like thunder.

The contact wire may be No. 30 to 36 platinum or copper (I prefer platinum). Manipulating the top thumb screw gives a front and back adjustment to the contact point. This, together with the side thumb screw, permits



Detail of Contact with Crystal.



Construction of Rear Pivot.

any point on the surface of the crystal to be reached. The cup is fixed in position, but may be revolved.

Contributed by

J. F. ARNOLD.

A CHEAP BUT EFFICIENT PORTABLE WIRELESS RECEIVING OUTFIT.

The outfit which I am about to tell how to construct has been used by me with great success. I have used it for one and one-half years and found it very efficient. First of all, I will

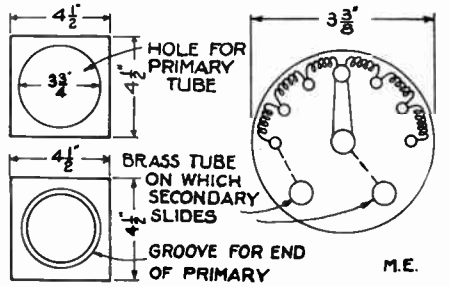


FIG. 1 FIG. 2

describe the making of the base. The base is made of whitewood. It should have the dimensions 18x12½x¾ inches. The edges should be beveled. The ends which support the primary should be 4½x4½x½ inches. In one of these pieces a round hole must be cut

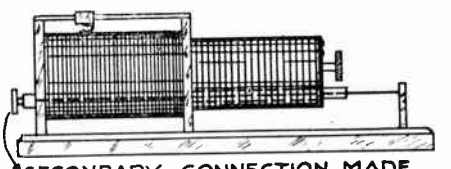


FIG. 3 M.E.

3¾ inches in diameter to allow the primary to set into it. The other end piece must have a circular groove of the same diameter, into

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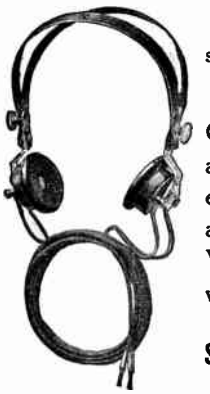

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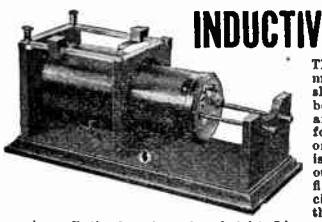

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which the cardboard tube of the primary may set (Fig. 1). The round pieces which fit in the ends of the secondary tube should be true circles 3⅛x½ inches. The cardboard tube, on which the primary is wound is 5½x3¾ inches. The outside diameter of the tube used is 3¾ inches, while the inside diameter is 3½ inches. The primary should be wound with No. 20

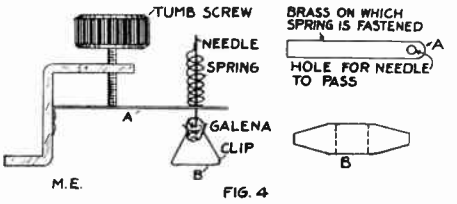


FIG. 4

enameled wire, thus taking less room and being easily scraped to allow the slider contact. Two sliders should be used. The slider rod should be 6x¼ inches, and of brass. Very good sliders may be obtained from the Electro Importing Co. The secondary should be of No. 28 S. S. insulated wire wound on a cardboard tube 5½x3⅜ inches. It should be tapped every ¾ inch and the leads brought

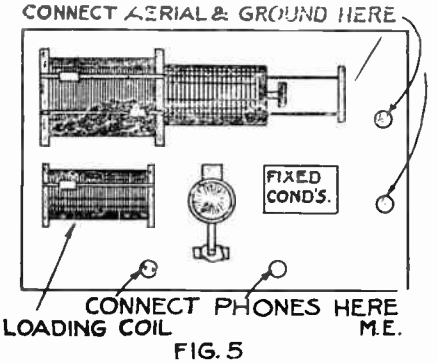


FIG. 5

out to a switch (Fig. 2). The secondary should slide on tubes of brass to which connections are made. These tubes should make contact with the ⅛-inch rod on which they slide, and the connections to the rest of the set should be made with them (Fig. 3). This completes the loose coupler. The detector is made as shown in Fig. 4. Everything is shown plainly in the drawing. Nothing need be said of the fixed condenser, as all amateurs can

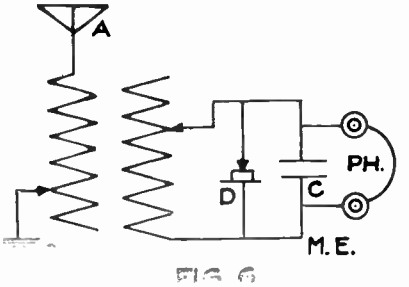


FIG. 6

construct them. A small loading coil can be used if it is thought necessary. After the above instructions have been carried out, the

World Radio History

base and other parts should be stained before they are assembled. The person making the set can use the color he prefers. Most any color will do. The one mentioned was stained walnut. A good finish can be obtained by first staining the set the desired color. Then take a small quantity of white shellac and rub it in well. This will take the dullness out of the stain. If regular varnish is used this is not necessary. The instruments should be set on the base, as shown in Fig. 5. They should be hooked up, as in Fig. 6. All wiring should be done with stranded wire, and all connections should be soldered to give best results.

Contributed by

J. W. D.

HOW TO BUILD A SIMPLE VARIABLE CONDENSER

In order to overcome the defects of the rotary plate condenser and still retain its fine adjustment, the following "built up" type was designed:

The ordinary condenser is built up of units, but in the following each alternate sheet is connected to a contact. The condenser proper is made by selecting a round wooden core, and wrapping it with several layers of paraffine paper of a good grade. The dimensions vary,

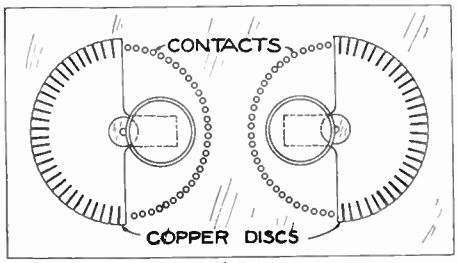


FIG 1

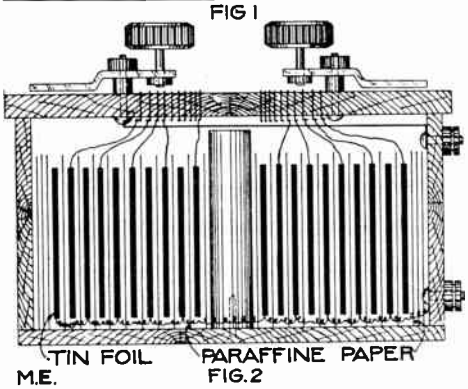
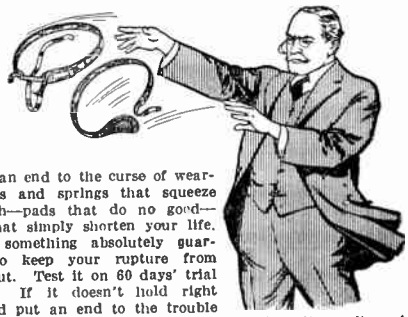


FIG. 2

but a core about 4 by 1½ inches is right for the average station. The tinfoil is applied between sheets of paper as is usual. Bring the lug or connector of the first sheet out at one end and the lug of the second sheet out at the other end, and so on, staggering the lugs at one end and keeping them in line at the other end, until about 120 sheets are applied. Now connect the 60 lugs that line up together and place this end down in a case

Away With Worthless Trusses



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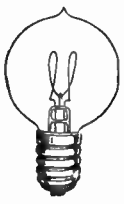

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Send for Descriptive matter to
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When writing, please mention "Modern Electrics."

of right size, as shown in Fig. 2. Bring a connection out to a binding post and fill the space around the condenser with paraffine wax.

The switch arms, to be placed on top of the case, are made of semi-circular copper discs, which have a projection to hold the hard rubber handle. The edge of the disc is slotted, as shown, to improve the contact between the rotating discs and the contact points. There should be about thirty contacts to each disc. These are made of finishing nails about 1½ inches long driven in the wooden top up to the heads, which are then filed off smooth and level. The projecting ends are then bent over at right angles, as shown at *B*, Fig. 1. Each contact is now connected to a sheet of foil. One switch arm should be connected to the other, and then to the remaining binding post. It is seen that the outer sheets of foil have considerably more capacity than the inner, and hence they should be thrown into the circuit from both ends, doing the coarse tuning with the large sheets, and the fine tuning with the small sheets.

This form of condenser is very compact, and may be mounted inside of a tuning coil, having the switches on the coil heads.

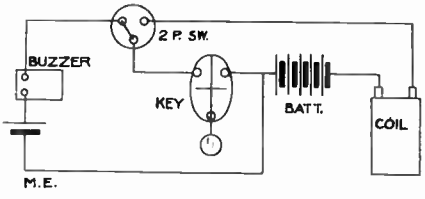
The difference of potential between any two contact nails is very small, and hence they may be driven very close together. All dimensions are left to the builder.

Contributed by

PAUL HORTON.

BUZZER TEST AND SPARK COIL WORKED BY SAME KEY

Enclosed please find drawing for buzzer test outfit, which can be worked from an ordinary telegraph key. I do not think the drawing needs much explanation. The two point



switch is for changing from the buzzer to the spark coil. This connection will permit the use of the key, which will be found to work much easier than a push button.

It is also handy for beginners, as it accustoms their ear to the sound of the message

Contributed by

FRANCIS J. CALLANAN.

JILTING HIM

Maud Muller was raking the hay.

"I'm an intelligent agriculturist at the very time you are in danger of the recall," she explained in refusing the Judge.—*New York Sun.*

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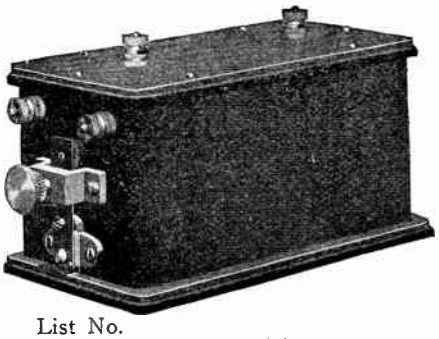
WIRELESS SPARK COILS



This style coil is especially adapted for Wireless Telegraphy and is furnished with heavy Platinum points. The coil is enclosed in a neat polished Oak Case with Brass trimmings and has condenser in base to decrease sparking at contact points. It will work on less current than any other coil on the market, requiring but 6 to 8 volts and ¾ of an ampere to 4 amperes, according to size of coil.

