(Model.)

H. F. FITZPATRICK.

Air Compressor.

No. 238,374. Patented March 1, 1881.

Fig. 1

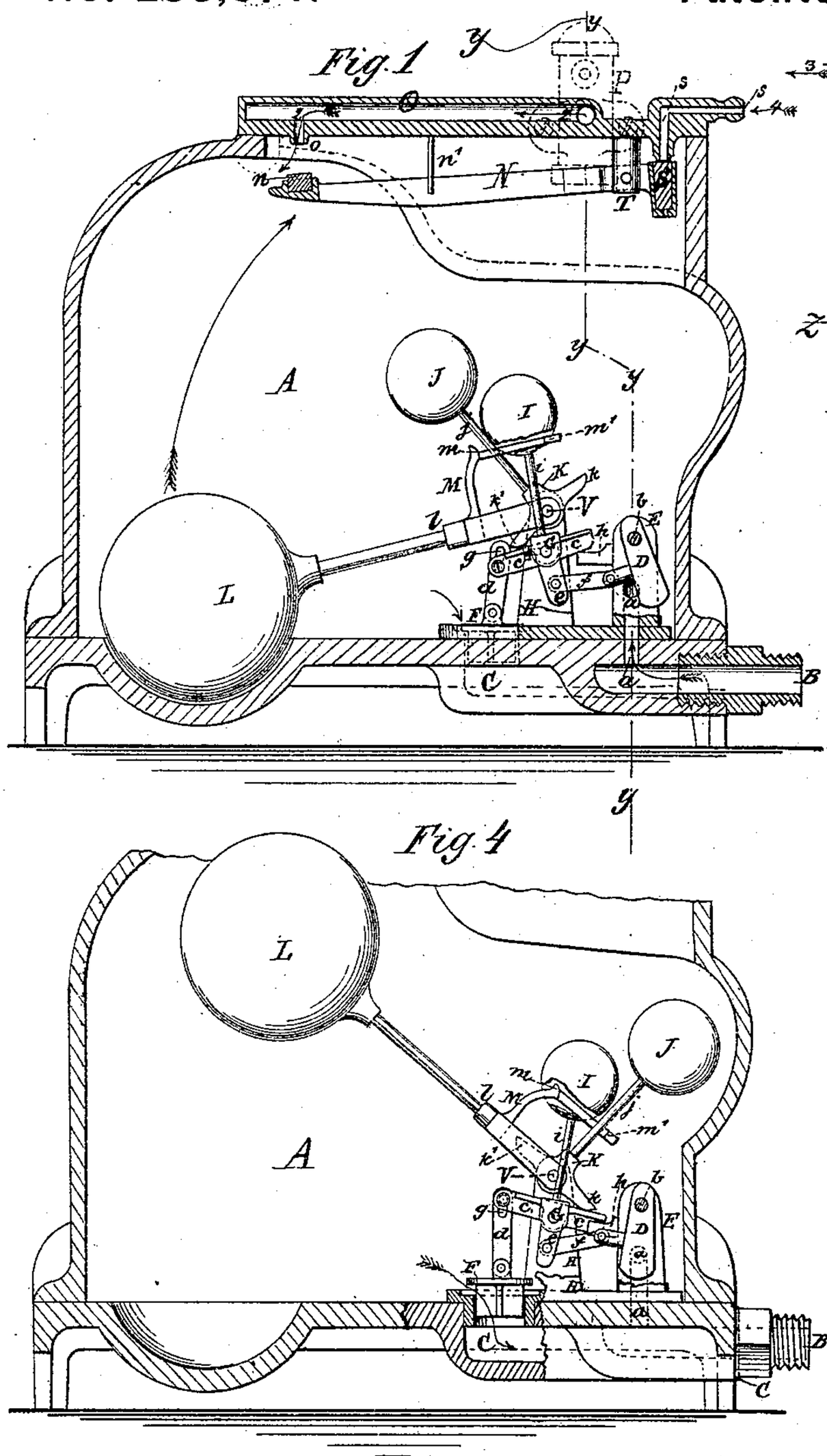


Fig. 2

