(No Model.) 3 Sheets—Sheet 1.

B. C. VANDUZEN.

PUMP.

No. 364,739. Patented June 14, 1887.

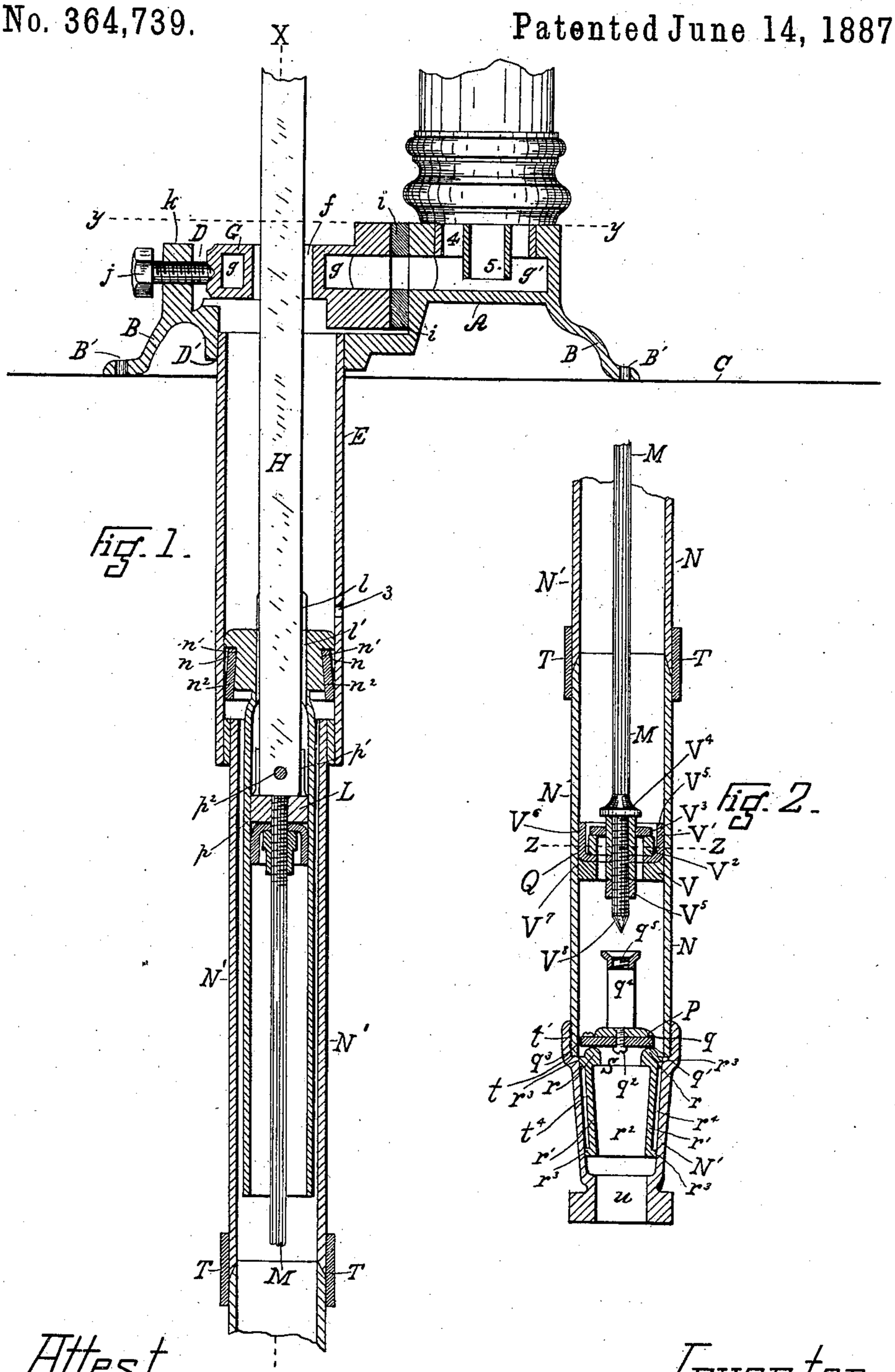

Fig. 1.

Fig. 2.

