# Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

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Address MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

NEW YORK, SATURDAY, MARCH 31, 1888.


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## SCIENTIFIC AMERICAN SUPPLEMENT

## No. 689.

**For the Week Ending March 31, 1888.**

Price 10 cents. For sale by all newsdealers.



## THE BELL TELEPHONE CASES DECIDED—THE PATENT SUSTAINED.

The judgment of the Supreme Court in the long delayed telephone cases was delivered March 19. The following were the cases:

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| Amos E. Dolbear *et al.*, *Appellants*, *vs.* The American Bell Telephone Co. | U. S. C. C. Mass. |
| The Molecular Telephone Co. *et al.*, *vs.* The American Bell Telephone Co. *et al.* [Cross appeal in the same case. | *Appellants*, U. S. C. C. S. D. N. Y. |
| The Clay Commercial Telephone Co. *et al.* *vs.* The American Bell Telephone Co. *et al.* | U. S. C. C. E. D. Pa. |
| The People's Telephone Co. *et al.*, *vs.* The American Bell Telephone Co. *et al.* | *Appellants*, U. S. C. C. S. D. N. Y. |
| The Overland Telephone Co. *et al.*, *vs.* The American Bell Telephone Co. *et al.* | *Appellants*, U. S. C. C. S. D. N. Y. |

The opinion was written by the late Chief Justice Waite. We make the following abstracts:

"The important question which meets us at the outset in each of these cases is as to the scope of the fifth claim of Bell's patent of March 7, 1876, which is as follows:

"'The method of and apparatus for transmitting vocal or other sounds telegraphically, as herein described, by causing electrical undulations similar in form to the vibrations of the air accompanying the said vocal or other sounds, substantially as set forth.'

"It is contended that this embraces the art of transferring to or impressing upon a current of electricity the vibrations of air produced by the human voice in articulate speech, in such a way that the speech will be carried to and received by a listener at a distance on the line of the current. Articulate speech is not mentioned by name in the patent. The invention as described consists in the employment of a vibratory or undulatory current of electricity, in contradistinction to a merely intermittent or pulsatory current, and of a method of and apparatus for producing electrical undulations upon the line wire.

"A pulsatory current is described as one caused by sudden or instantaneous changes of intensity, and an electrical undulation as the result of gradual changes of intensity, exactly analogous to the changes in the density of air occasioned by simple pendulous vibrations.

"Among the uses to which this art may be put is said to be the telegraphic transmission of noises or sounds of any kind; and it is also said that the undulatory current, when created in the way pointed out, will produce through the receiver at the receiving end of the line a similar sound to that uttered into the transmitter at the transmitting end. One of the means of imparting the necessary vibrations to the transmitter to produce the undulations may be the human voice. Articulate speech is certainly included in this description, for it is an uttered sound produced by the human voice."

"In this art, or, what is the same thing under the patent law, this *process*, this *way* of transmitting speech, electricity, one of the forces of nature, is employed; but electricity left to itself will not do what is wanted. The art consists in so controlling the force as to make it accomplish the purpose.

"It had long been believed that if the vibrations of air caused by the voice in speaking could be reproduced at a distance by means of electricity, the speech itself would be reproduced and understood. How to do it was the question. Bell discovered that it could be done by gradually changing the intensity of a continuous electrical current, so as to make it correspond exactly to the changes in the density of the air caused by the voice. This was his art. He then devised a way in which these changes of intensity could be made and speech actually transmitted. Thus his art was put in a condition for practical use. In doing this, both discovery and invention, in the popular sense of those terms, were involved—discovery in finding the art, and invention in devising means of making it useful; and for such discovery and such invention the law has given the discoverer and inventor the right to a patent—as discoverer for the useful art, process, and method of doing the thing he has found, and as inventor for the means he has devised to make the discovery one of actual value. Other inventors may compete with him for the ways of giving effect to the discovery, but the new art he has found will belong to him and those claiming under him, during the life of his patent. If another discovers a different art or method of doing the same thing, reduces it to practical use, and gets a patent for his discovery, the new discovery will be the property of the new discoverer, and thereafter the two will be permitted to operate, each in his own way, without interference by the other. The only question between them will be whether the second discovery is in fact different from the first.

