(No Model.)

4 Sheets—Sheet 1.

F. PEARN.

PUMP.

No. 557,285. Patented Mar. 31, 1896.

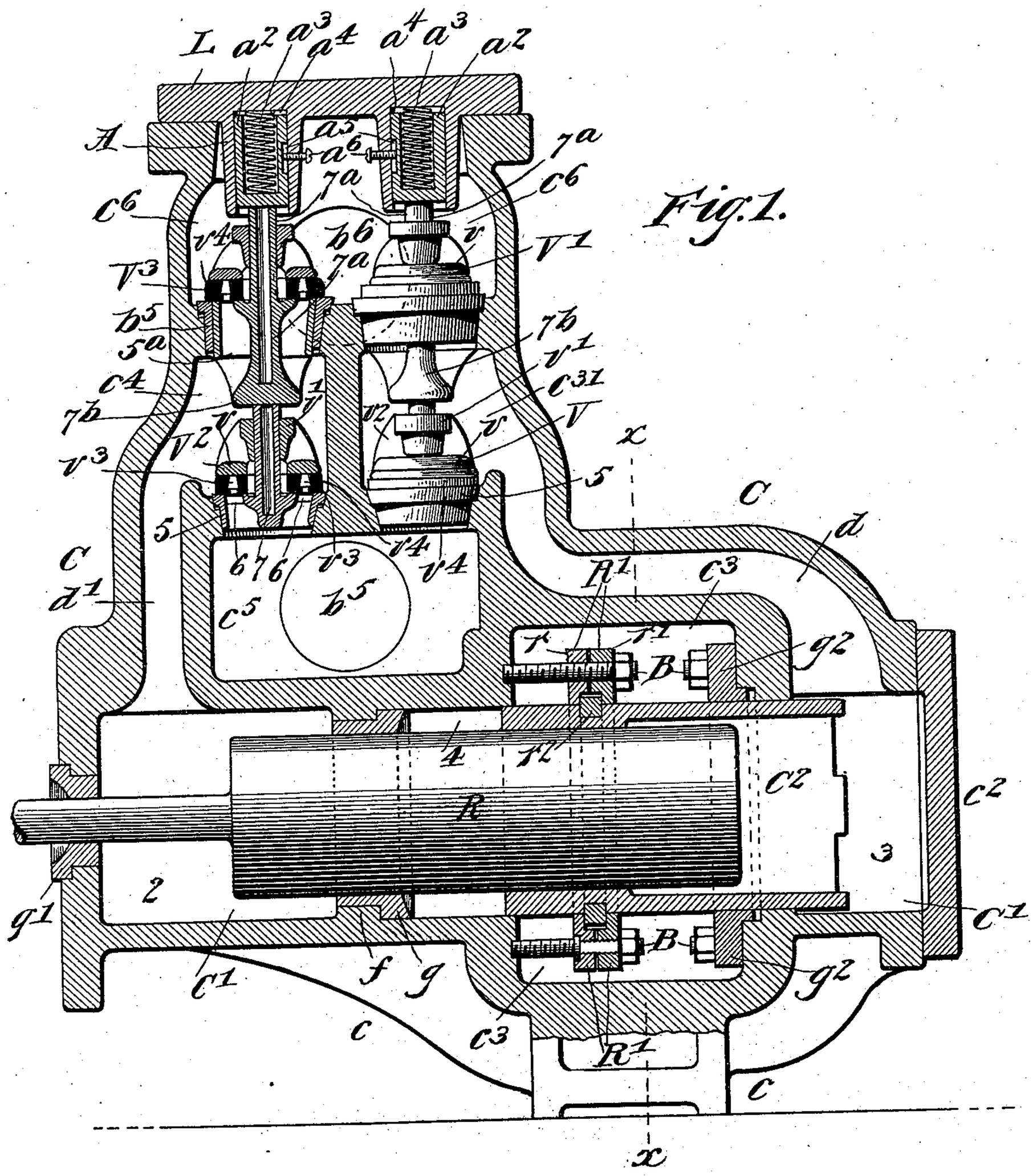

Fig. 1.

