(No Model.) 2 Sheets—Sheet 1.

M. DENNEDY.

INDUCTION VALVE FOR COMPRESSION PUMPS.

No. 422,385. Patented Mar. 4, 1890.

Fig. 1.

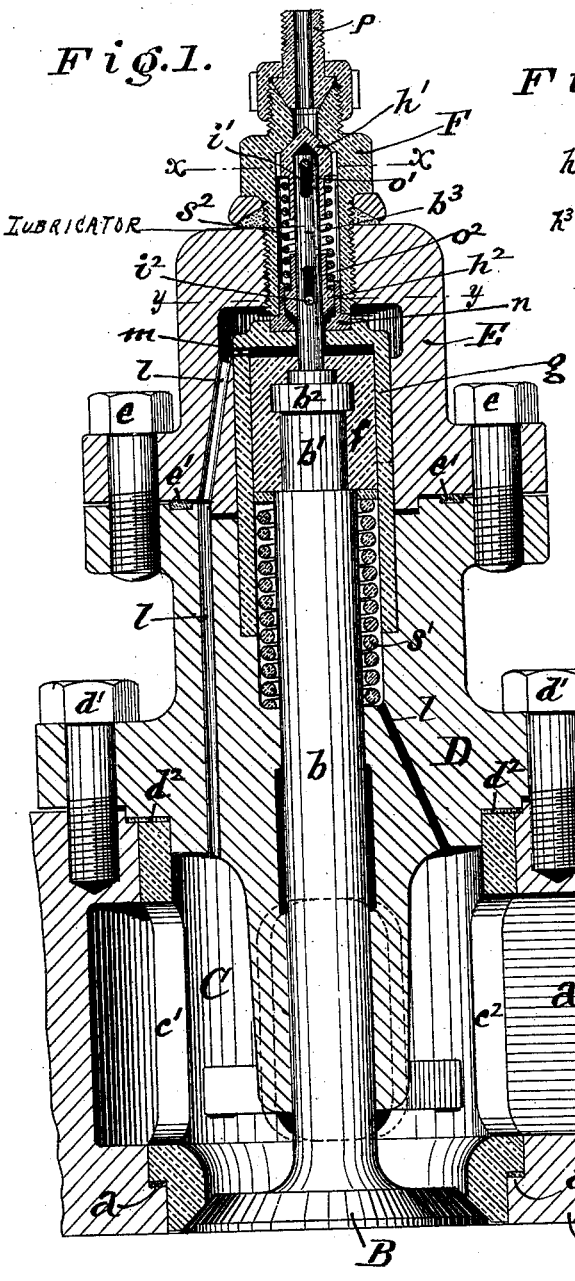

Fig. 2.

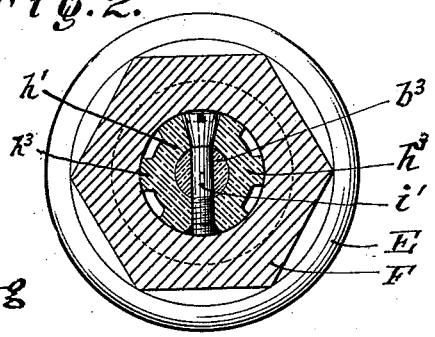

Fig. 3.