List No.		Price.
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64	Spark Coil, 2 inch, operates on 8 dry cells	9.00
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PATENTS

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PATENTS

A Talk to the Inventor

When you get an idea, do not apply for patent because some one says it is patentable. *Certain details* make it patentable—find out *what* these are, and get copies of nearest resembling patents, so as to judge the value of your improvements.

Send Sketch of Your Idea for free advice, and I will send you valuable book of patent information that you ought to have; written so you can understand it. Services of the highest class.

H. L. WOODWARD

Suite 15

9th & G Streets, Washington, D. C.

When writing, please mention "Modern Electrics."

Advice on Patents

TELEVISION

(73) B. A. Repelow, of New York, asks us what we consider as the best invention on television and how he can obtain copy of patent covering this.

A. We have published quite a few patents on television and refer you to our article on television in the December, 1909, issue of this magazine, which we can mail you for ten cents. There has also been described a patent on television on page 506 of our August, 1912, issue, which we can mail you for fifteen cents.

We have no data on hand whereby we could judge just what the best patent is.

TRANSFORMER

(74) J. H. Mellon, of Pennsylvania, sends in a sketch of a transformer which has a somewhat different shape from other transformers.

Our correspondent terms his invention a double secondary transformer and the idea of some of its points is very good except that it will be very hard to assemble such a transformer. Otherwise, we think the idea is good, but we are not sure that a patent can be obtained on this transformer, as it closely resembles the magnetic leakage type which has been patented. However, a search in the Patent Office might be conducted.

TROLLEY WHEEL

(75) Clare E. Tipping, of Toronto, sends in a design of a trolley wheel which is supposed to bring the trolley back to the wire if the trolley has slipped off.

A. This idea is an old one and has been patented as described in *Modern Electrics* about one year ago. As stated before, we advise inventors not to invent trolley wheels, as there is no demand for any.

DETECTOR

(76) W. H. Corbett, of Ohio, sends in a design of a detector and wants a candid opinion if it can be patented.

A. We have carefully studied the design, but come to the conclusion that it has no merit, and while perhaps a patent could be obtained, we think it would be useless, as we have often found out that a mere detector stand unless it is radically different from others, is of no value.

AERIAL MOTOR

(77) R. W. Walling, of California, sends in a design of a wind mill attached to the front of a radiator of an automobile The wind mill or fan to be operated by the wind or air pressure, while the automobile moves, and the power thus obtained to be conveyed to a dynamo in order to obtain current.

A. This looks very much like perpetual motion and the idea is, of course. of no practical value. A dynamo might just as well be attached to and driven from the automobile axle itself. as it makes no difference whether a fan in front of the automobile acts as a brake or whether the brake is put on the axle of the machine.

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REFERENCES

Lincoln National Bank.....Washington, D. C.
Little Giant Hay Press Co., Alma, Mich., and Dallas, Texas
Electro Importing Co.....New York, N. Y.
American Railway Appliance Co.....Oil City, Pa.
Farmers' Mfg. Co,.....Norfolk, Virginia
Griffin Mfg. Co.....New York, N. Y.
Warsaw Paper Box Co.....Warsaw, N. Y.
Butler Engineering Co.....Akron, Ohio
Garl Electric Co.....Akron, Ohio
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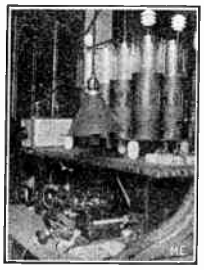

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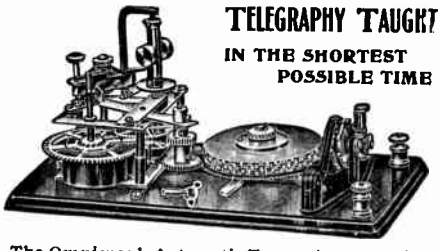

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When writing, please mention "Modern Electrics."

Our correspondent does not seem to be very well acquainted with the first laws of mechanics.

"TUNING CONDENSER"

(78) George W. Casey, Jr., of Pennsylvania, sends in a design of a variable condenser which he terms a tuning condenser, the tuning being done by means of a switch lever.

A. From the illustration shown it is impossible to see just how this condenser works and at best it would appear to us that there are a good many useless connections and more condensers than are actually required.

We do not think that a patent could be obtained on this device.

SELF-ADJUSTING AUTOMATIC MOTOR STARTER

(79) A. R. Coleman, of Virginia, sends in a design of a self-adjusting automatic motor starter which is supposed to immediately adjust itself for a light load, a heavy load or overload. Our correspondent wants to have our advice on the device.

A. The idea seems to be quite plausible, and we think it will work all right, but we are afraid that the release magnet will not be able to work quite quickly enough to take care, for instance, of a change from a very light load to an overload.

However, we would not condemn the idea on account of this, and if our correspondent will experiment with this device we are sure that he will come to a satisfactory conclusion, as the idea seems really worth while.

MARCONI DEMONSTRATES HIGH SPEED TRANSMISSION

It is reported from London that the Marconi Company gave a demonstration before representatives of the various government departments, of a new high-speed apparatus for the transmission of wireless signals.

Signals when received are recorded on a revolving cylinder which may afterwards be caused to repeat the signals at a rate of speed slow enough for operators to read them.

The device is also adapted to print the signals on a tape.

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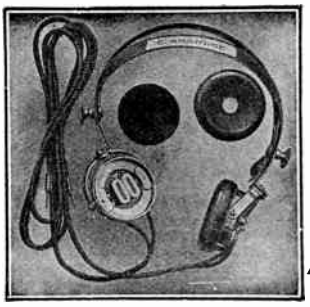

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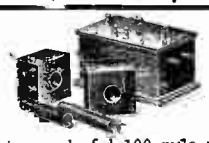

This wonderful 100 mile wireless coil is only made by us. Our imitators use secondaries with bare wire. **Ours is enamel.** Be sure you get our coil. Guaranteed to transmit from 75 to 100 miles, according to aerial used. This coil works on AC or DC in connection with our electrolytic interrupter. It gives about 2" spark. Can be taken apart without trouble. Size is 9 x 5½ x 4½". Weight of coil 9 lbs. Box is of quartered oak and highly polished and finished. Only best material used throughout. Your money refunded if not satisfactory. Price is **$7.50**

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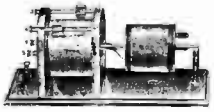
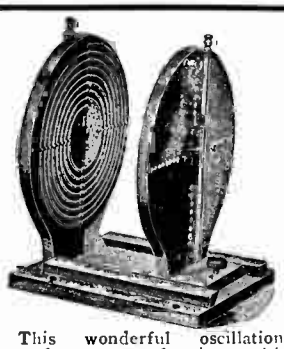


This beautiful loose coupler, finished in quartered oak throughout with latest style *bare wire wound primary* and two sliders. Secondary is wound with green silk insulated copper wire, giving the apparatus a beautiful business-like appearance. Workmanship is of the highest order throughout, and you will find this loose coupler to do anything and everything any other loose coupler of 3 times our price will do.

Secondary is connected with flexible silk cord to binding posts, and you will not have any trouble with loose sliding contacts, experienced so much on other loose couplers. Price... **$4.00**



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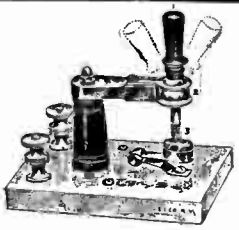

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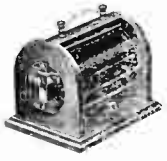

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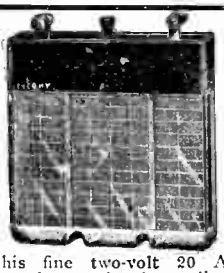
I thank you for the information pertaining to wireless that you gave me while I was working on same.

(Signed) Charlie L. Vanderburg.

Above is a sample of numerous letters received almost daily by us. DO YOU DEAL WITH HEADQUARTERS?



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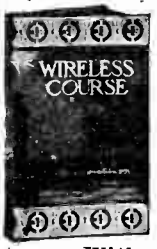

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on Enamel wire. This is positively the greatest sale, and the most ridiculous price reduction on first class enamel w re ever pulled off anywhere in the U. S.

We have so much of it that we must let you in on the deal. All the wire is absolutely new, unused and guaranteed. Your money back if you don't like the wire. Comes on 1 or 2-lb. spools only.

No. 34 B. & S. Enamel Wire, per lb..... **70c**
No. 35 B. & S. Enamel Wire, per lb..... **80c**
No. 36 B. & S. Enamel Wire, per lb..... **90c**

Only these 3 sizes at reduced prices.

This superb pony telephone receiver. Shell and cap made of hard rubber composition. Most powerful ring magnet. Nickel plated hanger. Wound to 75 Ohms resistance. *With two of these phones and no batteries conversation can be held over 500 feet.* The best low priced receiver made. Price each..... **40c**

The same phone wound to 1,000 ohms for wireless..... **$1.50**

By Mail, extra, each, $.07.

ANNOUNCEMENT.

FREE! Nearly ready, "Experimental Electricity Course." This course is of the same size as our Wireless Course and can be obtained absolutely free. Write today for conditions. *Do it now!*

FOLD, TEAR HERE AND MAIL ME 11-12

1913 CATALOG
Ready Nov. 10th

I enclose herewith 4c. stamp for which please send me your 196-page Electrical Cyclopedia No. 11 at once, containing 400 illustrations and over 1500 electrical articles and valuable information on electrical and WIRELESS subjects.

Name.....
Address.....
City.....

THE ELECTRO IMPORTING CO.
"Everything for the Experimenter"
233-Z FULTON ST., NEW YORK
Retail Store, 69 West Broadway

When writing, please mention "Modern Electrics."