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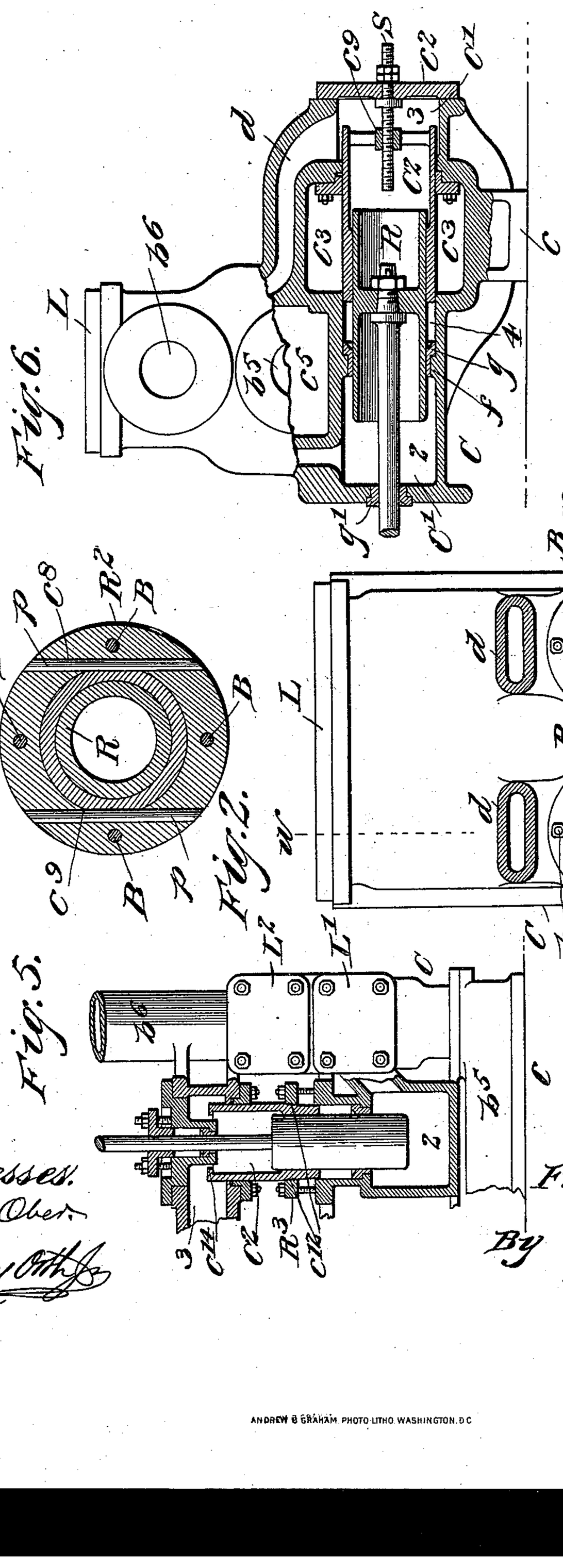
(No Model.) 4 Sheets—Sheet 2.

F. PEARN.

PUMP.

No. 557,285. Patented Mar. 31, 1896.



