

No. 794,059.

PATENTED JULY 4, 1905.

J. C. TRAUTWINE, 3D.

PIANO OR ORGAN.

APPLICATION FILED JULY 21, 1904.

3 SHEETS—SHEET 1.

Fig. 2.

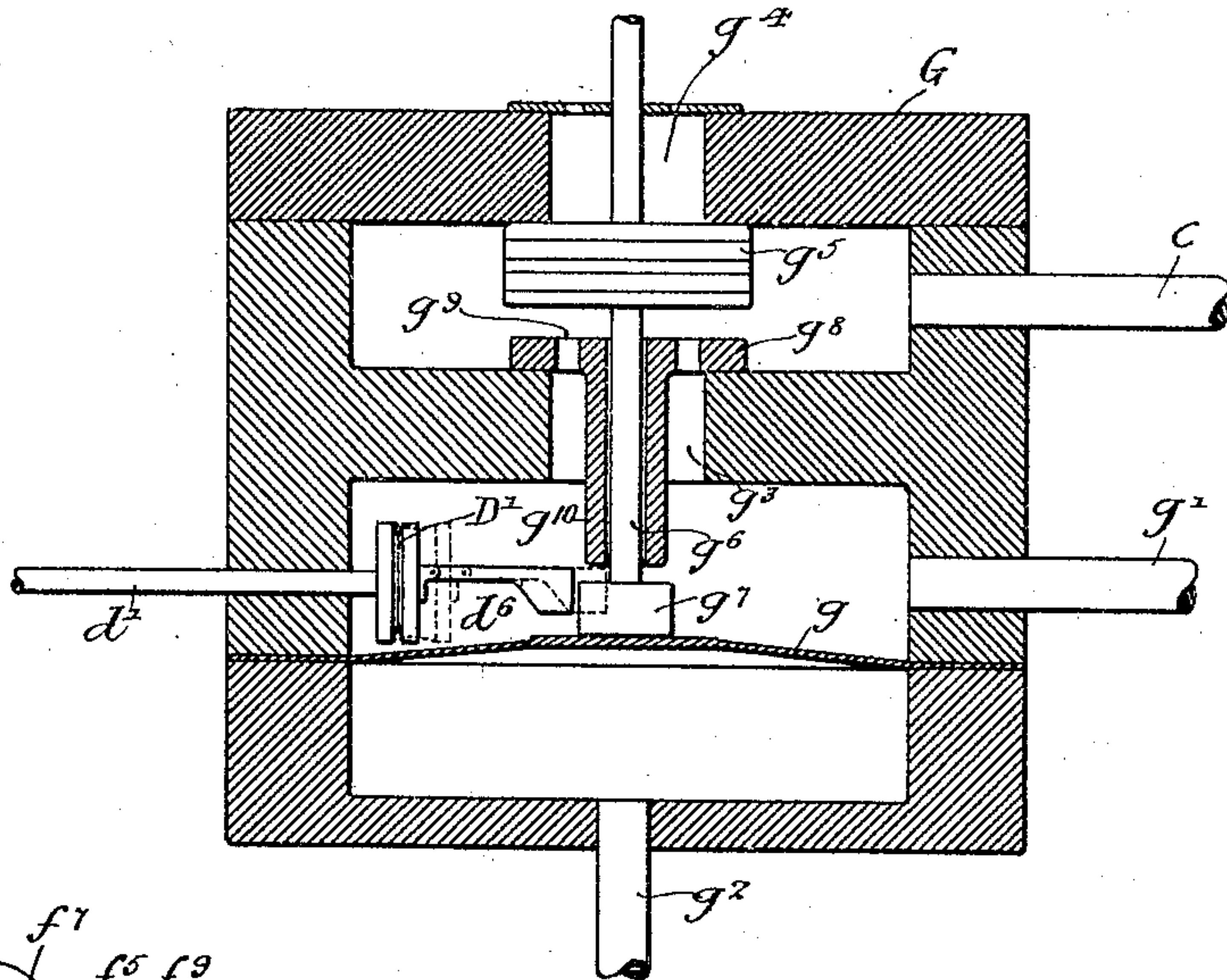
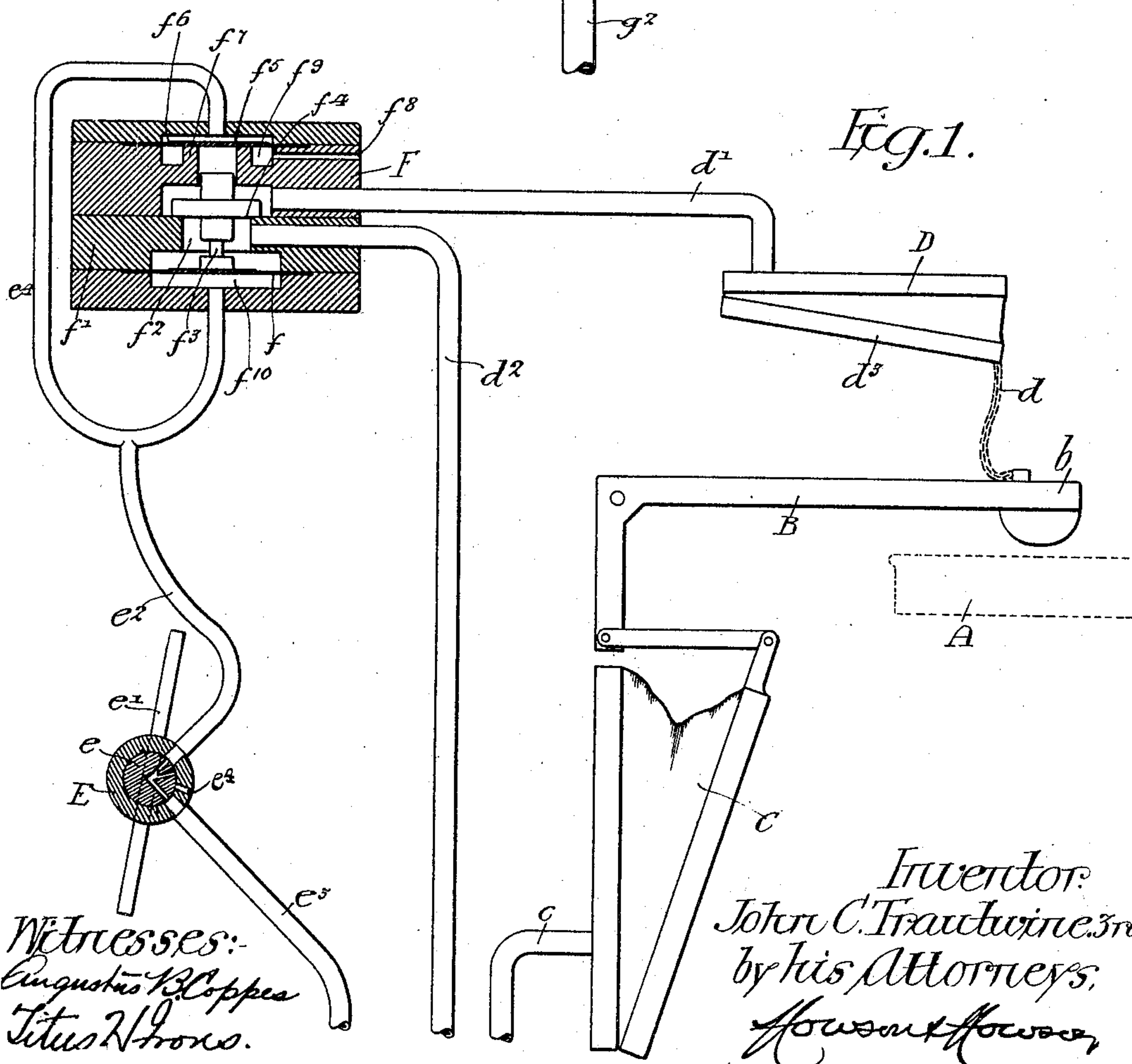