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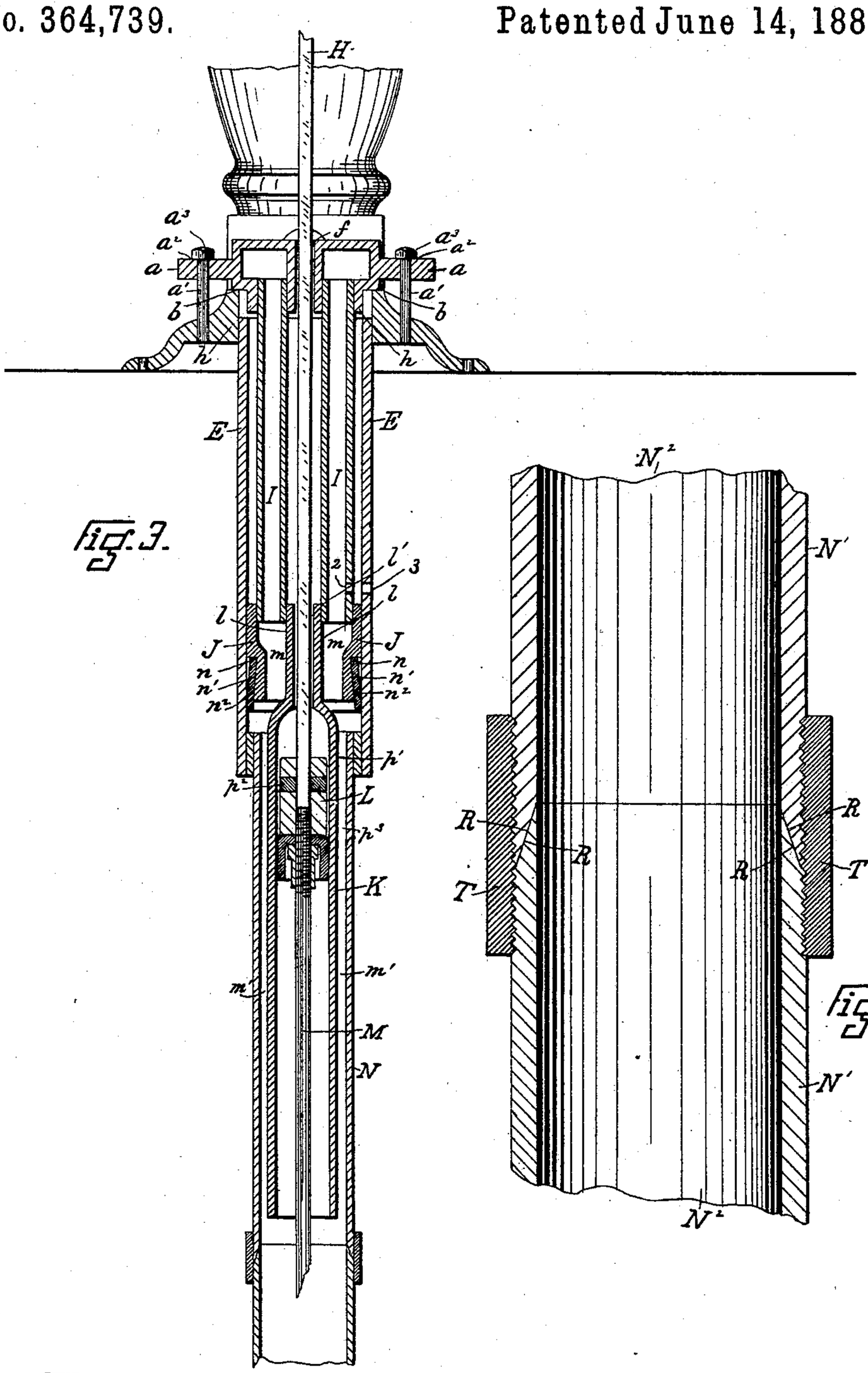

fig. 3.

fig. 4.

