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same thing. The whole story was a falsehood. Mr. Draper, the owner, came back on the stand and admitted his mistake. The bills for the pipe for the ram, and the freight bills on the railroad, and the receipts on the railroad books, all dated in 1878, and correspondence between the owner and his farm agent, written in December, 1877, complaining that the ram was not in, were found by us and produced. Drawbaugh himself made the ram and put it up, and had all the accounts and dates of it, but would not come forward himself to swear to any dates about it. Finally they had to abandon the fiction and admit that it was put in in 1878. Yet Drawbaugh, with this knowledge, and after he and his partners had seen these papers, procured these men to swear it back to 1875.

Then the Hunnings transmitter fraud was of the same character. They attempted to deceive Judge Wallace in open court, and then attempted to deceive this court in the Philadelphia tests, by smuggling the Hunnings invention inside their broken tumbler instrument F. We detected the fraud and exposed it; and if there had ever been any moral character to the case before that, this would have destroyed it.

[In closing, *Mr. Dickerson* contrasted the united recognition of the value of Mr. Bell's inventions by the scientific world of Europe, with the attacks upon him in the defence of these suits.]

*Mr. Causten Browne* for Dolbear.

It has suited the convenience of our opponents, in the course of their argument, to speak of the several appellants whose cases are before the court, as having contributed each an ingredient, so to speak, of a certain mixture to be used for the common behoof against the health of the Bell patent. That is a figure of speech. It is also, if they will pardon me, a fiction. So far as I am aware, no one of the appellants in this case has any right to speak for any other. I certainly know that nobody has any right to say anything for the Dolbear interest, except Mr. Maynadier and myself. The court will remember that these cases were grouped together upon

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the docket, partly for the convenience of the court and partly for the convenience of counsel, that an end might be made of the whole matter. The counsel for the several appellants are companions, but not allies. Every man fights his own battle in his own way.

Now, as to the Dolbear Company, its defence to the Bell Company's suit is different in kind from the defence of any other appellant here. It is this: that the Dolbear method and apparatus do not infringe, even under the broadest construction of the Bell patent that the law will permit; that they are based upon a discovery of Mr. Dolbear as original and as fundamental as that of Mr. Bell; that he as well as Bell, although coming several years after him, started from first principles to deal with the problem of electrically transmitting speech; that Bell proceeded by one road, which lay open to him by virtue of the scientific knowledge of that date; while Dolbear proceeded by a road discovered by himself where scientific men had supposed a practical advance in the arts to be impossible; and that, except in reaching the result of electrically transmitting speech, stated in one form of words or another, there is no resemblance between the two methods or the apparatus employed by the two inventors, so far as regards any patent protection enjoyed by Mr. Bell. You will at once see that many issues which have been discussed before you during the last two weeks are of no materiality to the Dolbear defence. If any alleged anticipation of Mr. Bell's invention of the speaking telephone, or if any assumed narrow construction of his patent, shall prevail, so much the better for us, of course. Your labors in dealing with the Dolbear defence will, in that event, be lightened. But all of these defences may fail; all attempts to prove anticipation of Mr. Bell's invention may fail; all attempts made by other appellants to limit the construction of his patent may fail; and yet the defence of the Dolbear Company remain untouched.

No construction of this patent will cover the Dolbear method as an infringement, except a broad construction *for the use of electricity for the purpose of transmitting articulate speech*. That will do it. But that, in words or in substance, must be



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maintained as the prerogative and monopoly of Bell, or, I humbly venture to believe, I shall have no difficulty in satisfying you that the decree in the Dolbear case must be reversed. I suppose it was because no other construction than this would suffice to suppress the practice of the Dolbear method, that a theory of invention so dangerously broad, to say the least, was asserted by the counsel for the Bell Company. I shall in due time make it plain that no such dangerous—I was going to say wild—theory of patentable invention will be found suggested by Mr. Bell in the specification which he, as we have learned from the argument, drew with his own hand.

