

# EXPERIMENTS IN WIRELESS TELEGRAPHY AT NOTRE DAME.



power, charge the vertical wire and project into ether a volume of magnetic waves that flashed unguided through space with the velocity of a ray of light and descended with their message into the tick of the coherer.

A brief description of the apparatus used in wireless telegraphy will aid to an understanding of the principles involved. There is a marked analogy between Marconi's system and the system of telegraphy now in use that was invented by Morse. Each has an instrument called the transmitter, so adjusted as to produce electric phenomena, and each has an instrument called the receiver, to reproduce the sounds. But while the Morse system is dependent on an electric current to conduct the signals, the Marconi system uses the ether as a conductor, and propagates the signals by electric waves.

The transmitter consists of an eight-inch induction coil, which is operated by a storage battery of twenty-five volts. From one of the binding posts of the induction coil a wire runs to a galvanized iron ball that is suspended from some object that rises above surrounding buildings. Ground wires complete the circuit. Electric disturbance is produced by forcing sparks across the space intervening between the discharging knobs on the induction coil. These knobs are adjusted and can be arranged so as to produce a spark of varying length, depending on the capacity of the metal ball and vertical wire which is attached to one terminal of the induction coil.

The rapid-oscillating, high-frequency (sometimes 200,000) between the knobs on the induction coil affect the ether in the vicinity of the vertical wire and metal ball so that electric waves are propagated in every direction. These electric waves continue until they reach a ball and wire similar to those connected with the induction coil. This ball and wire intercepts the waves, and conducts them to the receiver. The receiver consists of an instrument, called the coherer, which is connected with a high-resistance relay, such as may be seen in any telegraph office. This relay actuates an ordinary telegraph sponder.

Prof. Green became interested in the work after reading Marconi's paper read before the Institute of Electrical Engineers in London. When the successful experiments were made in transmitting messages across the English channel he determined to make an experiment for his electrical classes.

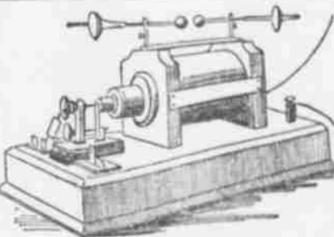
A number of visiting college presidents called at the laboratory during the experiment and witnessed the first working of the system. Among them were President Whitney and Vice-President Conway of Georgetown University, Washington; President O'Hara of Mount Saint Mary's College, Emmetsburg, Md.; President Leahy of Holy Cross College, Worcester, Mass.; President Fox of Saint John's College, Fordham, N. Y., and the president

of the Ottawa University, Canada. This trial was made between two rooms in Science hall and the instantaneous click of the coherer made known the success of the experiment.

The receiving station was then moved to machinery hall, a distance of 200 feet. The doors and windows of both buildings were closed and here it was seen that walls were no barrier to these magnetic waves. Whether the waves penetrate or go around a building is not known. The next day the coherer was removed to the various buildings on the campus with success equal to the first day's trial.

Prof. Green then suspended the vertical wire from the flagstaff on the campus, a height of 135 feet. The instruments were more accurately adjusted and a trial was made at St. Mary's academy, a mile and a half away. Here again the tapplings came as accurately as when a single wall divided the sending and receiving instruments.

In the laboratory at St. Mary's academy was an induction coil that had been brought from Paris by Rev. Provincial Zahm. This coil could be pressed into service in establishing a sending station at



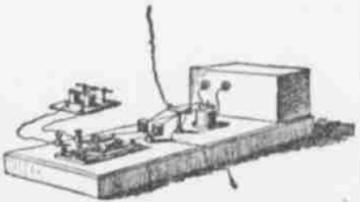
INDUCTION COIL.

St. Mary's, and Prof. Green set his students at work to fit up another set of instruments for that purpose. The instruments used in transmitting the messages require no more space than a sewing machine, and those at the opposite end may be carried in the hand. The storage battery used in the Notre Dame experiments had a capacity of forty ampere hours. The power was conducted to an eight-inch induction coil that transformed the low tension electricity of the battery to the high tension oscillating current that propagated the waves, which, discharged from the vertical wire and metal sphere, travel at the rate of 186,000 miles a second.

These waves resemble in length the waves of sound rather than those of light. A vertical wire and sphere receive the impulses and convey them to the coherer. This instrument is the essential one in the wireless system. It consists of a glass tube a few inches in length, the ends of which are closed with adjustable brass plugs. The space between these plugs is filled with filings of silver and nickel, which cohere when affected by the electrical waves. The cohesion of the parti-

cles reduces the resistance sufficiently to cause the relay to operate. The normal resistance of the coherer in Prof. Green's trials was 10,000 ohms; when affected by the impulses it was reduced to between ten and fifty ohms. The power of transmission is increased fourfold by doubling the height of the vertical wire. The waves can be concentrated in one direction, like the rays of a searchlight. This is effected by means of a Rigi oscillator and a reflector.