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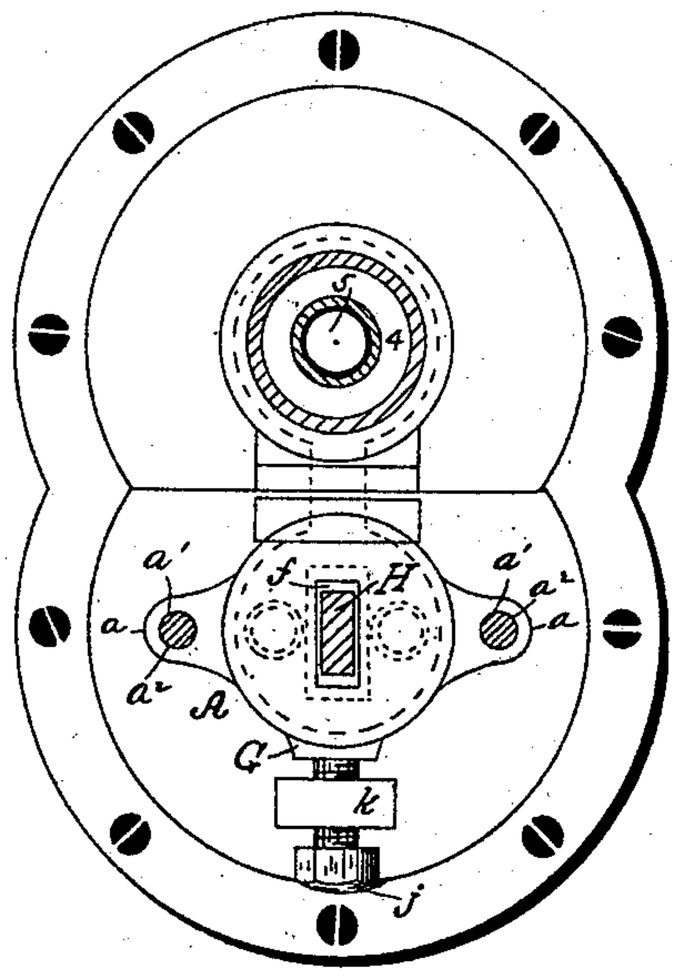

Fig. 5.

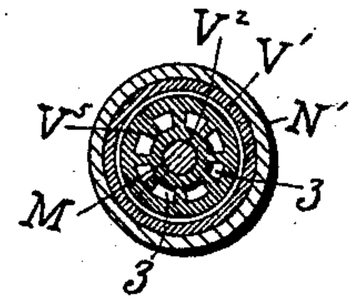

Fig. 6.

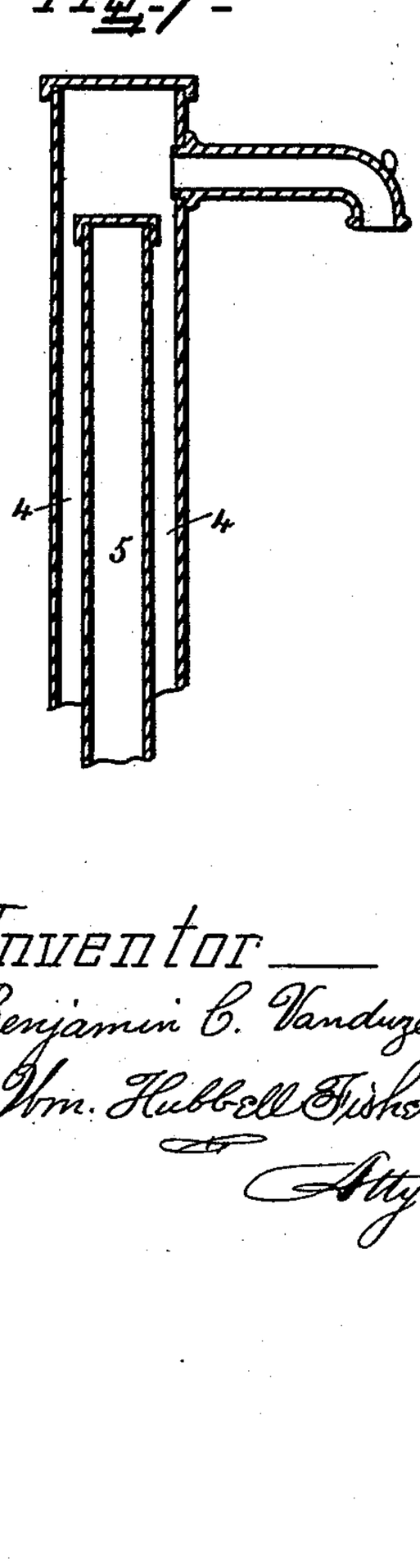

Fig. 7.

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UNITED STATES PATENT OFFICE.

BENJAMIN C. VANDUZEN, OF WINTON PLACE, OHIO.

PUMP.

SPECIFICATION forming part of Letters Patent No. 364,739, dated June 14, 1887.