"A patent for the art does not necessarily involve a patent for the particular means employed for using it. Indeed, the mention of any means in the specification or descriptive portion of the patent is only necessary to show that the art can be used; for it is only useful arts, arts which may be used to advantage, that can be made the subject of a patent. The language of the statute is:

"'Any person who has invented or discovered any new or useful art, machine, manufacture or composition of matter may obtain a patent.'"

"What Bell claims is the art of creating changes of intensity in a continuous current of electricity exactly corresponding to the changes of density in the air caused by the vibrations which accompany vocal or other sounds, and of the use of the electric condition that is thus created for sending and receiving articulate speech telegraphically. For that, among other things, the patent of 1876 was, in our opinion, issued, and the point to be decided is whether as such a patent it can be sustained."

"An effort was made in the argument to confine the patent to the magneto instrument, and such modes of creating electrical undulations as could be produced by this form of apparatus, the position being that such an apparatus necessarily employed a closed circuit incapable of being opened, and a continuous current incapable of being intermittent. But this argument ignores the fact that the claim is, first, for the process, and, second, for the apparatus. It is to be read as, *first*, a claim for the method of transmitting vocal or other sounds telegraphically, as herein described, by causing electrical undulations similar in form to the vibrations of air accompanying the vocal or other sounds, substantially as set forth, and, *second*, for an apparatus for transmitting vocal or other sounds telegraphically as herein described, by causing electrical undulations, substantially as set forth.

"The *method* 'as herein described' is to cause gradual changes in the intensity of the electrical current used as the medium of transmission, which shall be exactly analogous to the changes in the density of the air occasioned by the peculiarities in the shapes of the undulations produced in speech, in the manner substantially as set forth, that is to say, by the vibration or motion of bodies capable of inductive action, or by the vibration of the conducting wire itself in the neighborhood of such bodies, which is the magneto method, or by alternately increasing and diminishing the resistance of the circuit, or by alternately increasing and diminishing the power of the battery, which is the variable resistance method. This is the process which has been patented, and it may be operated in either of the ways specified. The circuit must be kept closed to be used successfully, but this does not necessarily imply that it must be so constructed or so operated upon as to be incapable of being opened. If opened, it will fail to act for the time being, and the process will be interrupted, but there is nothing in the patent which requires it to be operated by instruments which are incapable of make and break. The *apparatus*, 'as herein described,' which is included in the claim, is undoubtedly one in which the electro magnet is employed, constructed substantially as set forth in the specification. The one acting on the variable resistance mode is not described, further than to say that the vibration of the conducting wire in mercury or other liquid included in the circuit occasions undulations in the current, and no very specific directions are given as to the manner in which it must be constructed. The patent is both for the magneto and variable resistance *methods*, and particularly for the magneto *apparatus* which is described or its equivalent. There is no patent for any variable resistance *apparatus*.

"It is undoubtedly true that when Bell got his patent, he thought the magneto method was the best. Indeed, he said in express terms he preferred it. But that does not exclude the use of the other, if it turns out to be the most desirable way of using the process under any circumstances. Both forms of apparatus operate on a closed circuit by a gradual change of intensity, and not by alternately making and breaking the circuit or by sudden and instantaneous changes, and they each require to be so adjusted as to prevent interruptions. If they break, it is a fault, and the process stops until the connection is restored."

"We come now to consider the alleged anticipation of Philipp Reis; and here it is to be always kept in mind that the question is not whether the *apparatus* devised by Reis to give effect to his theory can be made with our present knowledge to transmit speech, but whether Reis had in his time found out a way of using it successfully for that purpose, not as to the character of the apparatus, but as to the mode of treating the current of electricity on which the apparatus is to act, so as to make that current a medium for receiving vibrations of air created by the human voice in articulate speech at one place, and in effect delivering them at the ear of the listener in another place. Bell's patent is not alone for the particular apparatus that he describes, but for the process that apparatus was designed to put into use. His patent would be just as good if he had actually used the Reis apparatus in developing the process for which it was granted. That Reis knew what had to be accomplished in order to transmit speech by electricity is very apparent, for in his first paper he said:

"'Since it is possible to produce anywhere or in any

manner vibrations whose curves shall be the same as those of any given tone or combination of tones, we shall receive the same impression as that tone or combination of tones would have produced on us.'"