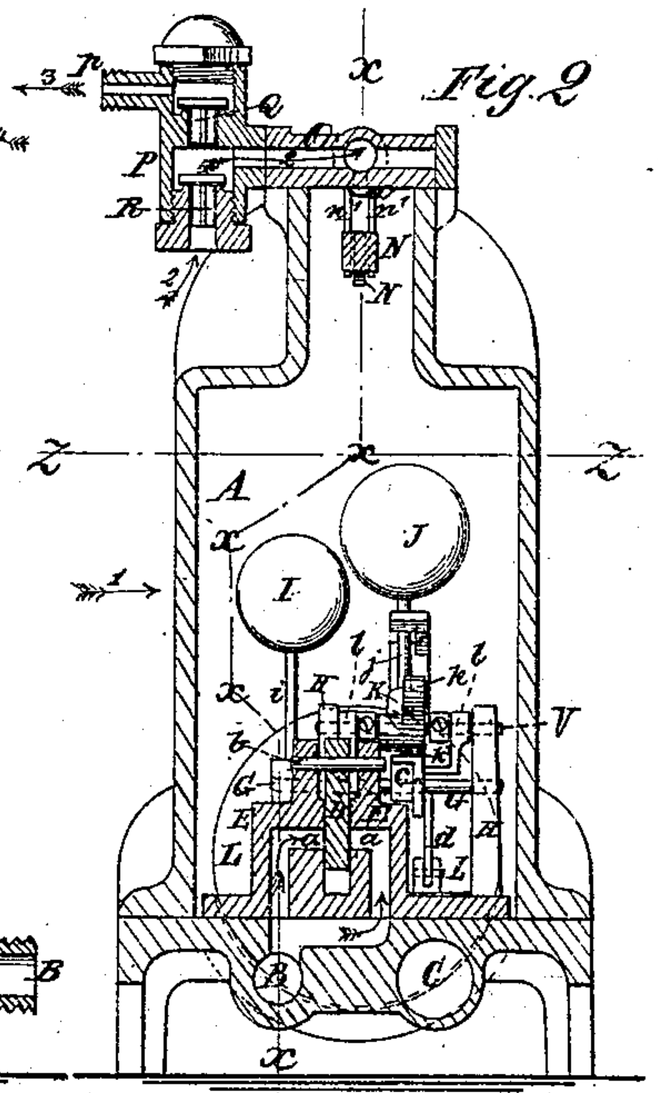


Fig. 4

Fig. 3

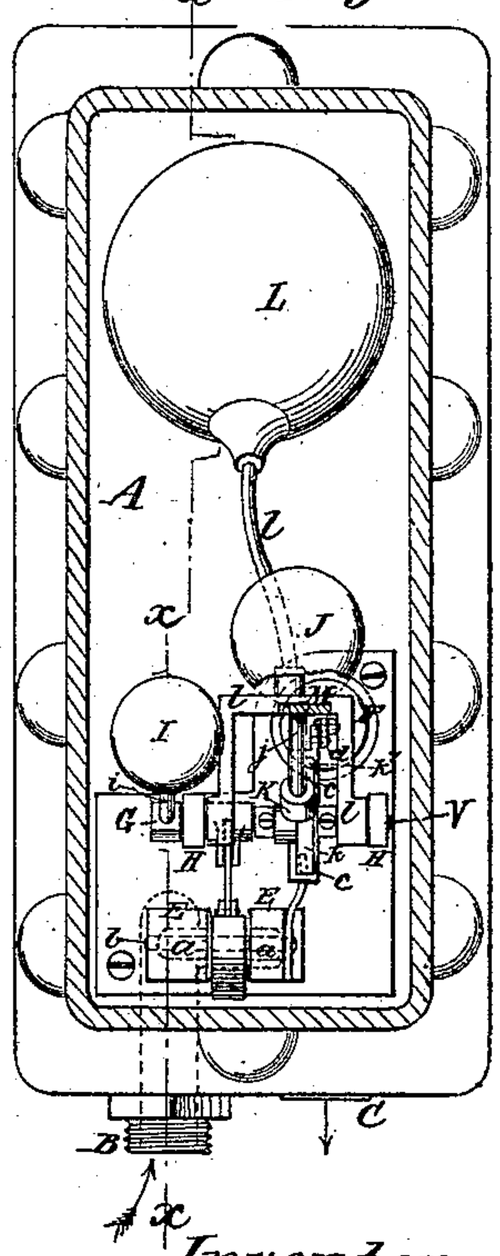
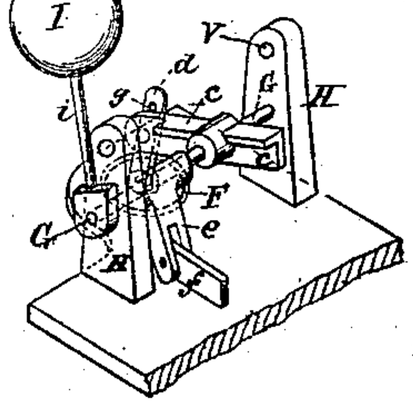


