SENDING TELEGRAMS WITHOUT ANY WIRES

NOVEL EFFECTS OF SIGNOR MARCONI'S WORK.

Some of the Difficulties Which This Now Celebrated Italian Investigator Had to Overcome Before He

From the New York Times.

Signor Gugitelmo Marconi's successful experiment in sending messages by electricity across the English channel without the aid of wires has astounded the world, but wireless telegraphy, like most other new things, had been known for some time before any practical anplication of it was possible. The theory and the law had both been carefully worked out before Marconi began dreaming of practical methods of utilizing electric waves. To the constructive genius of the young Italian, however, belongs the full credit for applyreally discovered and accurately classi-

The science of wireless telegraphy, for it has become practically a new science, dates its birth from Michael Faraday, who first recognized the nature of the electric waves, or rather the true movement and play of electricity, although the "waves" were not known to him as such. Faraday said that electricity was the result of the play of atoms and molecules. This suggested to James Clerk-Maxwell, the great Scotch physicist, who died in 1879, the similarity of light waves and electric waves. After experimenting he came to the conclusion that they were of the species and governed by similar laws. He concluded that the undulations or waves of electricity could be transmitted through the air in the same manner as light, and with about the same rapidity, as the electric waves differed from luminous waves

only in force. The German scientist Heinrich Hertz, who died in 1894, was able to prove beyond question of the correctness of the theory announced by Clerk-Mexwell. The verification of this theory, and the advances he made upon the laws discovered by Clerk-Mexwell, have warranted scientists in naming the electric 1896,

WHERE MARCONUS WORK BEGAN It is with these waves that Marconi has been experimenting so successfully. The way had been blazed out, but no scientist had followed it far enough to justify the conclusion that the waves would ever be used for the practical transmission of messages without the aid of wire. Marconi took up the study where Clerk-Maxwell, Hertz, Righi, Popoff, Sarasin, Branly and a dozen others had left off or had just arrived. He acted upon the example of Haeckel, who when he became a believer in evolution said that he would not make it the conclusion of his life study, but the starting point. Marconi saw where the study of the undulations had come to a stand, and he took up the investigations exactly at that point, and soon had perfected a system by which actual messages could be transmitted. The hypothesis became as practical a matter of commerce and daily life as the ordinary telegraph line or the submarine cable. The theory and the law had been established by others; he utilized it for the benefit of mankind. Hertz had measured the waves. Branty and Ducretet had invented receivers for registering them, and the Russian savant Popoff had successfully sent messages by means of them as early as 1895, but it had not been thoroughly demonstrated that the waves could be transmitter for a considerable distance, registered with case and easily read.

In nearly all discoveries of the preent day it is remarkable that some scientist, in the capacity of prophet had already announced in advance just what would be accomplished. Leverrier Indicated the place in the heavens where Neptune would be found by a telescope sufficiently powerful: Hueckel announced that some day the skeleon of the real ancestor of man-the missing link-would be uncarthed years before it was found in Java, and Clerk-Maxwell and Sir William Thompson announced, in turn, the laws by which the electric waves would act when their discovery and utilization were accomplished. Clerk-Maxwell showed that the light waves and electric waves were subject to sim-Har laws, and both could be transmitted through and by means of the dr or ether, Sir William Thompson showed that when a condenser was



is like shaking of a sad, pursu-She escapes from her wretched. unhappy self

new self; literally another being. new seif; literally another being.

"My wife is up and walks about a mile every pleasant day: she feels like another person, writes H. Todd Huguley, Esq. of Mount Inckson, Marion Co., Ind., in a letter to Dr. R. V. Pierce of Buffalo, N. V. "When I first saw your book referring to the cure of consumption I thought I would try Dr. Pierce's Golden Medical Discovery and Pavorite Prescription, as the doctors had given her up, and so I thought it could do no harm if it did no good.

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discharged by a dead wire oscillations of lessening intensity were produced, each series of oscillations being followed by a period of rest. This proved that the discharge was oscillatory, and it was by this fact that the waves were accurately measured and brought within practical use. Feddersen verified this theory.

