

J. M. STRATTON.
DOUBLE ACTING HORIZONTAL POWER PUMP.
APPLICATION FILED DEC. 2, 1909.

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Patented Dec. 13, 1910.

3 SHEETS-SHEET 1.

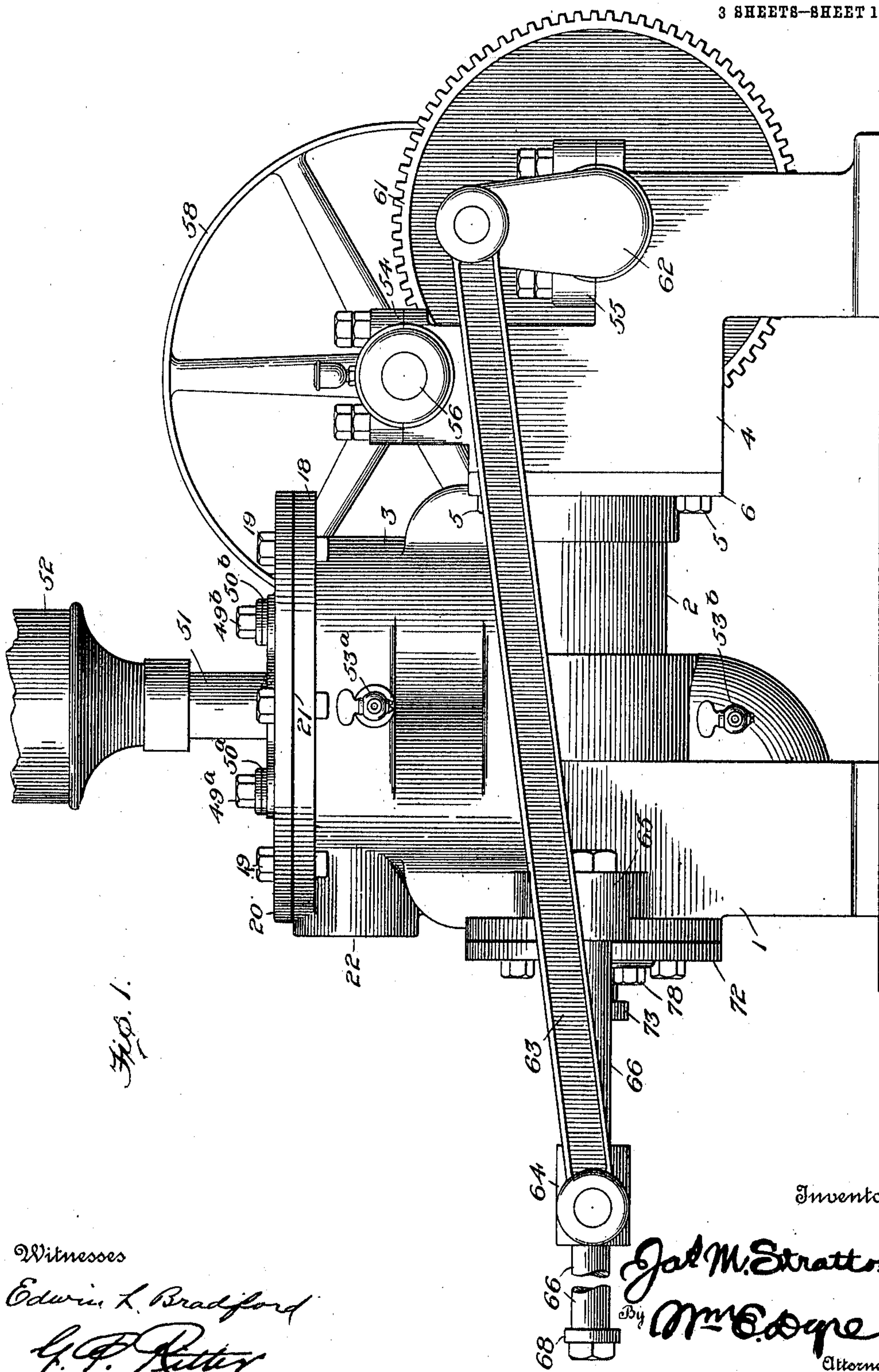


Fig. 1.