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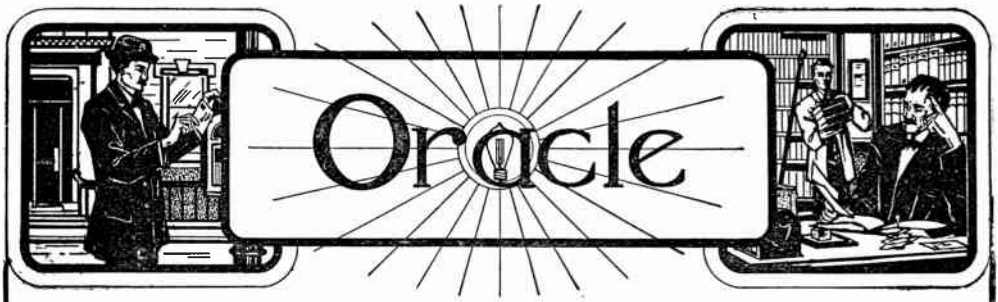

Queries and questions pertaining to the electrical arts, addressed to this department, will be published free of charge. Only answers to inquiries of general interest will be published here for the benefit of all readers.

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.

RECEIVING TROUBLES

(2182.) William Milton West, Maryland, writes:

Q. 1.—Should I be able to hear Cape Cod with the following hook-up: Loose coupler-primary 5 inches long, 3 inches in diameter, No. 24 DCC wire; secondary 5 inches long, 2¾ inches in diameter, No. 26 DSC wire, divided into ten parts? If not, please give me a hook-up which will make such possible. Aerial four strands No. 16 aluminum wire, 47 feet long, 2 feet apart, 25 feet above a three-story house.

A. 1.—You may be able to hear Cape Cod if you use an audion detector. We hardly think you can do it with any other kind of a detector on account of the small size of your aerial.

Q. 2.—What size helix should I make for a 2-inch coil?

A. 2.—Don't use a helix. Make up an oscillation transformer as per supplement to the June, 1912, issue of *Modern Electrics*.

Q. 3.—What is my wave length with the above receiving outfit?

A. 3.—You may probably tune up to about 1,000 metres with your apparatus and aerial.

SPARK COIL AND TRANSFORMER USED TOGETHER

(2183.) Charles F. Jacobs, New York, says:

Q.—I have an Electro Importing Company 1-inch spark coil and ½ kilowatt open core transformer and a Gernsback interrupter, and I wish to know if there is any way possible for me to run them both (coil and transformer) together on the one Gernsback interrupter, and, if so, how I should connect primary and secondary binding posts?

A.—These two coils cannot be used together for the reason that, if connected in series the current from the transformer coil would be so heavy that it would overheat or burn out the secondary of the spark coil and cannot be connected in parallel for the reason that the secondary voltages differ and one would pump current through the other.

MOTOR TROUBLES

(2184.) Arthur J. Bates, Massachusetts, asks:

Q. 1.—Which is the best way to tell an alternating current motor from a direct current motor, or vice versa?

A. 1.—The alternating current motors as a rule are marked either alternating current motor or A. C. motor; or, if not, the name plate usually bears the word *cycles* or the word *alternations*, preceded by a number. If the motor has no name plate and the rotating element has no commutator or slip rings the machine is an induction motor and operates on A. C. current only. If the machine has a commutator and brushes and the field frame is built up of sheet iron punchings the chances are that the motor is designed to operate on either alternating or direct current, although there are motors built this way which will operate only on alternating current, and others which will only operate on direct current. If the field frame is made of a solid mass of iron, either wrought or cast, and the motor has a commutator and brushes, it is a direct current motor.

Q. 2.—What voltage wound for, description: Armature, 3 inches long by 2 inches in diameter, twelve sections, each section wound with No. 26 B. & S. wire with a twelve segment commutator, armature of the lam-

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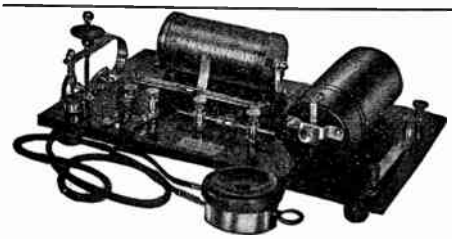
SENDING AND RECEIVING WIRELESS OUTFITS

COMPLETE — PORTABLE

IDEAL SETS AT A PRICE YOU CAN AFFORD TO PAY



Mounted on solid oak base, size 7 x 12

No. 796—$5 Value $3.90

Sends ½ to 1 Mile—Receives up to 500 Miles

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

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

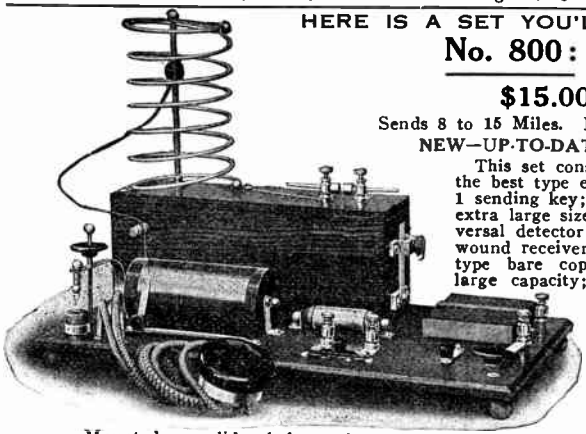
HERE IS A SET YOU'LL BE PROUD TO OWN

No. 800: $8.95

$15.00 Value

Sends 8 to 15 Miles. Receives 600 to 800 Miles

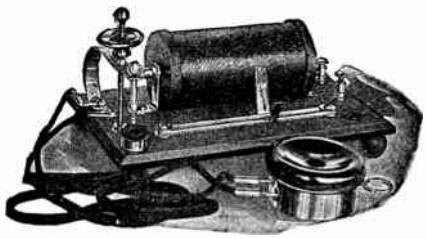
NEW—UP-TO-DATE—GUARANTEED



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

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

For the Beginner



No. 797 Mounted on Solid Oak Base ..... $2.50 VALUE..... Receives up to 500 Miles **$1.75**

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

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

By Mail 32c Extra

WIRELESS SPARK COILS

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

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

DON'T BUY BEFORE WRITING US. SEND AT ONCE FOR CIRCULAR M.

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NEW YORK

General Offices
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AN INVENTION WORTH $1,000,000

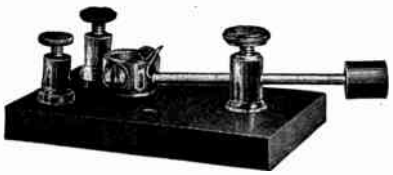
and **not** patented is as safe as a bag of gold on the sidewalk.

Anyone can take it and deprive the **owner** of its use. A **WISE** man does not hesitate to come to **me** and say: *"Here is my invention and your fee of $5.00, tell me if my invention is **patentable**, and **worth patenting** after you have looked through the Records and other places you think best. I want a **complete** and **candid** report."* And he gets it, because I give the matter **my personal attention,** and the benefit of my practical and technical experience. In addition the $5.00 paid goes to the fee for making up the papers and drawings of the case, if proceeded with. My charges are low and my work high-grade and **I see** that my clients' **patents** get what they are **worth**.

All my work is **guaranteed** and my general opinion and booklets free.

A. P. CONNOR
Electrical and Mechanical Engineer
PATENT ATTORNEY
121 Carroll St., S. E. Washington, D. C.

Detectors



Our Detector No. 54 is the most sensitive device for the detection of wireless waves yet produced. Satisfaction guaranteed. Price $1.50. Send 2c. stamp for catalogue.

Merker-Flocker Electric Co.
957 Liberty Ave. Pittsburgh, Pa.

Election Returns By Wireless
Don't Wait Until November
Erect Your Aerial Now and Have it Ready

Extra Strong No. 14 Bare Aluminum Wire
Best Phosphor Bronze Wire,
7 Strands, No. 22
Aluminum Wire (approx. 240 feet to the pound), $.50 per pound
Phosphor Bronze Stranded Wire,
1½c. per foot

FLETCHER-STANLEY COMPANY
32 & 34 Frankfort Street, New York

When writing, please mention "Modern Electrics."

inated disk type; 75 turns of wire to each section; field, two coils, each wound with about one (1) pound of No. 34 B. & S. wire, wound in a form and clamped around a field magnet; motor is of enclosed type, with two brushes and three binding posts?

A. 2.—Your motor is probably wound for 110 volts D. C.

Q. 3.—What was the trouble when this motor would only run without the field and only run on 110 volt D. C. about half speed, as recommended by the seller, and would not move with or without field on 110 volt A. C. 120 cycle?

A. 3.—From your description of the motor given above we judge that it is of the shunt wound type; that is, the two field coils are connected in series across the terminals of the armature; in other words, the field and armature are in parallel. Possibly you had the fields connected in series with the armature when you attempted to start it, and the current flowing through the field coils was insufficient to cause the armature to rotate; or it may be possible that the two field coils are connected up wrong, in that they produce two north poles or two south poles instead of one of each.

LEYDEN JAR. TESLA TRANSFORMER

(2185.) Marvin Mottashed, Louisiana, writes:

Q. 1.—I have made a one-half pint Leyden jar and would like to know how to charge it, so that a person may receive a shock from it?

A. 1.—Hold the jar in your hand and bring the knob connected to the inner coating near the positive terminal of a static machine or the positive secondary terminal of an induction coil, while the machine or coil is in operation, but do not bring the knob of the jar into actual contact with the terminal. When sparks cease to jump from the terminal to the knob of the jar the latter is fully charged and should be withdrawn while the machine or the coil is still in operation.

Q. 2.—I have a Tesla coil, secondary 2-inch diameter, 12 inches long, wound with No. 34 wire spaced 1/32-inch apart. The primary is wound with ten turns No. 12 wire. What should be the spark length of this coil, run by a 1¼-inch spark coil and two 1-pint Leyden jars?

A. 2.—The Tesla coil may produce a spark anywhere from 1 to 2 inches long, depending upon the detailed construction of the Tesla coil and the amount of current fed to the spark coil.

CONDENSER PLATE MATERIAL. LOOSE COUPLER WINDING

(2186.) Preston L. Gates, Minnesota, asks:

Q. 1.—Please give hook-up for following instruments and add any that I need to receive at least 200 miles with: Double slide tuner, 12 inches by 3 inches; loose coupler, primary 6 inches by 4 inches, wound with No. 28 copper wire with taps, secondary 5 inches by 2½ inches, wound with No. 32 copper wire, 10 taps; electrolytic detector, two small fixed condensers and an aerial 60 feet high, composed of four aluminum No. 14 wire, 50 feet long, spaced 2 feet apart, as per diagram? I

World Radio History

Boys! Have Loads of Fun with this Miniature Power Plant

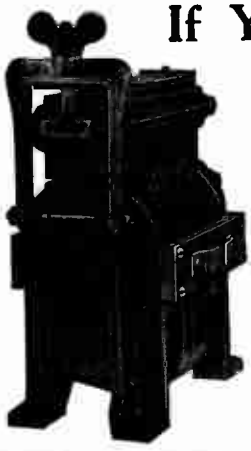
YES, BOYS, you can have a regular *power plant* right in your own homes. You can operate all your electrical toys on *live electric current.* No batteries needed. You can make all kinds of interesting experiments and have barrels of fun, if you own a

Thordarson Toy Transformer

To use a Thordarson Toy Transformer, you simply attach its long connecting cord to any alternating current lamp socket and it will operate small fans, motors, electrical toys, wireless or other induction coils; ring bells, buzzers, and light small lamps. In handsome black enameled steel case. Practically indestructible.

