(No Model.)

2 Sheets—Sheet 1.

H. LAMONT.

MECHANICAL TELEPHONE.

No. 338,983. Patented Mar. 30, 1886.

Fig. 1.

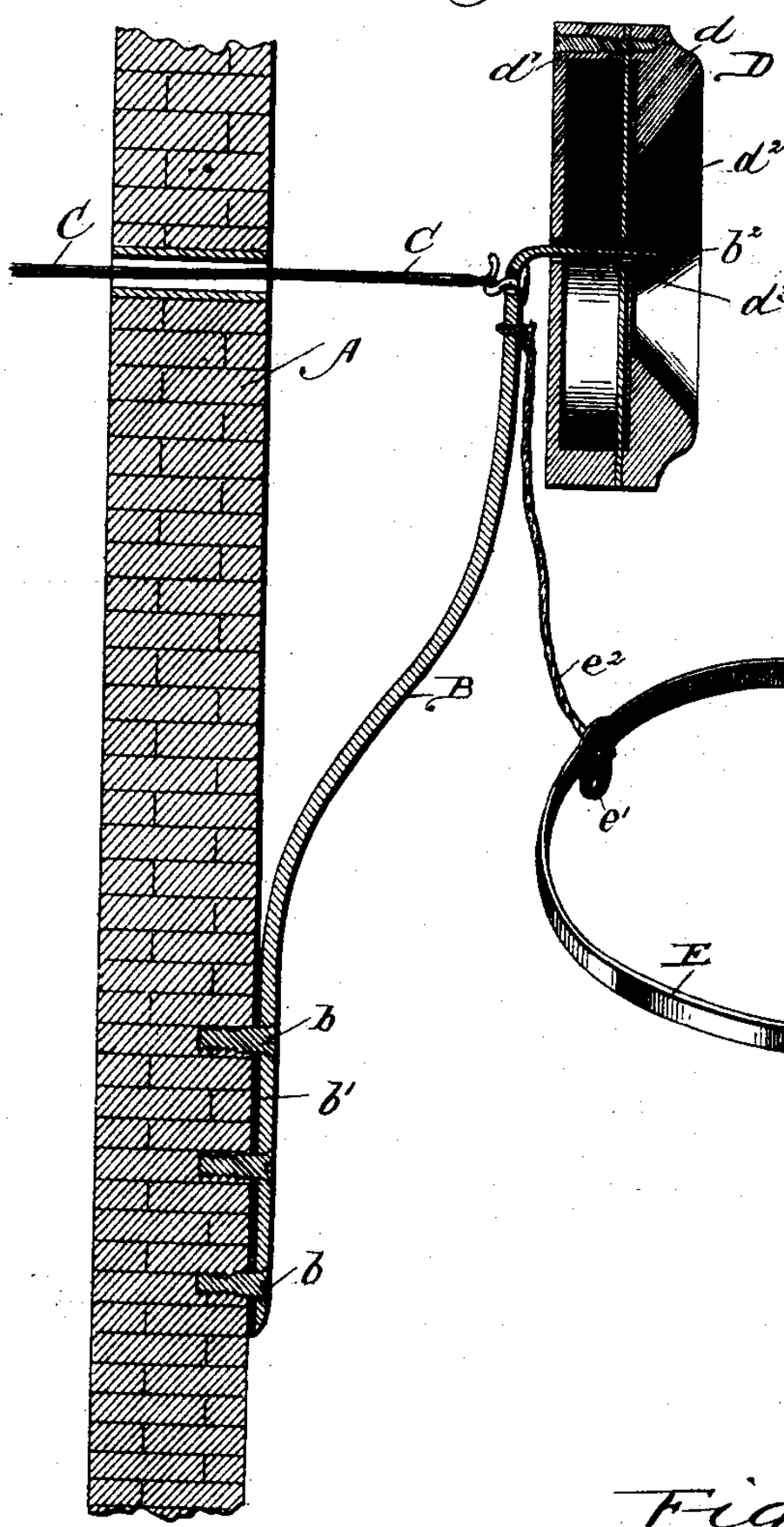


Fig. 2.