Fig. 1.



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3 SHEETS—SHEET 2.

Fig. 3.

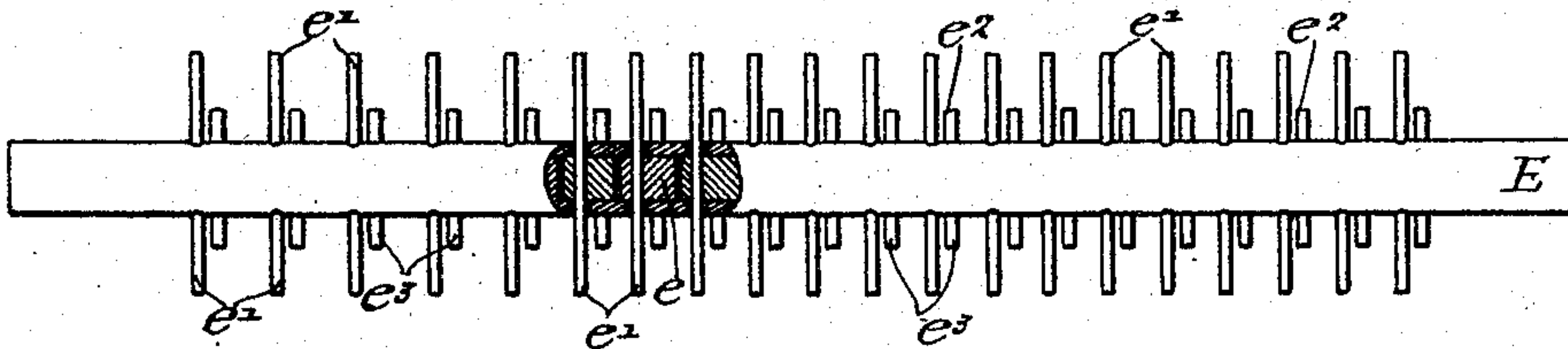


Fig. 4.

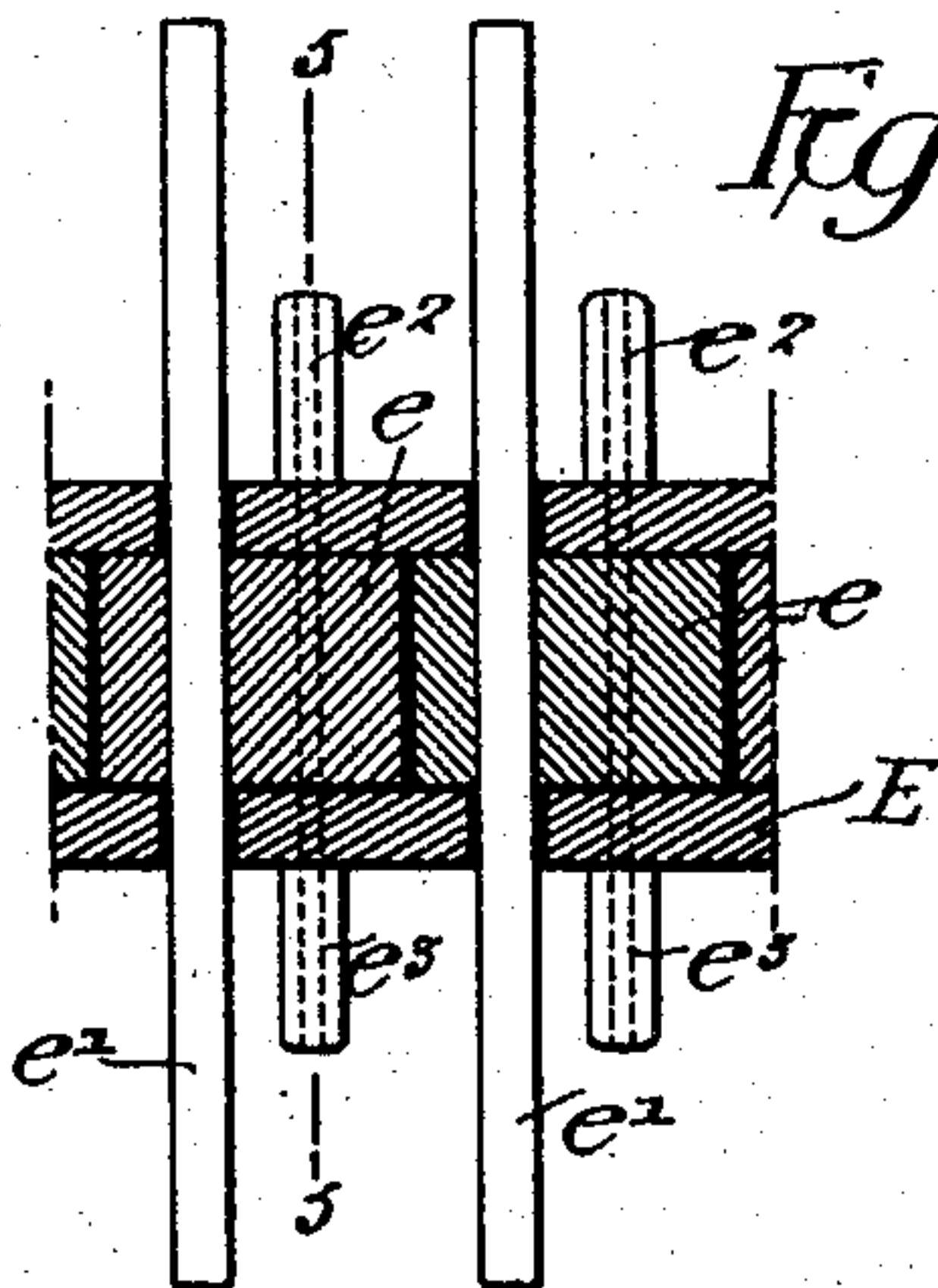


Fig. 5.