Makes the Dandiest Christmas Present

You could not ask for a more pleasing Christmas present than a Thordarson Toy Transformer. You'll like it better every day. If your dealer does not carry Thordarson Toy Transformers, write us for circular and full particulars.



If You Have a Wireless Outfit, You Need a Thordarson Flexible Step-Up Transformer

Endorsed by wireless experts. Power varied by simple turn of a thumbscrew. Connects direct to mains. No resistances or choke coils. Like all the THORDARSON specialties, the Flexible Step-up Transformer is electrically, magnetically and mechanically perfect. Two types—10,000 and 20,000 volts output. Write today for full information.

THORDARSON ELECTRIC MFG. CO.
509 South Jefferson St. **CHICAGO**

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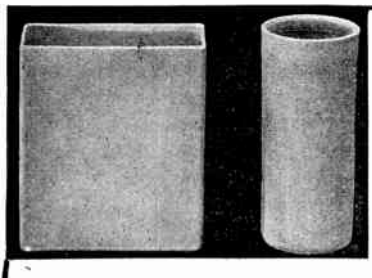
HIGHEST GRADES OF

MOULDED INSULATING COMPOSITIONS

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

THE SIEMON HARD RUBBER CORP.

BRIDGEPORT CONN.



We have been making porous cells since 1855. We are the makers of the famous Gray & Clark Patent Reinforced Top Cell. We make to order any kind of a porous cell or jar if it can be manufactured on a practical scale. If you have occasion to use porous cells or earthenware jars for batteries or other purposes, get in touch with us at once.

NEW ENGLAND POTTERY COMPANY, 149 Condor St., East Boston, Mass.

FAUCET WATER MOTOR

Complete with emery wheel, buff wheel, pulley to run sewing and washing machine, polish. In some cities where we have no agents, and where the water pressure is good, a **sample motor** will be given **free**; apply at once if you want to make some extra money, or if you can devote your whole time, liberal salary and commission will be paid. **$2.50**

ALCOHOL STOVES, LAMPS AND FLAT IRONS

ENGINEERS WANTED to send for catalog of indicators. Reducing Wheels Planimeters. Address

LIPPINCOTT M. S. CO.

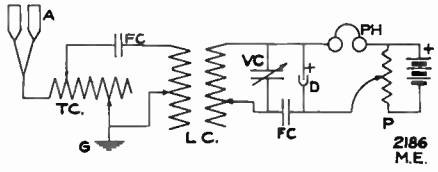
52 Columbia St.,

Newark New Jersey

When writing, please mention "Modern Electrics."

cannot increase my aerial in height or length.

A. 1.—Hook-up herewith.



Q. 2.—Can tin be used as the plates of a rotary condenser?

A. 2.—Yes.

Q. 3.—Does it make any difference which way the wire is wound on a loose coupler; that is, should the secondary be wound in an opposite direction than the primary, or not?

A. 3.—It makes no difference whether the two coils are wound in the same direction or in opposite directions.

SMALL DYNAMO CAPACITY

(2187.) Harry Wyatt, Connecticut, inquires:

Q. 1.—Will a 4-inch Hercules water motor on a 1-inch pipe with good pressure run the No. 9 Ken Davis generator sold by Mesco?

A. 1.—Yes. If the water pressure is from 60 to 70 pounds per square inch.

Q. 2.—Is it possible to lower the amperage of a dynamo by means of lamps?

A. 2.—Yes.

Q. 3.—Can I charge a 10-hour 6-volt battery and light a 1¾ ampere lamp with an 8-volt 4-ampere dynamo?

A. 3.—Yes.

WAVE FREQUENCY

(2188.) H. P. Jellison, Maine, wants to know:

Q. 1.—Do high and low frequency waves travel at the same speed; that is, do they travel the same distance in a given time? If so, would not a low frequency current have a longer wave?

A. 1.—Wireless waves travel at the same speed regardless of their frequency. If you refer to the antenna current, the lower the frequency the longer the wave.

Q. 2.—Since a long wave is to be preferred as it passes by any obstruction better than a short wave, why is it that people use a rotary spark gap to get a high frequency spark?

A. 2.—The rotary spark gap affects the frequency of the spark, but this has no effect on the frequency of the current in the antenna; the latter frequency is determined solely by the inductance and capacity in the condenser and aerial circuits.

Q. 3.—Explain how a Tesla coil changes the frequency?

A. 3.—A Tesla transformer does not change the frequency. The high frequency current is generated in the primary circuit containing the spark gap and condenser, and the voltage of this high frequency current is simply stepped-up in the secondary winding.

COST OF "MODERN AMATEUR WIRELESS STATION." HEATER CONNECTIONS

(2189.) Percy Davis, Ontario, asks:

Q. 1.—Would you kindly give me an estimate of the cost of an equipment for a wire-

World Radio History

BIG CATALOG

JUST OUT
300
BIG PAGES

What this Big Catalog Contains: 100 pp. Wireless Insts. 40 pp. Motors and dynamos. 20 pp. Telegraph Insts., 12 pp. Victrolas, etc., etc.

ELECTRICAL and WIRELESS SUPPLIES

Mailed for 6 cts, stamps or coin, which you may deduct on first order of $1.00. Great cost of catalog, and our low prices, prohibits distribution of catalog, except to those really interested.

LOWEST PRICES 25% to 33% SAVED

In purchasing from us. Just one instance: Our flash-lights, equipped with Mazda Lamps and new Tungsten batteries (400% more power, light and service than old carbon battery) are lower in price than most dealers' cost. $2.50 Miner's flash-light only $1.80, post. 22c; $1.75 "Bull Dog" only $1.20, post. 20c; $1.25 Nickel flash-light only 85c, post. 6c. The same low prices on wireless instruments, motors, magnet wire, binding posts and thousands of electrical products.

Our magnet wire is made by the largest factory in the U. S. S.C. and D.C. mean single and double cotton.

No.	S. C. per lb.	D. C. per lb.	Enamel lb.
16	.37	.40	.43
20	.45	.49	.46
22	.47	.53	.49
24	.51	.61	.54
26	.57	.70	.64
28	.68	.83	.73
30	.73	.96	.86
32	.92	1.10	1.02
34	1.19	1.42	1.36
36	1.45	2.00	1.65

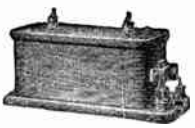
Only 6c, to show you are interested, secures you this great catalog.

Celebrated Ferron Detector. It yet remains the peer of all Detectors licensed for private use. Price only $5.00.

The Ferron Detector contains the same high grade crystal, and an adjustment equally as admirable as the Pyron Detector. licensed for commercial use and which sells for $65.00. License for private use permits of low price. A patron in Georgia writes: "Put Ferron in circuit and easily picked up several ships off Norfolk and New Orleans, also land stations. Signals came in so loud I could hear them with telephones removed some distance from my ears."

FREE Wireless Course

Our catalog is practically a free course in wireless. Has as much wireless information as many $1.00 wireless books. Contains a comprehensive exposition of the principles of wireless; the uses and purposes of all wireless instruments; detailed instructions, with diagrams, showing every step in the direction of aerials; over 30 diagrams, made by an expert in wireless, showing "hook-ups" for practically all combinations of wireless instruments. Over 100 pages devoted to wireless. Complete sets from a few dollars, to thousands of dollars, for high class commercial equipment.



STANDARD WIRELESS COILS. Note prices: ½ in. $2.75 2 in. $ 7.50 1 in. 4.00 3 in. 13.75 ½ K.W. Transformer coil, for line current, $6.25; with vibrator, $8.00.

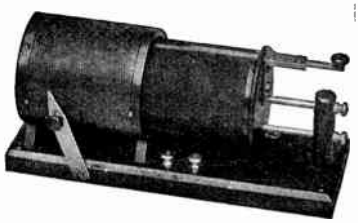
THE J. J. DUCK COMPANY, 432-434 St. Clair St., Toledo, Ohio

CATALOG "A" READY

We were delayed in obtaining our cuts; a large mailing list further delayed us. You will get your copy within a short time. If you are not on our list send for catalog enclosing 5c stamps (no post cards answered). That amount will be allowed on your first order.

"DIFFERENT" WIRELESS GOODS

The kind you can't help getting Results with. All of them have the "OK" of a well qualified judge backed with our guarantee. Our stock is the most complete. You can choose from 3 Loose Couplers. Three double slide tuners, six detectors, three variable condensers, three kinds of "Phones". The only spark coil made that will give satisfactory results on dry cell batteries — Transformers — Keys — Helixes—Condensers—Parts and Supplies.



$8.00

2,000 Ohms
$5.00 to $12.00

We do not show in this catalog our large line of Miniature Railways, Motors, Christmas Tree Lighting Outfits, Flashlights, Lamps, Sockets, etc. If you want to know about them write for catalog No. 15.

The Oldest and Most Progressive Electrical House Established.

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632 ARCH STREET, PHILADELPHIA, PA.