MEASURING THE WAVES. Sir William Thompson, while he had indicated the way to measure the waves, did not succeed in measuring them himself. The short period of the Could Project a Message Across the waves was so infinitesimally short that English Channel-The Idea Not a it defled measurement. In this they differed from light waves in that their period could not be measured in centimeters, but in millionths of millimeters. But another characteristic of the electric waves was used for the purpose of arriving at an accurate measurement of their short period. This was the fact that after each series of oscillations or undulations there was a period of rest. When once the geometric form of the undulations was determined it was comparatively easy to determine when a series of a given number of oscillations would end. A series of undulations was produced by every interruption of the induction spool. If the oscillations were short, the period of rest would be corresponding these laws and theories, while other ingly short; and in this way Professor scientists were still testing them to as-certain whether or not they had been whom Marconi studied, was able to measure more exactly the duration of the electric undulations.

After the waves had been measured and their character determined as nearly as possible, the next step was the receiving and registering of them. Hertz and Sarasin, in their experiments, made use of large metallic plates, on which the electric waves were reflected, as light waves are reflected in a mirror. It was estimated that the oscillations were as high as 100,000,000 a second. The results of these experiments showed ...e accuracy of previous calculations. They showed also that the phenomena were propa-gated with about the swiftness of light, and that they were transmissible in the same way and by the same means

THE FIRST MESSAGES.

In 1895 Popont had succeeded in sending and in registering a message. Righi had improved on his methods, and Marconi, in turn, improved upon the methods of Right. He introduced the use of the mast for increasing the length of the conductor, having discovered that the distance to which signals may be sent varies according to the square of the length of the conductor. His first notable success was in or one year after Popoff had deundulations after him, as the "Herizian | monstrated the practicability of transmitting messages without the use of

The French scientists claim precedence over Marconi in the practical use of the electric waves for transmitting messages. M. Rigaut, in an article in La Science Francaise of Feb. 24. says: "We have claimed for Mr. Branly the paternity of the essential feature in the receiving instrument-the 'coherer.

The French office of telegraphy is now engaged in making experiments with the apparatus of MM. Branly and 4. augaut, in the article re-Ducretet. escribes the apparatus as follows:

upports one end of an in-"The mast sulated cone for that floats in the air, while the other end communicates with the pole of an induction coil and one of the spheres of discharge. The other pole of the coll is connected with he other sphere and then with the earth. If the electric current passes land, summoning help in time. In such through a coil, a discharge takes place between the two spheres, which constitutes what is known as the 'oscillator.' Thus we have a discontinuous and oscillatory electric discharge, or a source of electric waves. "From the free extremity of the in-

sulated conductor fixed on the mast the waves radiate. This extremity may be terminated by a metallic surface, that furnishes, with the conductor, the requisite electric capacity. This radiating conductor is, then, the transmitter. A spring key, as in the Morse transmitter, enables the operator to make the discharge short or long.

"The receiver consists of a coheren r tube filled with metallic filings. ealled by Branly a 'radioconductor,' of a model invented by M. Ducretet. This is put in communication on one side with an insulated conductor of a manond tall mast, and on the other side with the earth. The end of the insulated conductor is the collector of the electric waves. On the other hand, the cohering tube is placed in the circuit of a battery and a very sentitive telegraphic relay. The battery current passes in the electro-magnet of the relay only when the electric waves, coming through space, traverse the coherer, causing it to become a conduc-

"As in all kinds of telegraphy, each station must have both transmitting and a receiving instrument. A portable receiving instrument suffices for the reading of the Hertzian waves sigeals; and by connecting it with a regstering apparatus the message may be printed on a band of paper." In February the French scientists were experimenting with sending a nessage over a distance of about nineteen miles. Marconi hal already trans-

mitted a message over a distance of

thirty-one miles. THE EARTH'S CURVATURE. When Marconi began working at his experiments there were a number of difficulties to overcome. One was the transmission of the message through damp air, clouds, etc., another was the transmission of the waves over such a distance as made the curvature of the earth a barrier to the course of the waves. He surmounted both difficulties, and succeeded in sending messages through clouds and fog, and in transmitting them at distances of thirty-two miles and more, proving that, to a considerable extent, at least, the problem presented by the earth's curvature could be solved. The distance to which the waves can be transmitted is still limited, and even Marconi has not claimed that they can be sent to any great distance; but it is probable that, with longer conductors, r by other means, the method will be applied in ways that will enable the operator to transmit messages to much greater distance than has yet

been done. Marconi found in a series of experients, that he could send messages through any weather known in England, and has succeeded in transmitting the waves through fogs and clouds to ships at sea, and between distant points on land. In this respect the electric wave differs from the light wave, which cannot pierce the heavy fogs of the coast. This power of the waves wil prove of incalculable value in the life-saving service, and it has pay the bare cost of mailing, or in licary, handsome cloth binding, for 31 England, where a ship in distress was stamps. A whole medical library in rescued by reason of the transmission of news of her situation through the Eric Medical Co., Buffale, N.Y.