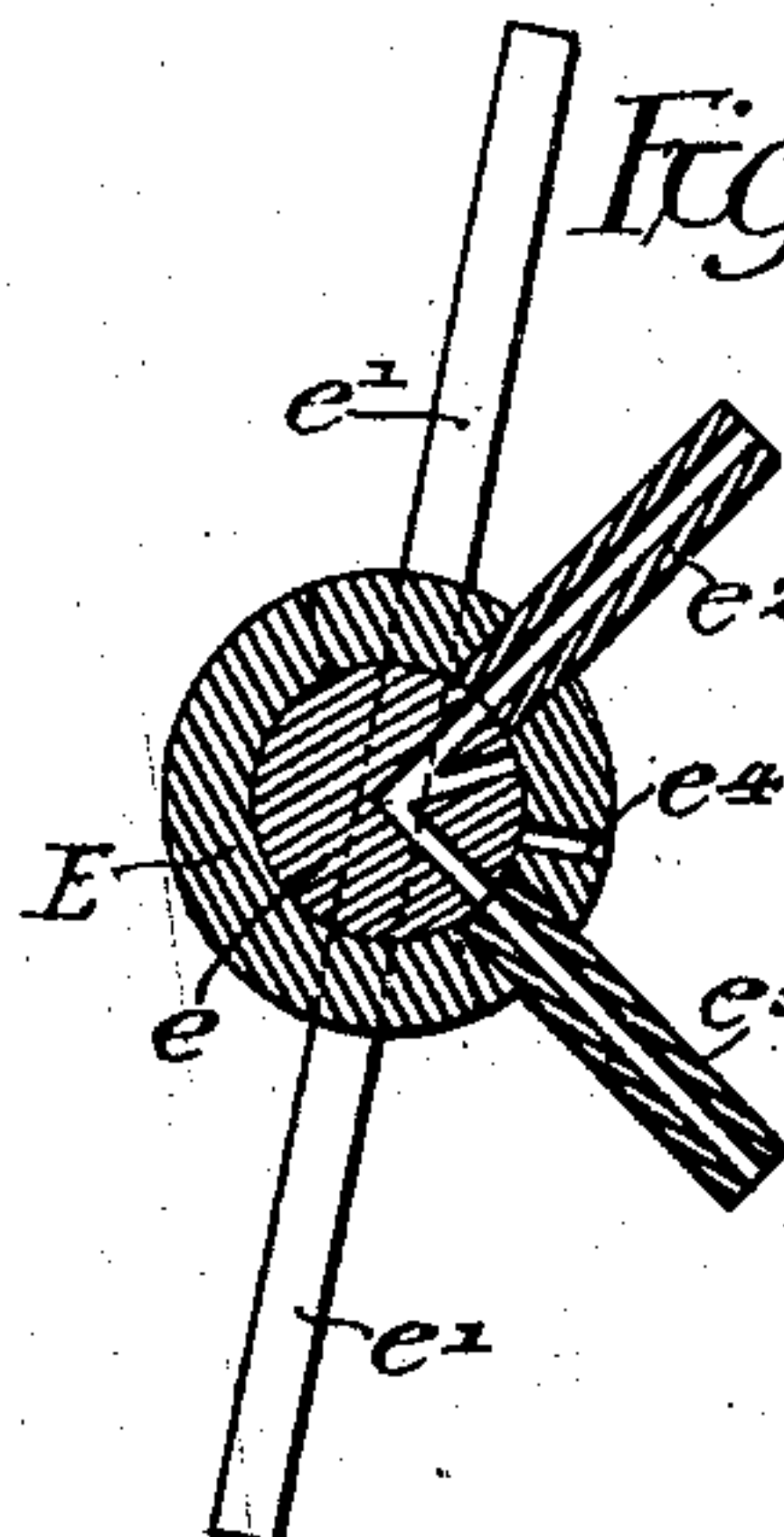


Fig. 6.