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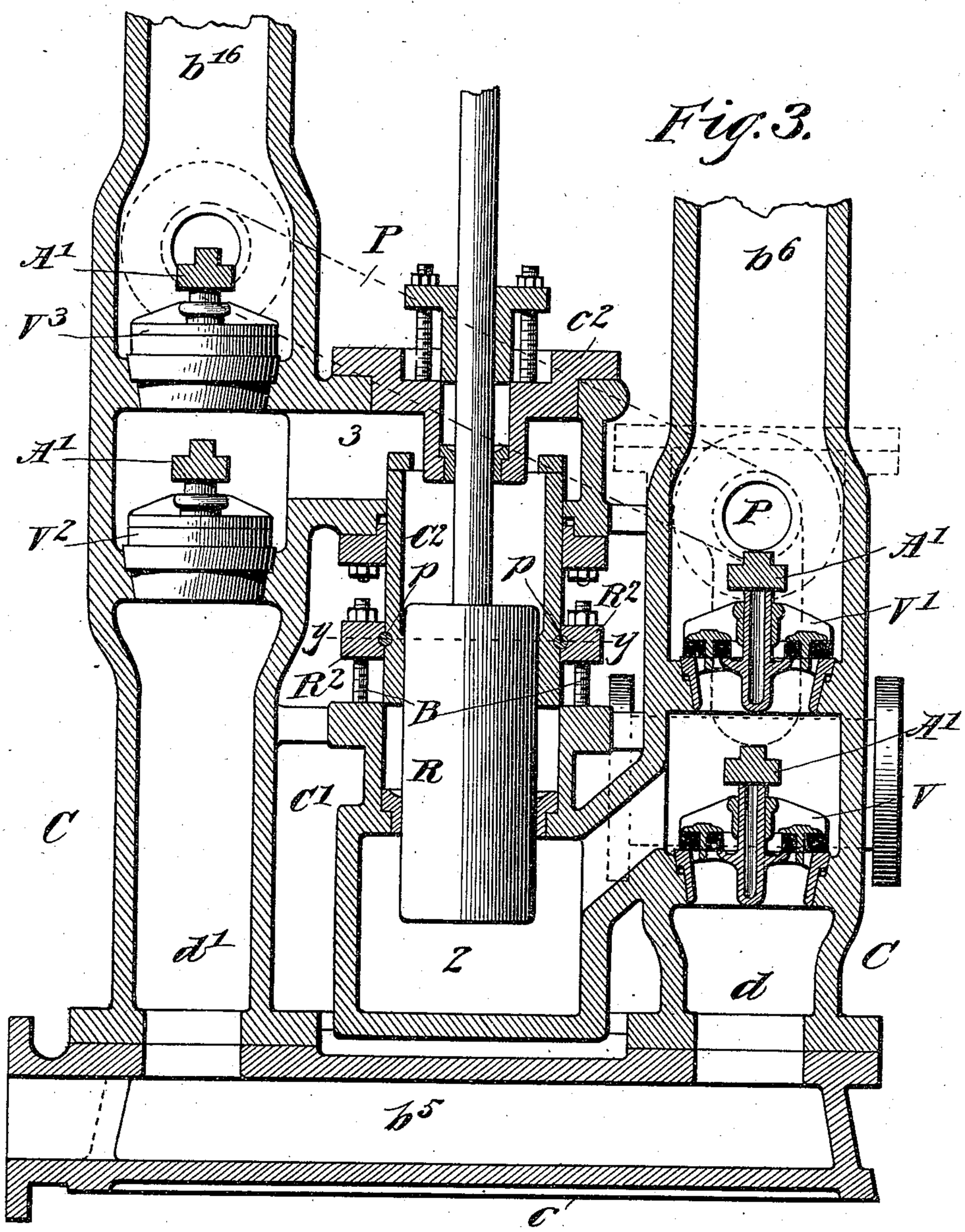
No. 557,285. Patented Mar. 31, 1896.

Fig. 3.



Witnesses.
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(No Model.)

4 Sheets—Sheet 4.

F. PEARN.

PUMP.

No. 557,285. Patented Mar. 31, 1896.

Fig. 8.