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3 SHEETS--SHEET 2.



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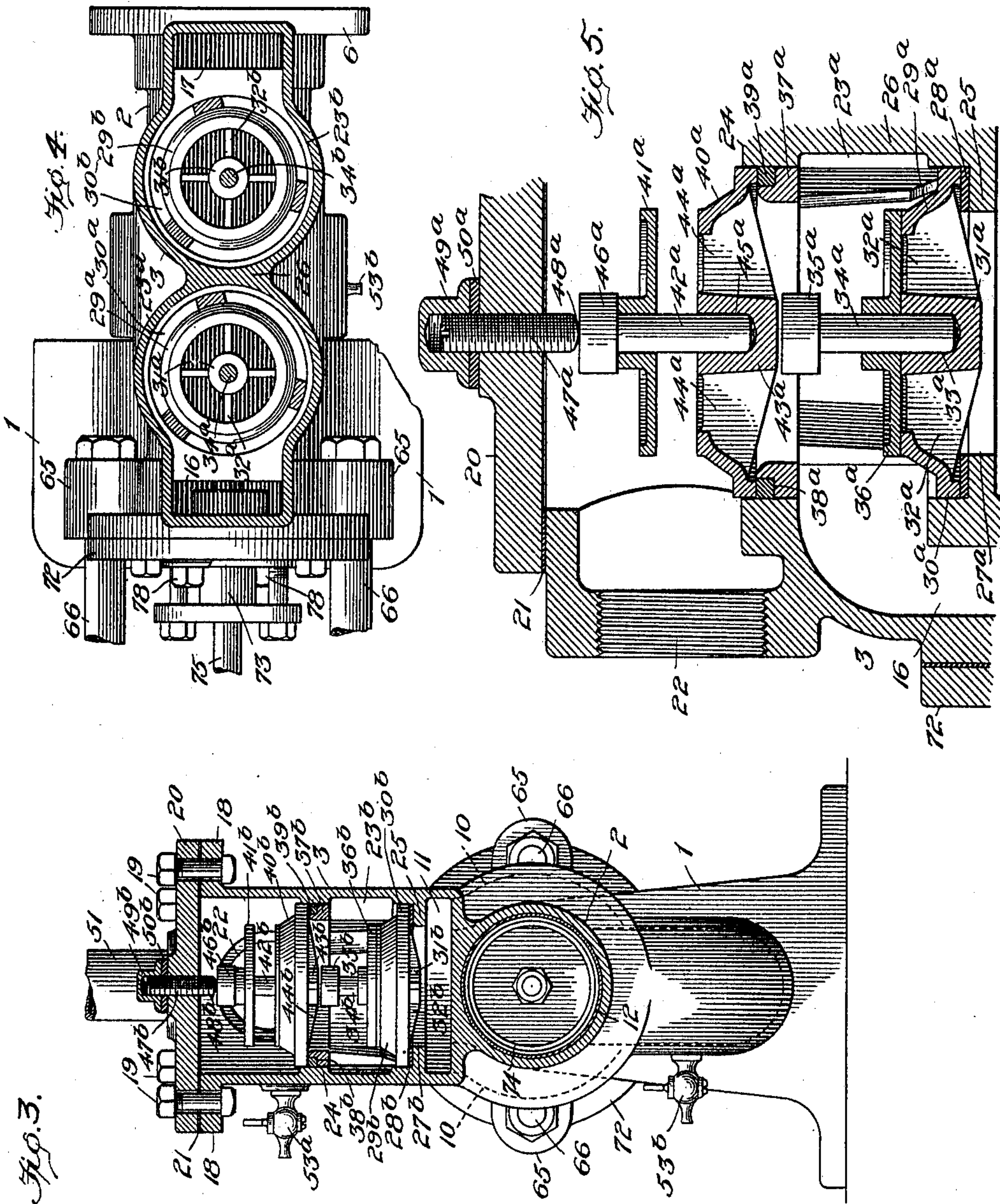
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UNITED STATES PATENT OFFICE.

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DOUBLE-ACTING HORIZONTAL POWER-PUMP.

