No. 835,777. PATENTED NOV. 13, 1906.

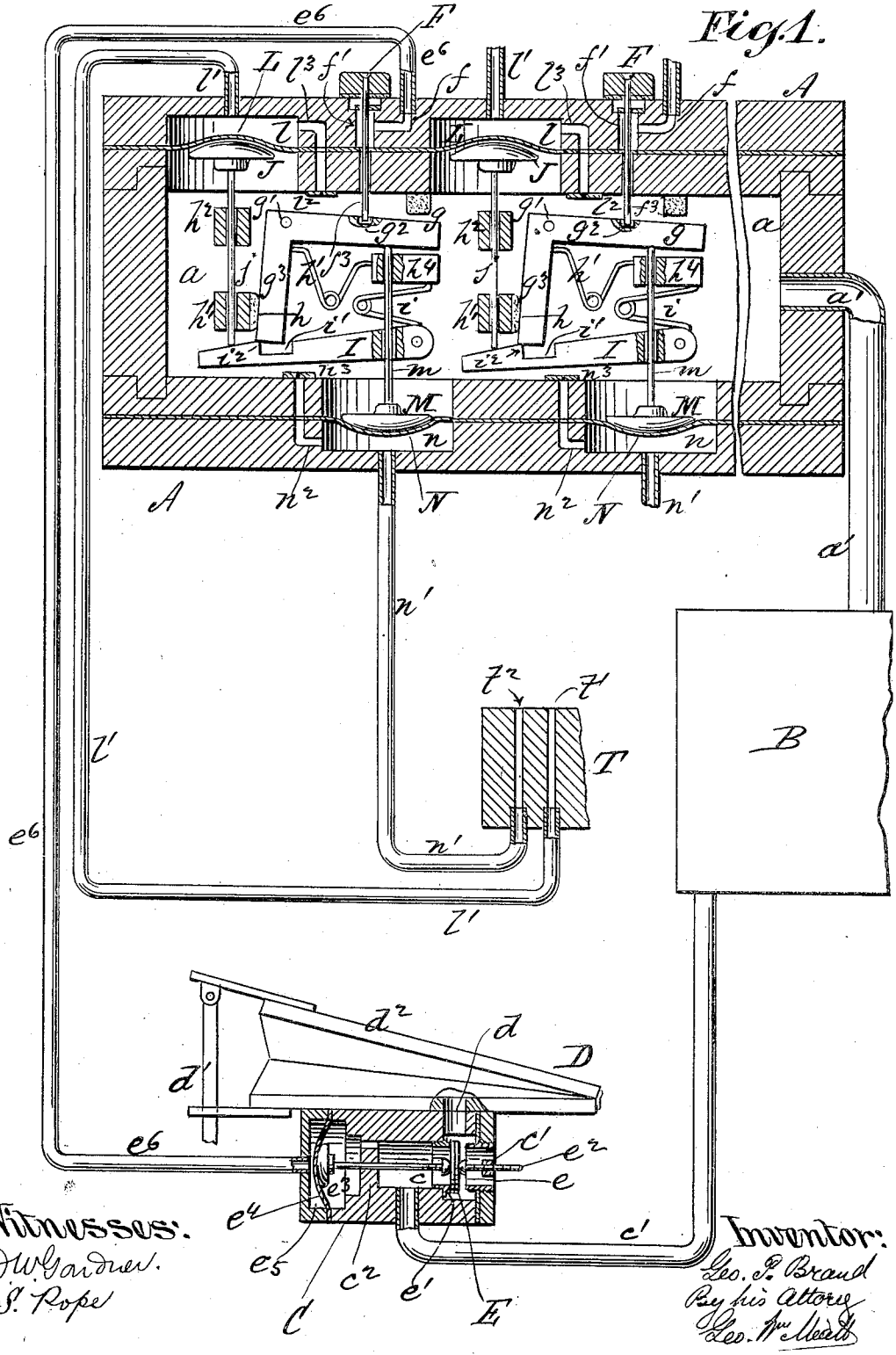
G. P. BRAND.

MEANS FOR AUTOMATICALLY CONTROLLING PNEUMATICALLY ACTUATED DEVICES.

APPLICATION FILED JAN. 16, 1906.

3 SHEETS—SHEET 1.

Fig. 1.