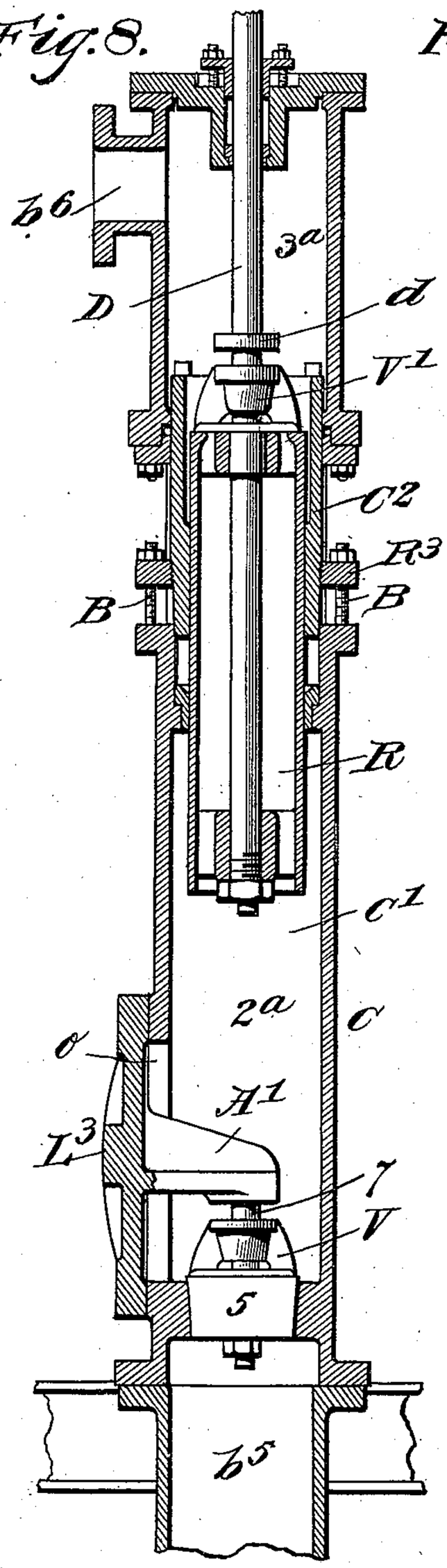
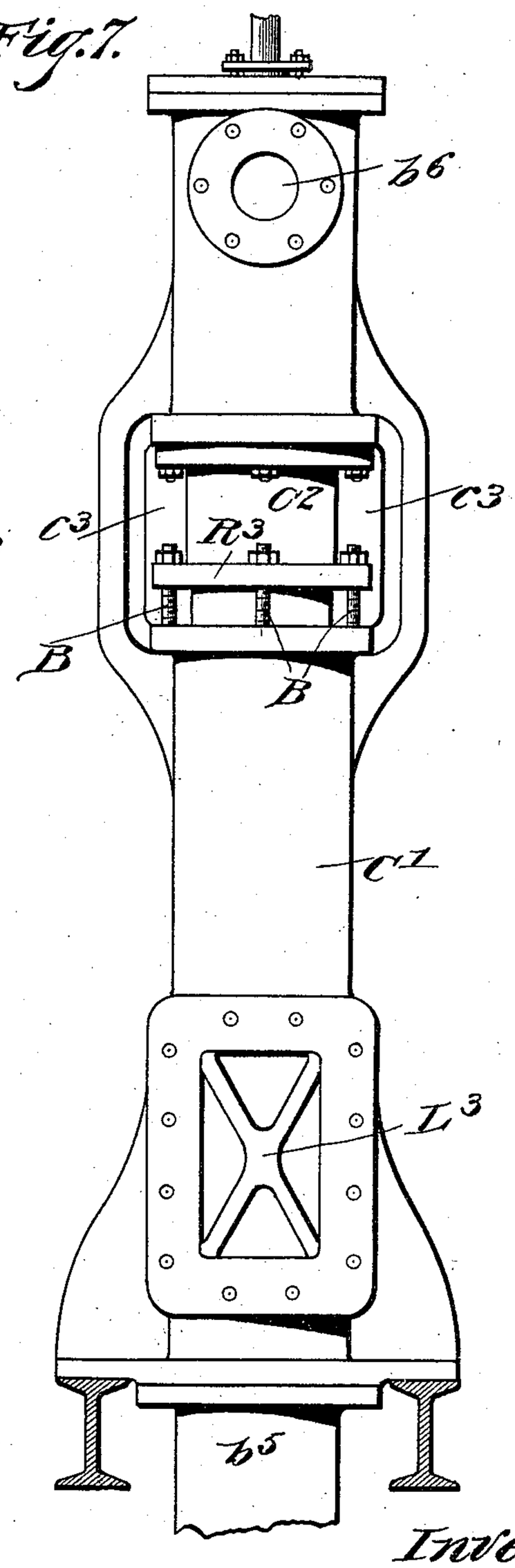


Fig. 7.



Witnesses.
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UNITED STATES PATENT OFFICE.

FRANK PEARN, OF MANCHESTER, ENGLAND, ASSIGNOR TO FRANK PEARN & CO., LIMITED, OF WEST GORTON, ENGLAND.

PUMP.

SPECIFICATION forming part of Letters Patent No. 557,285, dated March 31, 1896.

Application filed July 15, 1895. Serial No. 556,073. (No model.) Patented in England November 20, 1893, No. 22,207.

To all whom it may concern:

Be it known that I, FRANK PEARN, a subject of the Queen of England, residing at Manchester, in the county of Lancaster, England, have invented certain new and useful Improvements in Pumps, (for which Letters Patent have been obtained in England under date of November 20, 1893, No. 22,207;) and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters and figures of reference marked thereon, which form a part of this specification.

My invention has relation to pumps; and it has for its object certain improvements in the construction of the pump-cylinder and the inlet and outlet valves, whereby the efficiency and durability of the pump are materially enhanced and the construction simplified, as will now be fully described, reference being had to the accompanying drawings, in which—

Figure 1 is a sectional elevation taken on line *w w* of Fig. 2, looking toward the right, of a horizontal twin pump embodying my improvements, said Fig. 2 being a section taken on line *x x* of Fig. 1, looking toward the left. Fig. 3 is a vertical sectional view of a vertical twin pump, illustrating a modification in the mode of securing the adjusting ring or collar to the auxiliary or bridging cylinder and in the means for limiting the lift of the valves. Fig. 4 is a section on line *y y* of Fig. 3. Fig. 5 is a fragmentary vertical sectional view illustrating a further modification in the mode of securing the adjusting ring or collar to the auxiliary or bridging cylinder. Fig. 6 is a sectional side elevation of a horizontal twin pump such as shown in Figs. 1 and 2, illustrating a modification in the means for adjusting the ram auxiliary or bridging cylinder in packing the ram. Fig. 7 is an elevation, and Fig. 8 a vertical section, of a vertical single-acting pump having my improvements applied.

