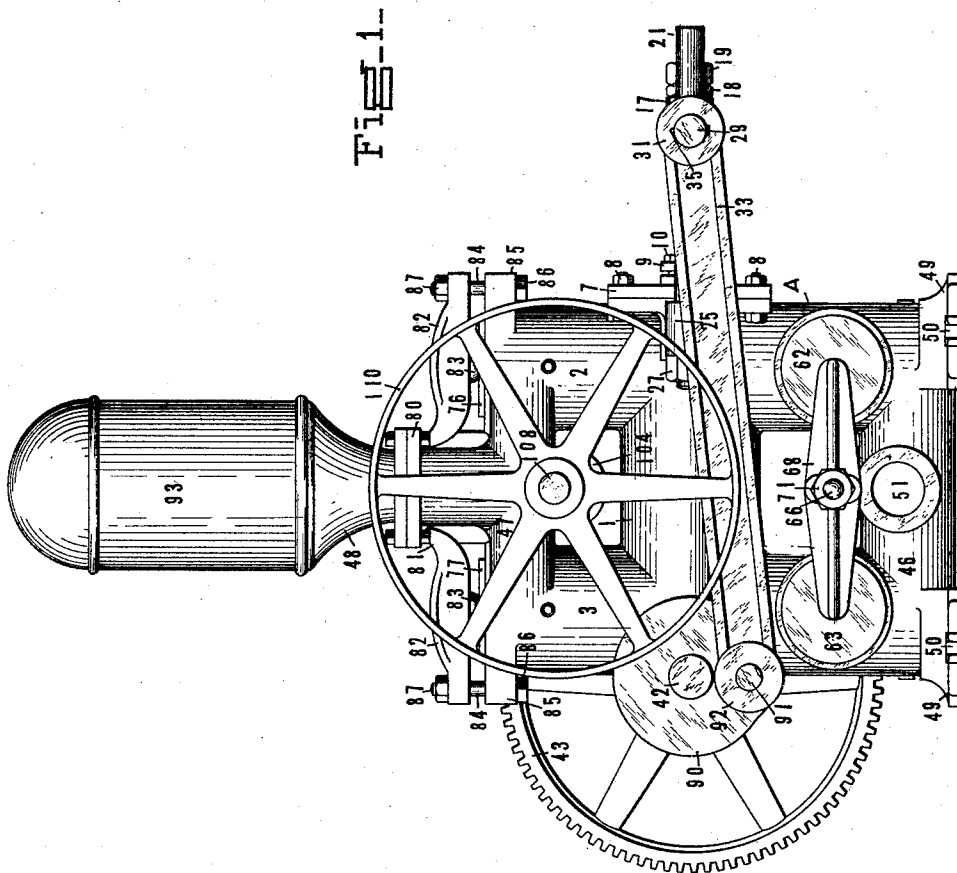


S. S. SMITH.
 DOUBLE ACTING COMPACT POWER PUMP.
 APPLICATION FILED APR. 6, 1910.

1,039,832.

Patented Oct. 1, 1912.
 5 SHEETS-SHEET 1.



WITNESSES:
Monroe J. Smith
Leonard A. Walcott

INVENTOR
S. S. Smith
 BY
Monroe J. Smith
 ATTORNEYS.

1,039,832.

5 SHEETS—SHEET 2.



Monterey
Leonard Watson

S. S. Smith.

BY
Dwight D. Phillips & Dwight D. Phillips
ATTORNEYS.

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5 SHEETS-SHEET 3.