The fifth claim of the patent, in so far as it is a claim for a method, reads thus: "The method of . . . 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*." Here are two limiting expressions: "as herein described" and "substantially as set forth." Now, I suppose that one of these, no matter which, is intended to refer the reader to the description of what is meant by the term, "electrical undulations"; and I suppose that the other, no matter which, is intended to refer to the description of the way in which those undulations are produced and used. Rejecting certainly one of them, and as I believe both of them, the counsel have set up as the patented invention of Bell the transmission of speech *by means of* "electrical undulations similar in form to the vibrations of the air accompanying the said vocal or other sounds," or, as they otherwise express it, "electrical changes which correspond to the sonorous motions of the air." Causing the sonorous motions of the air, (that is, the vibrations produced by speech,) to bring about, no matter how, corresponding electrical changes of any sort, which electrical changes bring about, no matter how, sonorous motions of the air, like the first,—is the patented invention, as the appellees contend.

This was substantially the view taken by Mr. Justice Gray in the court below. I respectfully submit that this, while

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denying Mr. Bell a patent *in terms* for the use of electricity to transmit speech, gives it to him *in substance* by giving him a patent for that which is done necessarily, in the nature of things, *ex vi termini*, whenever speech is transmitted by electricity. Of course, if a man cannot have a good patent, as it is agreed he cannot, for the use of electricity to transmit speech, he cannot have a good patent for that in which the electrical transmission of speech *consists*. He has changed the words of his claim, but not the things claimed.

[Mr. Browne here quoted from several scientific witnesses in support of this position, and among others from Dolbear, taking occasion to defend him from some attacks that had been made against him.]

The court below dismissed this testimony, saying: "The evidence in this case clearly shows that Bell discovered that articulate sounds could be transmitted by undulatory vibrations of electricity, and invented the art or process of transmitting such sounds by means of such vibrations. If that art or process is (as the witnesses called by the defendant say it is) *the only way* by which speech can be transmitted by electricity, that fact does not lessen the merit of his invention, or the protection which the law will give to it."

The learned Justice misunderstood. It is not a question of *the only way* to transmit speech by electricity. Producing electrical changes upon the line corresponding to the sonorous air changes is not *a way* of transmitting speech by electricity. *It is doing it*. It is that in which the electrical transmission of speech consists. It is the alternative form of words for the same thing. Not only do we see *now* that the electrical transmission of speech implies that, and consists in the fact that, the sonorous motions of the air produced by speech shall in some way cause corresponding electrical changes of some kind in the line conductor, which electrical changes shall in some way cause sonorous motions of the air like the first; but it was a physical truth, known among scientific men, and practically applied, that the electrical transmission of *sound in general* implied, and consisted in, the production in the line conductor of electrical changes corresponding to whatever sonorous



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changes *were* made in the air by making the sounds, and the utilization of those electrical changes to produce sonorous changes in the air like the first.

Whether Reis did or did not successfully reduce to practice a speaking telephone, he certainly did transmit sonorous air vibrations made by human speech; and he certainly knew that if he would transmit speech, he must translate into electricity the vibrations of the air, in their relative duration, and that so far as he failed, his mistake was in supposing that he could do it with his apparatus.

The philosophy of the motion of air particles is this. The air is moved in speaking by way of vibration, the air particles moving to and fro in straight lines only. They can only move in straight lines. Nothing produces any result except the movement of the air particles to and fro in straight lines. Every movement of air particles to and fro is a vibration, relatively long or short. In speech, every air particle moves or vibrates in obedience to a *combination* of impulses, the chief being that which would, by itself, produce what is called the fundamental, and the others being such as would produce what are called overtones; and it is the mixture of these fundamental vibrations and overtone vibrations which gives what we call quality. But the whole is nothing and can be nothing but a *combination of vibrations of different pitches and amplitudes*; for every vibration has some pitch, and some amplitude; that is what vibration means; and there is nothing but vibrations of air particles to do the business. These various constituent vibrations do not separately exist in fact. Only the resultant of them exists in fact, and is felt by any one air particle; as only the resultant of several forces applied to a billiard ball appears in the direction and character of the motion it takes up. And what is it that acts upon the ear, or upon the diaphragm against which you talk in using the telephone? It is and can only be the condensation and rarefaction of the adjacent air, varied according to the resultant of the forces by which the air particles at the rear of the elastic column of air have been acted upon. I say "elastic column," for, when I talk to your Honor, Mr. Chief Justice, you may imag-

