

W. HUBBARD.
Acoustic Telephone.

No. 237,979.

Patented Feb. 22, 1881.

Fig. 1.

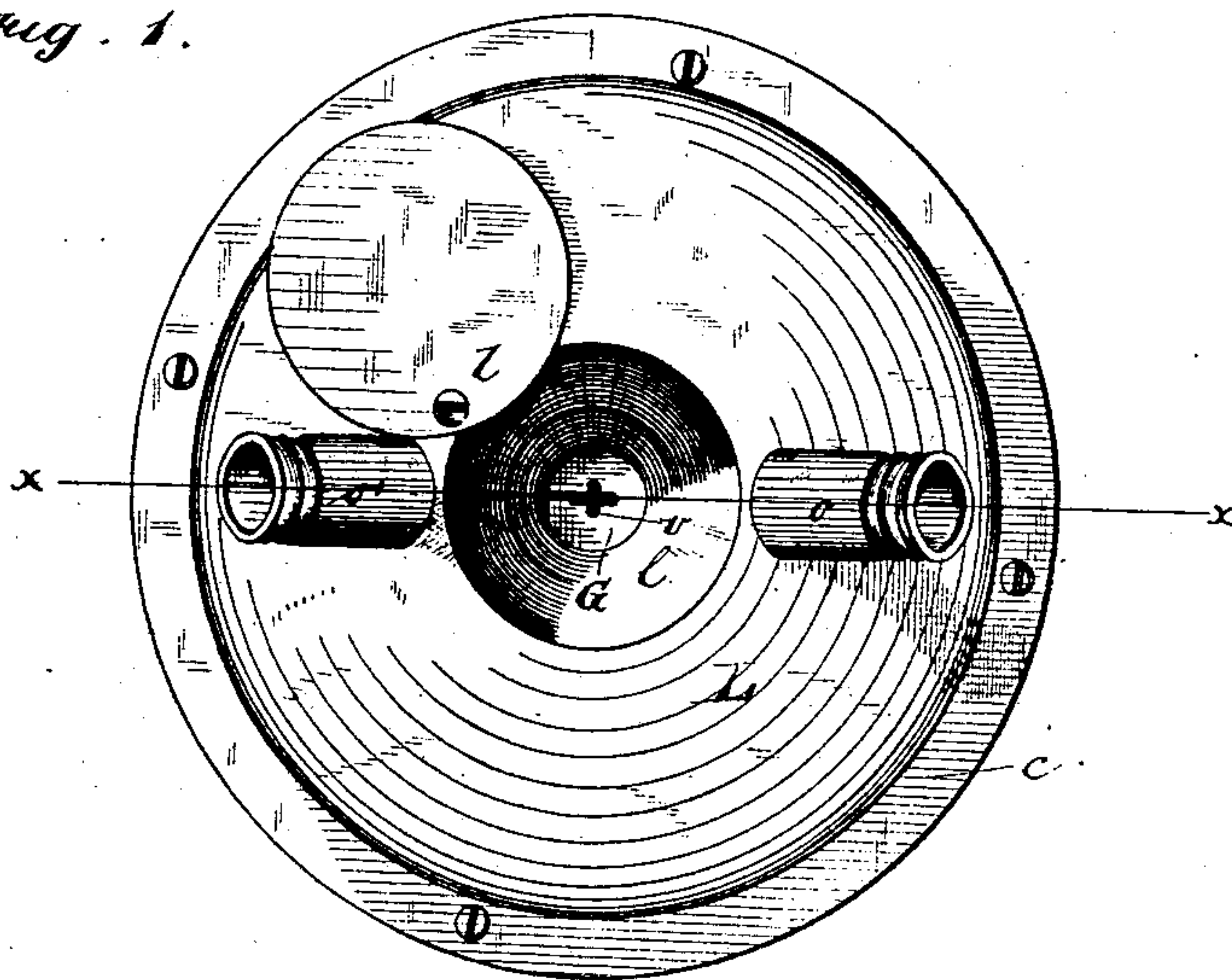


Fig. 2.