"Reis discovered how to reproduce musical tones, but he did no more. He could sing through his telephone, but he could not talk. From the beginning to the end he has conceded this. In his first paper he said:

"'Hitherto it has not been possible to produce the tones of human speech with a distinctness sufficient for every one. The consonants are for the most part reproduced pretty distinctly, but the vowels as yet not in an equal degree. The cause of this I will attempt to explain.'

"And again:

"'I have succeeded in constructing an apparatus with which I am enabled to reproduce the tones of various instruments, and even to a certain extent the human voice.'

"None of the many writers whose papers are found in the records claim more than this for Reis or his discovery."

"We have not had our attention called to a single item of evidence which tends in any way to show that Reis, or any one who wrote about him, had in his mind anything else than that the intermittent current caused by the opening and closing of the circuit could be used to do what was wanted. No one seems to have thought that there could be any other way. All recognized the fact that the minor differences in the original vibrations had not been satisfactorily reproduced, but they attributed it to the imperfect mechanism of the apparatus used rather than to any fault in the principle on which the operation was made to depend.

"It was left for Bell to discover that the failure was due, not to workmanship, but to the principle which was adopted as the basis of what was to be done. He found that what he called the intermittent current, one caused by alternately opening and closing the circuit, could not be made. under any circumstances, to reproduce the delicate forms of the air vibrations caused by the human voice in articulate speech, but that the true way was to operate on an unbroken current, by increasing and diminishing its intensity. This he called a vibratory or undulatory current, not because the current was supposed to actually take that form, but because that language expressed with sufficient accuracy his idea of a current which was subjected to gradual changes of intensity, exactly analogous to the changes of density in the air occasioned by its vibrations. Such was his discovery, and it was new. Reis never thought of it, and he failed to transmit speech telegraphically. Bell did, and he succeeded. Under such circumstances, it is impossible to hold that what Reis did was an anticipation of the discoveries of Bell. To follow Reis is to fail, but to follow Bell is to succeed. The difference between the two is just the difference between failure and success. If Reis had kept on, he might have found out the way to succeed, but he stopped and failed. Bell took up the work and carried it on to a successful issue."

The other alleged anticipations of Bell's invention are then discussed, including those of Van der Weyde, McDonough, Varley, and Drawbaugh, all of which are dismissed as untenable. The decision is sustained by four of the judges, while three of them dissent, believing Drawbaugh to be the prior inventor.

At the conclusion of the reading of the opinion of the court, Mr. Justice Bradley said that: "Mr. Justice Field, Mr. Justice Harlan, and myself are not able to concur with the other members of the court in the result which has been reached. The point on which we dissent is the question of Drawbaugh's invention. We think that Drawbaugh did anticipate the invention of Mr. Bell. We think that the evidence to that point is so overwhelming, both with regard to the number and character of the witnesses, that it cannot be overcome. Of course, it is a question of fact depending upon the weight of the evidence, and involves no question of law, and therefore it is a matter that does not require much observation on the part of those who dissent from the opinion, which is very ably drawn, and undoubtedly presents the whole case with great force. But on this point we cannot concur in the views of the court. We think that Drawbaugh did have an instrument in his shop as early as 1869 which used the variable resistance instrumentality in transmitting articulate speech to a distance, by means of electricity, and was distinctly heard and understood. That is the whole invention, so far as variable resistance is concerned.

"We also think that as early as 1871 he did produce an instrument employing the magneto-electric instrumentality altogether, substantially the same as that which is claimed in Mr. Bell's patent. In the one case, with regard to the variable resistance principle, over seventy witnesses were produced. The evidence of some of them may have been shaken with regard to the time that they had in mind; but the evidence of the great majority of them is not shaken at all. They were mostly plain people of the country, but they heard the words, and that is a matter that they could not be mistaken about. It did not require science nor literature nor refinement to understand that.