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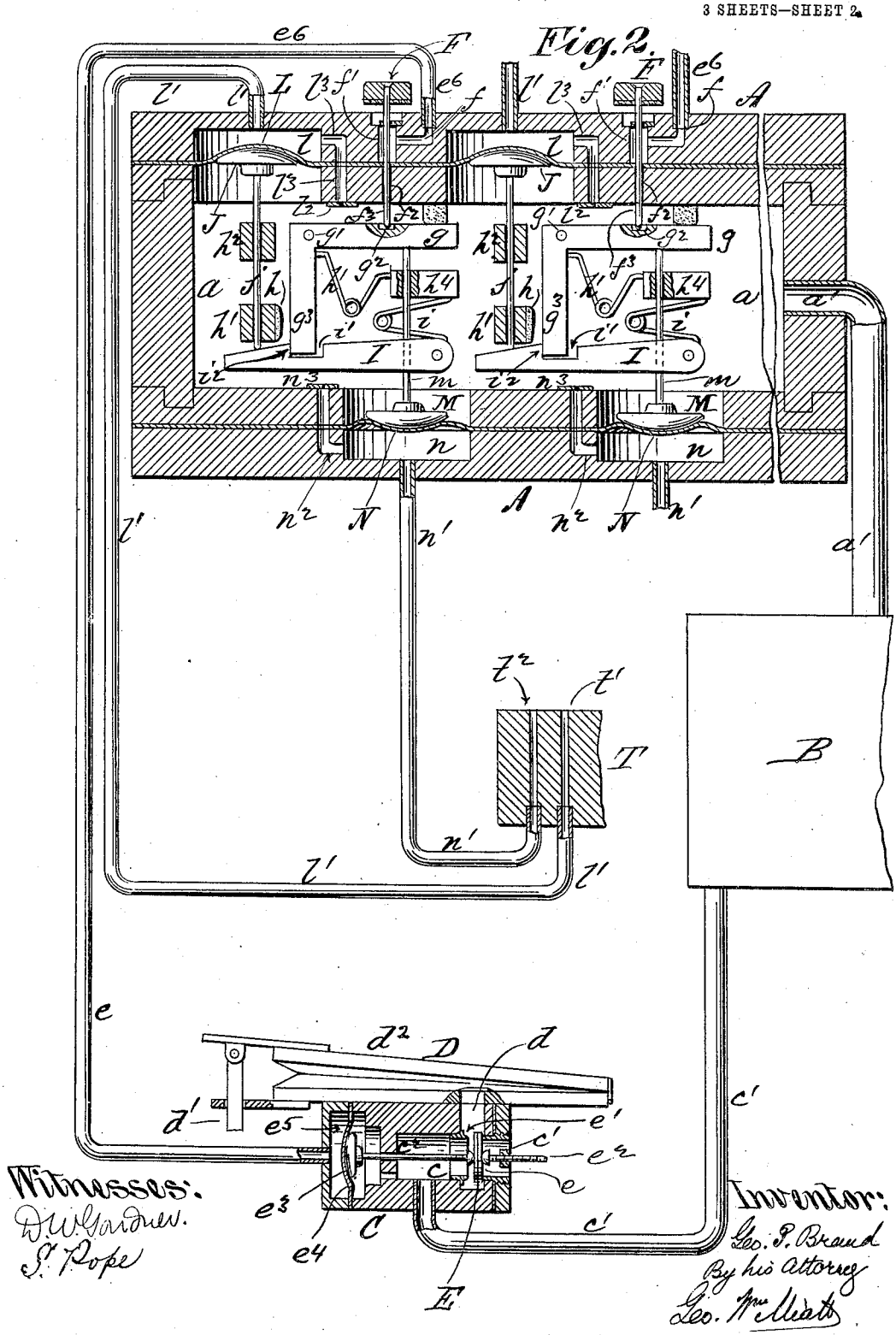
3 SHEETS—SHEET 2.

Fig. 2.



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3 SHEETS—SHEET 3.

Fig. 3.