Application filed April 22, 1884. Serial No. 123,887. (No model.)

To all whom it may concern:

Be it known that I, BENJAMIN C. VANDUZEN, a resident of Winton Place, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Pumps, of which the following is a specification.

My improvements relate to that class of pumps known as "double-acting force-pumps," and are especially applicable to deep wells.

The several features of my invention and their use conjointly or otherwise will be apparent from the following description and claims.

In the accompanying drawings, Figure 1, Sheet 1, represents a vertical central section of the upper portion of the pump-section and lever, its immediate support not being shown. Fig. 2, same sheet, represents a vertical central section of the lower portion of the pump, said section being taken in the same plane as the section of Fig. 1 is taken. Fig. 3, Sheet 2, represents a vertical central section of the upper portion of said pump, said section being taken at the dotted line *x x* of Fig. 1 and at right angles to the plane of the section of said Fig. 1, the lever and its immediate support not being shown, the actuating pump-rod and connecting-rod being left in elevation. Fig. 4, same sheet, represents a vertical central section of the preferred form of joint for uniting lengths of pump piping or tubing. Fig. 5, Sheet 3, represents a horizontal transverse section of a part of the pump, taken at the dotted line *y y*, Fig. 1, and a plan of other adjacent parts of the pump, the view being from above downward. Fig. 6, same sheet, represents a horizontal section of the lower piston, said section being taken at the dotted line *z z* of Fig. 2. Fig. 7 represents a vertical central section of the air-vessel and discharge-tube and a pump-stock and the chamber *g'* of the pump.

A indicates the supporting-base, connected in any suitable manner to the platform or equivalent support. A preferred mode of securing the base A to the platform consists in providing the base with holes B', through which bolts, screws, or rivets can be passed to secure the standard to a suitable platform, as C. The supporting-base has a recess, D, at bottom, provided with space or recess D', and in this opening and fitting the sides thereof is secured, (preferably by screw-thread,) the upper end of cylinder or tube E, whose function will be hereinafter described.

In the space or recess D is a device consisting of a hollow body, G, preferably circular in shape when viewed from above or below. This body G is secured in a suitable manner to the bed or base, a preferable mode being as follows: The body G is provided with suitable arms or lugs—as, for example *a*, one of which arms extends out from one side of the body G and the other arm from the other side of the body G. Each arm *a* is connected to the bed-piece A by its own bolt *a'*, passing down through a hole, a^2, in the arm and screwed into the bed-piece A. This body-piece G at each side sets upon shoulders *b b* of the bed A. Centrally located in the body G is a vertical slot or opening, *f*, passing entirely through the body G, and in this slot plays the actuating-rod H of the pump. This body-piece has a chamber, *g*, and there is no communication between this chamber *g* and slot *f*. This chamber communicates with two tubes, I I, one located on one side of the pump-rod H and the other on the other side of the said rod. Each of said tubes is connected to the body-piece G by suitable means. A preferred mode of connecting said tubes to said body G consists in providing the latter with tubular flanges or extensions *h*, and into each tubular flange is screwed one (viz., its respective) tube, I. The rear end of this chamber communicates with chamber *g'* of the bed-piece A. The chamber *g'* communicates with a suitable discharge-spout and an air tube or vessel, the preferred combination of said chamber *g'*, discharge-spout, and air-tube being as follows: Into this last-named chamber *g'* open air tube or vessel 5, closed at top, and discharge-tube 4, the latter communicating with the discharge-spout of the pump. Preferably tube 4 incloses air-tube. The points of juncture between the body or piece G and the adjacent ends or edges of the chamber *g'* are securely packed, preferably by means of a thin sheet or strips of packing, *i*, placed between the adjacent edges of chambers *g* and *g'*.

Suitable means are to be employed to press the body G rearward, so that said edges of chamber *g* shall press against the adjacent edges of chamber *g'*, and the preferred means for this purpose consists of a set-screw, *j*, engaging a screw-thread in a portion, *k*, of the bed-piece A. The rear end of this set-screw presses against the front end of the body-piece G, and forces the edges of chamber *g* of said body-piece G toward the adjacent edges of chamber *g'*, and thus compress the packing *i*. By making the said portion *k* of the bed-piece A broad and strong, and providing a recess in the front end of the body-piece G, and causing the end of the set-screw *j* to fit therein, the set-screw, when tightened, also assists in preventing the body-piece G from being lifted and from being moved laterally.