978,673.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, JAMES M. STRATTON, a citizen of the United States, residing at Salem, in the county of Columbiana and State of Ohio, have invented certain new and useful Improvements in Double-Acting Horizontal Power-Pumps; 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.

My invention in its broadest sense relates to pumps, but has reference more particularly to horizontally arranged double acting power pumps and to the valve mechanism contained therein.

It is designed, arranged and adapted for all uses in connection with which pumps of this class are ordinarily employed such, for example, as feeding boilers, supplying tank devices, irrigating and sprinkling purposes, and water supplies in general.

It has among other objects that of structural simplification, an increase in general efficiency, a decrease in the cost of construction and maintenance, and a more advantageous distribution of strains than heretofore known in similar structures.

The invention will be hereinafter described and particularly pointed out in the claims following.

In the accompanying drawings which form part of this application for Letters Patent, and whereon like characters refer to corresponding parts in the several views: Figure 1 is a side elevation of my invention, the superimposed air chamber being broken away for economy of space upon the sheet. Fig. 2 is a longitudinal central section through the invention, showing an instroke of the piston half completed. Fig. 3 is a transverse vertical section on the line 4—4 Fig. 2, showing in full lines one suction and one discharge valve, the latter open. Fig. 4 is a horizontal section on the line 5—5 of Fig. 2, with discharge valves removed, and, Fig. 5 is a relatively enlarged vertical central section of one valve case, suction and discharge valves, valve-seats, valve-guides, and pressure screw.

Reference being had to the drawings and numerals thereon, 1 indicates the main casting or pump-bed having formed integral therewith the superimposed pump cylinder

2, and valve case 3. The numeral 4 indicates an independently removable secondary casting of skeleton form constituting a part of the pump frame, and serving as a support for the rear end of the pump structure to which it is secured by suitable bolts 5 passing through abutting flanges 6, 7 upon said main and secondary castings, respectively.

Near the base of pump-bed 1 is the supply inlet 8, threaded as shown by Fig. 3, to receive a suitable supply or suction pipe (not shown) and opening directly into a hollow water-way 9, which latter in turn communicates with a supply duct 10 practically surrounding pump cylinder 2. Immediately above said cylinder 2 and in direct communication with the duct 10 aforesaid is a horizontal supply chamber 11 of an area materially greater than that of the duct 10 and of a length approximately corresponding with that of the pump cylinder.

The cylinder 2 is provided with a close fitting removable cylinder-liner 12 of non-corrodible material, is flanged at one end as at 13, and flanked at both ends by front and back circular chambers 14, 15 having up-rising ports 16, 17, respectively, as best shown by Fig. 2. Surmounting the pump cylinder 2, as an integral part preferably of the main casting 1, is the valve-case 3 aforesaid surrounded by a horizontal top flange 18, to which is bolted, as at 19, a single cover 20 having an interposed packing 21, also retained by agency of the said bolts. This case above its valve line is provided with an outlet or discharge port 22 adapted to receive a discharge pipe (common to such structures and therefore not shown), and is further provided with companion valve-chambers 23^a, 23^b both machined vertically through the floor 24 of said valve-case 3, and consisting of cylindrical openings, uniform in size from top to bottom and shoulder faced at 25. The said valve-chambers 23^a and 23^b formed substantially as above stated, are independent of each other being separated by the vertical partition wall 26 and into each of them leads one of the ports 16, 17. These chambers will be hereinafter referred to as front and back valve-chambers, and, together with their valves, will be distinguished by the exponents *a* and *b*, respectively. Within the valve-chambers 23^a and 23^b are located suction and discharge

valves arranged in superimposed pairs, the two sets being exact duplicates, so that a description of one will suffice for both sets.

At the base of each valve-chamber 23^a and 23^b there are inlet ports 27^a and 27^b, surrounded by the shoulders 25, which ports communicate directly with the horizontal supply chamber 11 aforesaid. Upon both shoulders 25 rest annular packing rings 28^a, 28^b and upon these in turn rest the pump valves which will now be particularly described, selecting for the purpose those located in the front valve-chamber 23^a as an exemplification of both sets.

