

No. 627,039.

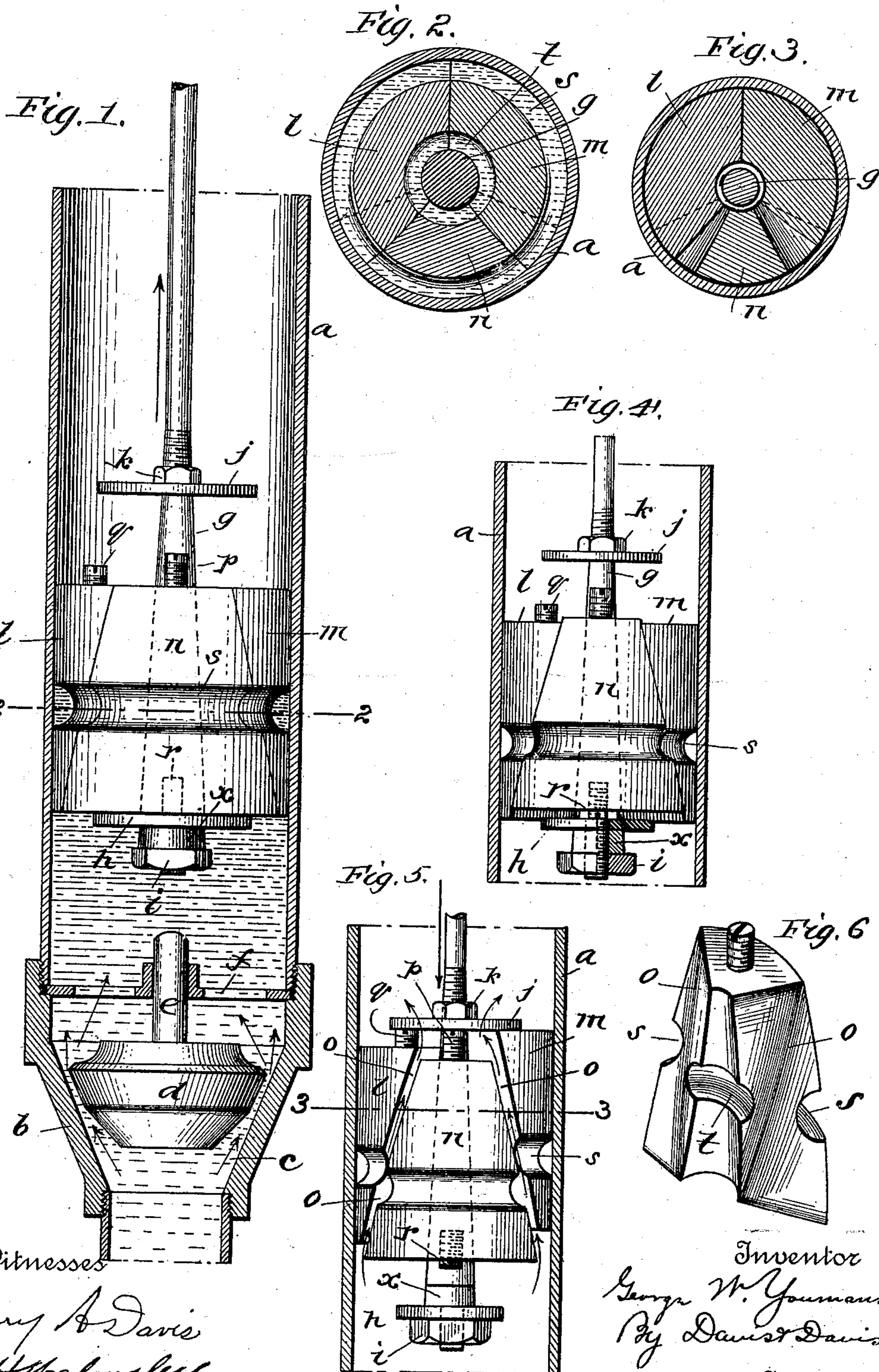
Patented June 13, 1899.

G. W. YOUMANS.

PUMP PISTON.

(Application filed July 8, 1898.)

(No Model.)



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UNITED STATES PATENT OFFICE.

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PUMP-PISTON.

SPECIFICATION forming part of Letters Patent No. 627,039, dated June 13, 1899.

Application filed July 8, 1898. Serial No. 685,438. (No model.)

To all whom it may concern:

Be it known that I, GEORGE W. YOUMANS, a citizen of the United States, residing at Rochester, in the county of Olmsted and State of Minnesota, have invented certain new and useful Improvements in Pump-Pistons, of which the following is a specification, reference being had therein to the accompanying drawings, in which—

10 Figure 1 is a vertical section of a portion of a pump, showing my improved piston in side elevation; Fig. 2, a horizontal section on line 2 2 of Fig. 1; Fig. 3, a horizontal section on the line 3 3 of Fig. 5; Fig. 4, a similar view to Fig. 1, showing the manner of adjusting the wedge-section to expand the piston to take up wear; Fig. 5, a similar view showing the manner in which the piston-sections separate to let the water up past the piston on the downstroke, and Fig. 6 a detail perspective of the wedge-section.