Sunday-School Lesson for April 23.

Jesus Comforting His Disciples.

JOHN xiv. 1-14

BY J. E. GILBERT, D. D., LL. D.,

Secretary of American Society of Religious Education.

The sacrament and the words in con-nection with it brought the death of Jesus before the little company in a most solemn and impressive manner. A feel-ing of sadness possessed all hearts, and the Saviour at once offered consolation (John xvi: 0. In no part of His whole ministry did He utter more kindly words, ANTIDOTE.-He began by offering a

specific against every form of trouble (verses 1 and 2), a compound of two elements sufficient to support any heart under all circumstances. The first of these was faith, that firm reliance upon these was faith, that firm reliance upon these was faith, that firm reliance upon love and power, but faith of two kinds.

As good Jows, they had always believed in God-now they are asked to believe also in Jesus, the Son of God, the Saviour also in Jesus, the Son of God, the Saviour time (Jer. xxxi: 2), and then not in the sense in which Jesus employed it (Mal. 1: 6). And yet it was the favorite appropriate to the Gospel, not merely to relation under the Gespel, not merely to be the prime condition of pardon and peace afterward (Rom. v: 1). The sec-ond ground of soul rest and freedom stated to the contrary. This truth brought in at the hour of separation, must have been very full of comfort to men who knew that their Master would soon leave them, but knew not what then might befull them.

Would be satisfied and would require no further instruction on the matter before them (verse 5). Then came a lesson which was needed more than any other—who ever had seen Jesus had seen the Father (verses 7 and 9). If the disciples had because the series of the trial, the would be satisfied and would require no further instruction on the matter before them.

PROMISE.-But hope is not to be kindied by the mere statement of a fact. What if there is a home beyond, a man-sion for the saints with many apart-ments suited to each, how shall these ments suited to each, how shall these humble fishermen find their way thither? The thought may have struggled in their minds unspoken until Jesus heard it and answered. One purpose of His departure from them was to prepare a place for them, to fit up and make ready the sternal home into which they will save eternal home into which they will enter beyond the grave. Precisely what that meant no one knows-no one needs to know. It is enough that the Lord of Life, after adjusting the disturbed rela-Life, after adjusting the disturbed relations of time, entered into the realm of spirits to make habitations for His own. But what was especially cheering. He will come again and receive His own, that they may be forever with Him (verse 3). When and how will He come? No man can answer. There is but slight hint of the manner (Acts i: 11), and less suggestion of the time (Matt. xxiv: 35), and we may therefore conclude that He intended to leave men in ignorance on the less precious. It sustained the aposties in all their trials (I Tim. vi: 10, and and believers all ages have rested in it.

intended to leave men in ignorance on those points. But the promise is none

DIRECTION.-Then followed a state-

a case the lighthouse was utterly help-

AT THE SEA LEVEL.

As to the curvature of the earth,

Marconi found that if he used a verti-

cal conductor on a mast of 114 feet the

messages could be sent without re-

gard to the curvature of the earth's

surface. It was demonstrated by

Hertz, Righi, Popoff and Lodge that

the transmission of these waves is

more readily accomplished at sea level.

It is for this reason that Marcont has

done most of his experimenting on the

coast. The French and Germans, on

the other hand, have attempted, in

the first place, to make use of the

waves as a means of sending messages

for the use of armies in the field. Last

autumn Marconi succeeded in sending

number of dispatches between Os-

borne on the Isle of Wight, and the

Prince of Wales' yacht, which was

moving at a considerable distance at

After he had succeeded in a great

number of experiments in England, he

wanted to make a severer test of his

apparatus, and asked permission of

the French government to establish a

station on the coast near Calais, for

the purpose of receiving and transmit-

ing messages across the channel. His

station on the coast near Boulogne-

sur-Mer. He erected his station on

the English side of the channel on the

South Foreland, in the county of Kent.