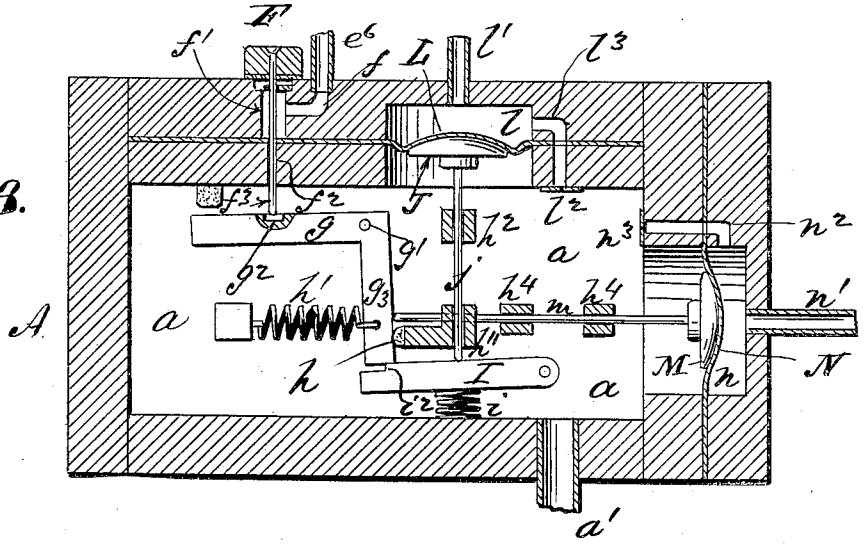
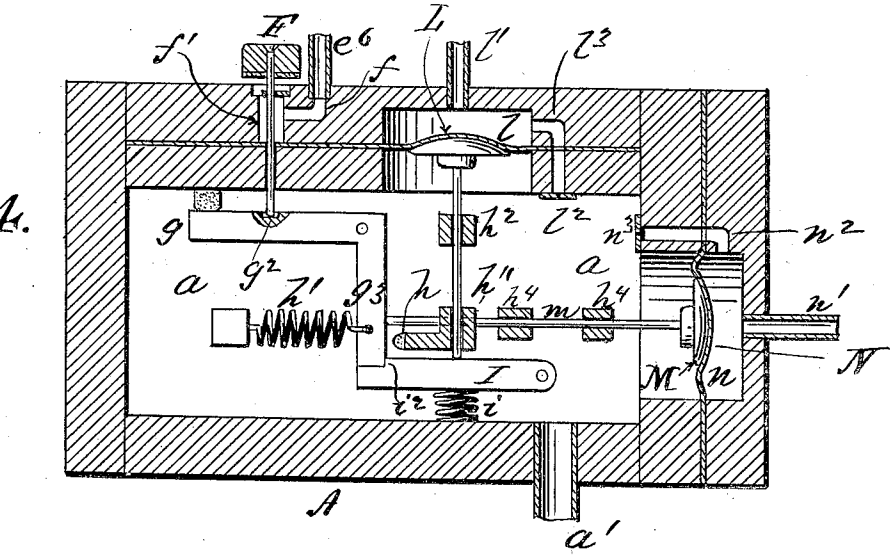


Fig. 4.



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UNITED STATES PATENT OFFICE.

GEORGE P. BRAND, OF NEW YORK, N. Y.

MEANS FOR AUTOMATICALLY CONTROLLING PNEUMATICALLY-ACTUATED DEVICES.

No. 835,777. Specification of Letters Patent. Patented Nov. 13, 1906.

Application filed January 16, 1906. Serial No. 296,313.

To all whom it may concern:

Be it known that I, GEORGE P. BRAND, a citizen of the United States, residing in the borough of Bronx, city, county, and State of New York, have invented certain new and useful Improvements in Means for Automatically Controlling Pneumatically-Actuated Devices, of which the following is a specification.

My invention relates to automatic means for operating pneumatics used to throw into or out of action another or third device, such as a soft or loud pedal, an expression, tempo, or other device used in automatic piano-players, although my invention is not necessarily confined to the latter use, since it is applicable to automatic players and mechanism generally.

The invention consists in the construction and arrangement of parts hereinafter described and claimed specifically.

In the accompanying drawings, Figure 1 is a sectional elevation, more or less diagrammatic, showing the parts essential to the practical application of my invention, the parts being in their normal positions or at rest. Fig. 2 is a similar view illustrating as compared with Fig. 1 the relative positions of the parts during action; Figs. 3 and 4, sectional elevations illustrating a modification in the arrangement of the controlling mechanism and showing the parts in the two positions.

A represents chestwork of any desired form or construction containing a tension-chamber *a*, communicating directly through the conduit *a'* with the wind-chest B, in which a state of partial vacuum is maintained by exhaust mechanism in the manner well known in the state of the art. *c* is another tension-chamber formed in the casing C, which latter may be individual to the particular valve and pneumatic shown in connection therewith or may represent a cross-section of chestwork in which the said tension-chamber *c* communicates with a plurality of such valves and pneumatics, which would be the usual arrangement of parts. In either case the tension-chamber *c* communicates directly with the wind-chest B through the medium of the conduit *c'*.

In the accompanying drawings I have shown only one actuating-pneumatic D, connected with one of my controlling devices, a duplicate of which is shown, however, it being understood that a controlling device is provided for each actuating-pneumatic used and that the action of each controlling device and actuating-pneumatic is individual and independent of the others.