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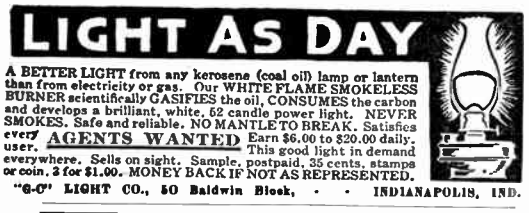
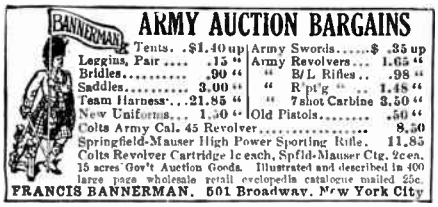




When writing, please mention "Modern Electrics."

less station such as was described in the September issue of *Modern Electrics?*

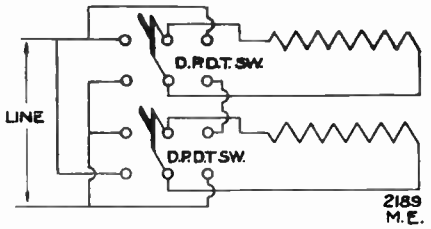
A. 1.—If the current supply is A. C. the cost of the apparatus is about $165.00, or if the current supply is D. C., the cost will be about $155.00. To this should be added the cost of conduit and fittings for the power wiring, which should not be more than $5.00, and the aerial, which would cost from $5.00 to $50.00, depending upon the size and height. If the supporting masts are very high it is probable that the cost of the aerial will exceed $50.00. Also, if the oscillation transformer is purchased instead of being built according to the June supplement in *Modern Electrics,* the additional cost will be from $5.00 to $22.00, depending upon the workmanship and finish of the instrument.

Q. 2.—Can a Canadian be a member of the Wireless Association of America?

A. 2.—Yes.

Q. 3.—How can I connect a heater which is divided into two sections so that I may connect the two sections in series, one section only, or the two sections multiple?

A. 3.—Connect the two sections to two DPDT switches as per diagram herewith.



When both switches are to the left the two sections are in multiple. When both are to the right they are in series. With either of the switches to the right and the other to the left, one section is connected in and the other is not.

DETECTOR POINTS. WIRELESS LAW REGARDING AMATEUR STATIONS

(2190.) Bryan G. Barker, Minnesota, inquires:

Q. 1.—What size wire is the enclosed sample? There is no wire gauge in town small enough to measure it. How much of this wire will it take to wind the field coils of a 1/30-H. P. motor? It is a bi-polar, A. C. motor wound for 110 volts 60 cycle.

A. 1.—The sample of wire submitted is No. 36, B. & S. gauge. We cannot say how much wire the motor will need, but in all probability a half pound of wire will be more than enough.

Q. 2.—What are the best styles of detector points for the following crystals: Ferron, galena, and silicon?

A. 2.—For the Ferron detector an iron point is generally used; with galena, a fine platinum or copper wire is generally used, though best results are secured by using a pointed crystal of tellurium in place of the wire; with the silicon detector a brass point is generally used, with good results.

Q. 3.—Does the Alexander wireless bill limit receiving as well as sending stations?

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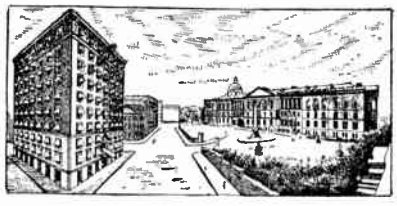

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A. 3.—As we understand the wireless law, the sending wave length is restricted to 200 metres, but there is no restriction on receiving wave lengths.

SPARK COIL SECONDARY

(2191.) M. Sayers, Connecticut, writes:

Q.—I have bought a secondary winding for a ½-inch spark coil from the Electro Importing Co., 1½ inches outside diameter, 1 inch inside diameter, 2 inches long. Please tell me what spark should this give?

A.—With proper primary, on 6-volt battery, this coil should give a full ½ inch spark.

2 KW. OSCILLATION TRANSFORMER. 2 KW. WIRELESS TRANSFORMER

(2192.) Willard S. Wilson, Delaware, asks:

Q. 1.—Please give the names of materials required for the construction of an oscillation transformer suitable for a 2 kw. set similar to the June supplement of *Modern Electrics*.

A. 1.—Build your oscillation transformer the same as shown in the June supplement, except that the ribbon should be one inch wide instead of that specified in the drawing.

Q. 2.—Please give me the latest specifications for a high voltage 2 kw. closed core type 110 volt A. C. transformer (for wireless transmission)?

A. 2.—Core, 17½ x 8¾ inches outside dimension, the cross section of the core being 2¼ inches square; primary, 13½ pounds No. 8 B. & S. gauge DCCC in three layers, 12 inches long, wound on one leg of the core; secondary, 21 pounds No. 28 DCC in thirty pies ¼ inch thick, having 920 turns each. The square hole in the pie should be 2¾ inches in diameter, and the overall length of the secondary winding should be 11 inches.

Q. 3.—Where can I obtain a core for the above transformer?

A. 3.—Sheet iron for transformer cores may be bought from the Electro Importing Company.

COIL WITH ELECTROLYTIC INTERRUPTER DRAWS TOO MUCH CURRENT

(2193.) James J. Hayes, Jr., Texas, writes:

Q. 1.—Using a 1½-inch coil with interrupter on 110 A. C. I get a ½-inch yellow flame ⅛-inch thick. When using a condenser (made up of 15 tinfoil plates 4 by 5 inches separated by 16 photographic glass plates) I get a 3/32-inch blue spark that crashes in a gap with ⅜-inch plugs and it fills the gap. Is this O. K.? If not, what is the trouble?

A. 1.—This seems O. K. to us.

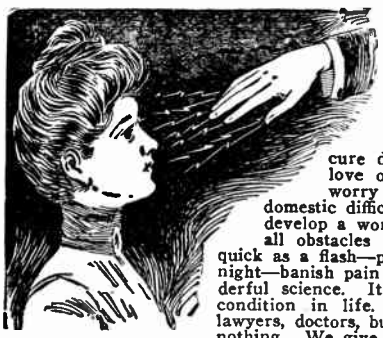
Q. 2.—Will a rotary sing when used with a 1½-inch coil interrupter on 110 A. C.? What is the correct acid to use in interrupter, commercial or pure sulphuric?

A. 2.—No. See answer to No. 2092, in the August, 1912, issue; also, article on "A Modern Amateur Wireless Station," in the September, 1912, issue. Either acid may be used.

Q. 3.—I have a copper rod running into the interrupter, but it fails to wear down to a point, and our meter—oh, my! I am afraid its wheels are going to run off their axis. The meter bill is up in the air. How can I improve in these faults?

A. 3.—Connect a lamp bank or a choke

World Radio History



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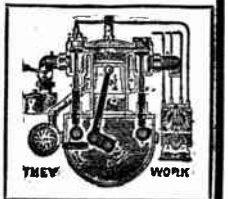

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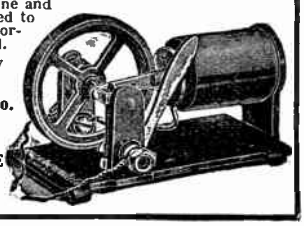
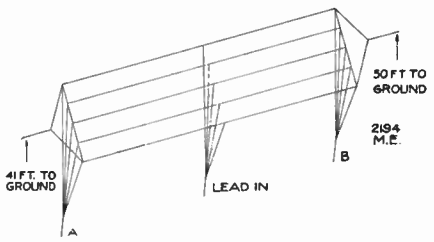


coil in the primary circuit to limit the primary current to 5 amperes.

ROTARY SPARK DISC SPEED

(2194.) Churchill Gerry, Massachusetts. wants to know:

Q. 1.—Would this aerial be better with or without the two fans A and B? Aerial is 50 feet high at highest end. Fan B is 15 feet long, fan A is 8 feet long. Aerial is 55 feet long.



A. 1.—The aerial will be better without the fans.

Q. 2.—Is the wave length of the above aerial over 100 metres? If so, how much?

A. 2.—No; the wave length is under 100 metres.

Q. 3.—What is best speed to run a rotary spark gap at which has 12 points on a wheel with a diameter of 3 inches?

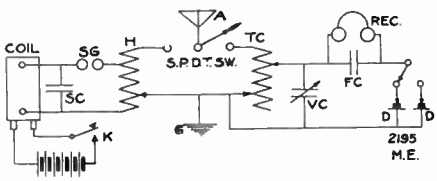
A. 3.—This should run from 3000 to 4000 revolutions a minute.

HUMMING DONE AWAY WITH BY SWINGING AERIAL

(2195.) Hermann Seele, Texas, asks:

Q. 1.—Please give me a hook-up for the following instruments: Receiving: Double slide tuning coil, silicon and galena detector, two point switch, a variable and fixed condenser and 2000 ohm H. B. receivers. Sending: One-inch coil, helix, spark gap, key, fixed condenser and a SPDT switch to change from receiving to sending.

A. 1.—Diagram herewith.



Q. 2.—When I first had my aerial running parallel with the high powered wires a humming sound was heard in the receivers. I then put the aerial at right angles with the high powered wires, and the humming sound stopped. The distance staying the same. Can you explain?

A. 2.—This is all right, and shows you have simply done what we have repeatedly advised amateurs to do when troubled with humming in the receivers due to nearby power wires. The explanation of the humming noise is that the alternating current in the power lines sets up a magnetic field which expands and contracts at the same rate as the frequency of alternation in the power current. This expanding and contracting magnetic field

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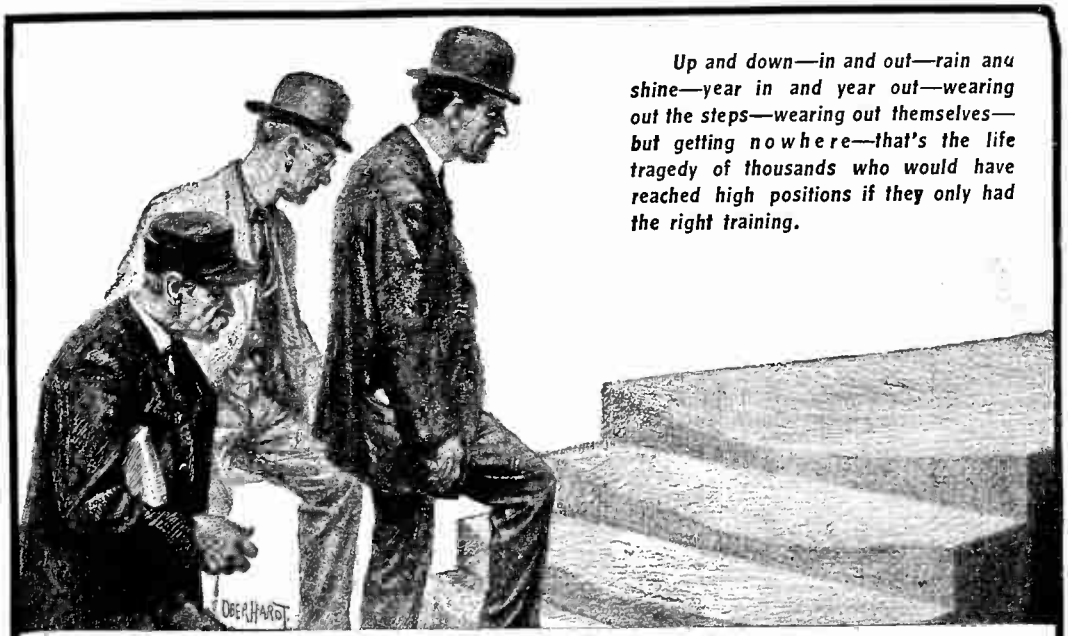

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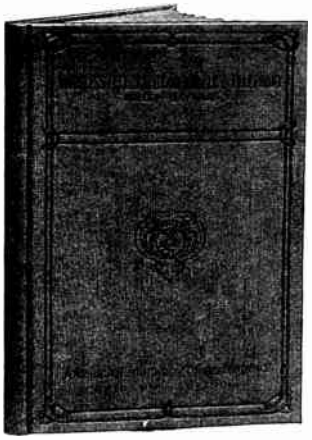

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in turn induces currents of the same frequency as the power current in the aerial when the latter is parallel to the power wire, and this induced current produces the humming noise in the receivers. When the aerial is swung around at right angles to the power lines the humming noise is done away with, for the reason that a wire carrying A. C. current cannot induce current in another wire which is placed at right angles to it.