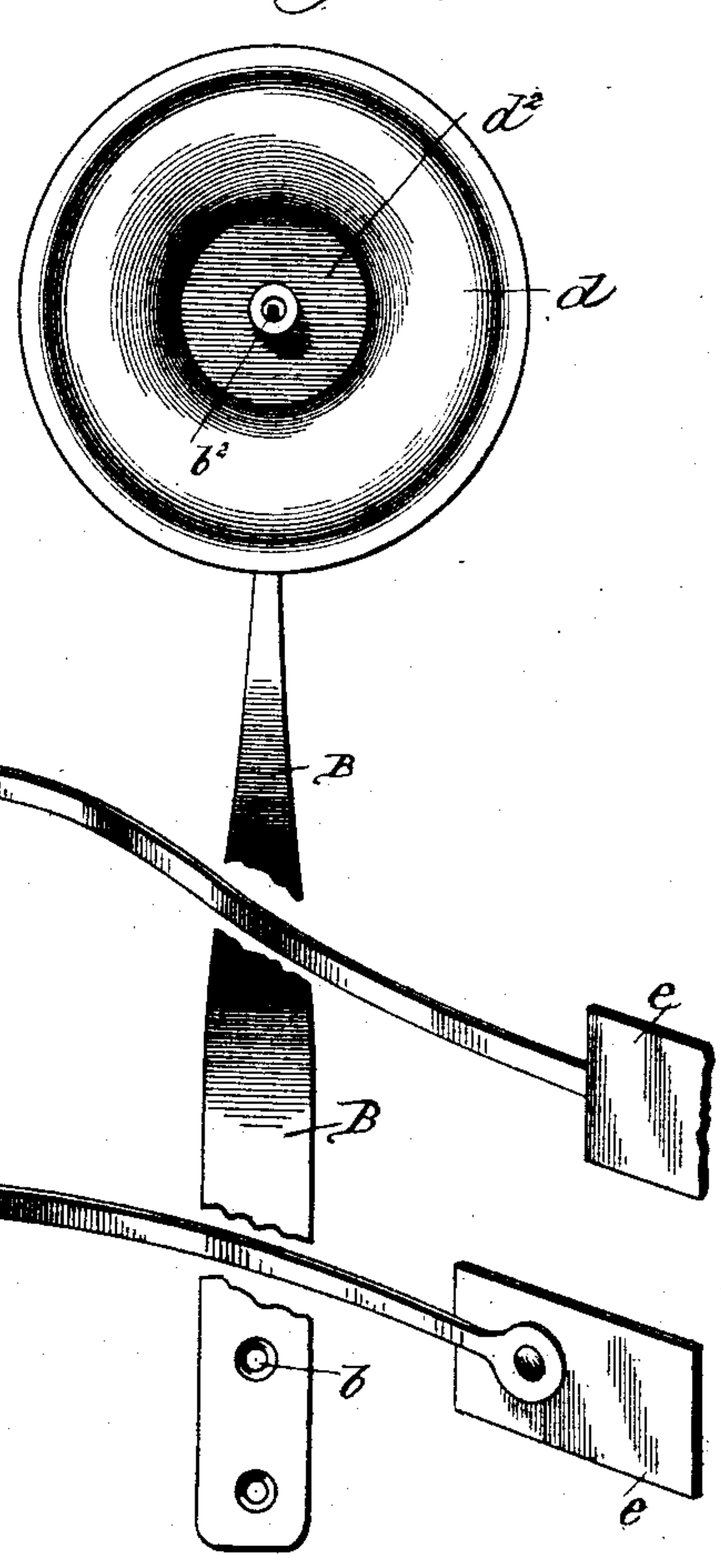