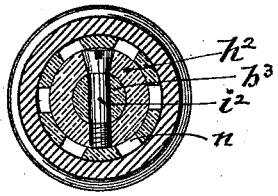

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Fig. 4

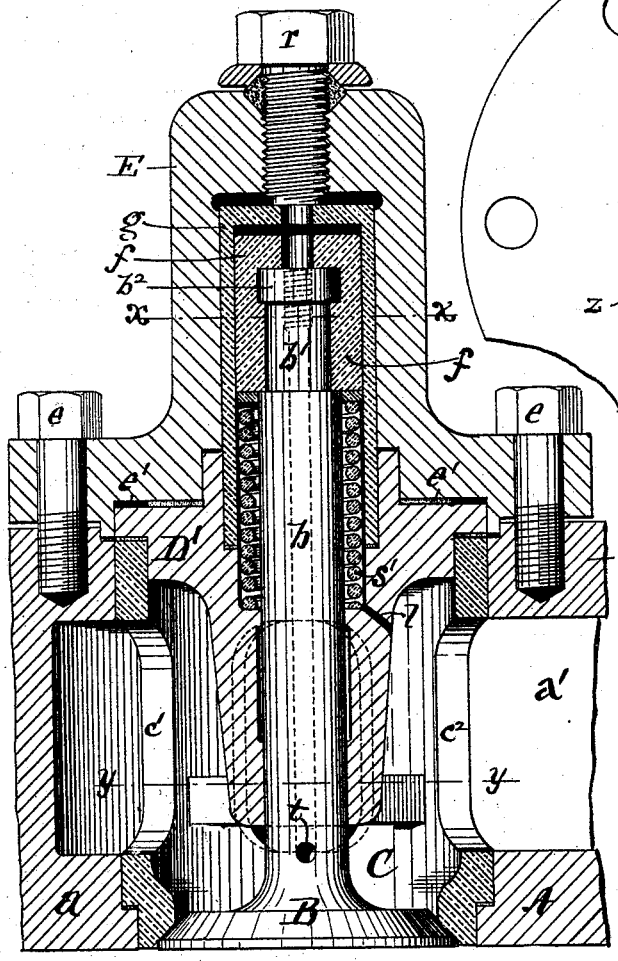


Fig. 5.

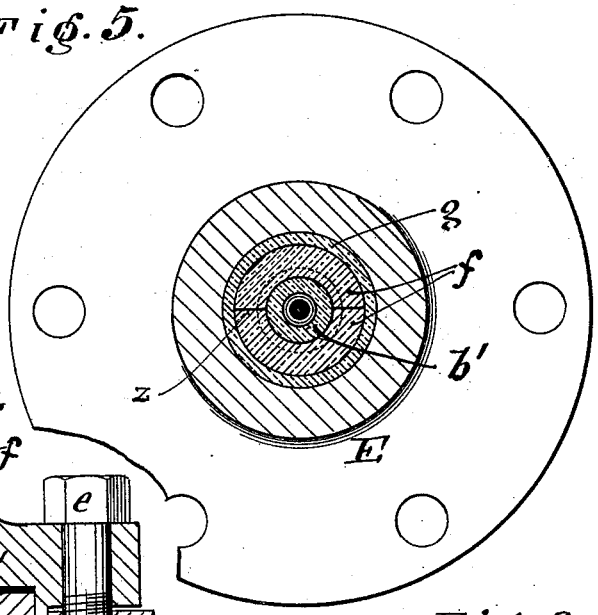
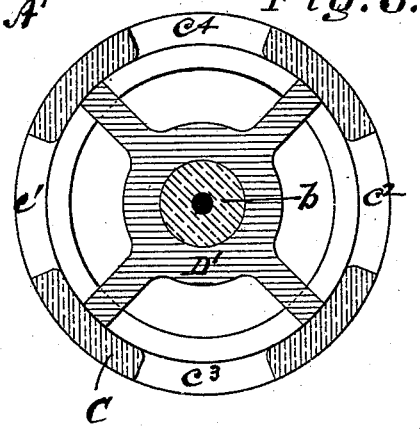


Fig. 6.



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UNITED STATES PATENT OFFICE.

MICHAEL DENNEDY, OF CINCINNATI, OHIO.

INDUCTION-VALVE FOR COMPRESSION-PUMPS.

SPECIFICATION forming part of Letters Patent No. 422,385, dated March 4, 1890.

Application filed September 11, 1889. Serial No. 323,681. (No model.)

To all whom it may concern:

Be it known that I, MICHAEL DENNEDY, a citizen of the United States, residing at Cincinnati, Ohio, have invented new and useful Improvements in Induction-Valves for Compression-Pumps, of which the following is a specification.

My invention relates to induction-valves of gas or air compressors, its object being to provide a construction economical in cost and efficient in action, to which may be also added devices whereby the valve may be made a means of lubricating itself and the interior parts of the compression-cylinder.

At the outset it may be mentioned that more or less difficulty has been experienced in the construction and due maintenance of the induction-valves of gas and air compression cylinders. The excessive pressure they withstand and the necessity of maintaining exactness of movement, of seating, and of clearance, renders it essential that the construction should be such as to give great facility of access for repairs, &c. To accomplish this many or most constructions employ many joints, bolts, nuts, pins, or keys, which are more or less liable to become loose and sometimes produce serious injury to the entire machine by their accidental displacement. In my invention I obviate these difficulties and introduce a construction in which no bolts or nuts are employed in any such relation or position as can by possible displacement get in the way of moving parts; also a construction in which the valve cannot by any possibility drop down from its holding elements and interfere with the piston movement.