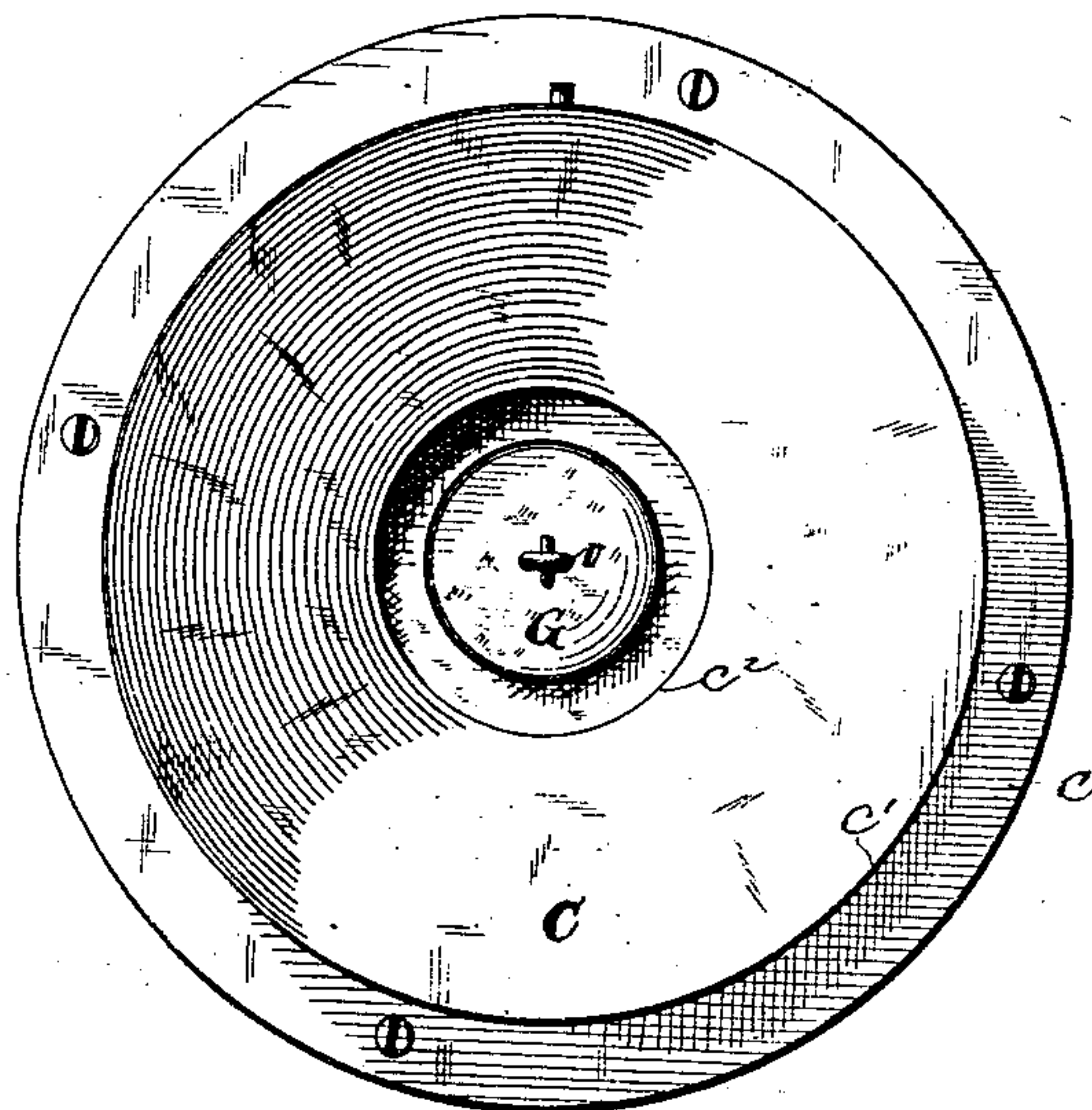