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ine a column of air reaching from my mouth to the drum of your ear. I press upon the end of that column next my mouth in a certain way. Your ear can perceive nothing but rarefactions and condensations, variations in degree, and in kind, if you please, of pressure upon the drum of your ear, due to impulses which I have given to my end of the column, and which have propagated themselves through to your ear. Condensation and rarefaction mean variations of pressure produced by movements of air particles to and fro. It can mean nothing else.

[*Mr. Browne* then read from the *Gartenlaube* *Reis* publication the passage commencing "Our ear" and ending "from each other," which will be found on page 65, *supra*, and contended that the whole problem was there stated, and that if what that writer says is necessary to be done, be done, the transmission of speech will follow.]

Mr. Bell undertook to solve this problem which, according to the appellees (and I have no occasion to dispute it) had baffled the scientific world, including, if you please, Mr. *Reis*. I have nothing to say against that. Mr. Bell came along and solved that problem; and that was, shall I say, *all* he did? Why, was it not a great thing to be the first man to solve that problem? Have I detracted a particle from his just renown as an inventor? Surely not. I am but protecting the right of another inventor to start also from first principles and, if he can, to find a method which is not that of Mr. Bell, in solving the same problem.

[After referring to *Tilghman v. Proctor*, 102 U. S. 707, as a correct and clear statement of the distinction in law between a patent for a process and a patent for a principle, *Mr. Browne* continued:]

We have now to inquire what was the method invented by Mr. Bell for solving the problem presented to *him*.

When he took his patent, there was but one agent that had ever been used for, variably attracting any object so as to make it vibrate and beat the air and give out audible sound. That agent was *magnetism*. There was but one practical use to which electricity had ever been put for the purpose of so caus-



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ing a body to vibrate and give out audible sounds; and that was as a *flowing current making an iron core an electro-magnet*, the variations of current strength causing like magnetic variations. Mr. Bell found a way to get electrical changes, corresponding in form to the sound waves, *in the current traversing the coils of an electro-magnet*, and so to produce corresponding variations in the magnet, and corresponding vibrations of a receiver armature. When I come to look at his patent, I shall give him the broadest construction that the actual fact of his invention can give any one; but I cannot, as I have been taught the law, include in his invention something which neither he nor any other man had then done or supposed could be done; that is to say, cause an armature to vibrate and give audible sounds by variations of *electrical attraction*, with no use of magnetism at all.

Dolbear, on the other hand, reduced to the service of mankind for the first time that property which Mr. Maynadier spoke of as the property of amber, or *elektron*, electricity, amberism. The power of a body charged with electricity to attract anything, though known for two thousand years to exist, had never been put to any practical use in the arts when Professor Dolbear made his invention; certainly it had never been supposed that variations of electrical attraction could cause corresponding vibrations of an armature. No instrument having any such operation ever existed before Mr. Dolbear's invention. Dolbear's receiving apparatus is properly enough *called* a condenser, because in structure it generally resembles the old condensers. That is to say, it has two plates electrically insulated and charged. But the operation is radically different from that of the old condensers. No operation of vibrating either plate by variations of electrical charge was contemplated or performed in the case of any of the old condensers. The arrangement of the parts or elements of the condenser did not admit of its being performed.

[After referring to and describing the Reis-Wright apparatus and the Varley patents, *Mr. Browne* continued:]

It is altogether a mistake to say that in any of these instruments there was any use whatever made of the power of elec-

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trical attraction, still less of varying electrical attraction, to control by way of vibration a diaphragm or any armature whatever set up in the electrical field. In all these old condensers the elements were placed close together, with a non-conductor (I do not mean air, but a solid non-conductor) interposed and closely fitted between them, so that the electricity might be condensed, which non-conductor prevented any practical vibration of either of the elements.