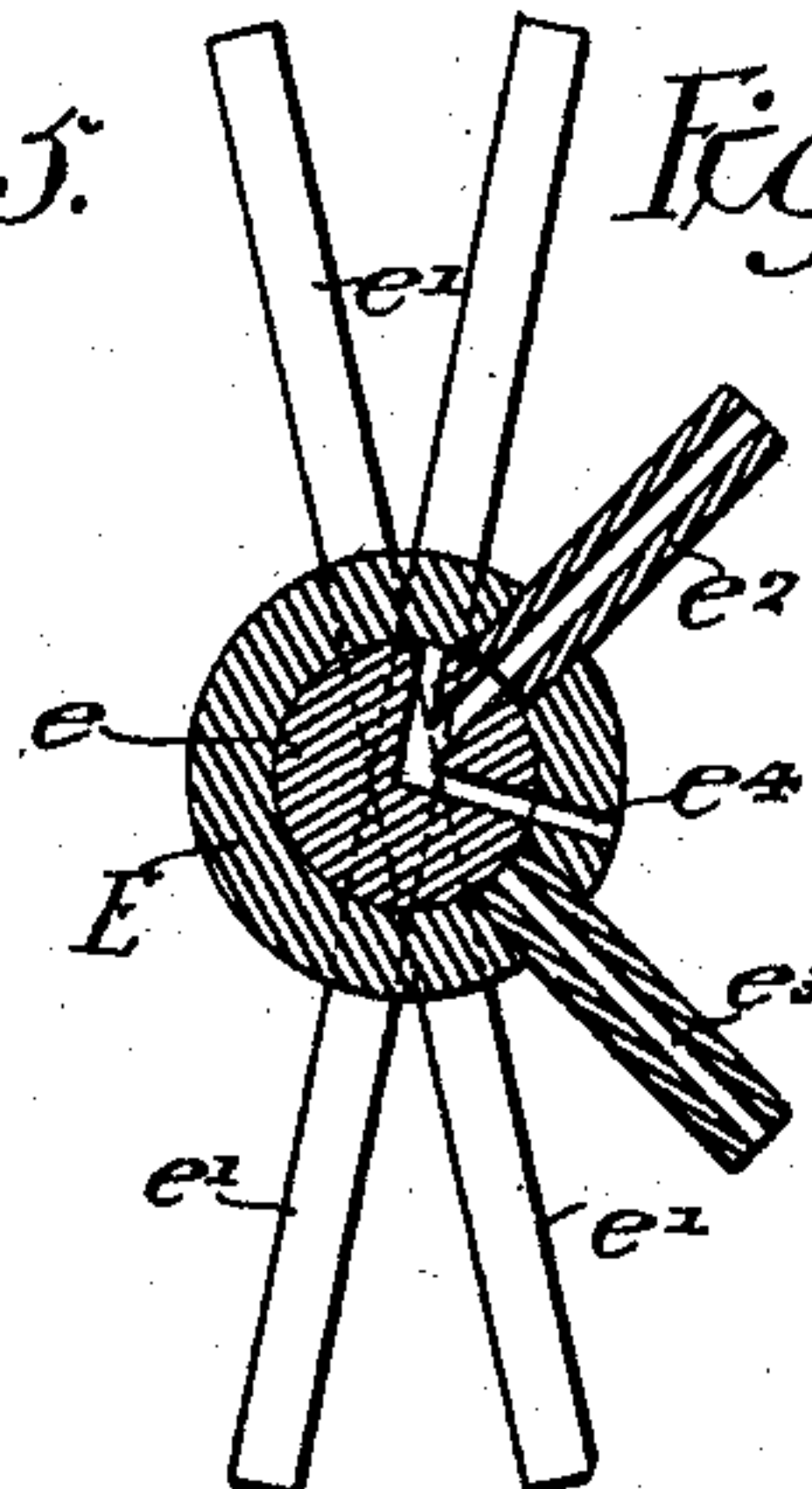
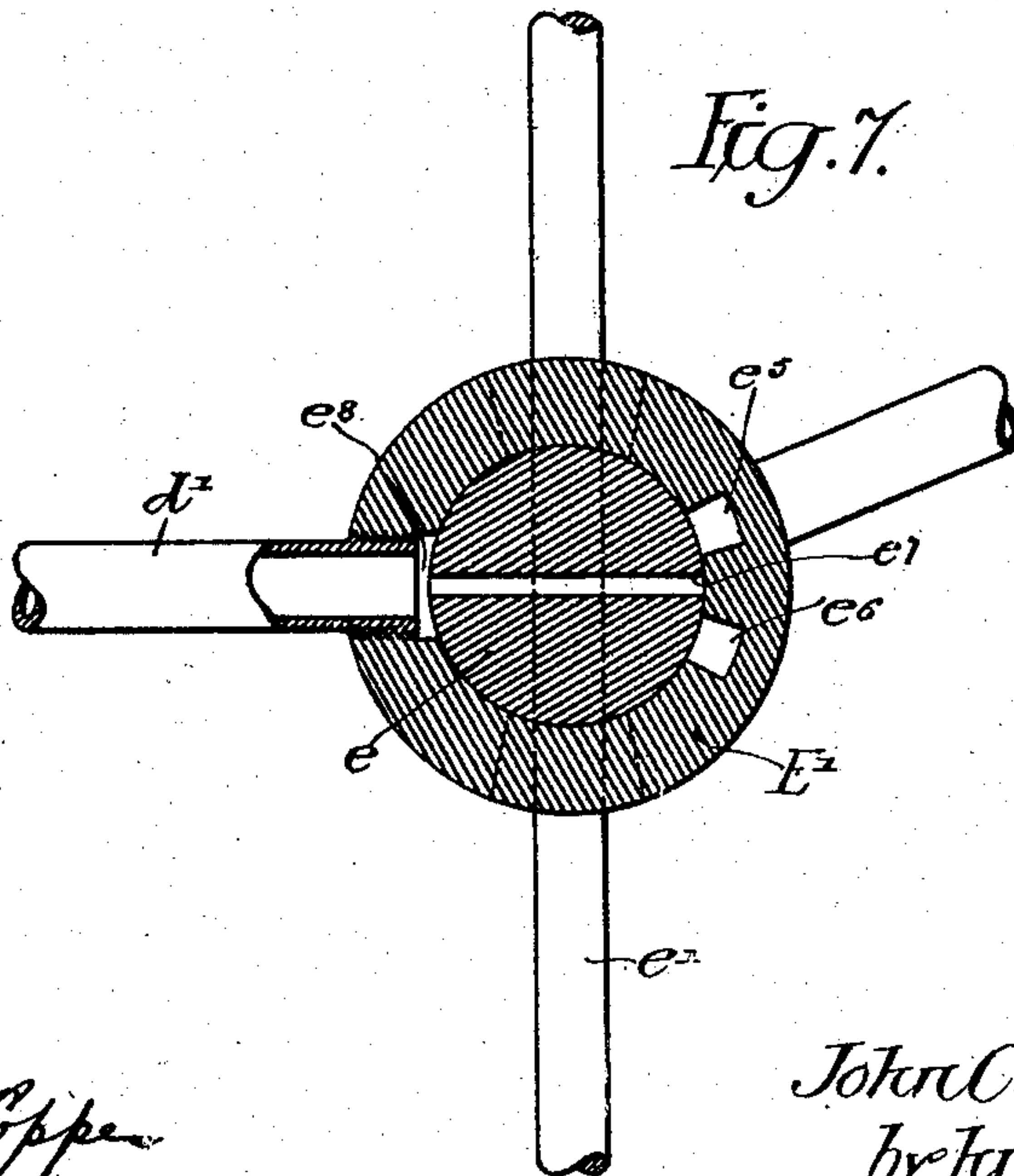


Fig. 7.



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3 SHEETS—SHEET 3.

Fig. 8.