Similar symbols of reference indicate like parts wherever such may occur in the figures of drawings above described.

Referring more particularly to Figs. 1 and 2, in which I have shown a horizontal double-acting twin pump adapted to be operated from any suitable motor, as a steam-engine, (not shown,) the operative devices are contained within the same casing C, and the arrangement is such that the said casing can be and is preferably made of a single casting, so that the bolting together of a plurality of sections and the liability to leakage to which such a construction gives rise are avoided, while the construction is materially simplified and cheapened.

The casing C is provided with a suitable base *c* and with two horizontal cylindrical chambers C′ above the base, said chambers extending from end to end of the casing. The chambers C′ are open at one end, said open end being closed by a suitable cover c^2, whereby access is readily had to said chambers.

As more clearly shown in Fig. 2, the chambers C′ are not continuous, there being a hiatus in said chambers formed by an opening c^3 extending across the casing, so that ready access may be had to the auxiliary or bridging cylinder, for purposes hereinafter to be described. From the outer or right-hand end of the chambers C′ lead two passages or ducts *d d*, that open into the chambers c^{31} for the inlet and outlet valves V and V′, respectively, for the pumps. From the opposite ends of the chambers C′ like passages or ducts *d′* lead to chambers c^4 for a second set of inlet and outlet valves V^2 V^3, respectively, c^5 being the inlet-chamber, having inlet branch b^5, and c^6 the outlet-chamber, having outlet branch b^6, said outlet-chamber being open at its upper end to afford ready access to the valves for any purpose, but normally closed by a suitable cover L.

Within the cylindrical chamber C′, to the left of the hiatus therein, is formed an annular flange or abutment *f*, that serves as a seat for a packing-gland or bushing *g*, in which the piston or ram R works. The stem of the piston or ram R extends through a suitable stuffing-box or packing-gland *g′* in the end wall of chamber C′, and said ram divides the said chamber into two chambers 2 and 3, re-

spectively. The space 4 between the ram R and the wall of chamber C′ at the right of the bushing *g* and the left of the hiatus or opening c^3 is filled with a suitable packing, (not shown,) said packing being suitably condensed and held in the annular packing-space 4 by means of an open-ended auxiliary or bridging cylinder C^2, that also serves as a guide-bearing for the piston or ram R and as a means to complete the continuity of the chamber C′—that is, to bridge the hiatus therein.

As shown in Fig. 1, the rear or left-hand end of the auxiliary cylinder C^2 fits the ram R snugly, while the outer or right-hand end of said cylinder is of slightly-greater diameter than that of said ram.

The auxiliary cylinder C^2 has a peripheral groove, in which is seated a ring r^2, that serves as a retaining device for an adjusting ring or collar R′ formed in two sections or consisting of two rings or collars $r\ r'$, having their inner periphery suitably recessed to fit the ring r^2, the collar-sections $r\ r'$ being firmly bolted together by means of bolts and nuts *b*, Fig. 2, and are provided with bolt-holes for adjusting-bolts B, that screw into the casing and by means of which the auxiliary cylinder C^2 is moved endwise to condense the packing in the space 4.

The inner wall of the duct or passage *d* is undercut or recessed for a packing-gland or bushing g^2 for the outer end of the cylinder C^2, said bushing being securely bolted to the aforesaid inner wall, as clearly shown in Fig. 1.

By the described construction ready access is had to the adjusting-bolts B at any time without interfering with the operation of the pump, and by the use of the auxiliary or bridging cylinder C^2 a fluid-tight joint is readily obtained between the chambers 2 and 3. Furthermore, it will be seen that the ram does not work in contact with the chamber-walls, but only in contact with the bushing *g*, the rear portion of cylinder C^2, and the packing in space 4, which latter can be readily condensed or tightened at any time until worn to such an extent as to require renewal, while the repacking can be readily effected by moving cylinder C^2 out of the packing-chamber 4 without removing cover c^2.

It will be seen from what has been said and from an inspection of the drawings that the labor of boring out and truing a long cylinder is here altogether dispensed with, the only parts requiring exactitude in construction being the bush *g* and a comparatively small portion of the auxiliary cylinder C^2.