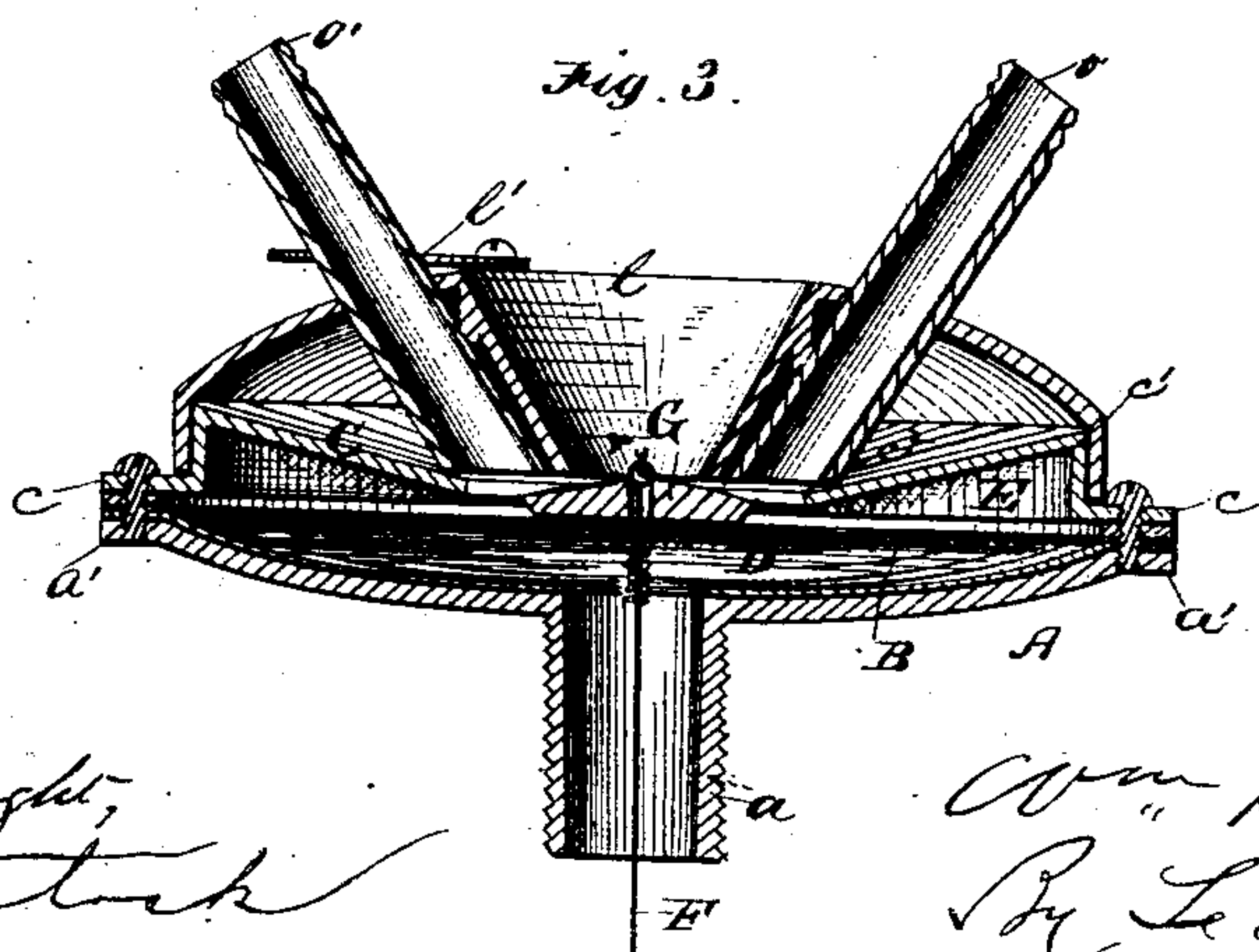