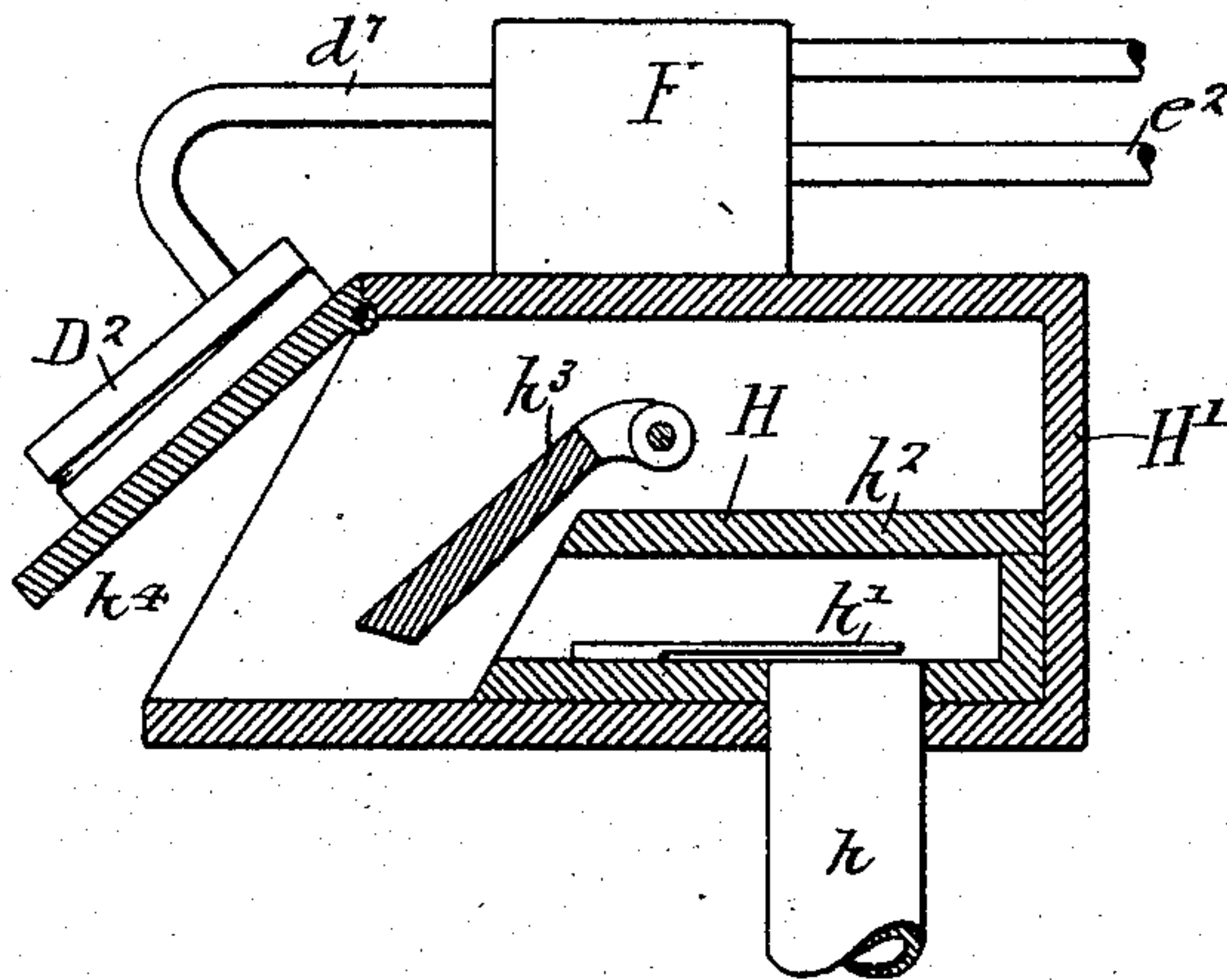
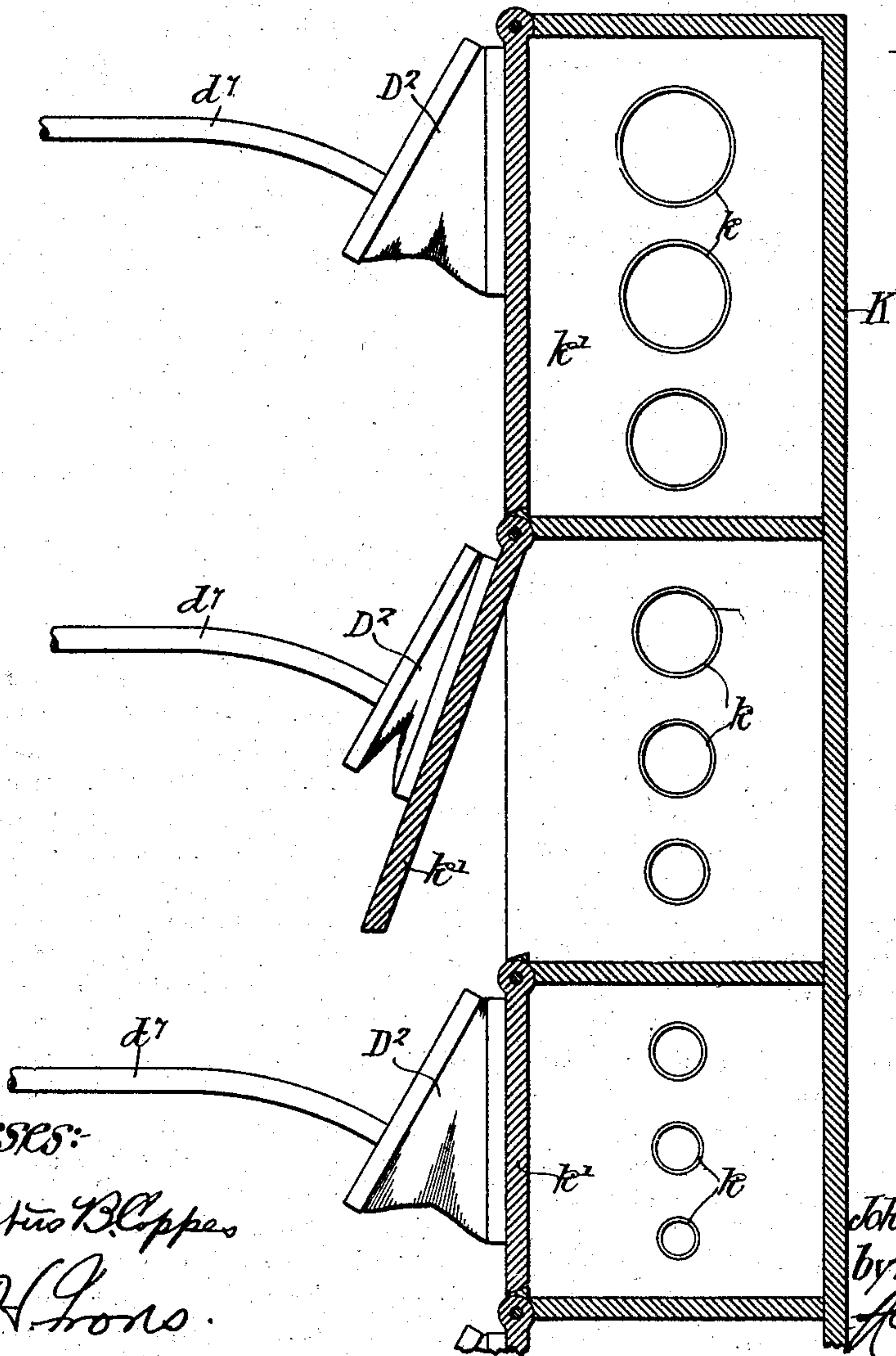


Fig. 9.