The tubes I I communicate below with a common ring or cylinder, J, and the connection between this ring J and each tube is preferably a screw connection; but in any case it is a water and air tight connection. In the center of this ring are two walls or partitions, *l l*, between which is a space, *l'*, in which the actuating pump-rod plays. These partitions *l l* entirely separate the space *l'* from the passages *m m* of said cylinder J, and there is no direct communication between them. This cylinder J is provided exteriorly with a packing which prevents water or air from passing up between tube E and this cylinder J. The preferred mode of packing n^2 for this purpose consists as follows: The lower portion of cylinder J is exteriorly provided with a surrounding recess, *n*, whose upper portion is deeper than its lower portion, the side of this recess being provided with a bevel or incline, *n'*. In this recess lies a sheet of packing, n^2, which fills the space between the side of lower edge of the cylinder and the interior surface of tube E. This packing also preferably extends a distance below the edge of cylinder J. Thus when liquid or air rises in the pump from below up to cylinder J the liquid or air must pass through its passages *m m*, and cannot pass between the outside of cylinder J and the inside of tube E, and any effort of said liquid or air to pass between said cylinder J and tube E will cause the lower end or edge of the packing to be pressed more securely and tightly against the inside of tube E, thus more tightly and securely packing said joint between said cylinder J and tube E and the better preventing any fluid from passing through said joint.

The partitions *l l* are rigidly connected at their lower ends to a tube, K, within which plays a piston, L, suitably packed, constructed, and connected to the pump-rod H. Preferably, the piston consists of a disk, *p*, having ing ears *p' p'*, between which ears is the lower end of the pump-rod, pivoted to said ears by a suitable pivot or bolt, as p^2.

Into the piston is screwed from below the connecting-rod M, and a packing, p^3, of the shape of an inverted cup, is located immediately below the piston and secured in place by a nut screwed onto pump-rod M and against the central portion of the said packing p^3. The lower end of tube E preferably is about opposite the piston L when the latter is at the upper end of its stroke, and to this lower end of said tube E is connected the tube N, preferably of less diameter than the tube E. This tube N is continued down to the water or other liquid and passes down into the latter a desired distance. At or in its lower end is located a suitable valve, P. This valve is preferably a check-valve, and may be constructed as follows:

q indicates the valve-piece provided with packing *q'*, centrally secured together by screw q^2, the valve being hinged to its seat *r* by a hinge or pivot, q^3. The valve-seat *r* carries an arch, q^4, overarching and spanning the valve. Through the valve-seat *r* is inlet-passage S, communicating with the water or other liquid of the well. In the present instance the valve-seat is continued downward in the form of an extension, *r'*, which tapers or diminishes in size toward its lower end. This extension *r'* is preferably provided exteriorly at top and bottom with annular outwardly-extending offsets r^3, which latter when present rest against the interior of the terminal portion N' of tube N. The slight interspace r^4 between the upper and lower offsets and the outside of extension *r'* and the inside of terminal tube or portion N' may be filled with packing. A convenient mode of packing this space consists in wrapping waste about the extension *r'* between the offsets and then pressing said extension *r'* down to place in tube or portion N'. This valve-seat *r*, with its extension *r'*, rests on and within the sides of the terminal portion N' of the tube N, this terminal portion being provided with shoulder *t* and female screw-thread *t'*, the shoulder *t* preventing the extension N' from being screwed too far onto tube N, and also admitting of packing, when desired, being placed between the lower end of tube N and the said shoulder. The terminal portion N' is interiorly tapered correspondingly to the taper of the exterior of the valve-seat extension. Thus the valve-seat extension *r'* becomes wedged in and supported by the terminal portion N'. The passage r^2 through extension *r'* and passage *u* through terminal portion N' connect with one another, and the said passage *u* opens out into the well and serves as the inlet to the pump. The lower end of terminal portion N' is preferably provided with a broad annular flange or foot.