The constructive details of my improvement are hereinafter more fully described, and are illustrated in the accompanying drawings, in which—

Figure 1 is a vertical axial section of the valve and casing in its preferred form complete with the lubricating attachment. Figs. 2 and 3 are horizontal cross-sections in the planes *x* and *y*, respectively, of Fig. 1. Fig. 4 is a vertical axial section of a slightly-modified construction of the valve and casing, in which the special lubricating attachments are omitted; and Figs. 5 and 6 are horizontal cross-sections in the planes *x* and *y*, respectively, of Fig. 4.

Referring now first to the construction shown in Figs. 1, 2, and 3, A designates the upper cylinder-head of the compression-pump, (these cylinders being usually, though not necessarily, placed in a vertical position,) and B the induction-valve, preferably of a conical form, seating upward in the cylinder-head A, so that its lower face lies flush with the plane inner surface of the cylinder-head B, in order that the compressing-piston (not shown) may approach the head closely with the least possible clearance.

The valve B, with its stem *b*, is preferably formed of steel or other hard or durable metal, and seats upon and in the lower end of a tubular section C, fitted to rest in an aperture of the head A and be supported by an outer enlargement of said aperture upon a shelf *a*. The section C extends upward through a casing A′, cast upon the head A, forming a chamber surrounding the valve-section C, and into which the induction supply-pipe enters at *a′* and communicates with the interior of the tubular valve-seat section C through radial apertures *c′*, *c²*, *c³*, and *c⁴*, as clearly shown in Figs. 1 and 5. The valve is guided vertically by an embracing guide-piece D, which, when the valve, as in Fig. 1, is to be provided with the lubricator, presently to be described, I prefer to construct, as shown, with an upper flange *d*, extending outward and seating upon the casing A′, where it is secured by bolts *d′*, and packed by a gasket *d²*, (usually of lead,) resting upon and extending over and beyond the upper margin of the vertical section C.

Surmounting the guide-section D is a cap E, secured thereto by bolts *e*, and packed by a gasket *e′*. The valve-stem *b* projects upward through the guide-section D into the cap E, where it is held by the following construction: The stem is peripherally grooved, as shown at *b′*, leaving collar *b²*, as an enlargement above the reduced portion *b′*, to which is accurately fitted an embracing matrix *f*, of cylindrical form, fitting the reduced portion of the stem closely, and divided in an axial plane into two portions, as indicated by the

diametrical dividing-line in the horizontal cross-section, Fig. 6. The matrix *f* is somewhat larger than the stem *b*, and is itself inclosed in an inverted cup *g*, extending below the matrix *f* into the guide-section D to a bottom ledge or seat. The annular space around the stem *b*, within the cup *g*, is extended somewhat below the cup *g*, and is occupied by a coiled spring *s'*, seating at the bottom in the guide-section D, and upholding the matrix *f* and the stem *b* by means of the described engagement of the matrix and the collar b^2 of the stem. The spring *s* is proportioned to form by the compression of its spirals into contact an absolute limit for the downward movement or unseating of the valve B, and the sliding fit of the matrix *f* in its cylindrical cup *g* constitutes a guide for the upper part of the valve-stem *b*.

The parts thus far described and their arrangement constitute the valve apparatus proper, and with a slight constructive modification, to be described later, are the same, whether the special lubricating attachment is used or not. It will be readily seen that by loosening the bolts *d' d'* the entire apparatus, including the valve and its attachments, can be at once lifted out and replaced, and by then loosening the bolts *e e* the valve may be entirely detached from its casing and connections and all parts removed. It will also be observed that the valve is held in its casing and prevented absolutely from falling downward below the limit formed by the compression of its spring *s* into an abutment or collar, and that there is also no possibility of any bolts or other separate parts falling down into the valve-chamber or seat-aperture.

The lubricating attachment is constructed as follows: The valve-stem *b* has an upward extension b^3, having slots o' o^2 opening from side to side and extended vertically, as shown. The extension b^3 is upward through a separate cylindrical valve-chamber F, screw-threaded into the cap E from above, having at the top and bottom seats for conical valves h' h^2, arranged as sliding collars upon the stem-extension b^3, and held apart by a coiled spring s^2 surrounding the stem. The valve-chamber F also serves as an abutting-screw upon the top of the inverted cup *g*, to hold it downward in position, and the lower valve-seat of the valve h^2 fits in the lower end of the chamber F without fastening, resting upon the top of the cup *g*, so that when the bolts *e* are removed and the castings D and E are separated the cap E may be removed without difficulty. The valve-chamber F is provided with a suitable packing where it enters the cap E, and is entered above by a pipe *p*, leading to an oil-reservoir. The valves h' h^2 are held to the stem b^3 by pins i' i^2, passing from side to side through the slots o' o^2, respectively. They are so placed apart in relation to the valve-seats of the valves h' h^2 as to allow one of the valves to seat in either direction of the movement of the stem-extension b^3, before the opposite valve opens by the continuation of the movement.