Fig. 3.



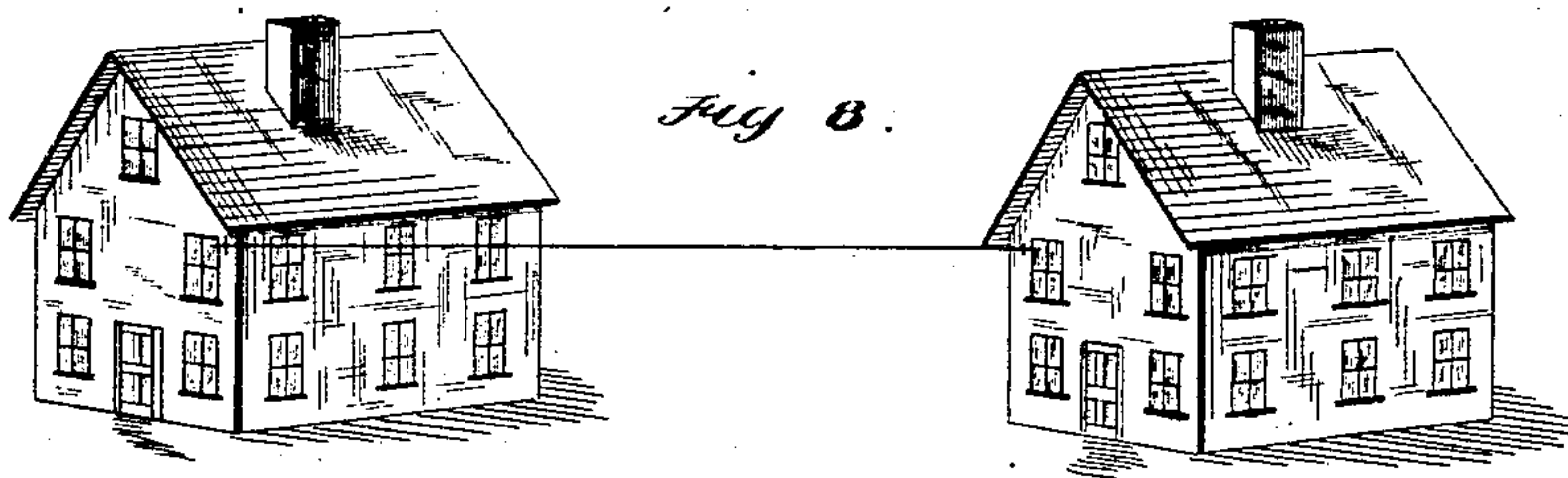
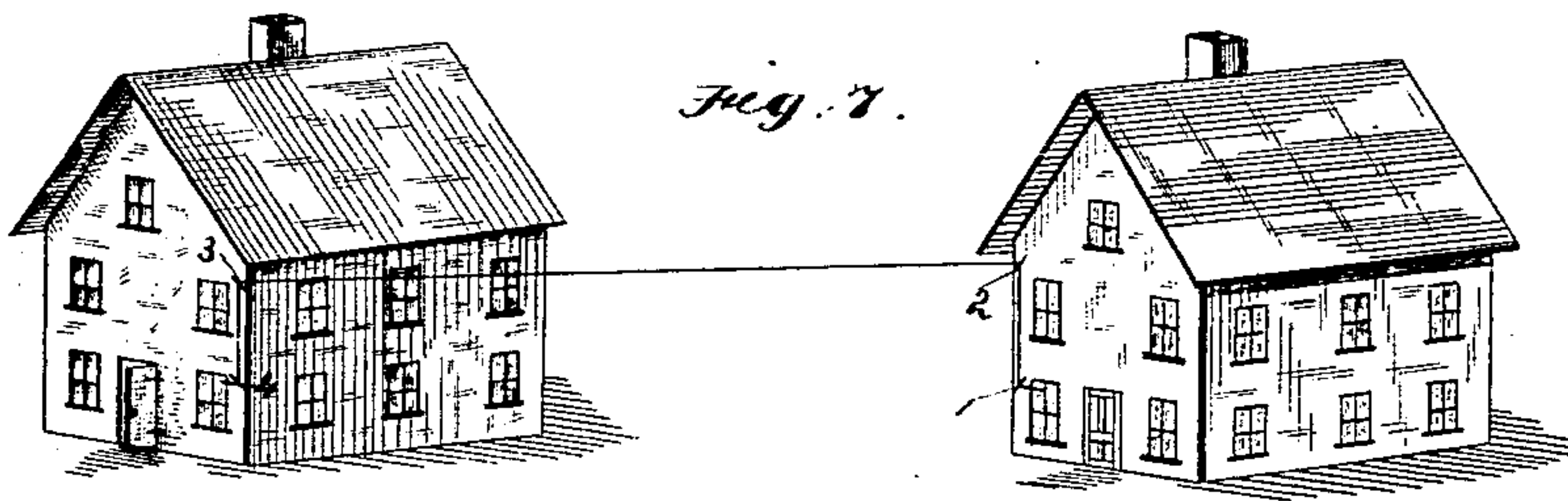