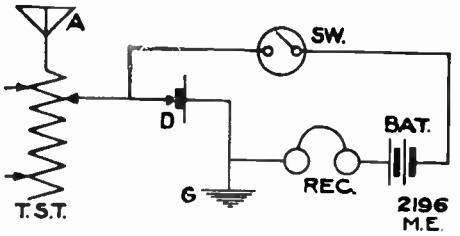
Q. 3.—Are there any other stations in San Antonio, Texas, commercial or amateur, except the Government one recently built?

A. 3.—There are no commercial stations in San Antonio. If you wish to have the amateur stations in your vicinity looked up, write to the Wireless Association of America and enclose fifteen cents to cover the expense of looking them up.

THREE SLIDE TUNER HOOK-UP

(2196.) W. Geiger, Ohio, writes:

Q.—I have a triple slide tuning coil and have only one slide connected, as shown in the hook-up below. Would like to know where to connect the other two sliders?



A.—If you are using a silicon detector, cut out the batteries and the switch and hook up the apparatus as per the diagram in answer to No. 2139 in the September issue of *Modern Electrics*, leaving out the variable condenser and putting a small fixed condenser in the position shown in the diagram.

AERIALS

(2197.) Luther Lachamber, Staten Island, asks:

Q. 1.—What is the wave length of my aerial, comprising two wires each 175 feet long and two wires each 93½ feet long? The latter are 58 feet high, and the former 58 feet one end and 35 feet other end.

A. 1.—If your lead-in is taken from the end of one of the pairs of wires the total wave length is about 400 metres, while if the lead-in is taken from the middle the wave length is about 300 metres.

Q. 2.—Is there any definite way, or an approximate way, in which to tell the wave length of an aerial by sight?

A. 2.—The approximate wave length may be found by estimating the distance from the spark gap to the end of the aerial and multiply this distance in feet by 4/3. The result will be the wave length in metres, but this will be a very rough approximation.

Q. 3.—Will an aerial comprising two wires 75 feet long and 3 feet apart, 50 feet high, be as efficient as one exactly the same dimensions but only four strands? If not, why not?

A. 3.—For receiving purposes the two-wire aerial will be practically as efficient as the

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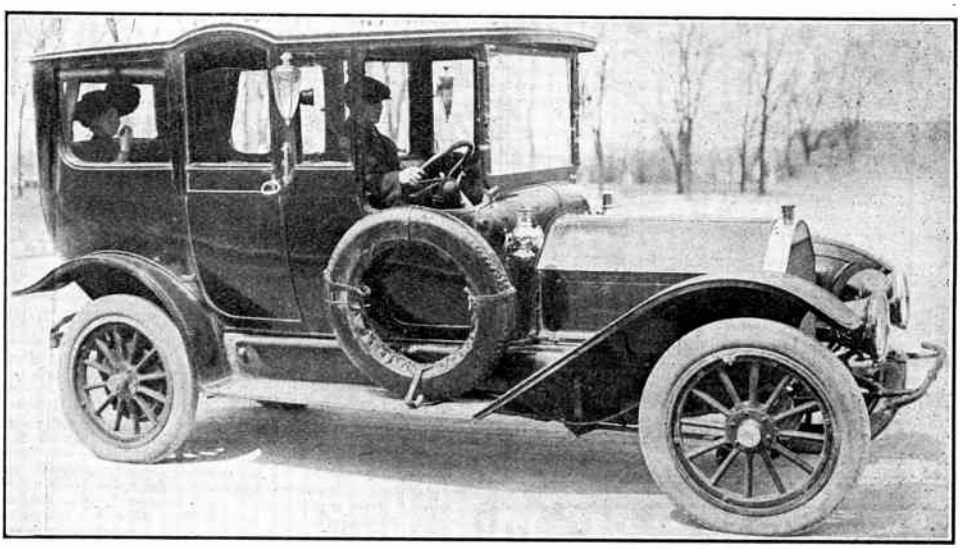

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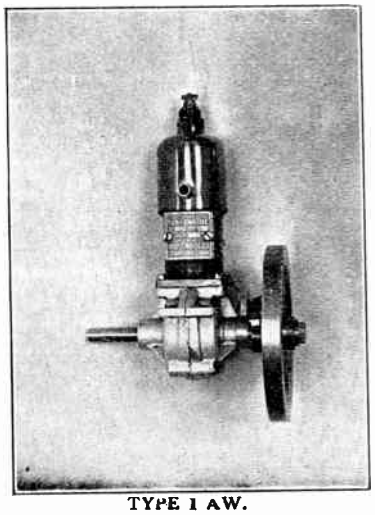

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four-wire aerial, but for sending the increased number of wires increases the capacity of the aerial and the amount of current in the vertical part, and this in turn increases the sending range.

TRANSFORMER

(2198.) Chester Fuss, New York, wants to know:

Q. 1.—Will two wireless stations about one-quarter mile apart work well if they are both grounded on pipe of the same water system?

A. 1.—Yes.

Q. 2.—Could a transformer for wireless be built like the type described on page 601 of September issue?

A. 2.—It can be built, but would not give satisfactory service for the reason that there would be a marked tendency to arc at the spark gap. This transformer is essentially a power transformer, and not a transformer of the wireless type.

SIZE AND LOCATION OF AERIAL

(2199.) Paul J. Hoffman, New York, says:

Q. 1.—My aerial, which is 55 feet long, 45 feet high, and composed of four wires spaced 9 inches apart, is in a long hall in my house (the only available place), and though I receive fairly well, I would like to improve it. Could I connect another aerial of the same capacity and two feet below it to the first, and so double the efficiency of my set?

A. 1.—This may increase the efficiency a little, but not very much.

Q. 2.—If not, how can it be done?

A. 2.—Put a big aerial up above your roof.

Q. 3. Can I use a rotary spark gap on a one-inch coil?

A. 3.—Yes, but see answer to No. 2092, in the August, 1912, issue, and also the article on the "Modern Amateur Wireless Station" in the September, 1912, issue.

WIRELESS CONDENSERS. WAVE LENGTH FORMULA

(2200.) W. C. Shinn, New Jersey, asks:

Q. 1.—What capacity should a fixed condenser be for a wireless receiving set?

A. 1.—The condenser should be adjustable and have a capacity of from 0.002 to 0.005 mfd.

Q. 2.—Please give formula for calculating condenser capacity; also give formula for calculating wave lengths in metres.

A. 2.—See the answer to No. 2074 in the July, 1912, issue.

Q. 3.—What capacity should a variable condenser be for a receiving set?

A. 3.—About 0.0015 mfd.

FERRON DETECTOR. AERIAL WIRE

(2201.) James A. Ray, Texas, inquires:

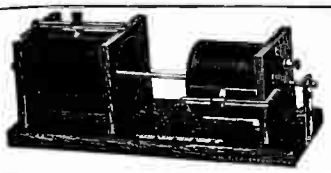
Q. 1.—Is the Ferron detector a good detector, and is it sensitive?

A. 1.—Yes; but it is rather difficult to get it into adjustment.

Q. 2.—Is copper wire better than aluminum wire for an aerial?

A. 2.—Yes, copper is better, but the aerial would be more expensive.

World Radio History



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OHM'S LAW

(2202.) Henry V. Nesbit, Indiana, writes:

Q.—Will you give me a rule or formula to solve this problem: It is desired to send a current through an external resistance of 40 ohms, using a battery of 10 cells; each cell has an internal resistance of 0.5 ohm and an EMF of 1.2 volts. What will the current be when all the cells are connected in series? What will the current be when the battery is made up of two groups of cells in parallel, each group consisting of five cells in series?

A.—This problem is easily solved by the application of Ohm's law. The current equals EMF, divided by the total resistance in the circuit. In the first case the EMF is 12 volts, the total resistance is 40 ohms plus the internal resistance of the cells (5 ohms), or 45 ohms, and the current is 0.266 amperes. With the cells connected in series parallel the EMF is 6 volts and the total resistance is 40 ohms plus the internal resistance of the cells (1.25 ohms), or 41.25 ohms, and the current is 0.145 amperes.

AERIALS. NEW STATION SLI

(2203.) Arthur E. Hapeman, Connecticut, writes:

Q. 1.—I have two aerials, one a single wire (copper), 200 feet long and 30 feet high, and the other a four-wire loop aerial 80 feet long and 25 feet high. I use these together for receiving. How should I get the best results in sending, by using both or one?

A. 1.—We think you will get better results by using the 80 foot four-wire aerial for sending, but you might try it both ways.

Q. 2.—What company owns the new SLI station, and where is it located?

A. 2.—This station is owned by the Atlantic Communication Co., and is located at Sayville, L. I.

Q. 3.—What is the rating of the transformer in kw., and what is the wave length of the station in metres?

A. 3.—The small set now in use for local ship service is a Telefunken outfit of about 2 kw. capacity and the wave length is about 2500 metres. Information as to the size of the large set to be used for trans-Atlantic communication is not yet available.

TUNING TRANSMITTER CIRCUITS

(2204.) Springfield Wireless Association, Massachusetts, asks:

Q.—Kindly give us directions how to tune the closed circuit of the transmitting set, viz., how to change capacity or inductance in order to get in resonance with the transformer? Would also like some data on condenser capacity for the different cycles and size transformers.