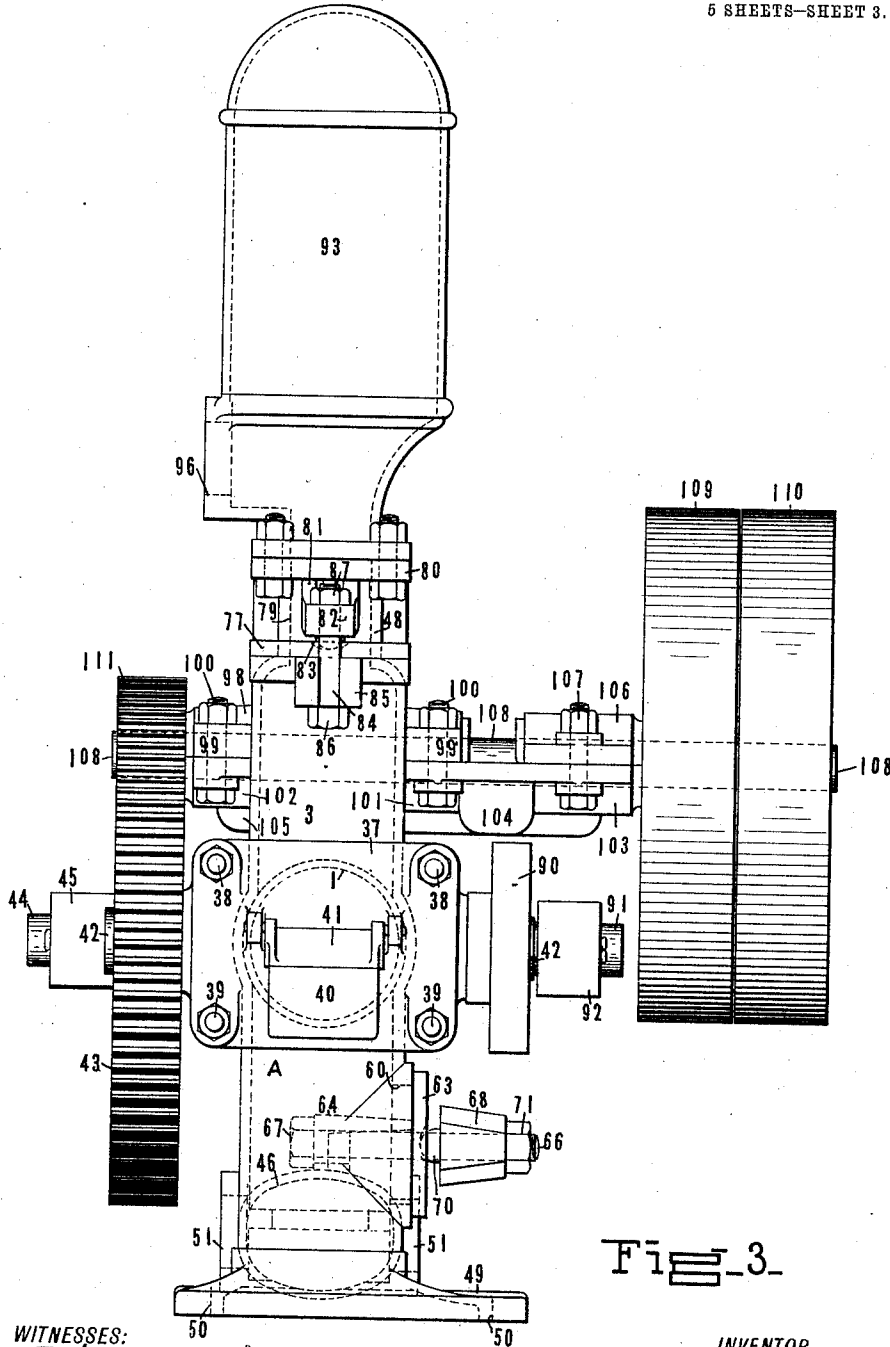


Fig-3-

WITNESSES:

Nov 11 1912
Leonard Waloon

INVENTOR

S. S. Smith

BY

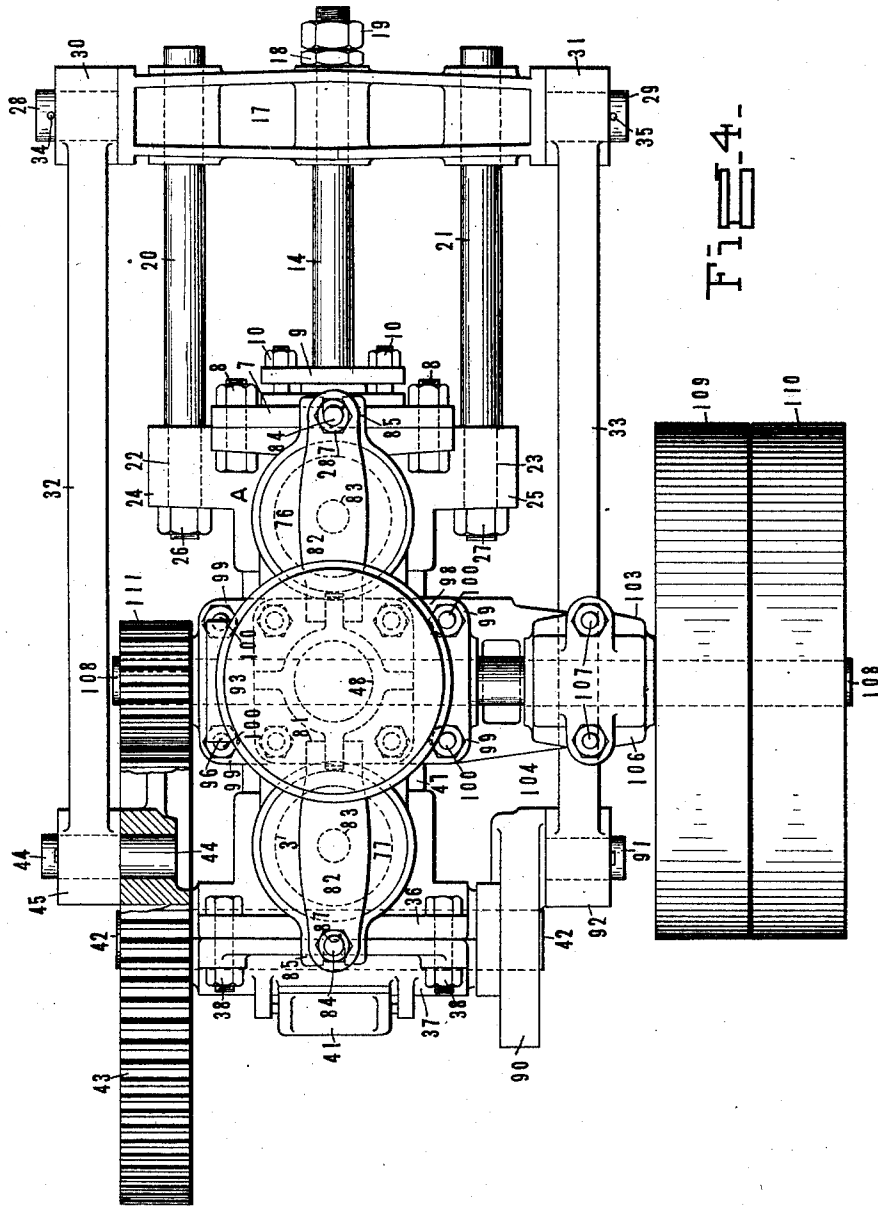
Ames, Coffey & Ames
ATTORNEYS.

S. S. SMITH.
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5 SHEETS—SHEET 4.



WITNESSES:
Monroe Perry
Leonard Watson

INVENTOR
S. S. Smith
BY
Dues, Chapin & Dues
ATTORNEYS.

S. S. SMITH.
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5 SHEETS—SHEET 5.

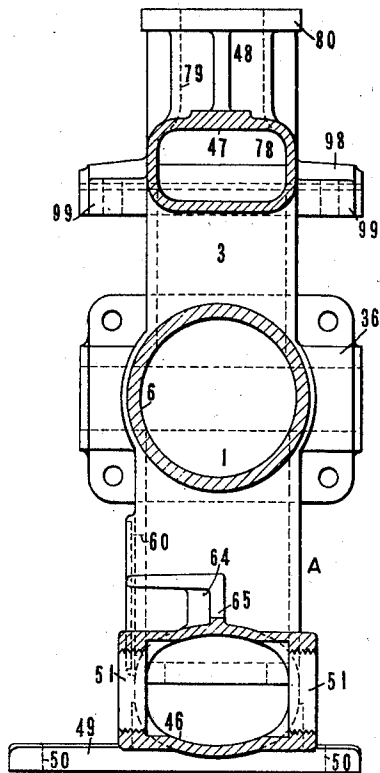


Fig. 5.