Inasmuch as the wear is exclusively sustained by the packing, the bushing *g*, and a comparatively small portion of the cylinder C^2, irrespective of any wear of the ram itself, these may be readily removed at a trifling expense when worn and new packing, bushing, and bridging-cylinder C^2 adapted to fit the ram substituted, said ram being also removable through the end of chamber C′, while through the opening c^3 in the casing C ready access is had to the rear end of said chamber for the replacing of the packing.

The important advantages derived from the described construction will be readily understood by those conversant with pumping-engines in view of the fact that in power-engines of this description the ram works generally at a speed of from eighty to one hundred feet a minute.

Instead of a two-part adjusting-collar R′ a solid collar R^2, Figs. 3 and 4, may be used and secured to cylinder C^2 by means of pins *p* seating in a tangential groove c^8 in the collar R^2 and in a peripheral groove c^9 of cylinder C^2. On the other hand, the cylinder C^2 may have an external screw-threaded portion c^{12}, onto which is screwed an internally-screw-threaded collar R^3, as shown in Fig. 5. In the last-named construction the cylinder C^2 is preferably provided at its outer end with interior projections or notches c^{14}, so as to afford a suitable hold to prevent said cylinder from revolving in screwing on the collar R^3.

Instead of imparting endwise motion to the bridging-cylinder C^2 for condensing or tightening the packing in space 4, as described, the appliances shown in Fig. 6 may be used, the cylinder C^2 being provided at its outer end with a central interiorly-threaded hub c^9 for a screw S, that has bearing in the cover c^2 for the open end of chamber C′, the screw being revolved in one or the other direction by any suitable tool, as a key or spanner, applied to its squared outer end.

My improved inlet and outlet valves are constructed and arranged as follows: The partition between the chambers c^4 and c^{31} and the chambers c^5 and c^6 have openings for valve-seats, 5 indicating the seat for the inlet-valves, it being of substantially tubular form, closed at its seat end and having ports 6 formed in said closed portion. The valve-seat is further provided with an axial hollow hub 7 projecting the required distance above its seat-face, on which hub the inlet-valve V is mounted so as to have free motion thereon, said valve consisting of a disk or ring *v*, united to a hub *v′* by radial arms v^2. From the under side of the disk *v* project pins v^3, which are preferably made of increasing diameter outwardly, so as to better retain the valve-packing v^4, of any well-known material, preferably rubber.

The outlet-valve V′ is of substantially the same construction as the inlet-valve, except in the following particulars: By preference I use a bushing b^5 for the valve-seat 5^a, while the hub 7^a thereof projects both upwardly and downwardly, the downwardly-projecting portion being of sufficient length to seat on the upwardly-projecting portion of the hub 7 of inlet-valve seat. The lower end of the aforesaid downwardly-projecting part of the hub 7^a of the outlet-valve seat is enlarged, as shown at 7^b, to form an abutment that serves

to limit the lift of the inlet-valve V, as clearly shown.

On the under side of the cover L for the outlet-chamber c^6 is formed or secured an abutment A for each outlet-valve V' V^3, which abutment consists of a socketed cylinder, which may be filled with a more or less elastic material that bears upon the upwardly-projecting portion of hub 7^a of the outlet-valve seat when the cover L is bolted down to limit the lift of the valves V' V^3, and thus allow for the thickness of the packing when used between said cover L and the facing of the outlet-chamber c^6. The same result may be obtained by fitting an inverted thimble a^2 in the socket of abutment A, so as to slide freely therein, said thimble containing a coiled spring a^3, having bearing on the bottom of the thimble and on the under side of the cover L or in a recess a^4 therein. The thimble a^2 has a longitudinal groove a^5, into which extends a screw a^6, that prevents said thimble from dropping out when the cover L is removed and applied.

As shown, the closed end of the thimble a^2 seats on the upper end of hub 7^a of the inlet-valve seat, the spring a^3 being sufficiently strong to hold said thimble in contact with the hub 7^a, while said spring will yield sufficiently to compensate for the thickness of packing that may be interposed between said cover and the facing of the outlet-chamber. The described construction and relative arrangement of valves is clearly shown in Fig. 1.

In Figs. 3 and 5 I have shown my improvements applied to a vertical twin pump, the lift of the valves being in this construction limited by an abutment in the form of an arm A' projecting from the covers or lids L' L^2, that close the opening through which access is had to the said valves, the construction of the arm being more clearly shown in Fig. 8. The construction or form of the pump-casing, Fig. 3, is altered to suit the altered conditions. b^5 indicates one of the inlet-passages in communication with both inlet-valves V V^2. The chamber C', bridging-cylinder C^2, and ram R are arranged relatively to each other, as above described, said ram dividing the chamber C' into two chambers 2 and 3. Above the inlet-valves are arranged their respective outlet-valves V' V^3, and b^6 b^{16} are the outlet branches. However, instead of two outlet branches but one may be used, preferably the one, b^{16}, on the left of Fig. 3, and the water coming from outlet-valve port on the right forced thereto through a diagonal pipe P, as shown partly in dotted and partly in full lines in said Fig. 3.