The actuating-pneumatic D in its normal position is inflated by reason of its communication with the atmosphere through its port *d* and the valve-seat *e* in the chest or casing. A rod or pitman *d'* is pivotally connected with the movable member d^2 of the actuating-pneumatic D, said rod or pitman *d'* being in turn connected with or acting upon, either directly or through intermediate parts, a device, be the same musical or otherwise, which it is desired to throw into operation automatically by the deflation of the said pneumatic D. This is accomplished by cutting off communication between the atmosphere and the interior of the actuating-pneumatic by means of the valve E when the latter is pressed against the valve-seat *e*, the transfer of said valve E from its inner seat *e'* to its said outer seat *e* at the same time putting the interior of the actuating-pneumatic in communication with the tension-chamber *c*. Normally the valve E is held against its inner seat *e'* by atmospheric pressure, owing to the tension within the chamber *c*. The valve E is mounted upon a rod e^2, supported in guides *c'* c^2, and at its inner end is provided with a button e^3, which rests against the diaphragm e^4, dividing the tension-chamber from the diaphragm-chamber e^5. The latter communicates through the duct e^6 and passage *f* with the space *f'* underneath the valve F, seated on the top of the chest A and opening to the atmosphere when raised, so as to admit air through the duct e^6 to the diaphragm-chamber e^5. When this happens, the pressure on the diaphragm e^4 overcomes that on the valve E and the latter is transferred from its inner seat *e'* to its outer seat *e*, as before set forth. The return of the valve F to it seat cuts off communication between the atmosphere and the diaphragm e^4, the confined air escaping into the tension-chamber *a* through the annular space f^2 around the valve-stem f^3 of the valve E. Said annular space acting as a "bleed" for the relief of the diaphragm e^4 thus allows the valve E to be returned to its inner seat *e'* by atmospheric pressure, thereby again cutting off communi-

cation between the tension-chamber c and the actuating valve-pneumatic and causing the inflation of the latter.

The chief feature in the present case consists in the novel mechanism for effecting the raising and lowering or opening and closing of this air-valve F. In both instances in Fig. 1 it is shown in its closed or normal position, with the lower ends of its stem f^3 just out of contact with the controller-arm g, the position of which controls the position of the valve F with relation to its seat, said controller-arm g being pivotally supported, as at g', to a stationary part within the tension-chamber a and being arranged to act as a lever of the second order in that the valve-stem f^3 when it rests upon it does so at a point g^2 between its fulcrum g' and the free end of the lever to which the power is employed. At the point of contact the upper surface of the controlling-lever g is preferably cut away or otherwise formed with a transverse groove or recess to fit over and steady the lower end of the valve-stem f^3 when the controlling-lever is raised to lift the said stem f^3 and valve F, as shown in Fig. 2. The controlling-lever g is formed with a lateral extension g^3, which in the normal position of the lever shown in Fig. 1 rests against a stationary buffer h, against which it is held by a spring h'.

A pivotally-supported latch I is held in contact with the lower end of the lateral extension g^3 by a spring i. This latch I is formed with a notch or recess i' for engagement with the end of said extension g^3 when the controlling-lever is raised, as shown in Fig. 2. Resting on the free end of the latch I is the stem j of a diaphragm-button J, said stem passing through stationary guides h'' h^2. The button J engages with the diaphragm L, interposed between the tension-chamber a and the diaphragm-chamber l, communicating through the duct l' with the opening t' in the tracker-bar T. A bleed l^2 closes the end of a lateral passage l^3 between the diaphragm-chamber l and the tension-chamber a.

Another diaphragm-button M rests on a diaphragm N, interposed between the tension-chamber a and the diaphragm-chamber n, the stem m of the button M extending up through the stationary guide h^4 into the path of the free end of the controlling-lever g. The diaphragm-chamber n communicates through the duct n' with the opening t^2 in the tracker-bar T, and said chamber n has a lateral passage n^2 extending to the tension-chamber a, but closed by a bleed n^3. The tracker-bar T is shown in longitudinal section, the perforated music-sheet traveling over the same transversely in the usual way, so that it is to be understood that the two openings t' t^2 are not in the same longitudinal plane on the music-sheet.