The distance between the two points is

about thirty-two miles. The elevation

afforded by the cliff and the mast was,

on the English side, about 400 feet

The experiment proved successful, and

the London Times printed a dispatch

of 100 words that had been transmitted

through the air, without the aid of

wires. Marconi says that he could

have sent a message ten miles further,

PREVENTS SEA COLLISIONS.

Andre Broca, in a recent number of

the Revue Scientifique, points out that

the greatest use to which the wireless

Strong Words

or forty-two miles.

equest was denied until quite recent-

when he was allowed to put up a

INTRODUCTION.—The topic given to this lesson by the international committee is appropriate to the sixth verse only. Another topic, as above, is believed to be better suited to the whole passage, By reference to the context it will appear that after the feet washing, Jesus resumed His place at the table and concluded the Paschal supper. While cating, in answer to John's question, Judas was pointed cut as the one who should betray Him (John xiii: 25), and immediately here. Him (John xiii: 25), and immediately he to the words, as if Jesus were proposing went forth into the darkness to complete a journey of which all present were ignited agreement with the chief priests. norant (verse 5). It is not at all sur-Afterward Peter was warned and the me-morial feast was instituted of which see how by an ignominious death their John makes no mention (Mark xlv: 22). Master would attain to that elevation which would make Him Lord and Sa-viour, worthy of their faith and service (Eph. 1: 21). Jesus did not directly re-

pelation under the Gespel, not merely to distinguish a person in the Godhead (Matt. xi: 23), but to express the relafrom trouble was hope, an outlook beyond the present, an anticipation of future good. Josus endeavored to awaken God and the feeling of His children (John this hope in the hearts of His disciples by saying what He had never said to them before, that there were many mansions in His Father's house, a home for all who loved Him. Of this they might be assured by the fact that He had never

known the one Person whem they saw known the one Person when they saw they would know the Person whom they had not seen (Col.: 15). Jesus said this, surprised that it had not been remem-bered that lie had previously said it (John xii: 45). might have fallen into error, and in all the subsequent centuries the church might have quoted His words to sustain what was very far from His thought. He was going by the cross and coming in did not intend to say that there were two distinct and independent Beings, the Father and the Son, the latter such an

image of the former that He needed only to be seen to convey a correct idea of the other. On the contrary Father and the other. On the contrary Father and Son are indissolubly joined to constitute one Belng. That thought is very forcibly and clearly expressed (verse 10). Jesus, the Son, was in the Father, and the Father was in Him (John x: 38). The two were present at one and the same place, and were never separated (John xvii: 21). This unity was such that even in His speech Jesus did not act alone, but, as He had stated on another occasion (John vii: 16), the words were also those of the Father, dwelling in Him, filled by Him, speaking and acting with Him. 4. Him, dwelling in Him. 4. Him. 4 was worthy of confidence, yet attented by deeds, and it contained promise of power to those who believed. 5. After His departure He will be the personnia to the certainty of receiving.—

It is this Jesus who offers Himself to troubled souls. What more do they need? In Him may every want be supplied, every longing satisfied, every trial borne, every care dispelled, every fear Him.

it will be almost impossible for collis-

ions to occur. Another use to which

it is already being applied is the sim-

llar one in light houses. In times of

storm or atmospheric disturbance, or

the intervention of fogs or mists, when

the light of the most powerful reflec-

tors will not pierce the thick air, the

electric waves will be used entirely

for purposes of signaling out to sea

to approaching ships. If these were

the sale uses to which wireless teleg-

on their warsnips for similar purposes

The waves can also be economically

used for sending messages between

points on land at not too remote dis-

tances, using the wires only for long

distances, say, beyond forty or fifty

Nikola Tesla, who experimented with

the Hertzian electric waves as early

as 1893, has called attention to the fact

that the sending of messages over land

may be made very uncertain, as the

communications may be interrupted by

placing an induction coil near one of

the terminals. Marconi and the other

scientists of Europe do not seem to

fear this difficulty. Throughout Europe

indeed, there seems to be but one opin

ion of the results obtained by Mar-

off. Right and others, and that is that

a great advance in science has been

made, and a revolution in the practical

use o. electricity has been brought

about by a handful of students within

Mr. Tesla and Professor Oliver Jo

making a series of experiments along

lines that were later followed by Sig-

nor Marconi, and which had been fol-

lowed earlier by Hertz. Righi and Pop-

off, so that the so-called discovery or

invention of Marconl is no new thing.