Valve-seat 29^a of skeleton form has a shouldered and radially projected annular base 30^a the periphery whereof fits snugly within the walls of the front valve-chamber 23^a, it also has a central hub 31^a supported by radial arms 32^a, whereby it is connected with said base 30^a below the plane of the upper surface or valve-seat proper, and, as best shown in section by Fig. 5, the said hub is drilled part way through from above thus forming a vertical pocket 33^a as the support for a valve-stem 34^a the latter having an enlarged head 35^a. Upon the stem 34^a is centrally impaled a vertically movable suction valve 36^a, also, by preference, of circular form having a ground under-surface to mate with the upper surface of the valve-seat 29^a aforesaid, and adapted to be arrested in its upward movement by the said enlarged head 35^a.

Surmounting the valve seat 29^a is a valve seat-retaining tripod 37^a, also of skeleton form, the depending legs whereof rest firmly upon the shouldered surface of valve seat 29^a to hold the latter down, and the upper annular body whereof is shouldered circumferentially upon its outer edge, as at 38^a, to receive a packing ring 39^a thus snugly retained in an annular pocket formed by the inner wall of the valve-chamber 23^a and the outer shouldered periphery of the annular body portion of the valve-seat-retainer 37^a.

Directly upon the packing ring 39^a rests a discharge valve-seat 40^a, circular disk valve 41^a and valve-stem 42^a counterparts of the suction elements above described; said last named seat being of circular form to snugly fit the interior of valve-chamber 23^a, having a central hub 43^a, radial hub-supporting arms 44^a, central pocket 45^a, the said valve-stem 42^a being supported in the said pocket and also having an enlarged upper end 46^a for limiting the upward movement of this valve. Still above the parts last described and in vertical alinement with valve-stems 34^a and 42^a is a pressure screw 47^a threaded through and consequently adjustable in cover 20, bearing directly with its rounded lower end 48^a upon the enlarged head 46^a of valve-stem 42^a for the purpose of firmly

retaining said stem and cooperating parts in operative position; while, as best shown by Figs. 2 and 5, there is threaded upon the upper protruding end of pressure screw 47^a a cap-nut serving also as a jam-nut 49^a suitably packed by an underlying washer 50^a.

Tapped into the cover 20 centrally as shown between cap-nuts 49^a and 49^b, or at any convenient point, is a coupling 51 for establishing communication between the interior of valve-case 3 and a superimposed air chamber 52 of ordinary construction. While as may be seen by reference to Figs. 1 and 3 valve-case 3 at a point immediately above the plane of the discharge valve-seats 40^a and 40^b is provided with a side drain cock 53^a, a similar cock 53^b being tapped into the main casting or pump-bed 1 at a point below cylinder 2, and consequently below the plane of the suction valves 36^a, 36^b as usual with this class of pumps.

The secondary casting 4 forming the detachable rear part of the supporting structure is practically hollow, and upon opposite sides of its longitudinal center is provided with double shaft-bearings 54, 54 and 55, 55, suitably babbitted, and having removable covers bolted in place as shown. Within these bearings 54 and 55 are located driving and driven shafts 56 and 57 respectively, the former 56 in a plane above and somewhat in advance of the latter, and the latter 57 being in a plane coincident with the longitudinal center of the water cylinder 2. Upon the projecting end of power or driving shaft 56 are fast and loose pulleys 58, 59, by agency whereof power from any source (not shown) may be applied. Upon this same shaft also at a point intermediate of its two bearings 54, 54 a spur gear or driving pinion 60 is affixed, same being constantly in mesh with a gear wheel 61 similarly situated upon the driven shaft 57 between bearings 55, 55 in the longitudinal center of the structure. The projecting ends of the driven shaft 57 are provided with oppositely disposed cranks 62 to each of which is pivotally connected a forwardly extending side pitman rod 63, which rods projecting beyond the front end of the cylinder 2 are pivotally connected to a cross head 64.

Bolted to lugs 65 projecting laterally from opposite sides of the main casting 1, and in the same horizontal plane with that of the center of the water cylinder 2, are two forwardly projecting parallel guides 66, 66. Upon these guide rods 66 the cross head 64 is mounted and adapted to reciprocate horizontally, while the outer extremities of said rods are connected by a cross bar 68 bolted in place and serving the purpose of a space bar.