A.—See article on "Limited Wave Lengths" in the March and June, 1912, issues of *Modern Electrics.*

AERIAL MAST

(2205.) J. E. Biggerstaff, Canada, inquires:

Q.—Can you tell me how to put up a pole for an aerial 60 feet high, and how I can make a pole for that? What kind of wood would I use?

A.—See page 262 in the June, 1912, issue of

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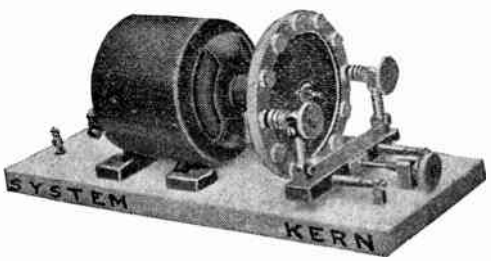

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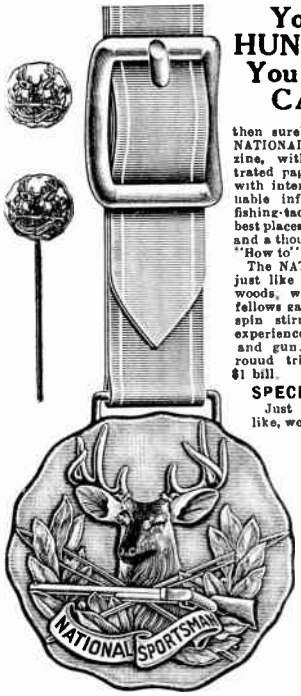

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BATTERY MATERIAL. STATIC MACHINE

(2206.) Cecil I. Hebb, Nova Scotia, writes:

Q. 1.—Please inform me how to mold manganese dioxide into a solid form to be used as an electrode to give a higher voltage than carbon in a battery?

A. 1.—Mix the manganese dioxide with some binding material and press into metal moulds under heavy pressure. Electrodes of this material will not give a higher voltage than carbons. The material is merely used as a depolarizer and prevents the voltage from falling off rapidly when the circuit is closed.

Q. 2.—Can I use the depolarizer in worn out dry cells? I have read that it consists of manganese dioxide and a little carbon powder.

A. 2.—No. The material left in worn out dry cells is exhausted and therefore useless.

Q. 3.—I have made a static machine as described by Thomas H. Smith on page 107 of the May, 1911, issue of *Modern Electrics*, with the following exceptions, instead of using brass balls I used cast lead ones and No. 9 galvanized iron wire instead of heavy copper wire. I used plates of glass 7 inches in diameter, with 16 sectors, and it would not work at all. Please tell me what is wrong?

A. 3.—We do not know what is the matter with your static machine. You probably have not followed the instructions in some important particular. The lead balls and galvanized iron wire should make no great difference, so far as we can see.

DIFFERENT KINDS OF WIRE IN AERIAL

(2207.) G. Duffner, New York, asks:

Q. Could I use two different kinds of wire in my aerial wires?

A. Yes.

LOOSE-COUPLER TAPS

(2208.) H. L. Dillon, Pennsylvania, wants to know:

Q. 1.—Can sheet zinc be used instead of brass on the rotary variable condenser and be as good as the one in the May issue of *Modern Electrics* by B. F. Dashiell?

A. 1.—Yes.

Q. 2.—How is the tap taken from the secondary coil of the loose coupler described in your book, "How to Make Wireless Instruments?" Is the coil wire cut, or is the tap wire twisted or soldered with the insulation scraped off? Please describe it, and how the wire is attached to switch points, and whether nails or screws are used?

A. 2.—The usual practice is to bore holes through the tube at the point where the taps are to be taken in and to push a loop of the wire through the hole, the loop being long enough to reach the switch point on the end of the secondary. The loop may be twisted together and soldered or not, just as you choose. For the switch points regular switch points or machine screws are used, with a nut on the inside end. The wire forming the tap is bared and clamped under the nut.

Q. 3.—Can No. 18 SCC magnet wire be

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used in making a tuning coil? If so, will one pound be enough?

A. 3.—Yes.

AERIALS

(2209.) Harold Sleeman, Pennsylvania, asks:

Q. 1.—What is the best type of aerial having six wires running parallel with the ground?

A. 1.—See diagram C in answer to No. 1985 in the May, 1912, issue.

Q. 2.—What gauge should the lead-in wires be?

A. 2.—If a wire is brought down from each of the aerial wires the same sized wire should be used throughout, while when only one lead is brought down, as shown in diagram B, the diameter of the lead should be equivalent to the sum of the diameters of all the aerial wires.

Q. 3.—How can the receiving set be shorted while sending?

A. 3.—Simply connect a SPST switch across the terminals of the receiving set and close the switch when sending.

WANTS HOOK-UPS

(2210.) A. Quattlander, New York, writes:

Q.—Will you kindly give me the receiving hook-up for the following: One electrolytic detector, one double slide tuning coil, two fixed condensers, and a double head set, with an aerial 60 feet long and consisting of four strands of aluminum wire 75 feet above the ground?

A.—Leave out one of the fixed condensers and connect detector and phones as per sketch in answer to No. 2186 in this issue, leaving out the variable condenser, and connect to the tuner as per sketch in answer to No. 2195.

Q. 2.—Will you please inform me if I could put the following detectors on one board with a switch, whereby I could switch any single one in at will: Electrolytic, galena, silicon, zincite and bornite? If so, can you furnish diagram for same?

A. 2.—Yes, it can be done. The detectors and phones should be connected as per diagram in answer to No. 2065 in the July, 1912, issue of *Modern Electrics.*

WANTS INSTRUMENTS

(2211.) N. Hawthorne, Kansas, says:

Q.—Please send me a list of instruments necessary to receive four or five thousand miles, and please give me the names of instruments necessary to send to some large station near me. I want instruments that can be home made with a few tools.

A.—See article on the "Modern Amateur Wireless Station" in the September issue of *Modern Electrics.* The aerial should be at least 200 feet high and 500 feet long and consist of no less than ten wires spaced ten feet apart. It is no use installing sending apparatus for this purpose, for the commercial and Government stations will pay no attention to you when you try to send to them.

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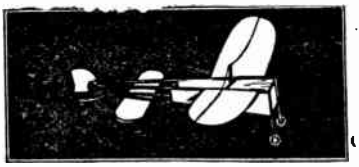

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If you have not been a subscriber of recent months, you have missed, in all probability, a large number of very valuable and useful articles. We have a few sets of the back numbers of this year. While they last we are willing to give all of the numbers for 1912, and the subscription for the complete year of 1913 for the regular yearly subscription price, $1.50. Canadian postage 35 cents extra for each year. Foreign postage 60 cents extra for each year.

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RANGES OF MODERN AMATEUR WIRELESS STATION

(2212.) Louis Gallo, Louisiana, wants to know:

Q. 1.—What is the range of the wireless station, supplement to the September issue of *Modern Electrics?*

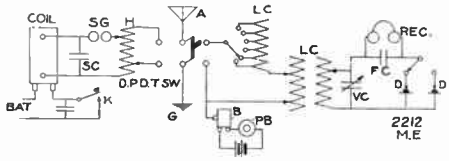
A. 1.—The receiving range is from 1000 to 1500 miles, and the sending, if A. C. current is used, 50 to 100 miles; or if D. C. is used, 15 to 50 miles.

Q. 2.—What other mineral or crystal, with the exception of silicon, will work to some advantage with an E. I. Co.'s universal detector stand?

A. 2.—Ferron or carborundum may be used with this detector stand.

Q. 3.—Please give a hook-up for the following: Receiving: Six point loading coil, loose coupler, with double slide on primary, rotary variable condenser, two fixed condensers, one large and one small; two detectors, silicon and crystal, head phone set and test buzzer. Sending: One-inch spark coil, secondary condenser, helix with two clips; spark gap, key and key condenser, aerial switch and necessary switches for instruments?

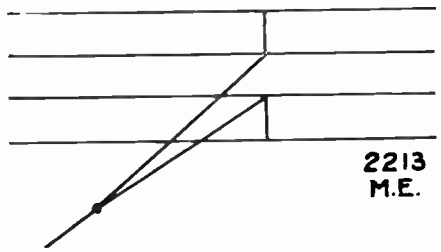
A. 3.—Diagram herewith. Leave out one of the fixed condensers.



LEAD IN CONNECTION

(2213.) Alvin B. Carpenter, Ohio, writes:

Q. 1.—My aerial consists of four No. 14 aluminum wires, 25 inches apart, 75 feet long and 35 feet high at one end and 42 feet at the other. Is this the proper way to take my lead-in wire, and is No. 18 annunciator wire too small? My lead-in wire comes from the middle of my aerial.



A. 1.—No. See diagram B, in answer to No. 1985 in the May, 1912, issue.

Q. 2.—Is this the right way to find the number of horse power needed for any engine? I want to make 7 amperes and 110 volts.

Volts x amperes = watts.
7 x 110 = 770 watts.
746 watts = 1 h.p.
∴ 770 ÷ 746 = 1 and a fraction h.p.

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A. 2.—Yes. Your reasoning is correct.

Q. 3.—Can I buy a governor for a 3 horse marine engine so as to have the engine drive a dynamo and make 110 volts and 7 amperes?

A. 3.—If your engine is a steam engine you can probably buy a governor and have no trouble, but if it is a gas engine you had better consult the maker before attempting to buy and fit a governor to it.

LONG GROUND WIRE

(2214.) Philip Wachtel, Indiana, asks:

Q. 1.—Does a long wire connecting instruments to the ground (a water pipe) have any influence upon them?

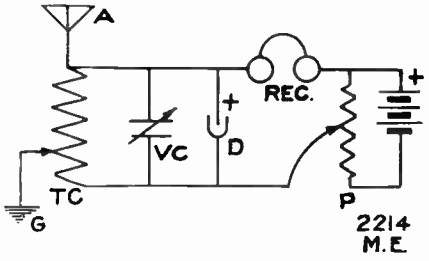
A. 1.—Yes, it increases the wave length.

Q. 2.—Is there a wireless station at Ft. Benjamin Harrison, near Indianapolis, and what are the call letters?

A. 2.—No.

Q. 3.—I have an Electro single slide tuner, electrolytic detector and 1,000 ohm phones. What instruments should I add to these to make them in perfect harmony with a 100 foot aerial, 65 feet high?