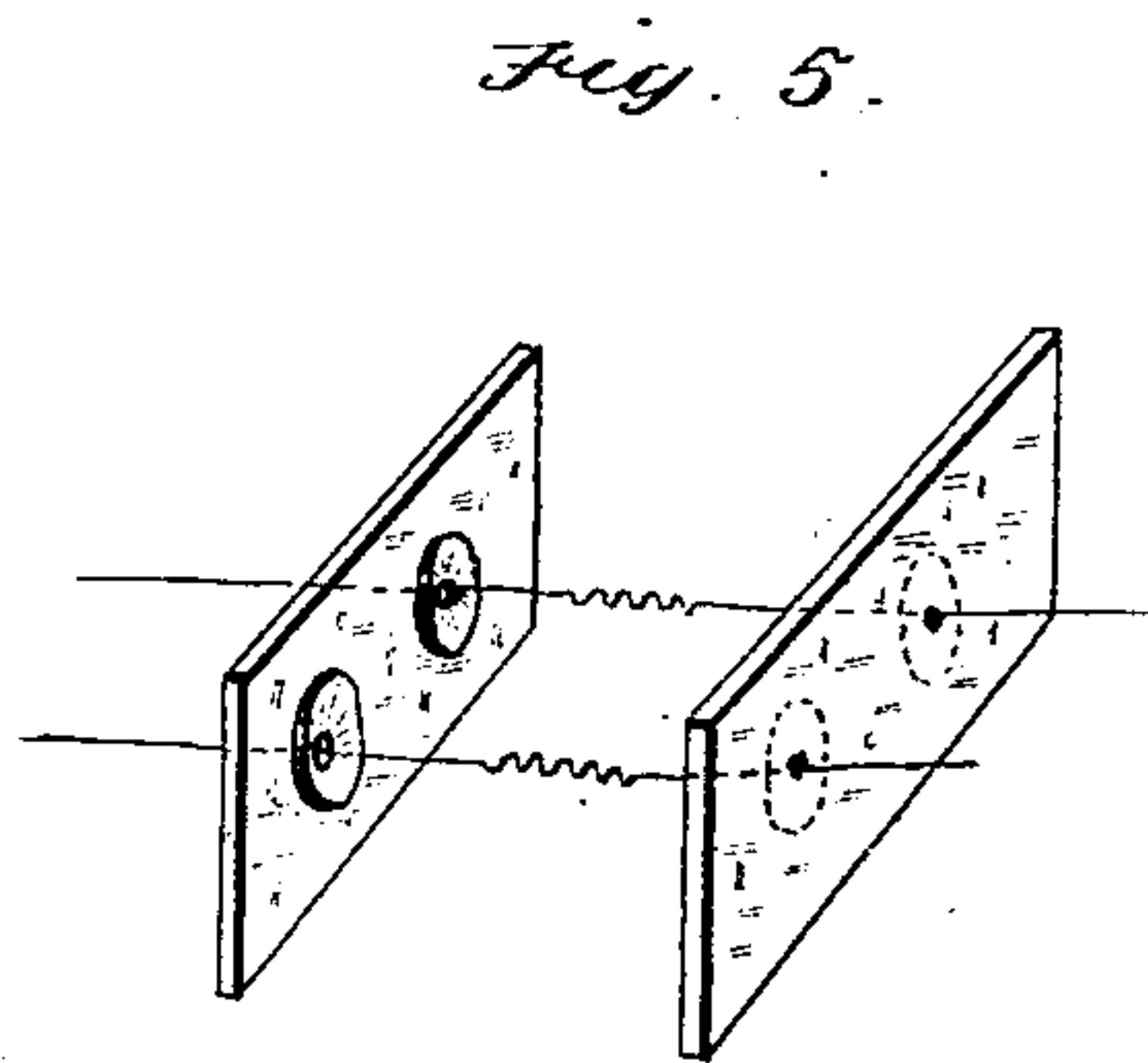
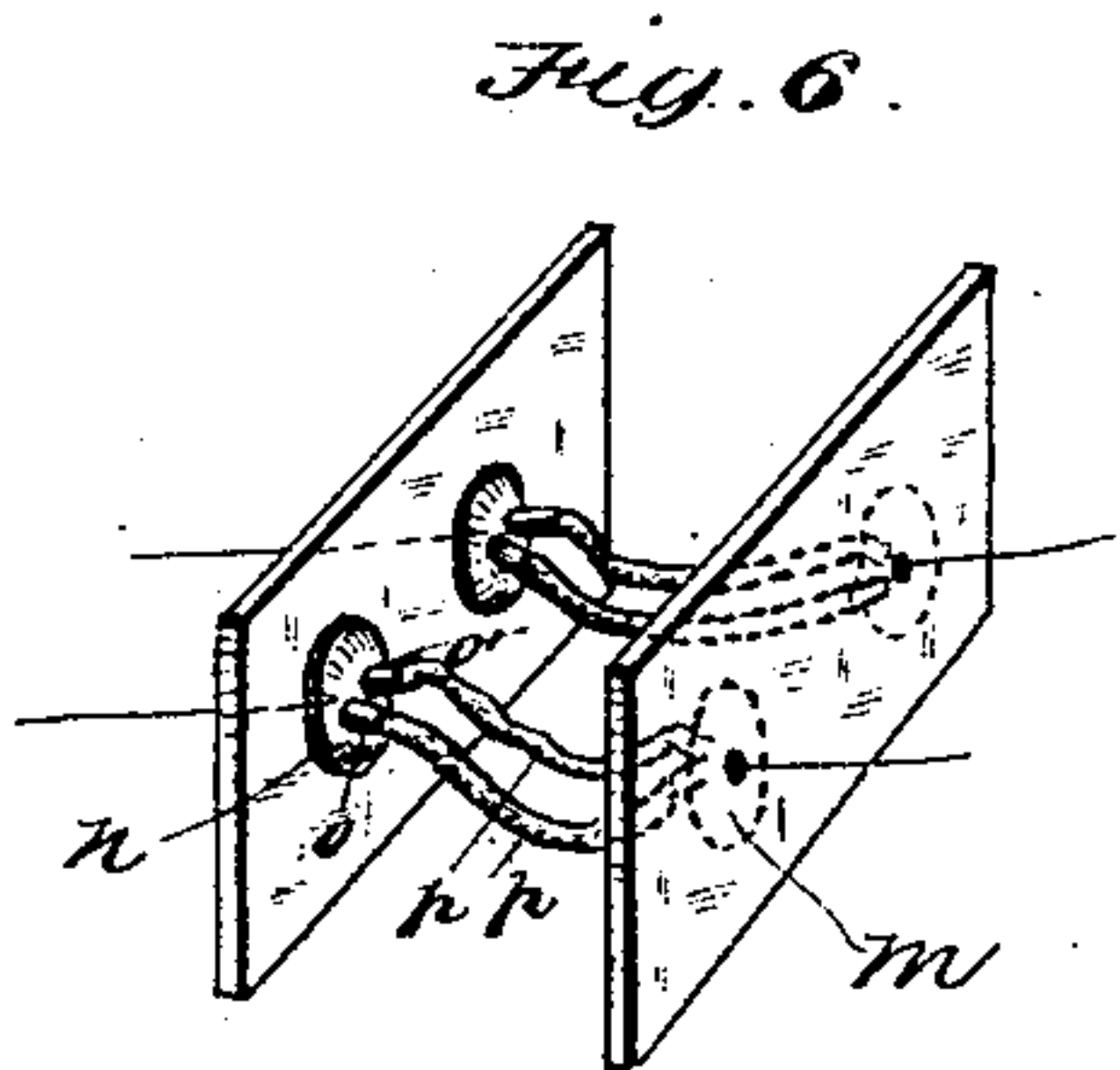