At its rear end the main casting 1 is broken by an opening 69 concentric with relation to the bore of the cylinder 2 for the

admission of a boring bar (not shown) during the operation of machining said cylinder. This opening is closed by a suitably packed head 70 bolted at frequent intervals as at 71 to the main casting 1 around the said opening 69. At the opposite or front end, cylinder 2 is closed by an ordinary cylinder head 72 properly bolted in place, and provided with an outside central and suitably packed stuffing box 73, as shown by Figs. 1 and 2.

Within the pump cylinder 2 is a piston 74 provided with double cup-leather packing, or any other suitable form, rigidly secured to the pump piston-rod or plunger 75, which latter, projecting through the stuffing box 73, is securely affixed in a central boss 76 on the cross-head 64 with which as a consequence it is adapted to reciprocate. Passing through cylinder head 72 at points diametrically opposite are set screws 77 covered by cap-nuts 78 similar to the screws and nuts 47^a, 49^a, 47^b, 49^b, hereinbefore described, the screws 77 bearing upon flange 13 of the cylinder liner 12 for holding the latter accurately in place.

The foregoing being a description of my invention in its preferred form of construction its use and operation may now be briefly set forth as follows: Referring to the drawings it will be quite obvious that power applied to pulley 58 drives pinion 60 in one direction the power being transmitted directly to gear 61, driven shaft 57, end cranks 62 thereon, and pitman rods 63 upon opposite sides of the pump cylinder. Thus it will also be observed that cross-head 64 is reciprocated in both directions upon the fixed guide rods 66, 66 carrying with it the protruding end of piston rod 75 to the inner end whereof is affixed the piston 74.

Referring more especially to Fig. 2 of the drawings it will now be considered that piston rod 75 is moving in the direction indicated by an arrow thereon, the inthrust of piston 74 having been half completed. During the said movement water or other fluid is drawn from the source of supply through horizontal chamber 11, port 27^a, suction valve 36^a as indicated by dotted arrows, via port 16 into the front end of the pump-cylinder 2. At the same time the water or other fluid in front of piston 74 is forced as indicated by full line arrows from the rear end of cylinder 2 via uprising port 17, to valve-chamber 23^b, through discharge valve 41^b, to the interior of valve-case 3, and thence from the pump by way of outlet or discharge port 22 to its point of utilization. During each reverse stroke of piston 74 the operation described is exactly reversed, the two sets of valves in chambers 23^a and 23^b alternating in their action, and the two valves of each set likewise alternating one invariably being closed when the other is open.

In the manner stated the pumping opera-

tion may be continued indefinitely, and while designed primarily for use as a double acting pump it is quite obvious that the principle disclosed is equally applicable to one of the single acting type; and moreover, that various structural changes, and modifications in the arrangement, combination and proportion of parts employed may be made and substituted for those shown and described without in the least departing from the spirit of the invention. It should also be particularly noted that the independent structural arrangement of the main and secondary cast frames 1 and 4, makes it possible, by merely withdrawing bolts 5 and disconnecting the pitman 63, to bodily remove the driving mechanism from the pumping mechanism without the necessity of cutting off the fluid supply. This for the purpose of repairs, or for change of gears to meet the constantly recurring speed and power conditions has been found in practice to be a matter of great importance. When, however, these main and secondary supporting frame members 1 and 4 are assembled as shown, the driven gear 61, like plunger 75, occupies a position coincident with the longitudinal center of the pump-cylinder 2, and the entire structure is balanced by the oppositely disposed side pitmen 63, 63 the more effectually to distribute all strains when pumping at high pressure. It will also be observed that the length of said pitmen, overreaching practically the entire structure as shown, reduces to a minimum the liability of stopping the driving mechanism upon a dead center. And for purposes of clearness in the claims to follow it will be understood that the term pumping mechanism relates to all of the necessary pumping parts of the present invention, which same are supported upon and carried by the main frame 1; and that in like manner the term driving mechanism applies to all necessary rotary elements supported upon and carried by the secondary frame 4.