The construction of the valves is shown in Figs. 2 and 3. The upper valve h' is provided with radial wings h^3, by which it is guided in the chamber F and between which wings the oil passes downward, Fig. 2, while the lower valve-seat is provided with a cylindrical collar *n*, extending downward within the chamber F, in which the lower valve is guided, and the collar is radially perforated for the passage of oil outward. Oil-passages may be carried downward, as at *l l*, Fig. 1, through the shell of the cap E and of the guide-section D into the chamber A', and to insure the entrance of oil into the interior of the cup *g* the cup may be radially pierced, as at *m*, near the top.

The action is as follows: In the position shown in Fig. 1 the valve B is in upper or closed position. By the downward movement of the compression-piston the valve B is opened and a condition of partial vacuum is produced in all the chambers and openings above. The lower oil-valve h^2 seats and the upper valve h' unseats. This allows oil to flow from the reservoir through the pipe *p* into the valve-chamber F, when, by the return of the piston on its upward or compression stroke, the upper oil-valve h' is seated and the lower oil-valve h^2 is opened, allowing the contents of the valve-chamber F to flow downward into the chambers and passages of the valve-casings. The oil thus ultimately finds its way by gravity, assisted by the suction of the piston, downward to the main valve B and its seat and into the compression-cylinder and sliding surfaces of the same. The construction shown in Fig. 4 is somewhat simpler and less expensive by omitting the special oil-feeding devices. In this case the cap E is brought down and a wider flange enables it to be secured by the bolts *e*, to the casing A' in lieu of the intermediate guide-section D of the former construction. The guide-section D' in this case fits within the cap E and rests upon the upper margin of the perforated valve-seat section C. The upper extension of the valve-stem and the oil-chamber and valves are all omitted, and in lieu thereof a set-screw *r* is inserted through the top of the cap E and bears against the inverted cap *f*. The construction otherwise is the same as already described, excepting that I omit the main oil-passage *l*, extending from the upper portion of the chamber, formed by the cap E, through the shell of the casings into the chamber A', and I may perforate the stem *b b'* axially down to a lateral oil-hole *t*.

It will be obvious that for the single groove *b'* of the valve-stem a number of such grooves may be employed, and that the matrix *f* may also be divided into any number of elements on horizontal planes, the essential principle of construction being to interpose around a reduced portion of the stem and beneath a

correspondingly-enlarged head, or simply beneath an enlarged head, a removable abutment filling the enlarged cavity in the casing, and itself resting mediately upon the lower ledge or shoulder of the cavity; also the cap or shield *g* may be omitted, as its function is incidental merely as a guide across the points of the casing to insure proper play in case of any defect of alignment in securing the parts of the casing together.

I claim as my invention and desire to secure by Letters Patent of the United States—

1. In a fluid compression-pump, an induction-valve having a relative enlargement upon its stem integral therewith, a perforated guide-casing having a relative enlargement of the stem-aperture opposite the stem enlargement, and a sectional block laterally filling the enlargement of the stem-aperture and embracing the stem beneath its enlargement and upholding it mediately from the bottom of the casing enlargement, substantially as set forth.

2. In an induction-valve construction for air or gas compression pumps, the combination of a valve seating upwardly in the compression-cylinder, a casing-guide for the valve-stem having an upper enlargement of the stem-guide aperture, a valve-stem peripherally grooved at its upper portion in said casing enlargement, and a sectional holding-block filling said casing enlargement, embracing the grooved stem, and forming a suspending abutment mediately with the bottom of said casing enlargement for upholding the valve and stem, substantially as set forth.

3. In an induction-valve for air or gas pumps, the combination of a valve-stem having an integral relative enlargement at the upper portion, a guide-casing having a relative enlargement of the stem-aperture opposite the stem enlargement and extending below the same, a sectional block embracing the stem below its relative enlargement in the casing enlargement, and a coiled spring surrounding the stem beneath said sectional block and supporting the same from the bottom of the casing enlargement, substantially as set forth.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

MICHAEL DENNEDY.

Witnesses:
L. M. HOSEA,
WM. G. HOSEA.