Fig. 6.

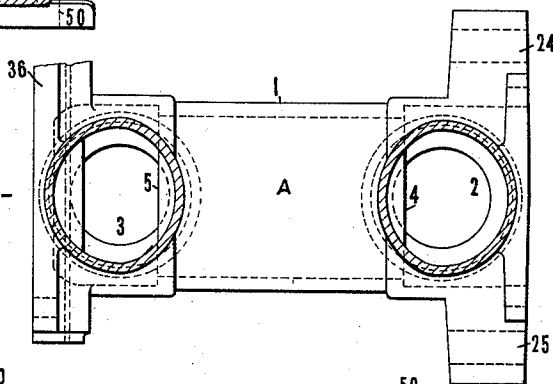
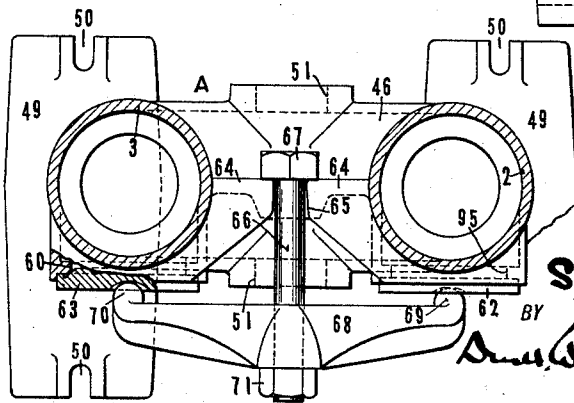


Fig. 7.



WITNESSES:
Donald Watson

INVENTOR

S. S. Smith

BY

Donald Watson
ATTORNEYS.

UNITED STATES PATENT OFFICE.

SIDNEY S. SMITH, OF SENECA FALLS, NEW YORK, ASSIGNOR TO THE GOULDS MANUFACTURING COMPANY, OF SENECA FALLS, NEW YORK, A CORPORATION OF NEW YORK.

DOUBLE-ACTING COMPACT POWER-PUMP.

1,039,832.

Specification of Letters Patent.

Patented Oct. 1, 1912.

Application filed April 6, 1910. Serial No. 553,748.

To all whom it may concern:

Be it known that I, SIDNEY S. SMITH, a citizen of the United States, residing at Seneca Falls, in the county of Seneca and State of New York, have invented certain new and useful Improvements in Double-Acting Compact Power-Pumps, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention deals with certain improvements in power pumps, but inasmuch as certain advantages characteristic of the same prominently appear in its more intense aspect as a double acting horizontal force-pump having a substantially unitary body casting, it will be conducive to clearness to fully disclose this invention through a detailed description of such embodiment.

One object within the contemplation of this invention is to render available a pump which is composed of very few separate parts and in which a single main casting embodies many elements which have heretofore constituted separate elements of machines of this class.

Another object of this invention is to render available a pump characterized by great simplicity, durability and general efficiency and in which the general construction shall be such that all parts are easy of access and readily adjusted for wear or otherwise.

A further object is to provide a pump of the most compact design consistent with its capacity, and which will provide large and easy waterways, and a superior structural strength throughout.

A more specific object is to so design the pump that, while the same will be notably high-grade, the manufacture of the same will entail but few machine operations and thus enable the device to be produced at a minimum of factory cost.

Another and more specific object is to so locate and arrange the various shaft bearings that the same may be rigidly supported, conveniently and well disposed, from a mechanical standpoint, and provided with ample means for lubricating the various journals of the device.

Other objects realized by the preferred more specific embodiment of the invention

are: to employ cylindrical waterways of great capacity thus utilizing the shape affording a maximum strength for the metal used and at the same time facilitating core-work and molding; to give the valves and seats therefor a circular shape and thus promote ease and accuracy in the construction thereof; to provide conveniently located hand-holes for gaining access to such valves without disturbing any of the working parts; to simplify and render more positive the means for keeping tightly closed the covers for such hand-holes; to provide an arrangement whereby a single removable piston-head suffices for the pumping cylinder and to support the main crank shaft directly on an integral part of the main casting on the side opposite that from which the piston-rod protrudes.

The invention accordingly consists in the features of construction, combinations of elements and arrangement of parts which will be exemplified in the construction hereinafter set forth, and the scope of the application of which will be indicated in the following claims.

In order that the more salient features of this invention may be more fully understood, drawings exemplifying one of the many possible embodiments thereof are annexed as a part of this disclosure and in such drawings, like characters of reference denote corresponding parts through several views, of which—

Figure 1 is a side elevation showing the general external appearance of the pump and displaying certain of the broad features of construction thereof. Fig. 2 is a view somewhat similar to Fig. 1, but showing certain parts broken away to more clearly exhibit certain details of construction and arrangements of parts of this device. Fig. 3 is an end elevation looking toward the right as shown by Fig. 2, *i. e.*, toward the crank-shaft end of the pump, and showing the general assembly of the pump from another viewpoint. Fig. 4 is a top or plan view showing certain parts and relationships therebetween not so clearly apparent from the foregoing figures. Fig. 5 is a vertical irregular section taken along the broken line 5—5 of Fig. 2 showing the cross-sectional contour of the upper and lower

cross-ways. Fig. 6 is a horizontal section through the body portion taken along line 6—6 of Fig. 2. Fig. 7 is a horizontal section taken along line 7—7 of Fig. 2. Fig. 8 is a plan view of the cap for securing the pinion shaft to its bearing on the under side of the upper cross-way. Fig. 9 is a section taken through line 9—9 of Fig. 8 showing the cross-sectional construction of the cap. Fig. 10 is a detailed view of one of the unitary removable valves.