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UNITED STATES PATENT OFFICE.

JOHN C. TRAUTWINE, 3D, OF PHILADELPHIA, PENNSYLVANIA.

PIANO OR ORGAN.

SPECIFICATION forming part of Letters Patent No. 794,059, dated July 4, 1905.

Application filed July 21, 1904. Serial No. 217,513.

To all whom it may concern:

Be it known that I, JOHN C. TRAUTWINE, 3d, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain Improvements in Pianos or Organs, of which the following is a specification.

One object of my invention is to provide mechanism particularly designed for use in connection with automatic or self-playing pianos and organs for subduing or softening the sound produced when any desired note or combination of notes is sounded.

More particularly, the object of the invention is to provide a device designed to regulate the force with which each or any finger or series of fingers of an automatic piano-playing instrument strikes its respective key or keys or in the case of an organ to regulate the opening of special swell-box lids, in either case making it possible for any note or combination of notes to be made loud or soft at will when sounded as compared with others in the same chord.

These objects I attain as hereinafter set forth, reference being had to the accompanying drawings, in which—

Figure 1 is a side elevation, to some extent diagrammatic and partly in section, illustrating a portion of one form of mechanism for carrying out my invention, this form of the device being particularly adapted for attachment to the outside of a piano-playing instrument and so designed as to require for its application but a relatively small change in the construction of said instrument. Fig. 2 is a sectional elevation of another form of my invention applicable to the interior mechanism of a piano-playing instrument. Fig. 3 is a front elevation, partly in section, of that part of my invention known as the "valve-bar." Fig. 4 is an enlarged sectional elevation of a portion of the bar illustrated in Fig. 3. Figs. 5 and 6 are sectional elevations taken on the line 5 5, Fig. 4, showing one of the valves in its two extreme positions. Fig. 7 is an enlarged sectional elevation of a special form of the valve-bar shown in Fig. 3. Fig. 8 is a sectional elevation of the swell-box of a reed-organ, showing my invention as applied thereto; and Fig. 9 is a sectional eleva-

tion showing my invention as applied to a pipe-organ.

Referring to Fig. 1 of the above drawings, A represents the key of an instrument, such as a piano, and I have shown only so much of an automatic device for playing this instrument as is necessary to illustrate the relation of my improved construction thereto. In the present case the automatic playing device for actuating the key includes a lever B, having one arm formed as a hammer *b*, placed to engage the key, and having connected to its other arm a pneumatic device, such as a diaphragm or bellows C, which latter is provided with suitable connections, (not shown,) whereby it may be placed in connection with an exhaust or pressure pump when it is desired to cause said lever to strike the key A.

In the present instance I have illustrated my invention as used in connection with automatic instruments whose actuating-bellows are designed to operate their attached parts when air is exhausted from their interiors, although it will be noted by those skilled in the art that my invention, as well as the automatic playing attachment, may be operated, if desired, by air under pressure.

The bellows C will hereinafter be referred to as the "actuating-pneumatic," and I provide in addition to this a relatively small bellows D, known as the "retarding-pneumatic," having its movable element attached to the hammer-arm of the lever B by means of a flexible connection *d*.

The interior of the bellows D, I connect by means of a pipe *d'* either directly to a valve *e*, forming a portion of the valve-bar E, described hereinafter, or interpose between it and said valve a relay structure, as F. The valve-bar E consists, preferably, of a hollow tube within which are a number of cylindrical valves *e*, each provided with an operating lever or arm *e'*, which passes through slotted openings in the tube, so as to permit revolution of the valve through a small angle. Each of the valves *e* has three radially-extending passages opening on its cylindrical face and all connected together, and there are, moreover, two pipes entering the valve-tube in such positions that when the lever *e'*

is in one position one pipe e^2 is placed in connection with the other pipe e^3 , while when the bar is in its opposite position said pipe is placed in connection with an opening e^4 through the side of the tube, and so with the external atmosphere. By connecting the pipe d' with the pipe e^2 and the pipe e^3 to an exhaust-pump or to a tank from which the air has been exhausted the bellows D may be placed either in communication with the atmosphere or with the exhaust-pump. If under operating conditions it is found that the flow of air to and from the bellows D is not rapid enough to cause motion of the movable element of the bellows D at sufficiently short intervals, then the relay device F may be interposed, the pipe e^2 being connected thereto, as illustrated in Fig. 1. Said relay preferably consists of a casing having within it a partition f'' , through which is a relatively large opening f^2 . The pipe e^2 is connected to a space f^{10} on one side of a diaphragm f , upon whose center rests one end of a valve-rod f^3 , having a valve f^4 so constructed that when said diaphragm is relaxed or drawn downwardly said valve closes the opening f^2 , whereas when air is admitted into the space under the diaphragm by means of the pipe e^2 said valve rises and permits communication between the two sides of the partition f'' . At the same time air under normal pressure is admitted from the pipe e^2 through a pipe e^1 to a second small chamber f^5 , thereby causing a secondary diaphragm f^6 to rest upon the seat f^7 , and so preventing flow of air from a passage f^8 into annular space f^9 and thence into the space overlying the partition f'' . With such construction the space above the diaphragm f is permanently connected, through a pipe d^2 , with the exhaust-pump or reservoir of the piano-playing instrument, (not shown), while the pipe d' from the bellows D is connected to the space within the casing which contains the valve f^4 above the partition f'' .