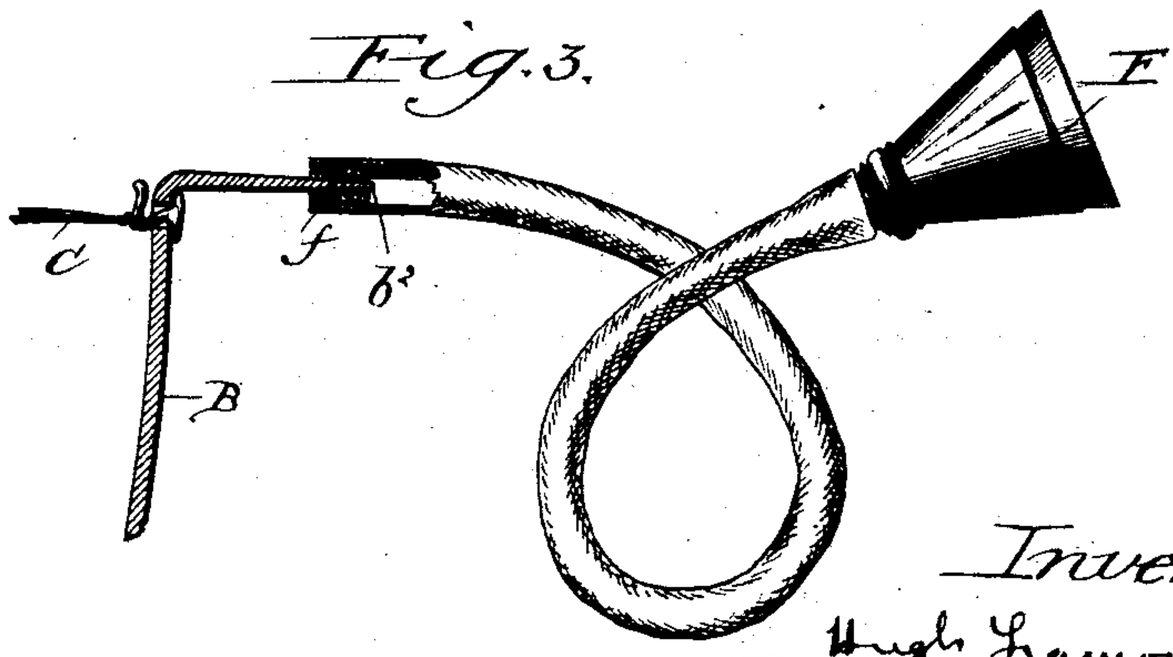