The object of this invention is to produce a simply-constructed piston for lift-pumps and other apparatus that will avoid the necessity of employing a valve in the piston, the piston being constructed of several sections that fit together and form a water-tight piston on the upstroke, but which separate upon the downstroke to let the water flow up past the piston, as more fully hereinafter set forth.

Referring to the drawings, *a* designates the pump-cylinder, *b* a cap screwed on the lower end thereof and having its inner surface beveled downward and inward to form a conical valve-seat *c*, and *d* a check-valve working on said seat *c* and guided in its vertical movements by having its stem *e* pass through a central opening in an open disk *f*, clamped between the cap and the cylinder.

40 The piston-rod has its lower end formed conical for a distance slightly longer than the piston, as shown at *g*, the conical portion tapering upward. At the lower end of the conical portion a circular flange *h* is removably secured by a nut *i*, and at the upper end of said conical portion is fastened a similar flange *j*, a nut *k* being threaded on the piston-rod to clamp this flange against the upper end of the conical part. The piston fits the cylinder and rests normally on flange *h*, but has a vertical movement independent of

the piston-rod, this movement being limited by the flanges *h* and *j*. The piston has a central conical opening of a size adapted to fit the conical part *g* when the piston rests upon flange *h*. The piston is constructed of three independent sections, two of the sections *l* and *m* being identical in shape and the other section *n* being substantially wedge shape, with the tapered end upward. The sections are formed by radially cutting the piston at three points, as shown most clearly in Figs. 2 and 3. The adjacent faces of the sections *l* and *m* are vertical and flat, but the adjacent faces between the intermediate section *n* and said sections *l* *m* are curved slightly vertically, as at *o*, giving them a sort of spiral form. The sections fit nicely to each other and to the cone *g* and are held in place around said cone solely by the pump-cylinder. The wedge-section *n* is provided with an adjustable stop *p* on its upper end to limit its upward movement, and the section *l* is provided with a similar stop *q*, both said stops being adapted to strike against disk *j*, the stop *q* being lower than stop *p* in order that said section *l* may rise higher than section *n*, as shown in Fig. 5. The section *n* is also provided with an adjusting screw or stop *r* at its lower end, which may be screwed out when it is desired to adjust said section *n* upward to spread sections *l* and *m*, and thereby compensate for wear.

The operation is apparent. Upon the upstroke of the piston the sections fit together upon the disk *h*, nicely fitting the cylinder and each other and cone *g*, thereby causing the check-valve to open and permit the water to flow in under the piston. Upon the downstroke the piston remains momentarily at rest, and the piston-rod moves down independently of it until stop *p* comes against flange *j*, whereupon the wedge-block *n* is carried downward with the rod, then flange *j* comes against stop *q*, and finally against the upper end of section *m*, whereupon all the sections are carried down bodily with the rod. Thus bringing the sections to rest successively at different heights provides channels between section *n* and the other two sections up through which the water rushes, the pressure of the water holding the sections against

flange *j* and said flange *j* being of course less in diameter than the cylinder to permit the water to pass freely upward. Upon the return stroke of the piston the sections will come to rest upon flange *h* in the same order, section *n* striking first, section *l* next, and section *m* last. By adjusting stops *p* and *q* the water-passages may be regulated, and by adjusting stop *r* the sections *l* and *m* may be spread slightly to compensate for wear. When section *n* is thus adjusted upward by stop *r* to spread sections *l* and *m*, these latter sections will of course be thrown out of true; but the untrueness will be so slight as to not affect the practical working of the piston to a material degree, if, in fact, the piston will not soon be worn true again. It will be observed that when the sections thus separate endwisely they will be permitted to close in slightly by reason of the tapering form of the piston-rod, thereby permitting a portion of the water to pass up between the curved faces of the sections and the cylinder and also between the adjacent straight faces between sections *l* and *m*; but it will be observed that the main body of the water will pass up between section *n* and the adjacent sections. The advantage of the spiral faces *o* upon the section *n* and the adjacent faces of the other sections is that the piston is thereby caused to rotate while in action, whereby it will wear its own seat in the cylinder, the common drawback of wearing vertical grooves in the piston and cylinder being thereby avoided. Rotation is caused by the rush of water up through the passages, the direction of rotation being toward the right in the views in the drawing by reason of the preponderance of pressure being brought upon the spiral face of section *m*, this preponderance of pressure resulting from the fact that the space between said section *m* and section *n* is larger than the opening between said section *n* and section *l*.