Fig. 5



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HUGH F. FITZPATRICK, OF NEW YORK, N. Y.

AIR-COMPRESSOR.

SPECIFICATION forming part of Letters Patent No. 238,374, dated March 1, 1881.

Application filed December 15, 1880. (Model.)

To all whom it may concern:

Be it known that I, HUGH FRANCIS FITZPATRICK, of New York, in the county of New York and State of New York, have invented a new and useful Improvement in Air-Compressors, of which the following is a specification.

My invention relates to hydraulic compressors constructed to work automatically, such as are used to supply and maintain a sufficient amount of air-pressure upon liquids contained in casks or tanks kept in the cellar of a building to force such liquid through a suitable discharge-pipe leading to a floor above, in order that the liquid thus raised may be conveniently drawn, when desired, through a faucet arranged on the said floor.

The invention consists in certain novel constructions and combinations of parts in a hydraulic air-compressor, whereby the following advantages are obtained: The pressure on the water-supply valve is evenly balanced, so that the power (and a very small one) needed to operate the said valve is the same under all variations of the water-pressure. The operation of the water-valves is instantaneous, thereby insuring more rapid compression, and consequently greater effect, than if it were gradual. The valves are acted upon successively by one movement of the same operating device, in such manner that the supply-valve is just closed before the discharge-valve opens, thus removing all water-pressure tending to counteract the opening of the latter valve, except only that slight and constant pressure due to the few inches depth of water above the valve in the compressor. Entrance of water into the compressed-air pipe is prevented, air admitted to and compressed air discharged from the compressor through one and the same valve, operated by the float, and the closing of the latter valve by the float opens a vent, to establish equilibrium of air-pressure above and below the water, to insure the escape of the latter through the then open discharge-valve.

In the accompanying drawings, Figure 1 represents a longitudinal vertical section of my improved air-compressor, (seen in direction of the arrow 1 in Fig. 2,) the section being taken on the broken lines *xx xx*, of Figs. 2 and 3. Fig. 2 is a vertical cross-section on the line *y y* of Fig. 1. Fig. 3 is a horizontal section on the line *z z* of Fig. 2. Fig. 4 is a view similar to Fig. 1, showing the parts in position as when the compressor discharges water—while in all the other views they are in the position as when it receives water and compresses air. Fig. 5 is a perspective detail view of the device, which is immediately connected to operate the water supply and discharge valves.

To clearly show the construction of some details, others are partly broken out irregularly, as will be observed, in places where they otherwise would hide the former from view.

Like letters of reference indicate like parts in the several figures.

A is the tank, in which the water enters to compress the air. B is the inlet, and C the outlet, for the water. D is the supply-valve, being simply a metallic arm having two opposite flat and parallel sides, and hinged or pivoted to oscillate between and in contact with the parallel vertical surfaces of two uprights, E, each of which is bored or cored through, and thus provided with a port or passage, *a*, communicating with the inlet B and issuing through the said parallel vertical surfaces of the uprights E on opposite sides of the valve D. Thus, whatever be the pressure in the water-main, its force is simply tending to compress the metal in the valve D without in any way increasing its friction against the surfaces with which it is in contact.