The rod M is continued down from upper piston, L, and is provided at its lower end with a suitable valve-piston, Q, a preferred form of which consists as follows: A plate or disk, V, is located on rod M, and upon this plate rests the lower part of a cup-shaped annular packing, V'. Above and located within the cup of the packing is a plate or disk, V^2. The disk V and disk V^2 are screwed to rod M,

and, being screwed tightly toward each other, the packing V′ is securely clamped between them. Around the rod M, and between plate V^2 and shoulder or flange V^4 of said rod M, is a circular flexible valve, V^3. In disk V and disk V^2 are openings, as *z*, (see Fig. 6,) and the center of the packing V′ is also open. Thus when the piston Q is being depressed the liquid is permitted to flow upward through the openings *z* and through part of the valve-piece V^3; but this valve-piece V^3 prevents any downward flow of water through piston Q. That portion of the tubing or piping in which valve-piston Q plays preferably consists of a short length or section, N^2, and its interior is made smooth and hard in a suitable mode. Thus (if of iron) it is enameled or plated; or it may be made of brass, &c. In this way the piston-valve Q is enabled to play accurately in the cylinder or section N′, and also be comparatively free from wear.

The lower end of the rod M, or the under side of the piston Q, is provided with means for enabling the rod M when depressed to take hold of the valve P or its connections and enable the said valve P and its connections to be drawn up through and out of the pump-tube N and tube E for inspection, removal, repair, &c., of the working parts, and also to be placed in the tube and pushed down to place.

A preferred means for enabling the rod M and valve P to be connected or disconnected at pleasure consists as follows: The lower end of the rod N is pointed, and behind the point V^8 is provided with screw-thread V^5. The top of arch q^4 is provided with a vertical opening, q^5, interiorly screw-threaded, and whose upper edge is beveled up and outwardly. When the rod M is depressed, its point is guided by the beveled edge of opening q^5 into said opening, and the rod then being rotated in the proper direction, the end of rod M is screwed into the arch q^5. Then the piston Q and its connections can be lifted out. So, also, the valve P can be inserted into the pump-tube N and carried down to place on its seat, as *r*, and can then be disconnected from rod M by rotating the latter in the proper direction.

The connecting-rod M is to be divided into lengths or sections of suitable length, and having suitable means whereby each section may be easily and quickly united to its adjacent length as the rod is lowered into the well, and be easily and quickly separated when the rod is being removed from the well.

The lengths or sections of pipe or tube N are to be connected in any desired manner. A preferred mode consists as follows: The adjacent ends of the sections N^2 to be united are oppositely beveled. For example, the outer edge of the upper end of a lower section is provided with a bevel, R, (see more particularly Fig. 4,) extending from below and outside upward and inward to the inner edge of said upper end; also, the inner edge of the lower end of an upper section is provided with a bevel, R, extending from within downward and outward to the outer edge of said last-named lower end. These bevels are both of the same inclination, and when the said ends of said sections are brought together these bevels fit each other tightly, and the inner surface of the tube at their point of junction presents a smooth and uninterrupted surface. A preferred means of holding these beveled ends of said sections together is as follows: On the outside of the adjacent ends of the sections of the pump-tube N is a screw-thread, and in uniting the sections the adjacent ends of both sections provided with screw-threads are respectively screwed into a screw-coupling, T. The bevels R on the sections, and their mode of fitting into one another, aid in stiffening the joint formed by the junction of them and the screw-coupling T or the latter's equivalent.

The advantages of having the bevels inclined from outside and below upward and inward is this, that the piston Q can be readily lifted out and withdrawn from the pump-tubing at the same time the upward-pointing end or edge V^6 of the packing V′ cannot impinge against any resisting edge at the interior seam or juncture of the joint, and hence will not be stopped, wedged, or cut by such seam. In inserting said piston the rounded lower corner, V^7, of the packing will operate to slide past the said seam. In the pipe E is a waste-hole, 3, and in one of the tubes I is also a waste-hole, 2.

The mode in which my pump operates is substantially as follows, viz: As the actuating-rod is elevated the piston L rises, and through the agency of connecting-rod M the piston Q also rises. The latter draws liquid from the well up through the check-valve P until it (the piston Q) has completed its upward stroke, at which time the space above check-valve P and below piston Q is full of liquid. The check-valve P now closes and the actuating-rod descends, and pistons L and Q also descend. The liquid below piston Q passes through the valve of said piston Q and up above said piston Q until the actuating-rod has reached the lower end of its stroke. As the latter again rises the piston Q draws up liquid from the well in the manner aforementioned, and at the same time lifts the liquid above it and forces a part of said liquid up into cylinder K and against piston L; hence the liquid finds no outlet. The remainder of the liquid is forced through space M′ between cylinder K and tube N, up through passage *m* and tubes I I into chamber *g* of body-piece G, thence into chamber *g′* of the bed A, and thence into discharge-tube 4, and thence it passes from the pump. The pump is now full of liquid, and as the actuating-rod descends the liquid resting on the check-valve P rushes through piston Q, and at the same time the piston L, descending, forces the liquid out of its cylinder K, up through the space *m′* between cylinder K and tube N, through passage *m* into the tubes I I, and thence through cham-