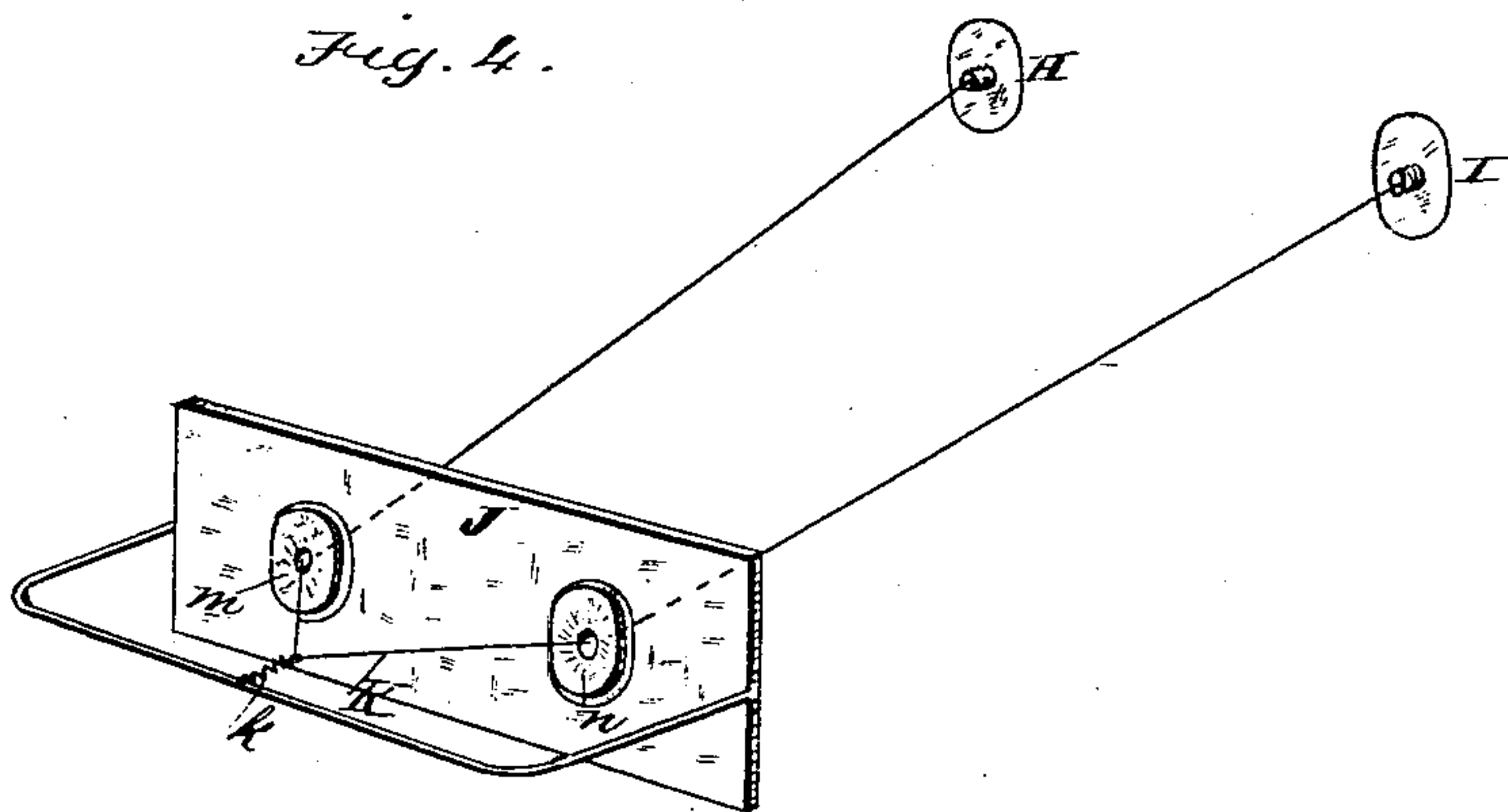
Attest:
W. O. N. Knight,
W. Blackstock