In the Dolbear receiver, on the contrary, one of the plates is held firmly so that it cannot vibrate, and the other is held so as to be free to vibrate according to the variations of electrical charge, and beat the air and give an audible sound; the two plates being separated by a body of air, so that no current can pass. Here was a change in construction, designed to produce a new operation, for a new purpose, without which change that operation could not be performed nor that purpose answered. To hold one element of a condenser still, so that it shall not vibrate, and suspend the other so that it shall vibrate, and then make use of its vibration according to variations of electric charge, was wholly and absolutely new. No such instrument existed. No such use of any instrument had ever been proposed or supposed to be possible. It cannot be said with any show of reason that any equivalent for it was found in any of the old condensers.

Dolbear's discovery of the capacity of variations of electrical attraction to make an armature vibrate accordingly, was accidental. He says that when he showed it to scientific men, "without exception they expressed their astonishment at hearing that variations of the electric potential of a terminal plate could practically produce any sound vibrations of an opposed diaphragm comparable to those produced by the varying attractions of an electro-magnet."

It is, I submit then, the truth that Mr. Dolbear, like Mr. Bell, has made (in the language of the brief of the appellees) an application of the laws of nature which no one had ever made before, which no one had thought of before, by an instrument which did not exist before, *the result only* being the same—that is to say, the electrical transmission of speech; or, in



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other words, making speech bring about corresponding electrical changes on the line conductor which in turn bring about corresponding audible vibrations at the receiving station.

The appellees say that "the characteristic of Mr. Bell's current is form, not mere continuity. The invention of the speaking telephone *does not consist in the employment of a merely continuous as distinguished from a merely intermittent current.*"

But Professor Cross, their leading expert, says in his deposition:

*"In an electrical speaking telephone the connection between the transmitter and receiver must be such that the latter shall not be acted upon merely at separate intervals, but the armature or other moving portion of the receiver must be constantly under the influence of and guided by the variations in the electrical current caused by the motions of the armature or other vibrating portion of the transmitter; and this vibrating portion of the transmitter itself must be able to substantially take up the complex motions of the air particles which act upon it. Only in this way can the quality, as well as the intensity of other sounds be reproduced, since not only the frequency of vibration but also the varying amplitude, and especially the varying form, must be reproduced in order to reproduce the quality called 'articulation.' The electrical circuit of the instrument must always present an uninterrupted path by which the continually varying current may travel from the transmitter to the receiver; that is, the circuit containing the battery or other source of electrical power, the transmitter, line wire, receiver and earth or return wire must always be closed."*

But the appellees say that *there are flowing currents* in Dolbear's method. In a sense this is true; but not in the sense of the Bell invention or of the Bell patent. The current in which the electrical changes corresponding to the sonorous air changes are produced, is the current *on the line conductor* extending, as Mr. Cross says, from the generator through the transmitter, through the receiver and back to the generator. This is plain from the Bell specification, for in the form of his apparatus shown in Fig. 7 and explained in the corresponding

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paragraph of the specification, there is *no other current* than that; the transmitter is an inductive diaphragm. In the commercial Bell telephone there is used a local circuit at the transmitting station for the purpose of producing the proper variations in the magnet at that same station; and so there is in the Dolbear apparatus. But this local circuit, including the magnet, is only for the purpose of inducing upon the line conductor, running from the transmitting station through the receiving station, the currents which are to do the work of transmitting the speech to the receiving station. These currents are in Bell the well-known circuit currents converted into magnetism by traversing the coils of an electro-magnet at the receiving station. In Dolbear, they are merely the currents which move to or from the receiving plate, which is thereby variably charged from instant to instant, so that it may exert its variable electrical attraction, *there being no magnetism at all*. The currents in the two are thus seen to be *essentially different in character, purpose, and result*.

The currents of Bell do their described work of transmitting the speech to the receiving station and there delivering it, by virtue of flowing, and only while they *are* flowing, through the coils of the receiving electro-magnet, whose corresponding magnetic variations vibrate the receiving diaphragm. All that vibrates the receiving diaphragm in Dolbear is the variations of charge of electricity in his attracting plate.