Continuing now by way of a more detail description of the herein illustrated exemplification, turning occasionally to the drawings as indicated by the reference characters, it may be preliminarily stated that this invention proposes a construction in which separate parts are dispensed with, so far as may be practical within the limits of commercial considerations and to that end, the body casting A is arranged to form not only the pumping cylinder itself, but also the inlet and outlet waterways and at the same time provide bearing supports for the actuating-shaft, the main-crank shaft, and the guide-rods for the piston cross-head. The pumping cylinder occupies a central position in this embodiment of the invention and is formed by a cylindrical shell 1 which is integrally connected adjacent its end with the two opposite, parallel, cylindrical upright waterways 2 and 3 respectively. If desired, the cylindrical shell 1 forming the pumping cylinder may have its ends projecting slightly into the waterways as indicated by 4 and 5 thereby slightly increasing the capacity of the cylinder and lengthening the stroke of the piston without materially restricting the capacity of the waterways. In order that the interior of the pumping cylinder may be readily bored out in the process of manufacture, and to provide for the admission of the piston, this invention contemplates an opening 6, shown more clearly by Fig. 5, extending through the outer wall of the upright waterway 2, and in register with the interior of the pumping cylinder. As shown, this opening is fully coextensive in diameter with the pumping cylinder and thus enables the piston to be readily introduced into the cylinder. This opening is preferably on the piston-rod side of the piston, so that the cover closing the same may also carry the stuffing-box for the piston-rod. Thus, as shown, the cover 7 is bolted in place by means of the bolts 8 and it is furnished with a gland sleeve 9 which coöperates in the usual way with suitable packing and can be drawn tight by means of the gland bolts 10. The piston may be of any desired shape but preferably consists of three disk like members 11, 12 and 13, (shown more clearly by Fig. 2) which are held in place on the piston-rod 14 by means

of the lock-nuts 15 and 16. The guiding and actuating means for the piston-rod 14 comprises a cross-head 17 which is bolted to the piston-rod 14 by means of the lock-nuts 18 and 19 and this cross-head 17 preferably has a sliding bearing on two oppositely positioned guides. Such guides are preferably formed by two sections of turned shafting 20 and 21 which are slightly reduced as shown by the dotted lines 22 and 23 at their secured ends, these reduced portions passing through corresponding apertures in the lugs 24 and 25 which are preferably cast integral with the corresponding upright waterway shell. These guide-rods 20 and 21 are then retained against withdrawal by means of the nuts 26 and 27 as will be perceived. This forms a very simple, inexpensive, and at the same time effective and durable method of providing guide-rods for the cross-head 17. In order to reciprocate the piston-rod 14 through the instrumentality of the cross-head 17, the latter preferably terminates at its extremities in two gudgeons 28 and 29 on which are journaled the ends 30 and 31 of the connecting rods 32 and 33 respectively, and to prevent lateral displacement cotter or taper pins 34 and 35 may be passed through the protruding ends of the gudgeons 28 and 29. On the opposite side of the body-casting, and preferably formed integral with the upright waterway shell 3, is a bearing boss 36 which is completed in structure by a bearing cap 37 held in place by bolts 38 and 39. This bearing cap 37 preferably also provides a suitable oil-well 40 cast integral with the same, which oil-well may be closed by a hinged flap 41, as will be readily understood. The above described parts form the bearing for the crank-shaft 42, which passes from one side of the machine to the other, and on the one side carries a large gear 43 to which is affixed the crank-pin 44 on which is journaled the enlarged end 45 of the connecting rod 32. Mounted on the other end of this crank-shaft 42 is a crank-plate 90 which is keyed or otherwise locked to the shaft 42 and which also carries a crank-pin 91 on which is journaled the large end 92 of the connecting-rod 33. Through this construction, it will be evident that great compactness in the arrangement of the pump-body, the crank-shaft, the gear for actuating the crank-shaft, the connecting-rods and the cross-head for the piston is attained, and that the construction may be carried out at a minimum of expense. This invention, however, also proposes the mounting of an actuating shaft also in a convenient and compact location, and furthermore provides for simplicity and compactness in the way of valves and ports and other water-ways as will now be described.

The main body casting A comprises in

addition to the two vertical upright waterways 2 and 3 and the intermediate horizontal pumping cylinder 1, a lower fluid cross-way 46, an upper fluid cross-way 47 and a riser 48 leading to the dome 93. The lower cross-way 46 combines the dual functions of a means for enabling the water to enter the pump and a suitable support for the entire structure. To that end, integral extensions 49 in the form of feet (see Figs. 2 and 3) serve as a base for supporting the entire pump, and these extensions may be provided with bolt recesses 50 to enable the pump to be bolted down on the floor of the structure in or on which the same is located. As appears more clearly from Fig. 2, the lower horizontal cross-way 46 assumes a tubular form, being hollow so as to enable the water to enter through the central admission ports 51, there being a similar port on each side, and thence pass alternately either to the right or to the left in the cross-way 46, according to the mode of operation of the piston in the pumping cylinder. Thus, assuming that the piston shown in Fig. 2 is about to begin its travel toward the left, the water will enter the ports 51, and thence travel through the ample space indicated by 52 on Fig. 2 into underlying proximity with the horizontal partition 53 formed in the lower part of the upright waterway 2. At this point is located a suitable check-valve which enables the water to rise and checks its fall. A very satisfactory construction in this respect consists in first manufacturing the check-valve complete in the form of the unit shown by Fig. 10 and then inserting the same in place in the pump through suitable openings. To that end, the base portion 54 of the check-valve has a tapered periphery 55 which is adapted to be driven home in a correspondingly formed circular aperture in the partition 53. A check-valve stem 56 rises centrally from the base portion 54, is provided with a head 57 at its upper end, and slidably centers the valve-flap or plate 58. The expansile spring 59 circumscribes the shank of the stud 56 and intervenes between the head 57 and the flap 58 and normally serves to retain the latter in place. A brass disk may be interposed between the lower end of the spring 59 and the flap 58 if desired, as shown by Fig. 10, and the headed end of the stud 56 may be socketed to facilitate its removal with a wrench if desired. It should here be observed that various forms of check-valve are available in this connection, but that illustrated is simple, durable and otherwise satisfactory in service, and is therefore preferred.