The theory and the law were at least

twenty-five years old when Marconi

and Right began their experiments.

But the men who do something prac-

tical with scientific laws are generally

and, before him, by Hertz, Pop-

ent discoveries of all time,

miles.

their faith in it by three methods. they were to accept it upon His declara-tion, resting upon that as final; second if that was not sufficient they might take His works in proof (verse ii), referring to many miracles which He had performed during His ministry, which had carried conviction to Jewish officials (John III: 2), as well as to the common people (John ix: 33); thirdly, whosever should believe on Him as the Son of God should also obtain power to do wondrous obscure. But He did call the thought of all back to Himself, as the way, the truth, and the Mfe-the way of approach to the Father, the truth or illustration of that way, and the giver of life to those who seek it (verse 6).

things (verse 12), and should, in fact, do greater things than He. This assertion had been previously made (Matt. xxi: 21), and it was actually verified in the history of the apostles (Acts iii: 6). And so the word, the deed, and the promise of Jesus, all three, were combined to lead the disall three, were combined to lead the disciples to accept the doctrine set forth.

PRAYER .- One other source of comfort PRAYER.—One other source of comfort was offered to the troubled disciples—a new method of prayer. These men had always sought Divine help, and they had been taught by Jesus a form that indicated the scope and spirit, and possibly the language in which they might make petitions. To all that had been previously said on the subject of prayers. Jesus now adde that it shall be prayer, Jesus new adds that it shall be most effective if made in His name. There had been up to that time no such supplication (John avi: 24). This form had been reserved for the time when Jesus should be absent, the propriety of which must appear. But, what is a little surprising, Jeaus Himself agrees to an-swer such prayers (verse 13), making Himself the ground of the request and the surety of its fulfillment. This again ascribes to Him a Divine prerogative, bringing glery to the Father. Becoming much bolder and more emphatic He de-clared that He would do anything which those disciples might ask in His name (verse 14). This startling offer may not have been intended for any others.

SUMMARY.—This whole lesson may be taken as Christ's testimony to Himself under five heads. 1. He was going away into the unseen to prepare mansions for Illa people; He was intending to return glory. 2. He was the way to the Father and the Father's house, the truth concerning both, and the life required to gain favor and entrance. 3. He was the image of the Father revealing Him, united with Him, dwelling in Him, filled by Father, dwelling in Him, speaking with dsarmed, every hope fulfilled. Child of Him. Here is probably a bolder declaration of Christ's essential Deity than with you wherever you go (Matt. xi:

was made by Him at any other time in [28-29). dded, smiled and walked away, returnvessels at sea of the approach of other ing in a few moments with another, who ships. He says that with transmitting and receiving instruments on each ship

> Then a thought struck him, and in his turn he smiled. Leaning down, he scooped up two handfuls of the coppers, stuck them in his pockets and walked off, remarking coolly: "Thank you-you may charge the rest to my account." And for that time at least the joke was on the

> > How It Happened.

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it comes to a question of the discovery of the theory and law, the palm wood, be awarded to James Clerk-Maxwell, who saw in vison everything that Popoff, Hertz Right and marconi have accomplished. Getting Even. There are two well-known business mewhom a very good story is told, says

the last decade.

an exchange.

The two had been having differences of opinion for some time, and at he things got so serious that one, who was a banker, dem ded that the other, a successful merchant, withdraw his account from the But this the merchant refused to do. He aid that it was a good busic, and he would stay.

There was nothing for the other man to do but accept the verdict, but he resolved to "get ahead" just the same, and when next the merchant presented a check

was rolling before him a small keg. They had cashed the check in pennies. For a moment the merchant was madcoiling mad.

other fellow.

Sympathetic Visitor (to prisoner)--"My good man, what brought you here?"

raphy could be put it would still be one of the greatest and most benefit-It was also be largely used in field operations in sending and receiving dispatches and information. As pointed out, the French and Germans are now utilizing the waves for this purpose, and the Italians are using them



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