The discharge-valve F to the outlet C is a vertical working or puppet valve, of much larger area than the valve D, and opened by being raised from its seat. Both valves are operated by one and the same movement of a rock-shaft, G, arranged between the two valves and parallel with the hinge-pin *b* of the valve D in bearings in the uprights H. For this purpose the shaft G has secured to it a horizontal tilting bar, *c*, which is connected by a pivoted link, *d*, to a lug on the discharge-valve F and a downward arm, *e*, which is connected by a pivoted link, *f*, to a lug on the supply-valve D, as shown in the drawings. The link *d* has a slot, *g*, in which the pivoting or connecting pin of the bar *c* works, so as to allow the pin to slide in the slot *g* without raising the valve F from its seat until the supply-valve D is closed.

To one end of the shaft G is secured an up-

right wire or rod, *i*, at right angles to the tilting bar *c*, and upon the upper end of the rod *i* is secured a weight, I. In tilting the bar *c* the weight I oscillates from one side to the other of a perpendicular line drawn through the center of the shaft G, and, as it passes the said line, adds impetus to the movement for operating the valves D F, and when at rest serves by its gravity to retain them in position, as will be readily seen with reference to the drawings. When the discharge-valve F is closed the pin of the bar *c*, working in the slot *g*, rests in the lower end of the said slot, as in Fig. 1, and, impelled by the weight I, depresses the valve F upon its seat, while at the same time serving as a stop to prevent the weight from tilting farther in that direction. When the supply-valve D is closed the weight I is prevented from tilting too far in the direction by a small stop, *h*, projecting from one of the uprights, E, with which stop the then descending end of the tilting bar *c* comes in contact, and is thus checked from further downward movement, as shown in Fig. 4.

The oscillating movement of the bar *c* to operate the valves is effected by the tilting-lever K, actuated by the rise and fall of the float L. The lever K is pivoted upon a shaft, V, which latter is secured in bearings in the uprights H, and arranged above and parallel with the shaft G. The lever K is pivoted upon the shaft V, just over the bar *c*, in such a manner that in tilting one or the other of its two ends *k k'*, projecting laterally on opposite sides of the shaft V, will depress one or the other end of the bar *c*, the end *k'* actuating that end of the bar *c* which is connected with the discharge-valve F, and *k* actuating that end of the bar *c* which is connected with the supply-valve D.

To the lever K, above the shaft V, and midway between the ends *k k'*, is attached at right angles a rod, *j*, upon whose upper end is fastened a weight, J, heavier than the weight I. The weight J in tilting oscillates like the weight I, but with larger throw from one side to the other of the same perpendicular line, its movements being effected directly by two shoulders or projections, *m m'*, upon an angular or bent bar, M, attached to the float-lever *l*, which shoulders, by the movement of the float, alternately raise the rod *j* of the weight J to and past the perpendicular position, allowing it to tilt over to the opposite side thereof. The float L is fulcrumed by the perforated end of its rod *l* upon the same shaft V which serves as fulcrum to the tilting-lever K, so that during the movement of the float no sliding motion causing unnecessary friction will occur between the shoulder *m* or *m'* and the rod *j*, they having one common center of motion.

The valves and passage for supply and discharge of air are arranged through the cover of the tank A, and a valve-chest, P, attached thereto. The compressed air passes from the tank through the nipple *o* and passage O to the chest P, and thence through the upper valve, Q, and pipe *p* in direction of arrow 3 to the cask or other receiver, the lower valve, R, being kept closed in the meantime by the pressure of the air-current. When a partial vacuum is created in the tank A by the outflow of water the back-pressure from the cask or receiver keeps the valve Q closed while air from the atmosphere enters through the valve R into the chest P, and thence through the passage O and nipple *o* to the tank A in the direction indicated by the arrows 2.

In order to prevent the possibility of water entering with the compressed air from the filled tank into the air-pipes, and at the same time to admit air into the tank above the water for establishing equilibrium of atmospheric pressure, so that the water may flow out through the open discharge-valve F, a vent, *s*, is made through the cover of the tank, and a lever, N, pivoted to a lug, T, near the vent *s*, and kept farther from lateral deflection by two guide-pins, *n'*, is provided at either end, with a rubber block, *n* S, (or a piece of other suitable material,) in position to act as valves to close or uncover the said openings *o s*. The end *n* of the lever N is raised by the float at the upper terminus of its throw, to close the nipple *o* and cause the valve S to descend and uncover the vent *s*, and the weight of the end *n* of the lever N being the heaviest, owing to its greater distance from the fulcrum, (or to an added weight,) drops when the float descends, and thus causes the valve S to rise up and close the vent *s*.