Some experiments in the Marconi system of wireless telegraphy took place recently between Wimereux, a village on the French coast three miles north of Boulogne, and the South Foreland. A pole 150 feet high was erected at Wimereux and the necessary instruments were placed in a small station. A pole of the same height was erected hard by the South Foreland lighthouse and the instruments put in one of the rooms. The distance from station to station is thirty miles. The tests were conducted with the assent of the French Government, under the per-



COHERER AND RELAY

sonal supervision of Mr. Marconi. The tests proved highly satisfactory. They were conducted in the presence of delegates from the French war office and the French postoffice, who expressed themselves much gratified at the excellent working of the system.

## "MEIN GOTT, IT IS UNHEARD OF"

### An Austrian Officer's Comment on Destruction of Cervera's Fleet.

Capt. Taylor gives an amusing account in the Century of his interview with an Austrian lieutenant who boarded the Illiana immediately after the fight at Santiago.

He was in full uniform, with a brilliant display of epaulets and gold buttons, white waistcoat and trousers, found us covered with the smoky dust of battle, groups of half-dressed men lining up to salute him as he passed, their faces streaked with powder-smoke and coal-dust. He stood on the bridge, finally. He looked polite bewilderment, and presented captain's request for permission to go through our blockading lines and get out from Santiago. Austrian retreating, desiring to leave that besieged town. After referring him to Admiral Sampson, and telling him he would be some distance to the westward, asked for news, and I told him we had just come out of action with Cervera's squadron. He showed great surprise and said:

"Then there has been a battle?"

"Yes," I replied.

"And the result?" he asked, eagerly.

"We have defeated them."

"But where is Cervera's fleet now?" he inquired.

"His flagship, the Maria Teresa, there, lieutenant," I answered, pointing, at the same time, to the beach, a few miles distant.

"But I see nothing there but smoke, captain!"

"It is the smoke of the Teresa burning, lieutenant; she is a wreck on the beach."

He was silent, and I continued:

"Close to her on the beach you will see another column of smoke; that is the Oquendo burning. On this nearer to us, is the Pluton, sunk by our breakers; and the Furor is near by, but is on the bottom in deeper water and is not visible."

"But," he interrupted, "you have then destroyed half those splendid vessels of Cervera's?"

"Wait, lieutenant," I continued, "look a few miles farther to the eastward, and you will see another column of smoke; that is the Vizcaya, on the beach near Aserraderos. As to the Colon, she is still farther to the eastward, out of sight from us here, but you will see her presently as your captain steers in that direction to find Admiral Sampson, who is at that end of our line."

His eyes ranged along the shore as pointed out the different vessels.

"Mein Gott!" he exclaimed, "you have destroyed the whole of that splendid squadron! I did not think possible."

After a moment more of silent astonishment, he said, with a polite sympathy which concealed eager professional curiosity:

"And your injuries, captain? What losses has the American squadron sustained?"

"None," I replied.

"But, captain, you do not understand; it is what casualties—ships lost or disabled—that I ask."

"None, lieutenant," I said, "The Diana was struck twice, suffered no injury, no loss. The other ships are totally in the same condition. We are all of us perfectly ready for another battle—as much so as before Cervera came out this morning."

His astonishment was now complete. "Mein Gott!" he exclaimed again, "Admiral Sampson's fleet has destroyed these great Spanish ships, and without injury to his own squadron! Sir, it is unheard of. I must go to inform my captain."

**FRITZ HARTE'S LOVE FOR LUXURY.**  
Bret Harte works away quietly in London, and seems to like the work, although the climate can hardly be compared with that of California. The effete luxury of the capital appears to suit him better than the rigors of the backwoods. I was speaking with him once on this subject, and explaining the rigid life Henry Thoreau had led at Walden Pond, as compared with the luxurious surroundings of modern authors. I advocated a return to the simpler habits of our ancestors.

"Yes," he said, "living on partridge pens sounds very fine in a book. What I visited Emerson in was astonished to find how close Walden Pond was to the Emerson homestead, and I commented on this. I had imagined that the pond was away out in the wilderness, miles from any human habitation. Before Emerson could reply, Mrs. Emerson spoke up in the tone of a woman exposing a humbug: 'Oh yes, Henry took good care not to get out of hearing of our dinner horn.'" Philadelphia Post.

**Perverse.**  
Cobwigger—How was it that dog of yours wouldn't do any of his tricks today?  
Brown—I guess it was because I was showing him to a man who wanted to buy a dog.—Harlem Life.

**About Railroad Employees.**  
There are 450 employees to every 100 miles of railroad in the United States.

From an actor's standpoint an encounter indicates that one good turn deserves another.

**THE** practicability of Marconi's system of wireless telegraphy was demonstrated at Notre Dame University by Prof. Jerome J. Green of the department of electrical engineering. It did not require elaborate mechanical devices to put the new system to a practical test. The



PROFESSOR MARCONI, Inventor of Wireless Telegraphy.

material of the apparatus used was taken entirely from the physical laboratory of the university. A storage battery that is common to any electrical workshop, a relay and key from the telegraph room, an induction coil from the X-ray apparatus and a coherer and choking coil made by students under Prof. Green's instruction constituted the paraphernalia. These were all that was needed to generate the

## THE LATE EX-SENATOR TABOR

Was Bred in Poverty, Acquired Millions and Died Without a Cent.