Fig. 3.



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(No Model.) 2 Sheets—Sheet 2.

H. LAMONT.

MECHANICAL TELEPHONE.

No. 338,983. Patented Mar. 30, 1886.

Fig. 4.

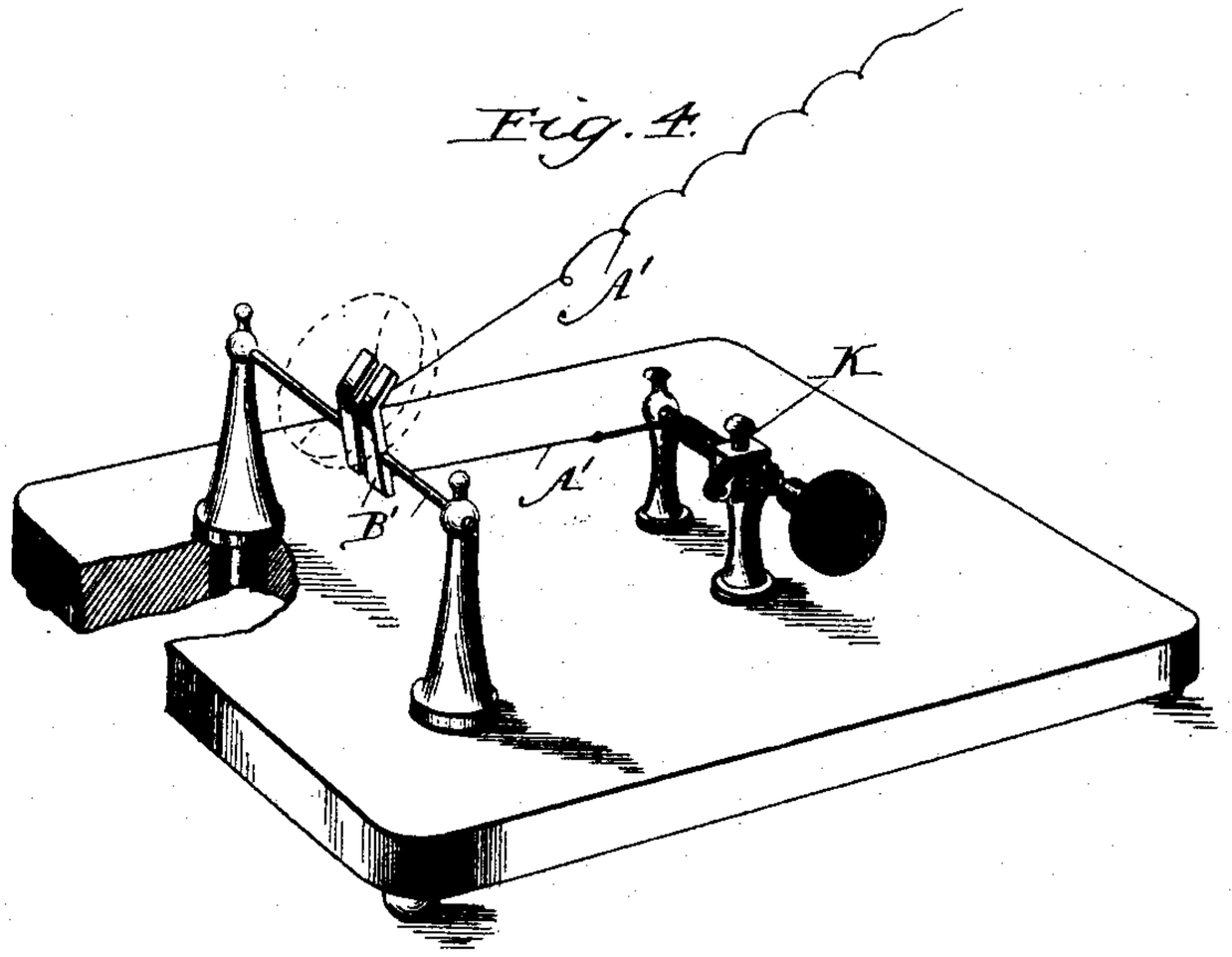
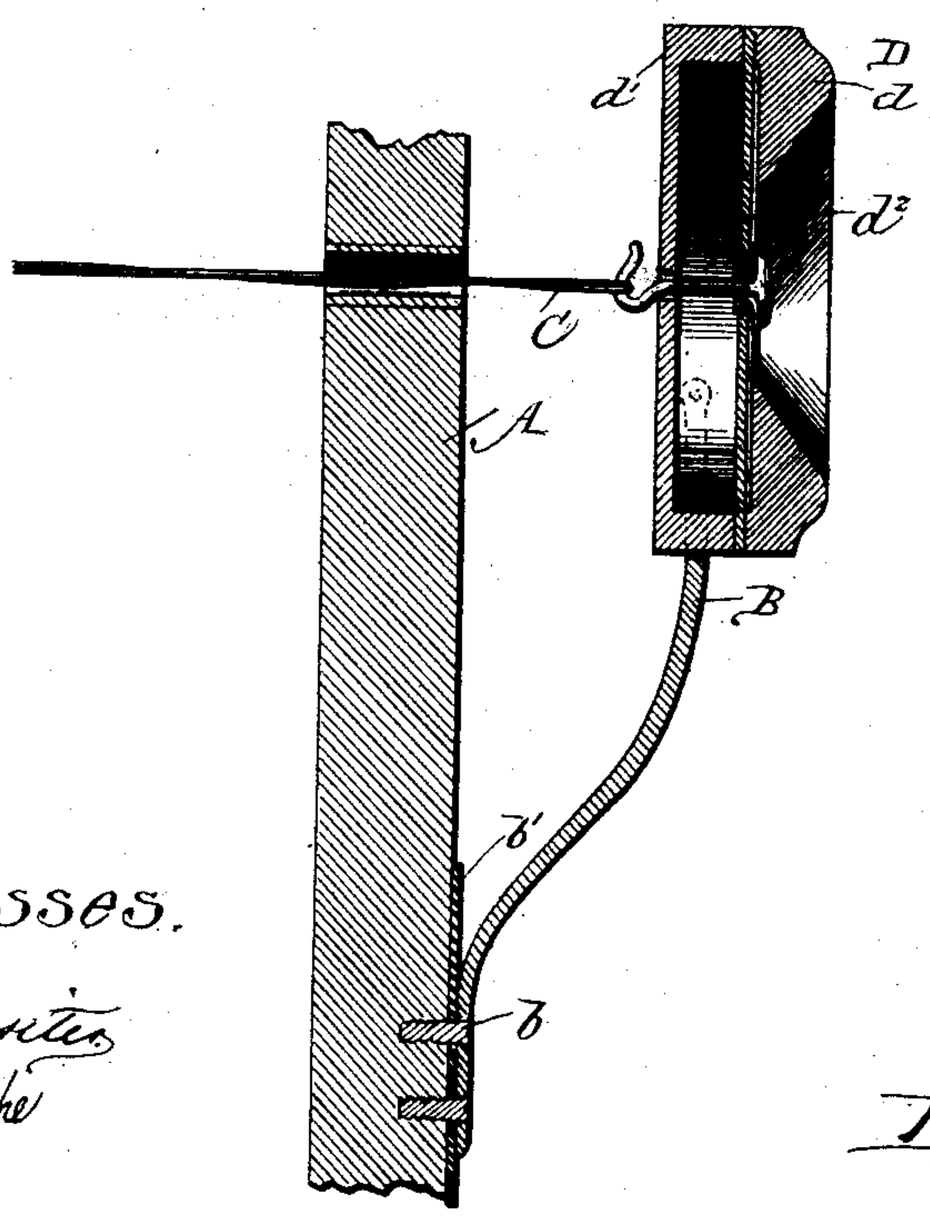