Assuming the tank A empty of water and full of air and the movable parts in position as in Fig. 1, the operation is as follows: Water, entering through the inlet B *a*, rapidly fills the tank A and compresses the air therein, which passes off through the passages *o* O P Q *p* to the receiver. As the float L rises with the water, the shoulder *m* comes in contact with and gradually raises the rod *j* of the tilting device J *j* K *k k'* until the float itself has raised the valve end *n* of the lever N to nearly close the nipple *o*. The rod *j*, having then passed its perpendicular, tilts on the other side thereof, and with the momentum of the tilting-weight J, the toe *k* strikes the higher end of the bar *c*, tilting the rod and weight *i* I past the perpendicular, in the position of Fig. 2, thus closing the inlet-valve D (the float closing the air-valve *n*) and opening the discharge F. Air enters the tank through the equilibrium-vent *s*, and the water begins to flow out through the outlet C. The float descends, the valve *n* drops from the nipple *o*, the valve S closes the vent *s*, and air enters (in the direction of arrows 2,) through valve R, chest P, and passages O *o*, so long as the water keeps flowing out. As the float descends, the shoulder *m'* comes in contact with and gradually raises the rod *j* until past its perpendicular, when the tilting device trips over, and, by the toe *k'*, trips the bar *c* and its connections *i* I, thereby closing the discharge-

valve F and opening the supply-valve D. This causes the operation as just described to be repeated, and so on continuously until the air-pressure in the receiver counterbalances the full water-pressure. The compressor then pauses in its work until the counter-pressure of air in the receiver-pipe is relieved.

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

1. In a hydraulic compressor, the combination, with a supply-valve, D, arranged to oscillate between and with two opposite valve-faces in contact with respective working-faces or valve-seats, of two uprights, E, said uprights having ports or passages *a a* issuing through their working faces in juxtaposition to each other and communicating with the general inlet B, substantially as and for the purpose set forth.

2. In a hydraulic compressor, the combination of an automatically-oscillated rock-shaft, G, having arms or elbow-lever *c e*, with the discharge-valve F, provided with connecting-link *d*, and the pivoted supply-valve D, provided with connecting-link *f*, for the purpose of instantaneously opening and closing the said valves by one oscillation of the shaft G, substantially as specified.

3. In a hydraulic compressor, the combination, with an automatically-oscillated rock-shaft, G, having arms *c e*, of a hinged supply-valve, D, connected to the arm *e* by a pivoted link, *f*, (without slip,) and a discharge-valve, F, connected to the arm *c* by a slip-link, *d*, for the purpose of operating the said valves successively by one and the same oscillation of the rock-shaft, substantially as hereinbefore set forth.

4. The combination, in a hydraulic compressor, of the tilting-lever K *k k'*, provided with the rod *j*, tilting-weight J, and actuated by the movements of the float L, with the check-weighted subjacent rock-shaft G, provided with the tilting-bar *c e*, and connected to operate the supply and discharge valves D F, substantially as hereinbefore set forth.

5. The combination, with the tilting-bar *c c* upon the water-valves, operating rock-shaft G, and with the lever K *k k'*, pivoted upon the shaft V and provided with the rod *j* and weight J, of the float L *l* M, having shoulders *m m'*, for tilting the said weight by contact with the rod *j*, to actuate the said bar *c c* as the float oscillates upon the shaft V, substantially as hereinbefore set forth.

6. The combination of the air supply and discharge pipe O, connected with the valve-chest P, between the air-supply valve R and the discharge-valve Q, and provided with the nipple *o*, with the valve *n*, arranged to close by the rising of the same float, L, which actuates the water-valve mechanism, substantially as described, for the purpose of excluding water from the air-passages when the tank is full.

7. The combination of the nipple *o*, of the air-pipe O, and the vent *s*, with the pivoted lever N, carrying at either end a stopple or valve, *n* S, to close the openings *o s*, respectively, said lever being heavier toward the valve *n*, so as to drop and keep the nipple *o* open and the vent *s* closed until raised by the float L to close the nipple *o* and open the vent *s*, substantially as and for the purpose set forth.

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