Mr. Bell employed, under the name of electrical undulations, variations of current strength producing like changes of magnetism, to receive and transmit air vibrations under the known law of the electrical transmission of sound, *i.e.*, that the electrical changes must correspond with the sonorous air changes. Dolbear employed variations of *electrical charge* to receive and transmit air vibrations under the same well-known law. Neither could patent the correspondence of the electrical changes with the sonorous air changes, because that was the known law of electrically transmitting sounds.

There is another way of putting this case. Mr. Reis tried, and, if you please (although that is disputed) failed, to transmit speech by variations of current strength in *an interrupted cir-*



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*cuit.* Mr. Bell tried, and succeeded, in transmitting speech by variations of current strength in a *constantly closed circuit*. Mr. Dolbear transmits speech by variations of electrical attraction, using *no circuit*, and no flowing current for that purpose at all.

I have thus far refrained from any examination of the Bell specification on the question of the construction of his patent, and have confined myself to a comparison of *the things done* by the two men, Bell and Dolbear. If the things done are, as I trust I have satisfied you that they are, essentially different, no possible construction of the patent for the one can make it cover the other. I now ask your Honors to look at the Bell patent and see if you do not find the specification (written by Mr. Bell's own hand) to be drawn with the clearest recognition of the fact that his invention lay in transmitting speech electrically by producing on the line conductor running to the receiving station electrical changes (corresponding to the sonorous air changes) in currents of electricity traversing the coils of an electro-magnet at the receiving station, and in that way converted into magnetism of corresponding variations at that station, which magnetic variations perform the work of vibrating the receiving armature accordingly to give out audible sounds like those spoken at the transmitter.

The specification describes no circuit but a ring circuit, running from the positive pole around to the negative pole, and at the receiving station traversing the coils of an electro-magnet. It describes a way of getting multiple telegraphy; it describes a way of transmitting musical tones; and lastly it describes a way of transmitting speech. But everywhere, throughout the specification, there is this one constant and sole agent employed for transmitting the air vibrations produced in either case, and reproducing them to the ear, viz., *a constant circuit with a current converted into magnetism whose variations vibrate correspondingly the receiving armature.*

Take the paragraph where the method of and apparatus for transmitting speech are described. Strip away as immaterial everything which can, by the most liberal interpretation, be so regarded. Let it cover a vibrating metallic disk as well as

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the described membrane carrying an attached piece of metal. Let it cover a variable resistance transmitter instead of a magneto transmitter, because that substitution may be found suggested in another part of the specification. But if anything in the description of the method of and apparatus for transmitting speech is *characteristic of and essential to* Bell's invention, it is this, that *the current* from transmitting station to receiving station on which the required electrical changes are to be impressed, is a current traversing the coils of an electro-magnet, and that the operative power for vibrating the receiving diaphragm is the varying magnetism so produced in that electro-magnet.

No such current is employed by Dolbear for transmitting speech. No magnetism is used by him for reconverting the electrical changes into sonorous air changes. His method is new, because based upon a mode of using electricity not at the time of Bell's patent known to be practicable, and is substantially and fundamentally different from Bell's. His apparatus is new, and it is essentially different from Bell's for the same reason.

The only resemblance between Bell and Dolbear is in the fact that each produces, *somehow*, electrical changes in the line conductor corresponding with the sonorous air changes made by speaking, and reconverts those electrical changes, *somehow*, into sonorous air changes at the receiving station. But this cannot be validly patented by Bell (even if his specification would bear such a construction) because it is, under another form of words, patenting the use of electricity for transmitting speech, and this, it is agreed, cannot be done.

*Mr. Wheeler H. Peckham* for the Molecular Telephone Company.

It is, of course, apparent to the court at this time, that there is a very considerable difference in the position occupied by the several parties defendant to this litigation. My learned friend, who represents the Dolbear interest, has stated with considerable emphasis that he speaks alone for that interest.