Fig. 5.



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UNITED STATES PATENT OFFICE.

HUGH LAMONT, OF BLISSFIELD, MICHIGAN, ASSIGNOR OF THREE-EIGHTHS TO WILLIAM HUBBARD, OF ELGIN, ILLINOIS.

MECHANICAL TELEPHONE.

SPECIFICATION forming part of Letters Patent No. 338,983, dated March 30, 1886.

Application filed October 27, 1885. Serial No. 181,051. (No model.)

To all whom it may concern:

Be it known that I, HUGH LAMONT, residing at Blissfield, in the county of Lenawee, State of Michigan, have invented certain new and useful Improvements in Mechanical Telephones, of which the following is hereby declared to be a full, clear, and exact description.

Mechanical telephones of ordinary construction are provided with a thin disk of metal, parchment, or the like, commonly known as the "diaphragm," which is mounted in position across the mouth of the telephone-box and has the line-wire attached thereto. If words are spoken in near proximity to the telephone-diaphragm, this latter being light and delicate in structure, is sensibly affected. The air-waves tend to develop oscillations corresponding therewith in the light diaphragm, which movements are communicated thence to the line-wire, and so to the telephone at the communicating-station. At such point the companion diaphragm is caused to oscillate in keeping with the impulses received through the line-wire, thereby throwing the adjacent air into waves of similar character, which are impressed upon the ear of the person at the receiving-instrument. Unless the diaphragm is thin and delicate it is incapable of any freedom of oscillation and cannot perform the necessary function of receiving from or of imparting to the air the wave movements distinctive of articulate speech. The motion of the diaphragm is essentially that of actual sensible oscillation, and not merely of internal molecular vibration or impact, like unto that which occurs throughout the line-wire. Aside from having a light .delicate diaphragm, it is essential in telephones of this class that sensitive tension be maintained between the diaphragm and the line-wire. If the connection between these parts be entirely broken, no transmission of the impulses from one to the other can occur; and in corresponding degree, so far as approach is made to this condition of complete isolation, by permitting the connection between line-wire and diaphragm to become loose and slack, so far is the sensitiveness of the instrument impaired. It becomes more and more incapable of transmitting the finer shades of impulse upon which clearness and distinctness of articulation depend. In practice provision is invariably made for securing this necessary tautness of adjustment between the line-wire and the diaphragm, and in some instances compensating devices have been proposed, the object of which is to effect such adjustment automatically. These automatic devices consist of an ordinary coil-spring set loosely between the telephone-box and its base-support, so that in such relation of the parts the box and diaphragm may shift and accommodate themselves to the changes in length of the line-wire (arising from variations in temperature) to which the wire is subjected. Over wires of any considerable length, the extremes of expansion and contraction must work with destructive effect upon the diaphragms of the telephone-boxes connected therewith, when these latter are provided with compensating-springs, as above mentioned. If the compensating-spring be powerful enough to adjust the telephone-box and diaphragm to any expansion of the line-wire that may occur, the spring is quite as powerful in resisting the contraction of the wire; but such resistance manifestly reacts upon the delicate diaphragm during any extreme contraction of the wire and causes the diaphragm to be torn or broken from its line-connection. If the spring be diminished in power to avoid this difficulty, it no longer serves to compensate for the extreme expansion of the line, so that at times the connection of the latter with the diaphragm is slackened, and the efficient transmission of the impulses no longer occurs. Even though no compensating-spring be employed, the stress of the line-wire frequently serves to tear the diaphragm from its connection.

The central idea in mechanical telephones prior to my invention was that of a thin disk or diaphragm in tense relation to the line-wire stretching therefrom, the delicacy in structure of the disk being regarded as an essential to its responsiveness.

My invention differs essentially in principle from such prior devices; and it consists in certain improvements in the construction of me-

chanical telephones whereby the need of the usual diaphragm is dispensed with, the molecular vibrations being imparted to the line-wire and being received therefrom without the necessary interposition of any delicate plate or disk capable of sensible oscillation, and such as is ordinarily understood to be requisite in devices of this character.

The nature of my improvements will be set forth in the following specification, reference being had to the accompanying drawings, forming part of the same, and will thereafter be more distinctly pointed out and defined in the claims at the conclusion thereof.

Figure 1 is a sectional view of one form of my improved telephone with the vibrant receiver secured thereto; Fig. 2, a front elevation of the transmitter and vibrant bar in position; Fig. 3, a detail view showing the telephone in modified form; Fig. 4, a view in perspective showing a different mode of securing the line-wire to the vibrant bar; Fig. 5, a view in section illustrating the plan of attaching the vibrant bar to the telephone-box.

Securely fastened to the wall A of the room, or other convenient point, is the anchor support or bar B, which may be of wood, metal, or other material, the molecules of which are capable of being maintained in tense or sensitive condition by subjecting the bar to strain. Preferably, the bar is made of steel, tapering slightly from its base-fastenings *b* to the free terminal, and somewhat bowed in contour, as shown. A sheet of rubber, felt, or the like, as at *b'*, may be interposed between the base of the bar and the wall, to prevent the ingress or egress of vibrations at such point to or from the bar. Near the upper end of the bar B the line-wire C is secured in any convenient manner, extending thence to the next station, as usual. When the line-wire is stretched tightly in position, the stress comes directly upon the bar or spring B, which thereupon is so far modified in condition as to develop in all parts thereof short of the fixed base a highly sensitive or tremulous state of its particles. In such situation the bar becomes a veritable microphone, susceptible to the slightest tremors which may be imparted thereto, and repeating these with marked fidelity to its proper connections. This vibrant peculiarity of the bar is utilized in lieu of the oscillation of the thin diaphragm of the ordinary telephone in receiving and transmitting articulate speech.