In Figs. 7 and 8 I have shown my invention in its application to vertical single-acting pumps, the ram R being, as usual, hollow and provided with an outlet-valve V', of substantially the construction above described, except that it is here mounted on the rod D of the ram, the lift of the valve being limited by a collar *d* on said rod. V indicates the inlet-valve, *o* the opening in the pump-cylinder through which access is had to said valve, and L^3 the cover for said opening, provided with the abutment-arm A' hereinbefore referred to, which arm bears on the upper end of the hub 7 of the seat 5 for said inlet-valve. In these figures (7 and 8) the same symbols of reference are used as in the preceding figures to indicate like or equivalent parts, the chamber 2^a being the inlet-chamber and chamber 3^a the outlet-chamber. The operation of the double-acting or single-acting pumps need hardly be described, as it will be readily understood by any one at all acquainted with pumping-engines, especially in view of the full description of the construction and relative arrangement of the operative devices.

In respect of Figs. 1, 2, 3, 5, and 6, I have described my invention in its application to horizontal and vertical twin pumps. It will, however, be understood that I do not limit myself to this construction, as it is obvious that my said invention is equally as applicable to single pumps, whether horizontal or vertical, double or single acting.

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

1. In a pump, the combination with the ram or piston cylinder having its continuity interrupted by a hiatus, an auxiliary cylinder bridging the said hiatus and having endwise motion in the ram-cylinder, and means operated from the outside of the pump for imparting endwise motion to said auxiliary cylinder; of a ram or piston working in the cylinders, for the purpose set forth.

2. In a pump, the combination with the ram or piston cylinder, having its continuity interrupted by a hiatus, a ram or piston of less diameter than its cylinder, a bearing for said ram within the cylinder at a suitable distance from the hiatus, whereby an annular packing-space open at one end is formed between the ram or piston and its cylinder, of an auxiliary cylinder in which the ram or piston has bearing, said auxiliary cylinder adapted to bridge the aforesaid hiatus and having endwise motion to and from the packing-space, and means adapted to be operated from the outside of the pump-casing for imparting such endwise motion to the auxiliary or bridging cylinder, for the purpose set forth.

3. In a pump, the combination with the ram or piston cylinder having its continuity interrupted by a hiatus, and provided with an interior circular bearing some distance from said hiatus, whereby an annular packing-space is formed of a height equal to the thickness of said annular bearing, and an endwise-movable auxiliary cylinder fitting into said ram or piston cylinder and bridging the hiatus therein, of a ram or piston having bearing in the main and auxiliary cylinders and dividing the said main cylinder into two chambers, valved passages leading from said

chambers and means reached through the space around the bridging-cylinder for imparting endwise motion to the last-named cylinder, for the purpose set forth.

4. In a pump, the combination with the casing provided with a transverse aperture and a cylindrical chamber of less diameter than said aperture on opposite sides thereof and opening into the same, said chamber on one side of the aperture provided with a bushing, whereby an annular packing-space is formed of a height equal to the thickness of the bushing, valved passages leading from the outer ends of said chambers, an auxiliary cylinder fitting into said chambers and bridging the hiatus therein, said auxiliary or bridging cylinder provided with a collar, and adjusting screw-bolts passing through said collar and screwing into one of the end walls of the transverse aperture whereby access can be had to the adjusting-bolts through said apertures, and endwise motion imparted to the auxiliary cylinder toward and from the aforesaid bushing, of a ram or piston adapted to reciprocate in said bushing and auxiliary cylinder, for the purpose set forth.

5. In a pump the combination with the ram or piston cylinder having its continuity interrupted by a hiatus, an auxiliary cylinder bridging the said hiatus and having endwise motion in said ram-cylinder; of means for imparting such endwise motion, comprising a collar on the auxiliary cylinder and bolts working in said collar and in one of the end walls of the ram-cylinder, said devices accessible through the hiatus in the last-named cylinder.