In order to gain access to the above mentioned parts for the purpose of inserting the valve in place or for the purpose of machining and screw-threading the opening in

the partition 53 during the process of manufacture, the side of the vertical waterway 2 is provided with an amply large opening or manhole 95 similar to that indicated by 60 on the opposite vertical waterway in Fig. 2. This opening is closed by means of a suitable cover plate 62 shown by Fig. 7, and the opposite waterway is identically constructed in this respect and provides a similar cover plate 63. Attention is particularly directed to the fact that these openings are arranged on the same side of the two upright waterways and this arrangement is utilized in retaining the cover-plate in place in a very positive yet essentially simple manner. This consists in providing the lower cross-way 46 between the two upright waterways 2 and 3 with a cross-flange 64 which is provided with a central recess 65 adapted to receive the shank 66 and retain the head 67 of the tension-bolt against the edges of such recess. This tension-bolt at its other end loosely passes through an aperture passing centrally through a yoke 68 which terminates at its opposite ends in abutment-balls 69 and 70 which in turn bear against counterpart central recesses in the plates 62 and 63. By screwing up the nut 71 on the end of the shank 66 of the bolt, the yoke 68 is caused to press the covers 62 and 63 in place tightly, yet with perfect equality, thereby absolutely preventing leakage or the like.

The upper valve construction of the upright waterways 2 may now be described. This is shown more clearly by Fig. 2 and in this case, it suffices that the upper ends of the upright waterways 2 and 3 are provided with centrally apertured horizontal partitions 72 and 73 and are provided with suitable check-valves 74, analogous to the construction above described with reference to the lower part of the upright waterway 2. A difference, however, exists in this respect: The opening for gaining access to the valves, instead of being arranged at the sides of the upright waterways, is preferably disposed at the top ends thereof. Thus, as shown by Fig. 2, the upright waterway 2 has in its upper extremity the large opening 75 which is closed by a circular cap 76. A corresponding construction and similar cap 77 is resorted to in connection with the other waterway 3. Between the cap 76 and the valve 74 is provided an ample passage 78 for the flow of the fluid, which passage forms the interior of the upper horizontal cross-way 47 which leads to a central and vertical conduit or passage 79 formed by the upright tube 48. All this is formed by a single suitably cored casting as will be readily understood from the annexed drawings. The upright central member 48 at its uppermost end provides a flange 80 to which is bolted the dome 93 having the discharge outlet 96, 130

and which is also utilized as an abutment for the engaging end 81 of the yoke 82 which provides a ball-abutment 83 co-acting with a corresponding depression in the cap 76. A bolt 84 passes through a suitable aperture in the lug 85 cast on the upright waterway 2 and is retained against withdrawal by means of its head 86 and has a nut 87 which is screw-threaded to its other end and is adapted to be turned to regulate the tension of the yoke 82 and thereby close the cap 76 with all desired tightness. The cross-way 47 is also very conveniently utilized as a support for the bearing of the driving or pinion shaft. That is to say, the under portion of this cross-way 47 is cast in the form of a half-section 98 of a journal-box, which half-section provides integral corner parts 99 apertured to receive the bolts 100. The counterpart or lower half-section 101 of the journal-box is elongated and consists of a supported part 102 which, by means of the above-mentioned bolts 100, is secured to the upper half-section 98, thereby completing the journal-box; and it also consists of the extension bearing 103 which provides a well 104 for receiving and retaining the lubricant. This lower half-section also has a well 105 located directly under the part 98, as indicated by Fig. 8. A cap 106 is, by means of the bolts 107, secured to the part 103, thereby completing an auxiliary journal-box adapted to embrace the driving-shaft 108 adjacent the fast and loose belt-pulleys 109 and 110. This driving-shaft 108, or pinion-shaft, as it may be termed, has keyed to the end which protrudes from the other side of the pump, a pinion 111 which is in mesh with the large gear 43 and serves to drive the latter.

From the foregoing it will be quite evident that the above-mentioned objects and advantages have been very fully attained by the herein disclosed embodiment, and that the several parts are exceedingly simple, compact and capable of operating under a high duty.

As a matter of convenience, and for the sake of brevity, the terms vertical, horizontal and the like, have been freely resorted to in the specification and claims, but it is to be understood that such terms have been merely adopted as expressing a relationship between parts, and are not to be regarded as limiting the position which the device may assume in space, since it will be obvious that for various purposes one or more of the elements of the device may be so arranged as to occupy various absolute positions in space without, however, materially altering the relationship between the various essential elements of the invention.

Without further elaboration and in the light of current knowledge, the foregoing

disclosure will sufficiently suggest and otherwise render obvious to those skilled in this art certain interchangeably available structures which, although perhaps calculated to appear widely different, under a superficial examination, from that herein illustrated, would nevertheless embody certain of the herein-disclosed features which, from the aspect of the prior art, constitute essential characteristics of this invention, and it is therefore to be understood that such structures should and are intended to be comprehended within the scope of the annexed claims.

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

1. A pump of the nature disclosed comprising, in combination, a horizontal cylinder, integral upright passageways arranged at the ends of said cylinder, a piston in said cylinder and having a piston-rod projecting externally thereof, a pinion shaft rotatably mounted above said cylinder intermediate said passageways, and operative connections intervening between the pinion shaft and the piston-rod to actuate the latter.

2. A pump of the nature disclosed comprising, in combination, a horizontal pumping cylinder, upright passageways arranged at the ends thereof, a piston in said cylinder having a protruding piston rod, an inverted journal box section cast integral with the body portion of said pump and arranged above said cylinder, a detachable journal box section under-hung to said first-mentioned section and arranged to extend in an axial direction on one side thereof, an actuating shaft journaled in said journal box, and operative connections between said actuating shaft and the piston rod.

3. A pump of the nature disclosed comprising, in combination, a horizontal pumping cylinder open at one end and permanently closed at the other, suitable passageways and valves arranged at the opposite ends of said pumping cylinder, a piston in said pumping cylinder having a piston rod protruding through the open end thereof, a cylinder head closing said open end and centrally apertured for said piston rod, a main bearing located approximately on the center line of said piston rod at the permanently closed end of said cylinder, a shaft journaled in said bearing, and operative connections between said shaft and said piston rod to enable the former to actuate the latter.

4. A pump of the nature disclosed comprising, in combination, a horizontal pumping cylinder, passageways arranged at the ends thereof, valves located in said passageways, said passageways being provided with hand-holes adjacent to and through which the valves may be removed, cover plates for said hand-holes, an equalizing clamping bar

common to and bearing at its ends against two of said covers, and a device bearing against an intermediate part of said bar to move the same to simultaneously maintain the covers on their seats.