Formed in the exterior surface of the piston is an annular groove *s* semicircular in cross-section, and a similar groove *t* is formed around the central passage of the piston, the grooves in the several sections being so formed that they register when the sections are at rest in their lowermost position, as shown in Figs. 1 and 2. These grooves fill with water at each stroke of the piston and serve as cushions and packings, thereby avoiding the necessity of using the ordinary packing and adding greatly to the durability of the piston. When section *n* is adjusted upward to take up wear, as shown in Fig. 4, the parts of the grooves in said section will be thrown slightly out of line, but not enough to destroy the function of the grooves.

It will be obvious that my invention is not confined to the specific construction shown and described.

It will be observed from Figs. 1 and 4 that between flange *h* and nut *i* is inserted a ring

x, having a tapering form corresponding to an extension of the tapering part *g* of the rod. The purpose of this ring is to provide an extension of the conical part *g* to compensate for wear between the sections and the said conical part *g*. To utilize this ring as an extension, it is simply necessary that it be clamped between flange *h* and the lower end of part *g*, as shown in Fig. 5. It is believed that a single ring will afford a sufficient length to compensate for such wear as may occur during the life of the piston; but it is evident that more rings may be employed if occasion require.

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

1. In a piston for pumps, the combination of a piston-rod carrying separated stop plates or flanges, a piston confined on the piston-rod between the said stop plates or flanges, said piston being comprised of a plurality of separable sections adapted to fit together upon one stroke of the piston, and to separate upon the other stroke, and means for arresting said sections at different points on this latter stroke, substantially as set forth.

2. In a pump-piston, the combination of a piston-rod, a piston adapted to have a limited sliding movement thereon, said piston consisting of a plurality of sections divided substantially radially, one of said sections being tapered toward one end, said sections being adapted to fit together upon the upstroke and form a solid piston and separate endwise upon the downstroke and form water-passages between the faces which come in contact upon the upstroke.

3. The combination of a piston-rod and a piston adapted to slide endwise thereon, means for limiting the movement of the piston, said piston being comprised of separate sections adapted to fit together and form a solid piston on the upstroke and to separate endwisely on the downstroke, and means for arresting the sections at different points on this latter stroke to form water-passages between the adjacent faces of said sections.

4. The combination of a piston-rod tapered upward, a piston having an endwise movement on said tapered portion, stops limiting the movement of the piston, said piston being comprised of a plurality of sections having their adjacent faces fit closely together to form a solid piston on the upstroke, means for separating the sections endwise on the downstroke, one of said piston-sections being tapered toward one end and the central opening in the piston being tapered upward, and for the purposes set forth.

5. The combination of a piston-rod and a piston thereon, said piston being comprised of a plurality of sections, adapted to fit together and form a solid piston on one stroke, means for endwise separating the sections upon the other stroke, thereby forming wa-

ter-passages between the adjacent faces, said means consisting of a stop on the piston-rod and a stop on one of the sections, said stop being adjustable to regulate the size of the water-passage.

6. The combination of a piston-rod and a piston rotatively supported thereon, said piston being comprised of sections adapted to fit together and form a solid piston on one stroke and to separate endwise on the other stroke to form water-passages between the adjacent faces of the sections, one of said adjacent faces being spirally formed, whereby the piston will be rotated at each stroke.

7. The combination of a piston-rod and piston endwise movable thereon, said piston being comprised of a plurality of sections having their adjacent faces formed to fit closely together to form a solid, closed piston upon the upstroke, one of said sections being tapered upward, one of the faces of this tapered section and the adjacent face of the adjacent section being spirally formed, and means for separating the sections endwise and forming water-passages therebetween upon the downstroke.

8. The combination with a piston-rod and piston thereon, said piston being provided with an annular external groove and being comprised of a plurality of sections adapted to close and form a solid piston on one stroke and open endwise upon the other stroke, the portions of the groove on the various sections coming into alinement when the sections come together and out of alinement when the sec-

tions separate, whereby the groove fills with water at each stroke, substantially as set forth.

9. The combination of a piston-rod and piston thereon, said piston being provided with an internal open groove and an external open groove, both grooves being annular, said piston being comprised of a plurality of sections adapted to close together to form a solid piston on one stroke and to separate endwisely upon the other stroke, the portions of the grooves on the various sections coming into alinement when the sections come together and out of alinement when the sections separate, whereby the grooves fill with water at each stroke, as and for the purposes set forth.

10. The combination of a piston-rod and piston thereon, said piston consisting of a plurality of sections divided substantially radially and one of the sections being tapered toward one end, and means whereby the sections are caused to fit together upon the upstroke and form a solid piston around the piston-rod and to separate endwisely upon the downstroke and form a passage or passages between the surfaces which contact upon the upstroke, substantially as and for the purpose set forth.

In testimony whereof I hereunto affix my signature, in the presence of two witnesses, this 2d day of July, 1898.

GEO. W. YOUMANS.

Witnesses:

GEO. W. GRANGER,
R. M. HUMPHREY.