Having thus described the preferred form of my invention, what I now claim and desire to secure by Letters Patent is:

1. In a valve action for pumps the combination with a suitably ported valve-chamber, of suction and discharge valves and valve-seats within said chamber, a peripheral flange upon each of said seats, and an independent valve-seat-retainer interposed between said flanges whereby they are properly spaced and retained in their relative operative positions, substantially as described.

2. In a valve action for pumps the combination with a suitably ported valve-chamber, of suction and discharge valves and removable valve-seats within said chamber, a peripheral flange at the base of each of said seats, and an independent valve-seat-re-

tainer interposed between said flanges whereby they are properly spaced and retained in their relative operative positions, substantially as described.

5 3. In a valve action for pumps the combination with a suitably ported valve-chamber having an interior supporting shoulder, of suction and discharge valves and removable valve seats supported by said shoulder, a
10 peripheral flange at the base of each of said seats, and an independent valve-seat-retainer interposed between said flanges whereby they are properly spaced and retained in their relative operative positions, substantially
15 tially as described.

4. In a valve action for pumps the combination with a suitably ported valve-chamber, of suction and discharge valves and valve seats within said chamber, a peripheral
20 flange at the base of each of said seats, an upwardly converging body forming part of said valve-seats, a valve stem rising from each seat, and an independent valve-seat-retainer interposed between the said flanges
25 upon the valve seats whereby they are properly spaced and retained in their relative operative positions, substantially as described.

5. In a valve action for pumps the combination with a suitably ported valve-chamber, of suction and discharge valves and valve seats within said chamber, a peripheral
30 flange at the base of each of said seats, an upwardly converging body forming part of said valve seats, a central hub secured to said body by radial webs, a valve stem rising from each of said hubs, and an independent valve-seat retainer interposed between said flanges whereby they are properly
35 spaced and retained in their relative operative positions, substantially as described.

6. In a valve action for pumps the combination with a suitably ported valve chamber, of suction and discharge valves and
45 valve seats within said chamber, a peripheral flange at the base of each of said seats, an upwardly converging body forming part of said valve seats, a central hub secured to said body by radial webs, a pocket in each
50 of said hubs, a valve stem supported in each pocket, and a valve-seat-retainer interposed between said flanges whereby they are properly spaced and retained in their relative operative positions, substantially as described.
55

7. In a valve action for pumps the combination

with a suitably ported valve chamber, of suction and discharge valves and valve seats within said chamber, a peripheral
60 flange at the base of each of said seats, an upwardly converging body forming part of said valve seats, a central hub secured to said body by radial webs, a pocket in each of said hubs, a valve stem supported in each
65 of said pockets having an enlarged head, and a valve-seat-retainer having an annular top interposed between said flanges whereby they are properly spaced and retained in their relative operative positions, substantially as described. 70

8. In a valve action for pumps the combination with a suitably ported valve chamber, of suction and discharge valves and valve seats within said chamber, a peripheral
75 flange at the base of each of said seats, and a valve-seat-retainer of tripod form interposed between said flanges whereby they are properly spaced and retained in their relative operative positions, substantially as described. 80

9. In a valve action for pumps the combination with a suitably ported valve-chamber, of suction and discharge valves and valve seats within said chamber, a peripheral
85 flange at the base of each of said seats, a valve-seat-retainer having an annular recessed top, and a packing-ring carried by the annular top of said retainer interposed between the flanges of said valve seats whereby they are properly spaced and retained in
90 their relative operative positions, substantially as described.

10. In a valve action for pumps the combination with a suitably ported valve chamber, of suction and discharge valves, valve
95 seats and valve stems within said chamber, a peripheral flange at the base of each of said seats, a valve-seat-retainer having an annular top and depending legs interposed between said flanges, and a pressure screw
100 passing through the cover of said valve-chamber and bearing upon the top of the discharge valve stem to securely retain all parts in their relative operative positions, substantially as described. 105

In testimony whereof I affix my signature, in presence of two subscribing witnesses.

JAMES M. STRATTON.

Witnesses:

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W. G. BUTLER.