The career of Horace A. W. Tabor, the former Croesus of Colorado, who died recently in Denver of appendicitis, was characteristic of the frontier communities in which he lived. It illus-



HORACE A. W. TABOR.

trates the ups and downs of life in a striking manner. He was a poor store-keeper, then a rich miner. He lived in a cabin, then in a palace. He sat in the United States Senate, one of its wealthiest members, and last year was glad to get the salary of postmaster of Denver upon which to eke out an existence.

Tabor was born in Vermont in 1830 and went to Kansas, where he served one term in the Legislature. After fighting grasshoppers and drought for some years he packed his wife and some things to eat and some tools to dig with into a prairie schooner and started to find gold. Sometimes he kept store in mining camps, selling flour for \$25 per 100 pounds and bacon for 50 cents a pound. Again he would test fortune in a placer claim, and then set up a forge and sharpen tools for the miners.

From 1861 to 1878 he led a monotonous existence, working drearily and profiting little. With the proceeds of the sale of his last yoke of oxen he opened a little store in a desolate Colorado gulch, about 10,000 feet above sea level. In April, 1878, he supplied "grub stakes" to two shoemakers who

were prospecting. These cobblers, August Riche and George F. Hook, dug for ore on the top of a hill. Other miners laughed at their folly, but the cobblers stuck to their picks, and after digging twenty-six feet struck a vein of carbonate ore of surpassing richness. This was the Little Pittsburg mine. Tabor made a million or more from his interest. The site of his store became the center of Leadville and Tabor grew immensely wealthy. His fortune was estimated at from \$6,000,000 to \$9,000,000. Then he moved to Denver.

At that time Denver was a placid town of 50,000 people. Tabor believed in its future. Near the city, "out on the prairie," he built La Veta Place at a cost of a million. This was his dwelling. Then in the city he built the Tabor Block and the Tabor Grand Opera House at a cost of \$2,000,000. His



SENATOR TABOR'S LAST HOME AND MINE.

building enthusiasm provoked a boom in Denver.

Tabor was ambitious to be a great figure in his state and in the country. In fulfillment of his ambitions he needed, or thought he needed, a seat in the United States Senate and a fair young wife. He got both. He paid \$400,000 to the faithful woman who had ridden with him in the prairie schooner and had shared in the privations of a prospector's life and the cruel cold of the

high plateaus of the Rocky Mountains. Though protesting, she obeyed her husband and sued for divorce on the ground of desertion. The decree was granted. Pretty "Baby" Doe, of Leadville, immediately became Mrs. Tabor No. 2. One ambition was fulfilled.

The seat in the Senate next was obtained, but for thirty days, to fill the unexpired term of Henry M. Teller. He failed of re-election. After his thirty days in office in Washington his fortunes began to wane. The need for ready money sent him to the lenders. Mortgages were the result. Mines failed. His buildings were not profitable. One by one the properties were sold. Millions slid from him as rapidly as they had come to him. Tabor became penniless.

He went out from Denver, lived in a cabin near Ward, Boulder County; located a mine and tried to dig new for-

tures out of the ground. Success was not so familiar as it had been at Leadville. For eight months he dug and found nothing and was forced to apply to Millionaire Stratton, a former \$3-a-day carpenter, who had struck it rich, for a loan. Stratton advanced him \$30,000 and Tabor continued his mining.

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that at 68 years of age Tabor might have adequate shelter and food.

## A PLAY UPON WORDS.

Experience of a Quartet of Rounders on a Visit to a Show.

It appears that one idle day the frog, the duck, the lamb and the skunk started forth together to visit the show. Just what sort of show it was, relates the Cleveland Plain Dealer, the chronicler doesn't state. Anyway, it was something that the queerly assorted quartet was anxious to attend, and they hopped and waddled, and gambled, and trotted toward the big canvas inclosure with delightful throbs of anticipation.

Finally they reached the door-tender, the frog leaping the line.

Well, the frog had a greenback and passed right in.

The duck had a bill and followed the frog.

The lamb had four quarters and followed the frog and duck.

But the unfortunate skunk was left on the outside. He had only a scent.

Naturally he turned away feeling pretty blue.

As he was slowly going back over the hill he met a hoop snake rolling along at a lively rate toward the show. The skunk greeted him, but the snake did not stop.

"Don't interrupt me," he cried, over his shoulder. "I've got to do a turn and I'm a little late."

And he rolled along.

At the top of the hill the skunk noticed another old friend approaching. It was the sardine.

"Hullo!" cried the sardine; "what's the matter?"

So the skunk told him.

"I can guess how you feel about it," said the sardine, sympathetically. "I belong to the smelt family myself. But, say, old fellow, you come right back with me—I've got a box."

And the skunk and the sardine went back together.

## Canadians in the House of Lords.

Canada has three of her sons sitting in the House of Lords, viz., Baron Haldiburton, the Earl of Carnwath and the Earl of Elgin.

When you have sympathy with an ugly person it is a sign that you are ugly yourself.