5 5. A pump of the nature disclosed comprising, in combination, a body casting comprising a tubular portion adapted to serve as a conduit for the fluid, a second tubular
10 portion disposed parallel with said first tubular portion and at a distance therefrom, a pumping cylinder connecting the intermediate portions of said tubular portions, one of said tubular portions having an opening
15 in its side directly opposite the connection with the pumping cylinder, a piston arranged in said pumping cylinder and having a piston rod extending through said opening, a plate apertured for said piston
20 rod and detachably closing said opening, ports and valves cooperating with said piston in pumping fluid, a crank shaft externally mounted on said first mentioned tubular portion intermediate its ends, a connecting rod connecting said crank shaft with the exposed end of said piston rod to enable the former to actuate the latter, and means for rotating said crank shaft.

6. A pump of the nature disclosed comprising, in combination, a body casting comprising a tubular portion adapted to serve as a conduit for the fluid, a second tubular
30 portion disposed parallel with said first tubular portion and at a distance therefrom, a pumping cylinder connecting the intermediate portions of said tubular portions, one of said tubular portions having an opening in its side opposite the connection with the pumping cylinder, a piston arranged in said
40 pumping cylinder and having a piston rod extending through said opening, a plate apertured for said piston rod and detachably closing said opening, ports and valves cooperating with said piston in pumping
45 fluid, a crank shaft externally mounted on said first mentioned tubular portion intermediate its ends, a connecting rod connecting said crank shaft with the exposed end of said piston rod to enable the former to actuate the latter, means for rotating said crank shaft, an actuating shaft mounted between the adjacent ends of said tubular portions, and operative connections between said actuating shaft and said crank shaft.

55 7. A pump of the nature disclosed comprising, in combination, a body casting comprising a tubular portion adapted to serve as a conduit for the fluid, a second tubular portion disposed parallel with said first tubular
60 portion and at a distance therefrom, a pumping cylinder connecting the intermediate portions of said tubular portions, one of said tubular portions having an opening in its side opposite the connection with the pumping cylinder, a piston arranged in said

pumping cylinder and having a piston rod extending through said opening, a plate apertured for said piston rod and detachably closing said opening, ports and valves cooperating with said piston in pumping
70 fluid, a crank shaft externally mounted on said first mentioned tubular portion intermediate its ends, a connecting rod connecting said crank shaft with the exposed end of said piston rod to enable the former to actuate the latter, means for rotating said crank shaft, an actuating shaft mounted above the pumping cylinder between the upper ends of the two tubular portions, and operative connections between said actuating shaft and said crank shaft to enable the latter to be rotated.

8. A pump of the nature disclosed comprising, in combination, a pair of parallel upright tubular body portions, a pumping
85 cylinder integrally extending between said uprights at a point intermediate the ends thereof, one of said upright portions having an aperture in its side opposite its connection with said pumping cylinder, a piston in said pumping cylinder and having a piston rod extending through said aperture, a crank shaft carried by said other upright tubular portion intermediate the ends thereof, and a connecting rod connecting said piston rod and said crank shaft to enable the former to be actuated by the latter.

9. A pump of the nature disclosed comprising, in combination, a pair of parallel upright tubular body portions, a pumping
100 cylinder integrally extending between said uprights at a point intermediate the ends thereof, one of said upright portions having an aperture in its side opposite its connection with said pumping cylinder, a piston in said pumping cylinder and having a piston rod extending through said aperture, a crank shaft carried by said other upright tubular portion intermediate the ends thereof, a connecting rod connecting said piston rod and said crank shaft to enable the former to be actuated by the latter, an actuating shaft mounted intermediate the two uprights, and operative connections between said actuating shaft and said crank shaft.

10. A pump of the nature disclosed comprising, in combination, a pair of parallel upright tubular body portions, a pumping
120 cylinder integrally extending between said uprights at a point intermediate the ends thereof, one of said upright portions having an aperture in its side opposite its connection with said pumping cylinder, a piston in said pumping cylinder and having a piston rod extending through said aperture, a
125 crank shaft carried by said other upright tubular portion intermediate the ends thereof, a connecting rod connecting said piston rod and said crank shaft to enable the former to be actuated by the latter, an actu- 130

ating shaft mounted above the cylinder intermediate the upper ends of said uprights, and operative connections between said actuating shaft and said crank shaft.

11. A pump of the nature disclosed comprising, in combination, a pair of parallel upright tubular body portions, a pumping cylinder integrally extending between said uprights at a point intermediate the ends thereof, one of said upright portions having an aperture in its side opposite its connection with said pumping cylinder, a piston in said pumping cylinder and having a piston rod extending through said aperture, a crank shaft carried by said other upright tubular portion intermediate the ends thereof, a connecting rod connecting said piston rod and said crank shaft to enable the former to be actuated by the latter, the upper ends of said uprights being integrally connected, an actuating shaft journaled in said connection, and operative connections extending from said actuating shaft to said crank shaft.

12. A double acting pump, comprising, in combination, a body casting including a pumping cylinder, tubular portions connected with the opposite ends of said pumping cylinder and disposed at substantially right angles thereto and having their adjacent ends connected with suction and discharge chambers, respectively, a piston arranged in said pumping cylinder and having a piston rod extending through the side of one of said tubular portions, a bearing in said body casting closely adjacent said pumping cylinder, a rotatable shaft in said bearing, and intermediate connections between said shaft and said piston whereby the latter is actuated.

13. A double acting pump, comprising, in combination, a body casting including a horizontally disposed cylinder, a pair of parallel upright tubular portions connected with the opposite ends of said pumping cylinder, connections between the adjacent ends of said upright portions forming suction and discharge chambers, and a bearing formed on one of said parts of said body casting, and a rotatable shaft mounted and secured in said bearing and having connections with said piston whereby motion is transmitted from one to the other.