ber *g* and chamber *g'* and through discharge-tube 4. As the actuating-rod rises the piston Q again fills cylinder K with liquid and forces the remainder of liquid (which piston Q raises) out of the pump, as aforementioned, and the consequent descent of the piston L forces the liquid in cylinder K out of the pump, as aforementioned. Thus these operations are successively repeated as the pump is operated, and a continued stream is ejected from the discharge-orifice of the pump. The air vessel or chamber 5 contributes to make the stream more even in its continuous discharge. The proportion which the capacity of the cylinder K with reference to its piston and stroke bears to the capacity of cylinder N' and its piston and stroke is preferably as 1 to 2.

The waste-hole 3 in tube E performs a double function. Should liquid work up between the piston L and the inner side of tube K and through slot *l'* it would, after accumulating, fill the tube E outside of tubes I I, and then, not being able to find egress, would resist the upward stroke of piston L and thus impede and perhaps altogether stop the action of the pump.

The waste-hole 3 in tube E allows the egress of such liquid that perchance finds its way into the tube E outside of tubes I. Furthermore, it is desirable that this pump should in cold climates be what is known as a "non-freezing pump." I therefore provide waste-hole 2 in tube or tubes I, and when the pump stops working the liquid in all of that portion of the pump which lies above waste-hole 2 will pass out of said hole, and then out of waste-hole 3 in tube E, thus emptying the pump.

It may be well here to remark that the tubing of the pump above the openings 2 and 3 is sufficiently long to cause the said openings to lie below the frost-line.

The primary advantages in the construction of this pump are, first, that the pump is cheap, convenient, and efficient; second, the pump tubing or piping, as N, when formed—as it usually will be—in sections, can be readily put together and lowered into the well, and can also be readily raised and the various sections easily and quickly separated; third, all of the working parts of the pump can be readily and quickly inserted into the tubing or piping N and as quickly and readily withdrawn; and, fourth, the body-piece G, tubing I I, cylinder J, and cylinder K can be readily inserted in the pump along with the working parts, and quickly and firmly set in position by set-screw *j* and bolts *a'*, and can be readily withdrawn along with said working parts.

The various features of my invention are preferably employed together; but one or more of said features may be employed without the remainder; and, in so far as applicable, one or more of said features may be used in connection with pumps or pumping devices other than those herein specifically described.

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

1. The combination of bed-piece A, having space D and chamber *g'*, and the body-piece G, having chamber *g* and the slot *f*, and set-screw *j*, and packing, substantially as and for the purposes specified.

2. The combination of bed piece A, having space D and chamber *g'*, and body-piece G, having chamber *g* and slot *f*, and provided with arms *a'*, and set-screw *j*, and bolts *o*, substantially as and for the purposes specified.

3. The combination of bed-piece A, having space D and chamber *g'*, and body-piece G, having chamber *g* and slot *f*, and set-screw *j*, the inclosing-tube E, and interior tubes, I I, connected to said body-piece, cylinder J, connected to the lower end of said tubes, and provided with slot *l'* and passages *m*, cylinder K, connected to cylinder J, and piston L, connecting-rod M, piston Q, check-valve, and tube N, substantially as and for the purposes specified.

4. The combination of bed piece A, having space D and chamber *g'*, and body-piece G, having chamber *g*, and slot *f*, and set-screw *j*, the inclosing-tube E, and interior tubes, I I, connected to said body-piece, cylinder J, connected to the lower end of said tubes I I, and provided with slot *l'* and passages *m*, cylinder K, connected to cylinder J, and piston L, connecting-rod M, piston Q, the end portion of rod M having screw-thread terminating in a pointed end, and the check-valve, the latter being provided with arch q^4, having a central opening, q^5, beveled above, and having screw-thread below for enabling the rod to be connected at will with said valve for the convenient removal of the valve from the pump or its insertion therein, substantially as and for the purposes specified.

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