"In regard to the other instrument, some forty or fifty witnesses were produced who saw it. Many of them heard the language produced through it, and a number of witnesses who did not hear the language produced through these instruments saw them or heard them talked about, so as to fix the time that they were in existence, and it seems to us that on this subject of time and of result there is such a cloud of witnesses that it is impossible not to give credence to them. There is no doubt that Mr. Bell's merits are very great in appreciating the importance of the discovery, and in bringing it before the public in such a manner as to make it appear to be what it is, one of the most important discoveries of the century. He was a man whose professional experience and whose scientific attainments enabled him to see at a glance the importance of it. Drawbaugh was a different sort of man. He did not see it. Had he done so, he would have taken measures to interest persons with him in it, and have brought it out. He was a mechanic, a plain mechanic, somewhat better instructed, perhaps, than most ordinary mechanics, a man of more reading, a man of more intelligence. But he looked upon what he made more as a curiosity than a matter of speculation, a matter of financial importance or of importance to the public. This is the way we view his condition of mind in regard to it, and explain why he had not taken more pains to bring it forward to the notice of the public. It is the tendency of the human mind to attach importance to the results and inventions of those who have achieved eminence. Watt was the idol of the British nation, from the time of his first invention of the steam engine until the day of his death, and until the present time; and everything that was invented about the steam engine was attributed to him. It was the glory of England, the glory of Watt, and of course every patriotic British subject would hoot at anything it was claimed Watt did not invent, or attribute it to him. That is a principle of the human mind on which we think a great deal may be explained with regard to the feeling toward this important service which Mr. Bell has rendered with regard to this invention. The plain mechanic of Pennsylvania is of no account. The scientific and illustrious—for he is illustrious—Mr. Bell, it cannot be but that he did invent this thing! And yet if Mr. Bell on the 14th day of January (I think it was) or February, when he applied for his patent at the Patent Office, had had in his laboratory the things that Drawbaugh had, he would have been filled with an excitement far exceeding that which has animated the great inventors of the world when they made the discoveries they have made, and he would have exclaimed: 'Eureka! Eureka!' He would have appreciated it, if Drawbaugh did not.

"What had he when he applied for his patent? On the 10th of June, 1875, they thought they heard something, but were not sure; but he knew the principle, and he patented it. Up to the time of making his application for a patent they had not succeeded in producing intelligible speech, more than a word or two; perhaps a word or two. If Bell had done at that time as much as Drawbaugh had done, according to the evidence, he would have had no hesitation in claiming the greatest discovery that the world has seen in the present century.

"This is an outline of the views which we have on this subject. We have nothing to say depreciatory of Mr. Bell at all, for he has real merits; but we think that this obscure mechanic did do the thing, and that he is entitled to the merit of being the first inventor.

"We will take an opportunity within a few days to write a further statement and file it."

## CHIEF JUSTICE WAITE.

At six o'clock on the morning of March 23 occurred the death of Judge Morrison Remich Waite, the Chief Justice of the Supreme Court of the United States, and the seventh incumbent of that dignity. He was born in Lyme, Conn., November 29, 1816. In 1837 he graduated from Yale College and took up the study of law. He settled in Maumee City, Ohio, and there practiced his profession. In 1849 he was a member of the State legislature. A year later, he moved to Toledo. He was acquiring much influence in the political life of the day, and declined many offers of nominations to Congress, and refused also a seat on the bench of the State of Ohio Supreme Court. In 1871–72 he was one of the counsel for the United States before the Geneva Arbitration Tribunal. In 1873 he presided over the Constitutional Convention of his adopted State. On January 21, 1874, he received his appointment as Chief Justice of the United States, and has since devoted himself entirely to the duties of that position. He had written the decision in the telephone cases. Although far from well, he insisted upon attending the session of the court on March 19, when it was read. Judge Blatchford performed this duty, owing to the illness of the Chief Justice. As soon as possible after the reading, he drove home, and since then never rallied. Owing to his position, many adjournments of the courts throughout the country were taken.