The bar B terminates in something of a point, b^2, at its free end, upon which point may be loosely mounted an ordinary telephone-box, as at D. The box D may consist of the two usual sections, *d d'*, between which is clamped a disk, d^2, of wood, paper-pulp, or the like, said disk having a thimble, d^3, set in its central orifice to receive the end of the vibrant bar B. The box D can freely turn about its support, or be permanently fastened thereto, and with its diaphragm performs no necessary function other than to direct and concentrate upon the sensitive vibrant bar the impulses due to the sound-waves. The tremors thus imparted to the bar pass to the line-wire and so to the station in communication therewith.

In conjunction with the vibrant bar B, to which the line-wire is secured, there is provided a vibrant receiver, E, which may be of material like unto said bar, and which is preferably bent in bow-like form, so that the ends thereof can bear with slight elasticity against the ears of the operator when the receiver is distended and applied. Plates or spherical knobs *e* of india-rubber, metal, gutta-percha, or the like, may be attached, as shown, to the ends of the receiver for comfort and ease in resting the same against the ears. Being thus in readiness, the operator needs but to touch the vibrant receiver against some point of the vibrant bar B, preferably short of its fixed base, whereupon the impulses imparted to said bar from the line are at once communicated with exceeding clearness and fidelity along the sensitive receiver to the ear. For convenience, there may be a hole, as at *e'*, in the receiver, by which, while messages are passing, the latter may be fitted over and be sustained upon the point b^2 of the vibrant bar B, although, as above stated, any other point along the bar B will serve for the escape of the molecular tremors to the vibrant receiver.

If desired, the vibrant receiver may be dispensed with entirely, and the point of the bar B be caused to bear upon the teeth, the impulses being communicated thence directly by the teeth and roof of the mouth to the ear and auditory nerve; or, again, instead of touching the receiver directly to the vibrant bar, the suspension-cord e^2, especially if it be of piano-wire or the like, may be drawn taut, and thus serve as the medium for communicating the impulses from bar to receiver.

In practice it has been found that for short distances the disk *d* of the telephone-box D, although but loosely set upon the point of the vibrant bar B, serves as a receiver, and will distinctly reproduce the sound-waves. Over longer lines, however, or where many abrupt angles occur, the vibrant receiver E will better perform the desired function.

As illustrated in Fig. 3, an ordinary speaking-tube, F, may be attached to the vibrant bar B in lieu of the telephone-box and its diaphragm, as in Figs. 1 and 2, a plug, *f*, of cork, rubber, or the like in the speaking-tube furnishing a convenient means for affixing said tube to the bar, although the same is not essential. The vibrant receiver E may be used by the operator, as before detailed, or the speaking-tube itself may serve directly as the medium for transmittal both from and to the vibrant bar. When so employed, it is convenient to branch the tube, after it leaves its attachment with the vibrant bar, one of said branches passing to the mouth and the other to the ear of the operator. In this particular construction having the speak-

ing-tube as part thereof, the plug *f* performs in molecular transmittal the same function as does the diaphragm *d*² of the previous form. In Fig. 4 the vibrant bar B′, from which the line-wire A′ leads, instead of being fixed at one end, as first described, is set pivotally upon the rod *g*, said rod being sustained by the posts *h*, mounted preferably in sockets of rubber, as at *i*, in the base-board I. The line-wire A′ passes about the bar B′ and is conveniently fastened to the adjusting device K, by which it can be drawn tight to secure requisite tension. When thus adjusted, the tension is immediately reflected upon the bar B′, which thereupon becomes highly sensitized as before, and tremulously susceptible to the passing impulses. The flat diaphragm of the ordinary telephone may be applied, as shown in dotted lines, to any part of the vibrant bar B′, and thus serve to receive or to transmit the impulses. Obviously, however, there is no tension upon the diaphragm of the telephone. If desired, the vibrant receiver E may be used in conjunction with the diaphragm-transmitter, and, upon being touched to the bar B′, serves to convey the passing impulses to the ear of the operator, as already detailed.