6. The casing C provided with a transverse aperture c^3 and the ram or piston chambers 2 and 3 intersecting said aperture, said chamber 2 provided with a circular rib f, a bushing g seated on said rib, the valved passages d and d' leading from chambers 2 and 3 respectively, and the auxiliary cylinder C^2 fitting into said chambers and bridging the hiatus therein, and a collar on said auxiliary cylinder within the aperture c^3, of a ram adapted to reciprocate in the aforesaid bushing and auxiliary cylinder, and adjusting-bolts B passing through the collar and screwing into one of the end walls of the transverse aperture, whereby the auxiliary cylinder can be moved toward and from the bushing, substantially as and for the purpose set forth.

7. A pump comprising a casing provided with a transverse aperture, a ram or piston chamber intersecting said aperture and provided with an internal annular seat-flange, two valve-chambers having seats for inlet and outlet valves, passages leading from opposite ends of the ram or piston chamber to the inlet side of said valve-chambers, an inlet branch in communication with the aforesaid passages, and an outlet branch in communication with the outlet sides of the valve-chambers, in combination with a bushing seated in the annular flange in the ram or piston chamber, an auxiliary cylinder fitting into said chamber and adapted to move toward and from the aforesaid bushing, means operated through the transverse aperture in the pump-casing for imparting motion to said auxiliary cylinder, and a ram or piston adapted to reciprocate in such bushing and in the auxiliary cylinder, said ram or piston separating the passages leading to the valve-chambers from each other, substantially as and for the purpose set forth.

8. A pump, comprising a casing provided with a transverse aperture, a ram or piston chamber open at one end intersecting said aperture and provided with an internal bearing, a cover for closing the open end of said chamber, and a valved passage leading from each end of said chamber, in combination with an auxiliary cylinder fitting into the ram or piston chamber and bridging the hiatus therein, means for moving said cylinder toward and from the internal bearing in said chamber adapted to be operated from without the pump, and a ram or piston working in said bearing and in the auxiliary cylinder, substantially as and for the purpose set forth.

9. In a pump, superposed valve-seats, the lower seat provided with a hub projecting upwardly and axially from the seat-face, the upper seat provided with a like hub and with a downwardly-extending stem of greater diameter than and having bearing on the upper end of the hub of the lower valve-seat, a resilient abutment having bearing on the outer end of the upwardly-projecting hub of said upper valve-seat, and a fixed abutment encompassing said resilient abutment, in combination with a valve for and loosely mounted on the upwardly-projecting portion of the hub of each seat whereby the downwardly-projecting stem on the upper valve-seat serves to limit the lift of the lower valve and the aforesaid fixed abutment that of the upper valve, substantially as and for the purpose set forth.

10. In a pump, superposed valve-seats, the lower seat provided with a hub projecting upwardly and axially from the seat-face, the upper seat provided with a like hub and with a downwardly-extending stem of greater diameter than and having bearing on the upper end of the hub of the lower valve-seat, a removable resilient abutment having bearing on the outer end of the upwardly-projecting hub of said upper valve-seat, and a fixed abutment encompassing said resilient abutment, in combination with a valve for and loosely mounted on the upwardly-projecting portion of the hub of each seat, whereby the downwardly-projecting stem on the upper valve-seat serves to limit the lift of the lower valve and the aforesaid fixed abutment that of the upper valve, substantially as and for the purpose set forth.

11. A pump provided with superposed bear-

ings, a valve-seat for and removably seated in each bearing, the lower valve-seat provided with an upwardly-projecting axial hub, the upper seat provided with a like hub and with a downwardly-projecting stem of greater diameter than and having bearing on the end of the lower valve-seat hub, and a removable resilient abutment having bearing on the upward extension of the upper valve-seat hub, in combination with a valve for and loosely mounted on the upward extension of the hub of each seat, substantially as and for the purpose set forth.

12. In a pump, the combination with the valve-chamber open at top, a valve-seat in said chamber provided with a hub projecting axially therefrom, and a valve loosely mounted on said hub, of a cover for the chamber, a resilient abutment having bearing on the end of the valve-seat hub, and a fixed abutment encompassing the said resilient abutment adapted to limit the lift of the valve, said abutments connected with the cover, for the purpose set forth.

13. In a pump, the combination with the valve-chamber open at top, a valve-seat in said chamber provided with a hub projecting axially therefrom, and a valve loosely mounted on said hub, in combination with the valve-chamber cover having a socketed projection, a thimble having sliding motion in the socket of the projection and bearing on the valve-seat hub, and a coiled spring within the thimble having bearing on the closed end thereof and on the cover respectively, and adapted to hold said thimble in contact with the valve-seat hub, for the purposes set forth.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

FRANK PEARN.

Witnesses:

PETER J. LINSEY,

WILLIAM FAULKNER.