## Electricity in the Hotel Ponce de Leon, St. Augustine.

Mr. H. M. Flagler has, in his famous hotel, the largest isolated plant for supplying electricity in this country, or, in fact, in the world.

It consists of four Babcock & Wilcox multitubular boilers, each of which has a nominal rating of 107 horse power; four Armington & Sims engines, three of 60 horse power and one of 125.

Each of the 60 horse power engines drives an Edison dynamo of the latest type, having a capacity of 640 sixteen-candle lights. The other engine drives two machines of the No. 16 type. The rating given is nominal, as the plant admits of an increase in power of 25 per cent over and above the rating.

It is doubtful if there exists another electric light plant with so perfect a system of control and regulation.

Each dynamo has its own regulator, which controls the amount of electricity produced, and indicators showing the volume and pressure of the electricity.

The machines are all connected to heavy bars of flat copper, termed "omnibus wires," with which, by a switch in the headboard of the machines, they may instantly be connected or disconnected. To the "omnibus wires" are connected a series of heavy copper cables, called "feeders," which pass to the most important centers of lighting in the hotels Ponce de Leon and Alcazar. No lamps are directly connected to these "feeders," but they carry the current to the local distributing points, from which a large number of smaller wires, "mains," lead the electricity to the "services." These in turn conduct it directly to the lamps in the buildings.

Danger from fire by this system—the Edison—is reduced practically to *nil*. At the junction points of the "'bus wires," "feeders," and "mains," are inserted fuses, composed of an alloy of lead and tin, which volatilizes at a temperature of 400°. If, by any accident, the copper wires conducting the electric current should come in contact with each other, before the temperature of the copper could be raised sufficiently to set fire to any inflammable substance in proximity to it, the safety fuse would vaporize and open the circuit. As soon as the trouble had been rectified, a fresh fusible plug would be inserted, and the current reestablished in this circuit.

Nor is there any danger to human life from coming into contact with the wires or machinery of the system. The pressure is only of about 100 volts, which any child can receive with impunity.

This plant supplies all the lights used in the hotels Ponce de Leon and Alcazar—in all about 5,500 incandescent lamps.

*Apropos* of this subject, it will perhaps be of interest to mention an experiment which Mr. Flagler has been trying, in connection with the great artesian well which was, a few months ago, opened on the hotel grounds.

Directly over the well, which throws a solid column of water, 12 inches in diameter, 35 feet into the air, a huge turbine wheel has been placed. Bolted direct to the shaft of this wheel is an Edison dynamo, capable of supplying 375 sixteen-candle lamps. Several hundred Edison incandescent lamps have been placed on the walls of the building over the well, and together with the indicating and regulating apparatus connected with the dynamo. The trials in generating electricity by this way by power derived directly from the earth have proved eminently satisfactory, as far as the steadiness and constancy of the light are concerned; but the power secured has not been so great as was at first anticipated. This, in great measure, is due to the method in which the stand pipe is connected with the turbine, and to the arrangement of the paddles in the wheel, which allows a great deal of water to pass by. Changes are now being made which will obviate these troubles, and it is expected that when these are completed, the steam plant can be shut down late in the evening and not started again until early the following evening, the hydraulic plant furnishing all power necessary for supplying light in the interim.

Hydraulic experts throughout the country have condemned this scheme as impracticable, and have doubted the constancy of the flow of water from the artesian. This, however, has not in three months perceptibly diminished. The experiment is interesting, as being the first case on record where natural water power for driving machinery has been derived directly from the earth. It has been conducted under the supervision of Messrs. Wm. Kennish, an expert in hydraulics, and W. J. Hammer, of Boston, an electrical expert connected with the Edison Electric Light Co., and who is in charge of the entire department of lighting at the Ponce de Leon.

H. BRADFORD ROCKWOOD.

St. Augustine, Fla., March 13, 1888.

FORTY-THREE of Iowa's many schoolhouses are built of logs.