As shown in Fig. 5, the line-wire, instead of proceeding directly from the vibrant bar B, is in connection with the diaphragm or disk of the telephone, as in usual practice. The bar B in this form is attached at its forked or branching ends to the telephone-box; but in such relation said bar is far more than a mere bracket-support to the telephone-box, for when the line-wire is tightly stretched, as necessary, the vibrant qualities of the bar B are at once developed, and the sensitiveness of the telephone is thereby greatly increased. The vibrant receiver E can be applied to the bar in this form of mechanism, and the tremulous impulses existing therein be transmitted by means of said receiver to the ear, as before. This vibrant peculiarity of the bar B enables a much stouter and stronger diaphragm to be used than is ordinarily admissible, so that the tension or pull of the line-wire can in consequence be better resisted. The telephone-box and the diaphragm itself, in the form now under consideration, become in effect no more than an expanded continuation of the vibrant bar proper, and in such view transmit the wave-impulses, not by sensible oscillation, but by internal molecular impact. In any modification in form of which my invention is susceptible, this expedient of a vibrant bar located at the terminals of the line-wire and highly responsive to the molecular disturbances imparted thereto is to be observed,

So sensitive does the vibrant bar become under tension that in many instances it is quite capable of acting directly to transmit the impulses to the line without the interposition of the telephone-diaphragm at all. The use of such diaphragm, however, is in general desirable, although the construction thereof, and the point of its connection with or application to the vibrant bar are comparatively unimportant. Excellent results are obtained by employing wood or paper pulp sheets as the material for the diaphragm, as hereinbefore specified.

In the practice of my invention it is obvious that many minor changes may be made not affecting the principle thereof. Since the stress of the line-wire comes ordinarily upon the vibrant bar direct, it is obvious that the stout bar will allow heavier wires, or even cables, and a higher tension of the line to be employed than the delicate diaphragms of the old style of mechanical telephone could permit. Changes in tension of the wire which would throw the ordinary diaphragm completely out of service may occur in the new form without materially affecting the sensitiveness of the line.

It will be understood that while the best effects are obtainable when the vibrant bar extends from its base-support outward and free to the terminal point thereof, such peculiar shape is not essential, nor is it necessary that the bar remain unsustained, except at its base-fastenings. Wedge-blocks inserted at the back of the bar, above its base and between said bar and the wall, do not destroy the sensitiveness of the mechanism. If there be any portion thereof under tension from the line-wire, causing the molecules to be thrown into a condition of strain or unstable equilibrium, the bar will act with more or less success to transmit the impulses.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In mechanical telephones, the combination, with the line-wire, of the vibrant bar in tense connection therewith, said bar serving to receive and transmit the molecular impulses from and to the line-wire, substantially as described.

2. In mechanical telephones, the combination, with the line-wire, of the vibrant bar in tense connection therewith and the sound-transmitter mounted upon said bar, substantially as described.

3. In mechanical telephones, the combination, with the line-wire and with the vibrant bar in tense connection therewith, of the vibrant receiver for said bar, the same being capable of application to the ear of the operator, substantially as described.

4. In mechanical telephones, the combination, with the line-wire and with the vibrant bar in tense connection therewith, of the elastic vibrant receiver for said bar, the same being capable of application to the ear of the operator, substantially as described.

5. In mechanical telephones, the combination, with the line-wire, of the vibrant bar in tense connection therewith and the telephone-box, the diaphragm of which bears freely upon said bar, substantially as described.

6. In mechanical telephones, the combina-

tion, with the line-wire, of the vibrant bar in tense connection therewith and the telephone-box, the diaphragm of which is loosely and pivotally set upon said bar, substantially as described.

7. In mechanical telephones, a vibrant receiver adapted to conduct the molecular vibrations from the vibrant bar to the ear of the operator, substantially as described.

8. In mechanical telephones, the combination, with the line-wire, of the vibrant bar in tense connection therewith and the telephone-box having paper-pulp diaphragm to bear against said bar, substantially as described.

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