Inventor.
Wm. Hubbard
By L. H. Hill,
His Att'y.

W. HUBBARD.
Acoustic Telephone.

No. 237,979.

Patented Feb. 22, 1881.



Attest:

W. H. Knight,
W. Blackstock.

Inventor:

Wm. Hubbard,
By L. Hise,
His Att'y.

UNITED STATES PATENT OFFICE.

WILLIAM HUBBARD, OF ELGIN, ILLINOIS.

ACOUSTIC TELEPHONE.

SPECIFICATION forming part of Letters Patent No. 237,979, dated February 22, 1881.

Application filed January 3, 1880.

To all whom it may concern:

Be it known that I, WILLIAM HUBBARD, of Elgin, in the county of Kane and State of Illinois, have invented a certain new and useful Improvement in Acoustic Telephones; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 represents a front view with the cap L in place; Fig. 2, a similar view with the cap L removed. Fig. 3 is a sectional view taken on the line $x x$, Fig. 1. Figs. 4, 5, and 6 are views showing the application of the invention to the purposes of a telephone-exchange. Fig. 7 illustrates the old mode of putting up acoustic-telephone wires, and Fig. 8 illustrates my improved mode.

Similar letters of reference in the several figures denote the same parts.

This invention relates to that class of speaking-telephones in which atmospheric sound-vibrations are reproduced at a distance through the medium of diaphragms connected by wires or their equivalents; and it consists in several improvements which tend to increase the effectiveness of this class of instruments and adapt them to the purposes of a telephone-exchange, all which I will now proceed to describe.

In the drawings, A indicates the back plate of the instrument, B the diaphragm, and C the front plate, the construction of the parts being such as to form a chamber, D, behind the diaphragm, and a chamber, E, in front of it. The wire F, or its equivalent, is connected, in the usual manner, to a button, G, at the center of the diaphragm.

I provide the back plate, A, with a central tubular extension, a , on its side, which extension is intended to enter the opening in the wall or other support, and thereby center the instrument with such opening. I recommend that the extension be slightly tapered toward its outer extremity, and that it be provided with exterior screw-threads, by which it can be screwed into and securely held in the opening provided, as aforesaid, for the passage of the wire. By this construction the wire will be caused to extend centrally through the

opening and through the tube a to the button G at the middle of the diaphragm.

The plate A is cast or constructed in concavo-convex form, with a small circumferential flange, a' , through which screws are inserted, to connect it to the front plate and secure the diaphragm in position. By this means the chamber D is constructed in plano-convex form, which my experiments have proved to be superior to the forms heretofore in use, in that it causes an increased force in the vibrations of the diaphragm, and thereby an increased volume in sound. To prevent the "ringing" or "echoing" which is generally observed in this class of instruments, the chamber or chambers may be lined with felt, paper, or other non-resonant substance.

The front plate, C, is constructed with an external flange, c , through which to receive the screws which connect the front and back plates of the diaphragm together, and at the inner edge of such flange it extends laterally nearly at right angles to the plane of the flange, thus forming an annular shoulder, c' , from the edge of which it extends inward and backward to the central opening, c^2 . The result of this construction is a chamber, E, of plano-concave form, which I have found to be best suited to the purposes of the instrument, in that it gives a somewhat increased force of vibration to the diaphragm, and at the same time adapts the instrument to be spoken into and to be properly applied to the ear.

The instrument, so far as above described, is applicable both to the sending and receiving of spoken messages or other sounds or signals.

Another part of my invention consists in adapting the class of telephones to which this invention pertains to being operated in connection with what is known as a "telephone-exchange," whereby different lines or instruments can be put into direct connection with each other by means of a system of switches or interchangeable connections at an intermediate central office.

To explain the manner in which I accomplish this, let H, Fig. 4, represent an instrument which it is desired to put into communication with the distant instrument I through the medium of the telephone-exchange J,

wherein m is the receiving-instrument connected to the station H, and n is the receiving-instrument connected to the station I. Normally the two lines m H and n I are dis-
 5 connected, and this part of my invention consists in providing means whereby the received vibrations of the diaphragm of the instrument m may be transmitted to the diaphragm of the instrument n , and therefrom to
 10 the final receiving-station I. The connection between the two instruments m n , for the purpose aforesaid, may be effected either by a direct wire extending from one diaphragm to the other, or by a column of air confined in a
 15 tube extending from one diaphragm to the other, it only being necessary that the vibrations of the diaphragm m should be communicated to the diaphragm n , either of the above means satisfactorily answering the purpose; and in this connection I would state
 20 that I do not confine myself to the use of a metal wire specifically, as a string or other similar article might be substituted; nor do I limit myself to a column of atmospheric air, as a column of gas or any other fluid or liquid
 25 capable of transmitting sound-vibrations without interfering with the action of the diaphragm would answer the same purpose.

The details of the connections of the telephone-exchange may be arranged in various
 30 ways. With the wire or cord connection it is only necessary to attach an eye, v , to the front side of the button G, or at the front and center of the diaphragm of the receiving-instruments, as shown in Figs. 1, 2, 3, and then connect
 35 the eyes of the two receiving-instruments by means of a connecting-wire, K, to which a suitable tension is imparted by a spring, k , of any form and construction. With this arrangement the vibrations recorded at m will
 40 be transmitted through the wire or cord K to the diaphragm n , and thence to the station I.