A. 3.—You will need in addition, a variable condenser, a potentiometer and two or three cells of dry battery, the apparatus being connected up as per diagram herewith.



WEIGHT OF IRON PIPE MASTS

(2215.) H. Rodenburg, New York, inquires:

Q. 1.—Will two 6 volt 60 A. storage batteries be too strong for a 2 inch Manhattan coil? Kindly give diagram of connections.

A. 1.—No. Connect the positive binding post of one battery to the negative binding post of the other and connect the two remaining posts to the primary terminals of the coil, inserting the key in one of these leads No diagram is necessary.

Q. 2.—How many one pint Electro Leyden jars should I use in connection with the 2 inch coil?

A. 2.—Three or four.

Q. 3.—How much will these masts weigh: three sections, 1st—15 feet of 2 inch pipe, 2nd—15 feet of 1½ inch pipe, 3rd—15 feet of 1 inch pipe; three sections, 1st—10 feet of 1½ inch pipe, 2nd—10 feet of 1 inch pipe, 3rd—10 feet of ¾ inch pipe?

A. 3.—The 45 foot mast should weigh about 125 lbs. for the pipe and fittings, and the 30 foot mast about 60 lbs.

CAPACITY FORMULA

(2216.) H. W. Bibber, Massachusetts, asks:

Q. 1.—Please give rule for calculating the

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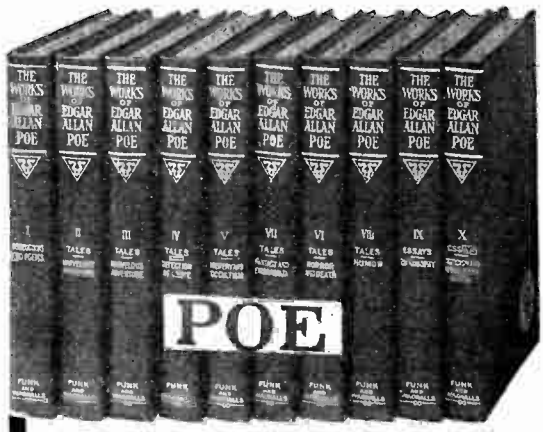

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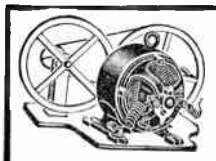

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capacity (in microfarads) of condensers?

A. 1.—See answer to No. 2074 in the July, 1912, issue of *Modern Electrics*.

Q. 2.—Is an oscillation transformer like the one described in the June supplement to the *Modern Electrics* suitable for use on a one inch coil?

A. 2.—Yes.

Q. 3.—Can a rotary or quenched spark gap be used on a one inch coil?

A. 3.—Yes, but see answer to No. 2092 in the August, 1912, issue, also the article on a Modern Amateur Wireless Station in the September, 1912, issue and the article on the Quenched Spark in the February, 1912, issue.

PRIMARY CURRENT FOR TRANSFORMER COIL. CONNECTIONS OF AERIAL WIRES

(2217.) Fred H. Sheldon, Jr., California, writes:

Q. 1.—I wish to know how much voltage and amperage the E. I. Co.'s ½ kw. coil takes?

A. 1.—This coil requires 5 amperes on 110 volt circuit or 10 amperes on 12 volt battery.

Q. 2.—Could it be run by a dynamo giving that same voltage and amperage?

A. 2.—Yes.

Q. 3.—How can I connect my aerial which is 100 feet long and composed of four No. 14 copper wires 16 inches apart so that I can get the longest wave length out of it? One end is in the yard on a pole 20 feet high and the other end on the side of a mountain on a pole 15 feet high.

A. 3.—Connect all your wires together at the upper and lower ends and take the lead in from the lower end. This will not give you the longest possible wave length, but having the inclined aerial you would increase the wave length at the expense of the sending efficiency.

LIGHTNING ARRESTER

(2218.) Charles Unger, New York, asks:

Q.—Kindly give me a simple description of lightning arrester for a small wireless set?

A.—This should consist of two brass plates ⅛ inch thick, 2½ inches long and 1½ inches wide. Mount them on a porcelain or slate base with the long edges facing each other and with a gap of not more than 0.015 inch between them. Connect one plate to the aerial and the other to the ground. This arrester complies with the rules of the National Board of Fire Underwriters.

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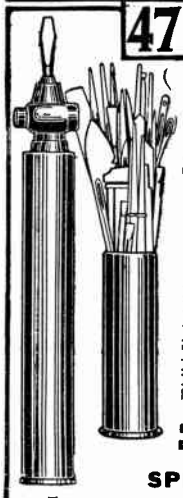

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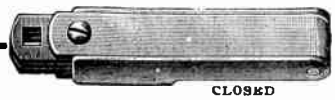

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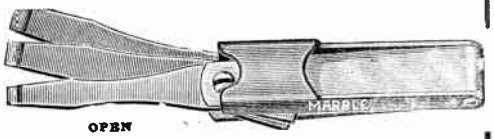

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PACIFIC WIRELESS SERVICE

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NEW FRENCH SPARKLESS WIRELESS SYSTEM

It is reported from Paris that a young French Engineer, Julien Bethenod, has invented a new sparkless system of wireless telegraphy, by the use of which it is claimed that interference is practically done away with and great speed of transmission can be had.

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The system is also applicable to wireless telephony.

PRIVATE STATION AT KANE, PA.

There has recently been erected a private station at the New Thompson Hotel, Kane, Pa. As yet, only receiving apparatus has been installed, but the owner expects to install a powerful set of transmitting apparatus. On a recent test they were able to hear the Telefunken station at New York, the Norfolk Navy Yard, and boats and shore stations on the Great Lakes.

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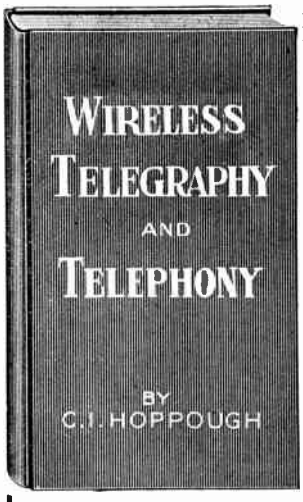

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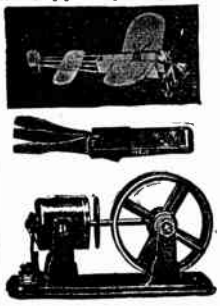

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(*Continued from page* 824.)

effective position when desired. To this extent, an additional coil spring 28 is provided and has one end thereof engaged with the bottom of the tender 2 and the opposite end connected through an opening 30 in an extension 31 of the frame 15 and then extended through an eye 32 carried on the lever 16. The cable is then returned through the opening 30 and guided in any desired manner to a convenient point in the cab 1, whereby the operator may, at will, draw upon the cable and force the lever downwardly. It is, of course, understood that the conductor 4 is extremely smooth and will cause no obstruction whatsoever to the current collector carried by the lever, but it will be seen that should, for any reason whatsoever, there be any obstacle in the path of said lever, the same may yield and ride thereover, in view of the spring 28. The end of the cable 29, extended to a convenient point in the cab of the locomotive, may be engaged with any desired form of catch mechanism, so that the operator may force the current collector into engagement with the conductor with more or less force, as desired, and retain the same in such position.

As before stated, the wire 23 extends upwardly from the lever 16 to the phone box 24, and also extending from said phone box is a ground wire 33 which is guided in any desired manner to the rear portion of the tender 2, where it is extended within a funnel member 34 carried on said rear portion of the tender and insulated therefrom. This funnel member is secured to the bottom of said tender and leads from a water tank 35 therein, said funnel member being provided with a hinged cap or valve 36 which is normally closed and prevents the exit of the water from the tank 35 through said member, and in order to provide for the opening of said valve or cap 36, a cable or the like 37 is extended therefrom and guided in any desired manner to a convenient point in the cab of the locomotive, so that the operator at any time may draw upon the same and open the valve 36 to allow the water from the tank to flow through said funnel member. The wire 33 which, as stated before, is extended within the funnel member 34, does not extend completely therethrough and in engagement with the ground, so that when it is desired to conduct the current to the ground, the water is allowed to pass through said funnel member which will carry the current therewith and accomplish the result.

Although I have described the member 20 as a current collector which is carried by the portion 18 of the sleeve and adapted to collect the current from the conductor 4, it must be here stated that a pad or the like 37′ formed of such material as sponge is

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carried by the front face of said portion 18 and bent therebelow to be received between the lugs 25 of said member 20. This pad 37' is adapted to be moistened with water, whereby the current from the conductor may be more readily passed to the collector 20 without being broken, and in order to provide means for the moistening of said pad, a barrel or tank 38 of any desired size, may be provided and carried by the tender 2, said tank 38 having a tubular member 39 leading therefrom to a point immediately adjacent the point where said pad is secured to the member 18. This tubular member 39 extends for a portion of its length along the side of the arm 16, as does the wire 23, and at the point wherein the member 39 leads to the tank 38, a valve or the like 40 is provided which is operated by means of a connection 41 which extends to the cab, whereby when the operator desires to allow the water from the tank to flow through said tubular member 39 to the pad 37', the same may be accomplished by merely drawing upon the connection 41. Thus, by means of this valve connection, the water from the tank will not be wasted and when the moistened pad is in contact with the conductor, the current from said conductor to said collector will be unbroken. Thus, by using water for both connections between the phone and the conductor, the current flows practically in a sound volume and is not adapted to be readily broken, thereby preventing the stuttering effect which is usually prevalent in phones of this type.

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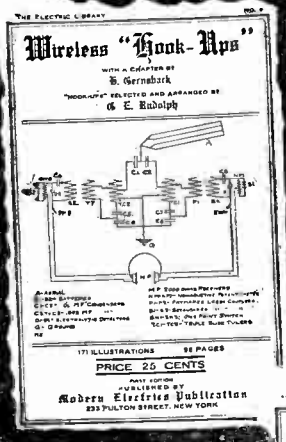

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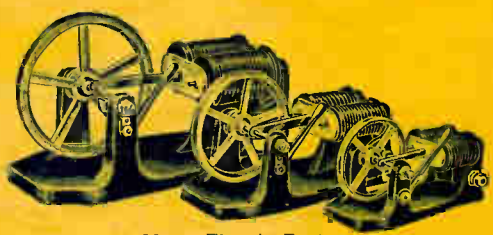

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