Under operating conditions in using the relay device F the movement of one of the valve-levers e' into such a position that its valve permits air at atmospheric pressure to enter the pipe e^2 causes the diaphragm f and valve f^4 to be forced upward, as above described, and so exhaust the air from the interior of the bellows D through pipe d' , passage f^2 , and pipe d^2 , thus holding the movable element d^3 of the bellows in its raised position. If, now, by means of any of the well-known devices the air be exhausted from the interior of the bellows C through pipe c , so as to cause the lever B to strike the key A, it will be seen that the motion of said lever will be retarded and the blow struck said key will be a relatively light one and the note so sounded will be relatively soft in volume. If, on the other hand, the valve-lever e' be so moved as to place the pipe e^2 ,

through pipe e^3 , in communication with the exhaust-pump, then the pressure on both sides of the diaphragm f will be balanced and the valve f^4 will close the opening f^2 . This will place the interior of the bellows or retarding-pneumatic D in communication with the atmosphere through the opening f^8 , since the diaphragm f^6 will be held away from its seat f^7 on account of the vacuum in the chamber f^5 , connected to pipe e^2 , as above noted. This permits the movable element of said bellows to assume the position shown in Fig. 1, so that when the acting pneumatic C operates the lever B the key A will be so struck as to give a note the normal volume.

If it be desired to do away with the relay device F, a construction of valve-bar similar to that shown in Fig. 7 may possibly be employed, there being within the tube of the valve-bar E' two longitudinal slots e^5 and e^6 , respectively, connected to the exhaust-pump or reservoir and to the atmosphere. The pipe d' from the retarding-pneumatic will be connected directly to said tube, within which is a close-fitting valve e , having a single passage e^7 in the form of a slot extending almost through the valve e . With this construction the interior of the bellows D may be placed in direct communication with the atmosphere when the arm e' is in one of its extreme positions and may be connected directly to the exhaust-pump when said bar is in its second extreme position, it being noted that the space e^8 in the interior of the tube E' into which the pipe d' opens is of such dimension as to always be in communication with the passage e^7 in the valve irrespective of the position of the lever e' . It will be noted that, if desired, the above-noted construction of valve-bar, as shown in Fig. 7, may be used with advantage even when the relay is also used.

If it be permissible to materially alter the construction of the operating mechanism of the piano-playing instrument in applying my invention thereto, I may make use of the construction shown in Fig. 2, which illustrates a sectional elevation of a modified form of relay-box at present used in a well-known type of automatic instrument. In this case the pipe c from the actuating-pneumatic is connected to one chamber of the casing G, which is provided with a second chamber below the first, having across it a diaphragm g , whereby it is divided into two parts. The upper of these parts is connected, through a pipe g' , to an exhaust-pump, while the lower is connected by a pipe g^2 either directly or through a relay device with one of the openings in the tracker-board or mouth-piece, over which a perforated music-roll may be passed. The portion of the chamber into which the pipe g' opens connects with the chamber with which the pipe c is

connected through an opening g^3 , while the latter of these chambers may also be placed in communication with the atmosphere through an opening g^4 . A valve g^5 has a spindle g^6 , provided with an enlarged portion g^7 , resting upon the center of the diaphragm g . Said spindle is so placed and constructed that when the diaphragm is in its uppermost position said valve closes the opening g^4 , while when the diaphragm is in its lowermost position the valve ordinarily closes the opening g^3 . In carrying out this form of my invention I provide an auxiliary valve g^8 , which is freely movable upon the spindle g^6 and has through it a number of openings g^9 , closed by the valve g^5 when this latter is in its lower position. The governing or controlling pneumatic D' is supported in any desired manner within the casing G and is, as before, provided with a pipe d' , which may be connected to any of the pipes e^2 of the valve-bar E either directly or through a relay device. Connected to the movable element of this bellows D' is a bar d^6 , which when the diaphragm g is in its lower position and the bellows D' open will be interposed between the enlarged portion g^7 of the spindle g^6 and the lower end of a sleeve g^{10} , depending from the auxiliary valve g^8 . If, as before, the lever e' of the valve-bar is so moved as to connect the pipe d' with the atmosphere, the movable element of the bellows D' assumes the position shown in dotted lines in Fig. 2, and consequently moves the block or bar d^6 between the sleeve g^{10} and the head g^7 , so that when next said pipe g^2 is placed in communication with the atmosphere the diaphragm g rises, and with it the valve g^8 , thereby providing free communication between the exhaust-pump connected to the pipe g' and the interior of the acting pneumatic or bellows C , connected to the pipe c . The key A is therefore struck with full force and the corresponding note is sounded with its normal intensity. When, however, the valve-bar e' is so moved that the pipe d' is connected to the exhaust-pump, the bar d^6 is withdrawn from between the sleeve g^{10} and the head g^7 , so that the sleeve g^{10} descends and the valve g^8 rests and remains upon its seat regardless of the motions of the valve-stem g^6 . Thus the passage between the bellows C and the exhaust-pump is throttled, and whatever air is withdrawn from the bellows is retarded in its flow by being made to pass through the relatively small openings g^9 in the valve g^8 , so that the operation of said bellows C is retarded and a relatively light blow is given to the key A , thereby producing a soft or subdued note.

If desired, the device may be applied to both reed and pipe organs, as illustrated in Figs. 8 and 9, in which H is the swell-box of one reed or set of reeds of a reed-organ. This

is provided with the usual pipe h and reed h' , which latter is inclosed within a box h^2 , having a pivoted valve or cover h^3 for closing its open end. The above parts will in turn be inclosed within a casing H' , which is preferably provided with a hinged valve or cover h^4 , operated by the bellows or controlling-pneumatic D^2 . This is connected by a pipe d^7 with a relay device of the construction shown at F or directly with the valve-bar E' , and if it be desired to damp or subdue the volume of sound produced by the reed the lever e' of a valve-bar of the construction shown in Figs. 3 to 7, inclusive, is so moved as to cause air under atmospheric pressure to be admitted to said bellows, thereby permitting it to open, and so close the flap or cover h^4 . When, on the other hand, it is desired that the full volume of the note shall be delivered, the apparatus is manipulated so that the air is exhausted from the bellows D^2 , and thereby made to open said swell-lid h^4 .

When it is desired to apply my invention to a pipe-organ, the pipes may be arranged within an inclosing casing or a series of casings, as indicated at K in Fig. 9. The organ-pipes k are in the present instance arranged in a number of series (usually twenty-one) of three each, each series being within a chamber of the casing, closed by a hinged lid k' . To these lids bellows D^2 are attached in the same manner as are those illustrated in Fig. 8, and it is obvious that when any of said bellows are open the hinged covers are in their closed positions, so that the note or notes sounded by the pipes are subdued in tone. On the other hand, when a cover is caused to assume its open position by the closing of the bellows attached to it the pipes when sounded give notes of full or normal intensity.

It will be seen that in Fig. 9 a number of pipes are controlled by means of a single pneumatic device, and it is similarly obvious that, if desired, a single retarding or controlling-pneumatic or bellows may be made to govern or operate upon more than one of the hammers or other devices for sounding a musical note.