14. A pump of the nature disclosed comprising, in combination, a body casting comprising a tubular portion adapted to serve as a conduit for the fluid, a second tubular portion disposed parallel with said first tubular portion and at a distance therefrom, a pumping cylinder connecting the intermediate portions of said tubular portions, one of said tubular portions having an opening in its side opposite the connection with the pumping cylinder, a piston arranged in said pumping cylinder and having a piston rod

extending through said opening, a plate apertured for said piston rod and detachably closing said opening, ports and valves cooperating with said piston in pumping fluid, a crank shaft externally mounted on said first mentioned tubular portion intermediate its ends, a connecting rod connecting said crank shaft with the exposed end of said piston rod to enable the former to actuate the latter, and means for rotating said crank shaft.

15. A pump of the nature disclosed comprising, in combination, a body casting comprising a tubular portion adapted to serve as a conduit for the fluid, a second tubular portion disposed parallel with said first tubular portion and at a distance therefrom, a pumping cylinder connecting the intermediate portions of said tubular portions, one of said tubular portions having an opening in its side opposite the connection with the pumping cylinder, a piston arranged in said pumping cylinder and having a piston rod extending through said opening, a plate apertured for said piston rod and detachably closing said opening, ports and valves cooperating with said piston in pumping fluid, a crank shaft externally mounted on said first mentioned tubular portion directly in line with the axis of the cylinder, a connecting rod connecting said crank shaft with the exposed end of said piston rod to enable the former to actuate the latter, means for rotating said crank shaft, an actuating shaft mounted above the middle of the cylinder and between the upper ends of said tubular portions, and operative connections between said actuating shaft and said crank shaft.

16. A pump of the nature disclosed comprising, in combination, a body casting comprising a tubular portion adapted to serve as a conduit for the fluid, a second tubular portion disposed parallel with said first tubular portion and at a distance therefrom, a pumping cylinder connecting the intermediate portions of said tubular portions, one of said tubular portions having an opening in its side opposite the connection with the pumping cylinder, a piston arranged in said pumping cylinder and having a piston rod extending through said opening, a plate apertured for said piston rod and detachably closing said opening, ports and valves cooperating with said piston in pumping fluid, a crank shaft externally mounted on said first mentioned tubular portion directly in line with the axis of the cylinder, a pair of connecting rods arranged on opposite sides of the body casting connecting said crank shaft with the exposed end of said piston rod to enable the former to actuate the latter, a driving gear mounted on one end of said crank shaft, an actuating shaft mounted above the pumping cylinder between the upper ends of the two tubular portions, and

operative connections between said actuating shaft and the driving gear on said crank shaft to enable the latter to be rotated.

17. A pump of the nature disclosed comprising, in combination, a pair of parallel upright tubular body portions, a pumping cylinder integrally extending between said uprights at a point intermediate the ends thereof, one of said upright portions having an aperture in its side opposite its connection with said pumping cylinder, a piston in said pumping cylinder and having a piston rod extending through said aperture, a crank shaft carried by said other upright tubular portion intermediate the ends thereof, and a pair of connecting rods connecting said piston rod and said crank shaft to enable the former to be actuated by the latter, the one rod being on one side of the pump and the other on the other side of the pump.

18. A pump of the nature disclosed comprising, in combination, a pair of parallel upright tubular body portions, a pumping cylinder integrally extending between said uprights at a point intermediate the ends thereof, one of said upright portions having an aperture in its side opposite its connection with said pumping cylinder, a piston in said pumping cylinder and having a piston rod extending through said aperture, a crank shaft externally carried by said other upright tubular portion intermediate the ends thereof and directly in line with the piston rod, a connecting rod connecting said piston rod and said crank shaft to enable the former to be actuated by the latter, an actuating shaft mounted intermediate the two uprights directly above the center of the cylinder, and operative connections between said actuating shaft and said crank shaft.

19. A pump of the nature disclosed comprising, in combination, a pair of parallel upright tubular body portions, a pumping cylinder integrally extending between said uprights at a point intermediate the ends thereof, one of said upright portions having an aperture in its side opposite its connection with said pumping cylinder, a piston in said pumping cylinder and having a piston rod extending through said aperture, a crank shaft externally carried by said other upright tubular portion intermediate the ends thereof and in direct line with the piston rod, connecting rods located on opposite sides of the cylinder connecting said piston rod and said crank shaft to enable the former to be actuated by the latter, an actuating shaft mounted directly above the center of the cylinder intermediate and below the upper ends of said uprights, and operative connections between said actuating shaft and said crank shaft.

20. A pump of the nature disclosed comprising, in combination, a pair of parallel upright tubular body portions, a pumping

cylinder integrally extending between said uprights at a point intermediate the ends thereof, one of said upright portions having an aperture in its side opposite its connection with said pumping cylinder, a piston in said pumping cylinder and having a piston rod extending through said aperture, a crank shaft carried by said other upright tubular portion intermediate the ends thereof, a connecting rod connecting said piston rod and said crank shaft to enable the former to be actuated by the latter, the upper ends of said uprights being integrally connected, an actuating shaft journaled in the under side of said connection, and operative connections extending from said actuating shaft to said crank shaft.

21. A pump of the nature disclosed comprising, in combination, a pumping cylinder, a fluid conduit arranged transversely at one end of said pumping cylinder and cast integral therewith, an inlet valve at one end of said fluid conduit, an outlet valve at the other end of said fluid conduit, a piston arranged in said pumping cylinder and having its piston rod extending through the opposite end of said pumping cylinder, a cylinder head apertured for said piston rod normally closing said end of said pumping cylinder, a crank shaft journaled exteriorly to said fluid conduit intermediate its ends, a connecting rod extending from the crank shaft to the exposed end of said piston rod, and means for actuating said crank shaft.

22. A pump of the nature disclosed comprising, in combination, a tubular fluid conduit having an opening at one end in alignment with the bore thereof, a valve mounted in said conduit adjacent said opening, a cap normally closing said opening and adapted to be readily removed to gain access to said valve, a valve arranged at the opposite end of said conduit, a pumping cylinder transversely extending from said conduit at a point intermediate the ends thereof, a piston arranged in said pumping cylinder and having a piston rod extending through the end thereof remote from said conduit, a cylinder head apertured for said piston rod and detachably closing said open end, a crank shaft externally carried by said conduit opposite the end of the cylinder, a connecting rod connected at one end to the piston rod and at the other end to said crank shaft, and means for rotating said crank shaft.