The operation is as follows, the parts being at rest in the relative positions shown in Fig. 1: When a perforation in the music-sheet comes into coincidence with the opening t^2 in the tracker-bar T, air is admitted through the duct n' to the diaphragm-chamber n, thereby raising the diaphragm N, and with it the button M and its stem m, which latter is thus made to raise the controlling-lever g against the resistance of the spring h', the latch I by reason of its spring i automatically locking the lever g in its raised position as soon as the lower end of the lateral extension g^3 passes beyond the shoulder i^2 and into the notch i. The raising of the controlling-lever g, acting upon the stem f^3, raises the valve F from its seat, thereby admitting air to the diaphragm-chamber e^5 through the medium of the duct e^6, and causing the diaphragm e^4, acting on the button e^3, to transfer the valve E from its inner seat e' to its outer seat e, thereby deflating the actuating-pneumatic D, as hereinbefore set forth. As a result the rod or pitman d' performs the work assigned to it, throwing into or out of action, as the case may be, any special device with which it may be connected.

The locking of the controlling-lever g automatically in this raised position by means of the latch I insures a maintenance of the condition of affairs above described even though the music-sheet covers the opening t^2 in the tracker-bar and until said controlling-lever g is released by the latch I. This occurs when a perforation in the music-sheet comes into coincidence with the perforations t' in the tracker-bar T, thereby admitting air through the duct l' to the diaphragm-chamber l. This causes the diaphragm to depress the button J and rod j, which latter forces the free end of the latch I downward against the resistance of the spring i sufficiently to release the end of the lateral extension g^3 of the controlling-lever g from the shoulder i^2 of said latch I, when the spring h' returns the controlling-lever g to its normal position, thus allowing the valve F to reseat itself and exclude the air from the duct e^6 and diaphragm-chamber e^5. As the confined air escapes from said chamber e^5 and duct e^6 through the bleed f^2 around the valve-stem f^3 the diaphragm e^4 yields and the valve E is forced away from the outer seat e and onto its inner seat e', reëstablishing communication through the port d between the atmosphere and the interior of the actuating-pneumatic, which is thereby reinflated and causing the retractile movement of the rod or pitman d'.

It will be seen that the construction and operation of parts is essentially the same in the modification illustrated in Figs. 3 and 4, as above described, the main difference being that the resetting rod m, button M, diaphragm N, &c., are arranged in a position at right angles to that shown in the first two figures of the drawings.

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

1. In pneumatic apparatus controlled by a perforated sheet passing over a tracker-bar, the combination with said tracker-board and with a tension-chamber of a pneumatic for actuating a special device and means for inflating and deflating said actuating-pneumatic, consisting of a double-seated valve opening to the atmosphere on one side and to a tension-chamber on the other, a pneumatic for operating said double-seated valve, a valve for admitting air to operate said pneumatic, a controlling-lever for raising said valve from its seat, a pneumatic controlled from the tracker-bar and arranged to raise said controlling-lever, a latch for automatically locking said controlling-lever when raised, and another pneumatic controlled from the tracker-bar and arranged to act on the said latch to release the said controlling-lever, together with means for returning the latter automatically to its normal position.

2. In pneumatic apparatus controlled by a perforated sheet passing over a tracker-bar, the combination with said tracker-board and with a tension-chamber of a pneumatic for actuating a special device and means for inflating and deflating said actuating-pneumatic, consisting of a double-seated valve opening to the atmosphere on one side and to a tension-chamber on the other, a pneumatic for operating said double-seated valve, a valve for admitting air to operate said pneumatic, a controlling-lever for raising said valve from its seat, a pneumatic controlled from the tracker-bar and arranged to raise said controlling-lever, a latch for automatically locking said controlling-lever when raised, another pneumatic controlled from the tracker-bar and arranged to act on the said latch to release the said controlling-lever, means for returning the latter automatically to its normal position, the said controlling-lever, latch and the rods for operating the same being situated in a common tension-chamber, and said tension-chamber.

3. In pneumatic apparatus controlled by a perforated sheet passing over a tracker-bar, the combination with said tracker-board and with a tension-chamber with pneumatic mechanism for directly controlling a special device, of a valve for admitting air to actuate said pneumatic-controlling mechanism, and mechanism for opening and seating said valve said mechanism being situated in a common tension-chamber and consisting of a controlling-lever arranged to raise said air-valve from its seat, an automatic latch for securing said controlling-lever when raised, a diaphragm-pneumatic and rod for raising said valve-controlling lever, an air-duct connecting the diaphragm-chamber with an opening in a tracker-bar, another diaphragm-pneumatic and rod for disengaging the latch from said valve-controlling lever, an air-duct connecting the diaphragm-chamber of the last-named pneumatic with an opening in the tracker-bar, and chestwork inclosing and forming said common tension-chamber, and connected with suitable means for exhausting the air therefrom.

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