A single switch-board, as shown in Fig. 4, may be employed for the purpose, or a double
 45 switch-board, as shown in Fig. 5. In the former case the receiving-instruments are arranged side by side and the straining-springs are arranged opposite to the board. In the latter case the receiving-instruments are arranged
 50 opposite to each other, and the springs preferably form a portion of the direct connection between them, as shown by the drawings. Any number of receiving-instruments may be thus arranged, and by means of suitable wires
 55 and springs any two of the instruments may be connected together for the purpose of transmitting a message. The call is made simply by tapping upon the sending-diaphragm with a pencil or other light instrument, in response
 60 to which the attendant, having ascertained what station it is desired to communicate with, hooks one end of a connecting-wire into the eye of the instrument through which the call is received, and the other end through the eye
 65 of the instrument through which the communication is to be transmitted to its ultimate destination.

When the connection between the receiving-instrument is to be effected by a column of air or other similar fluid, the receiving-instruments
 70 are each to be provided with a cap, L, which fits tightly over and around the shoulder c' , and is fastened thereto by a bayonet-joint or other suitable fastening. This cap is provided
 75 with a conical mouth-piece, l , capable of being tightly closed by a cover, l' ; and it is further provided with one or more projecting tubes,
 80 o o' , the ends of which should be corrugated or roughened externally, or provided with screw-threads for the attachment of a flexible tube. The inner ends of the tubes o o' extend
 85 nearly to the central opening of the face-plate C. The tubes are inclined from each other for the purpose of bringing their inner ends nearer together and of leaving room between them
 90 for the conical opening through the cap. Preferably I arrange a pitch-pipe in one of the tubes o o' , by which a distant station may be called or signaled. The mode of forming the
 95 connection at the telephone-exchange by means of these tubes is shown in Fig. 6, and the operation is as follows: The conical opening l being normally uncovered, any signal may be readily heard through it. The attendant at the
 100 exchange, after ascertaining the station with which it is desired to connect, will then close said opening by means of the plate l' , and will connect the tubes o o' of the receiving-instrument m to the tubes o o' of the receiving-instrument n by means of two flexible or jointed
 105 and preferably elastic connecting-tubes, p , as shown in Fig. 6. The vibrations of the diaphragm m will then be transmitted through the contained columns of air in the tubular connections to the diaphragm n , and thence
 110 to the ultimate receiving-station.

I have found in practice that the tubular connections and the direct metallic connections are substantially practical equivalents
 115 of each other in the operation of this class of telephones for the purposes referred to. The tubular connection and also the wire connection are here shown and described as extending
 120 from the front side of one diaphragm to the front side of another; but there is believed to be no reason why a similar tubular connection between the rear side of the two instruments, or from the rear side of one to the rear
 125 side of another, would not answer the same purpose. The flexible tubes are of advantage for other purposes than that of connecting the instruments at the exchange. They may be
 130 used as well at the end of the line, and when there used can be conducted from the instrument to any part of the room, and by means of them the telephone can be readily worked
 135 without the necessity of going to the instrument itself either to call or carry on the communication. Another great advantage derived from them is the saving of at least four
 140 angles in a single wire running to places in opposite directions and communicating to the rooms on the lower floors. Heretofore such lines have been arranged substantially as shown

in Fig. 7, necessitating the angles 1 2 3 4 in order to raise the body of the wire high out of the way between the buildings; but by means of the tubular connections at the end the wires
 5 can extend directly between the upper part of the buildings, as shown in Fig. 8, with the instruments arranged directly at their ends, and the speaking-tubes extending down from the instrument to the apartment or place most
 10 convenient for operating. In this case the central opening, *l*, of the cap *L* should be closed.

The mouth-piece at the end of the flexible tube is funnel-shaped, having a stem of the same size as the metallic tube, so that the rubber or flexible tube, when slipped off at the
 15 mouth-piece, will fit on or in the tube of another attachment. Any other form of mouth-piece may be substituted in place of the one shown, if desired.

20 I do not claim as my invention the tubular central stem or projection at the rear side of the instrument, through which the wire is received and by which the instrument is centered and supported; nor do I claim the combination, in an acoustic telephone, of a hollow
 25 sound-conveyer passage or tube, or a flexible diaphragm adapted to transmit sound to or from the air or other fluid contained in the hollow conveyer; but

What I do claim as my invention, and desire 30 to secure by Letters Patent, is—

1. In an acoustic telephone, a diaphragm provided with means for the attachment of wires to both its front and rear sides, whereby the instrument is adapted to the purposes of
 35 an "exchange," substantially as described.

2. An acoustic-telephone instrument having a front plate, *C*, with a central opening and a raised rim or shoulder, *c'*, whereby the internal chamber, *E*, increases in size from
 40 the central opening toward the shoulder, substantially as described.

3. In an acoustic-telephone instrument, the combination of the back plate, the diaphragm, and the dishing front plate having the central
 45 opening, of a removable cap to inclose and confine the air in front of the front plate, said cap having a tapering tubular opening at its center, and tubes which communicate with the diaphragm, substantially as described. 50

4. The combination of the back plate, the diaphragm, the front plate, and the cap, said cap having a tapering central tubular opening, with a removable plate for closing it.

WILLIAM HUBBARD.

Witnesses:

F. A. EDWARDS,

WM. G. HUBBARD.