I claim as my invention—

1. The combination with a plurality of the note-sounding devices of a piano or the like, of a controller for limiting the force of each unit of said plurality of sounding devices of the system, and independently-operated devices actuated by the performer constructed to connect any one of said controlling devices either to the atmosphere or to a source of fluid different therefrom, whereby said devices may be rendered operative or inoperative at will, each device including a valve-casing, an oscillatory valve therein, and a handle to each valve, substantially as described.

2. The combination with the mechanism of an automatic piano-playing instrument in-

cluding a series of hammers, of a fluid-actuated device operatively connected to each hammer independently of the mechanism for operating the same, and means for actuating said devices, said means including a series of manually-operated valves independent of each other, and respectively controlling said fluid-actuated devices, said valves including a casing, a cylinder therein, and a handle for turning said cylinder in its casing, there being in each valve passages whereby its respective fluid-actuated device may be connected either to the atmosphere or to a source of fluid under pressure different from the atmosphere, substantially as described.

3. The combination with the mechanism of an automatic piano-playing instrument, retarding devices, controlling-valves for governing said retarding devices, and relay-boxes interposed between said devices and said valves, each of said relay-boxes having connections to a controlling-valve, to a source of vacuum and to a retarding device, a valve for governing the connection of the retarding device to the atmosphere or to a source of vacuum, and two diaphragms, one controlling the position of said latter valve and the other governing the flow of air to the retarding device, substantially as described.

4. The combination in an automatic piano-playing instrument, of a series of bellows, a series of independent oscillatory two-way valves supported outside of said instrument, whereby the flow of fluid to the bellows is controlled, a series of pneumatically-actuated hammers having operating devices, and means connecting each bellows and one of the devices for operating a hammer, said means being arranged to cause the hammer to strike blows of different intensity depending upon whether said bellows is open or closed, substantially as described.

5. The combination with the mechanism of an automatic piano-playing instrument, of a series of retarding-bellows, a series of relay-boxes, a series of controlling-valves for said relay-boxes, and connections between said relay-boxes, the retarding-pneumatics, the valves and a source of vacuum, each relay-box having two connections to each controlling-valve and being provided with chambers having diaphragms, there being in each relay-box two valves, one operated by one of the diaphragms to control the connection between the retarding-pneumatic, the atmosphere and the source of vacuum, and the other controlling the flow of air from the atmosphere to the retarding-pneumatic, substantially as described.

6. The combination with the mechanism of an automatic piano-playing instrument having hammers and actuating mechanism therefor, of a plurality of bellows operatively connected to the hammers thereof independently of the actuating mechanism for said

hammers, said bellows being connected to act in opposition to said mechanism, with means including a series of oscillatory valves external to the instrument for independently controlling the flow of fluid to each of said bellows, including means for connecting the bellows at will either to the atmosphere or to a source of air under pressure different therefrom, substantially as described.

7. The combination with the mechanism of an automatic piano-playing instrument, of a number of bell-crank levers, each having one arm serving as a hammer, and a fluid-actuated device active upon another arm, with a second fluid-actuated device for each lever connected so as to act upon the hammer-arm against the first device, and a series of independent two-way valves external to the instrument and having handles for respectively controlling the flow of fluid to said second devices, said valves being made to connect the latter devices at will either to a source of vacuum or to the atmosphere, substantially as described.

8. The combination with the mechanism of an automatic piano-playing instrument, of a series of retarding-bellows, a series of relay-boxes, a series of valves for controlling the operation of said relay-boxes, and connections between said relay-boxes and the retarding-pneumatics, the valves, and a source of vacuum, each relay-box having two connections to each valve, and chambers having diaphragms, there being in each relay-box two valves, one operated by one of the diaphragms to control the connection between the retarding-pneumatic, the atmosphere and the source of vacuum, and the other controlling the flow of air from the atmosphere to the retarding-pneumatic, with means for manually operating the controlling-valves, said valves being provided with passages for connecting the diaphragm-chambers of the relay-box either with the source of vacuum or with the atmosphere, substantially as described.

9. The combination with the mechanism of an automatic piano-playing instrument, of a series of retarding-pneumatics, a series of relay-boxes therefor, controlling-valves for said relay-boxes, and connections from each relay-box to an operating-valve, to a source of vacuum and to a retarding-pneumatic, each relay-box having two diaphragms governed by its controlling-valve, one of said diaphragms having a seat and acting as a valve to control the flow of air from the atmosphere to a retarding-pneumatic, a movable valve within the relay-box controlled by the second diaphragm and placed to permit the connection of the retarding-pneumatic either with the atmosphere or with the source of vacuum, substantially as described.

10. The combination with the mechanism of an automatic piano-playing instrument

including a series of hammers and means for actuating the same, of a series of fluid-actuated devices operatively connected to the respective hammers and in addition to said operating means, structures including automatic valves for connecting said devices either to the atmosphere or to a source of pressure different from that of the atmosphere, and a tube containing a series of independent valves external to the instrument and operative at will, for governing the operation of said first valves, substantially as described.

11. The combination with the mechanism of an automatic piano-playing instrument having a series of hammers and mechanism for actuating the same, of a bellows mechanically connected to each hammer, a number of casings having connections to said bellows, to the atmosphere and to a source of pressure different from the atmosphere, a valve in each casing for connecting the bellows either to said source of pressure or to the atmosphere, and other valves for actuating said first valves, the same having a common containing-tube and individual handles whereby they may be operated at will and being connected to cause automatic operation of said first valves when so operated, substantially as described.

12. The combination with the mechanism of an automatic piano-playing instrument including a source of vacuum, a series of hammers and means for actuating the same, of a series of independent manually-operative

valves having a common containing-casing whereby they are carried adjacent to each other upon the outside of the instrument, and a series of retarding devices having connections to said valves so arranged that said devices may be independently connected at will either to the atmosphere or to the source of vacuum, substantially as described.

13. A controlling device for the mechanism of an automatic musical instrument, said device including a tubular structure, a series of valves therein, means for operating the valves and means for connecting each valve to a portion of the mechanism of said instrument and the atmosphere, or to a source of fluid under pressure different from that of said atmosphere, substantially as described.

14. The combination with the mechanism of an automatic musical instrument, of a tube, a series of cylindrical pieces within the same provided with passages, and means for moving said pieces independently of each other, there being connections to said tube whereby each valve may be connected to the musical instrument and the atmosphere, or to a source of supply of fluid different from that of the atmosphere, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOHN C. TRAUTWINE, 3D.

Witnesses:

WILLIAM E. BRADLEY,
JOS. H. KLEIN.