23. A pump of the nature disclosed comprising, in combination, a body casting having a tubular portion serving as a fluid conduit, an integral portion transversely extending from said tubular portion at a point intermediate the ends thereof and forming a pumping cylinder, inlet and outlet valves arranged at the respective ends of said tubular portion, one end of said tubular portion hav-

ing an opening in alinement with the bore thereof, a cap normally closing said opening, a piston arranged within said pumping cylinder and having a piston rod extending through the end remote from said tubular portion, a cylinder head apertured for said piston rod and detachably closing an opening in registry with the bore of the pumping cylinder, a guide extending parallel with said piston rod and supported by the body casting, a cross head having a bearing on said guide and secured to said piston rod, a crank shaft carried by said tubular portion, a connecting rod pivoted to said crank shaft and also to said cross head, and means for actuating said crank shaft.

24. A pump of the nature disclosed comprising, in combination, a body casting comprising a vertical tubular portion serving as a fluid conduit, the lower part of said portion extending at right angles for a short distance and leading to an inlet opening, an opening arranged at the side of said portion adjacent the lower end thereof, an inlet valve positioned within said tubular portion adjacent said opening, a cover normally closing said opening and adapted to be removed to replace said valve, said opening in said cover portion being adapted to permit direct access to said valve, the upper end of said tubular portion having an opening in registry with the bore of the same, a discharge conduit leading at right angles from said tubular portion adjacent the upper end thereof, a valve seated in said tubular portion adjacent said discharge, a cover closing the opening in the upper end of said tubular portion and adapted to be removed to gain access to said valve, a pumping cylinder extending transversely from said tubular portion intermediate the ends thereof, a piston arranged in said pumping cylinder and having a piston rod extending through the end thereof remote from said tubular portion, a cylinder head apertured for said piston rod and normally closing the opening through which the piston rod extends, a crank shaft exteriorly journaled to said tubular portion intermediate the ends thereof, and in line with the axis of the cylinder, a connecting rod connecting said crank shaft with said piston rod, and means for actuating said crank shaft.

25. A pump of the nature disclosed comprising, in combination, a body casting comprising a vertical tubular portion serving as a fluid conduit, the lower end of said portion extending at right angles for a short distance and leading to an inlet opening, an opening arranged at the side of said portion adjacent the lower end thereof, an inlet valve positioned within said tubular portion adjacent said opening, a cover normally closing said opening and adapted to be removed to replace said valve, the upper end

of said tubular portion having an opening in registry with the bore of the same, a discharge conduit leading at right angles from said tubular portion adjacent the upper end thereof, a valve seated in said tubular portion adjacent said discharge, a cover closing the opening in the upper end of said tubular portion and adapted to be removed to gain access to said valve, a pumping cylinder extending transversely from said tubular portion intermediate the ends thereof and having its opposite end adjacent and in registry with an opening in the body casting, a piston arranged in said pumping cylinder and having a piston rod extending through said opening, a cylinder head centrally apertured for said piston rod and normally closing said opening, a crank shaft exteriorly journaled to said tubular portion intermediate the ends thereof and in line with the axis of the cylinder, a connecting rod connecting said crank shaft with said piston rod, an actuating shaft positioned on the cylinder side of said tubular portion above said cylinder, and driving mechanism intervening between said actuating shaft and said crank shaft.

26. A pump of the nature disclosed comprising, in combination, a body casting comprising a tubular member, an inlet and an outlet valve arranged at each end of said tubular portion, a pumping cylinder extending transversely from said tubular portion at a point midway the ends thereof, a piston in said cylinder and having a piston rod extending through the end of said cylinder remote from said tubular portion, a cover apertured for the said piston rod and detachably closing the opening through which said piston rod extends, a crank shaft arranged near the other end of said pumping cylinder, a connecting rod connected with said crank shaft and with the exposed end of said piston rod, and means including a main driving shaft supported from said body casting closely adjacent said cylinder for actuating said crank shaft.

27. A pump of the nature disclosed comprising, in combination, a body casting having a tubular portion adapted to serve as a conduit for fluid, the upper end of said portion terminating in an opening in registry with the bore thereof, a cover detachably closing said opening, a valve arranged in the end of said tubular portion adjacent said top opening, a port adjacent said valve, an opening in the side of said tubular portion adjacent its lower end, a valve arranged adjacent said opening, a cover plate adapted to normally close said opening, said opening in said cover portion being adapted to permit direct access to said valve, a pumping cylinder integrally extending transversely from said tubular portion at a point intermediate its ends, a piston in said pumping

cylinder having a piston rod extending through an opening in the body casting distant from the above-mentioned tubular portion, a cover apertured for said piston rod and normally closing said opening, a crank shaft mounted adjacent the opposite end of said cylinder, and a connecting rod connecting said crank shaft with said piston rod to enable the former to actuate the latter.

28. A pump of the nature disclosed comprising, in combination, a body casting having a tubular portion adapted to serve as a conduit for fluid, the upper end of said portion having an opening in registry with the bore thereof, a cover detachably closing said opening, a valve arranged in the end of said tubular portion adjacent said top opening, a port adjacent said valve, an opening in the side of said tubular portion adjacent its lower end, a valve arranged adjacent said opening, a cover plate adapted to normally close said opening, said opening in said cover portion being adapted to permit direct access to said valve, a pumping cylinder integrally extending transversely from said tubular portion at a point intermediate its ends, a piston in said pumping cylinder having a piston rod extending through an opening in the body casting distant from the above-mentioned tubular portion, a cover apertured for said piston rod and normally closing said opening, a crank shaft mounted adjacent the opposite end of said cylinder, a connecting rod connecting said crank shaft with said piston rod to enable the former to actuate the latter, an actuating shaft mounted above said pumping cylinder adjacent the upper end of said tubular conduit, and operative connections intervening between said actuating shaft and said crank shaft to enable the latter to be actuated by the former.

29. A pump of the nature disclosed comprising, in combination, a pumping cylinder, a fluid conduit arranged transversely at one end of said pumping cylinder and cast integral therewith, an inlet valve at one end of said fluid conduit, an outlet valve at the other end of said fluid conduit, a piston arranged in said pumping cylinder and having its piston rod extending through the said end of the pumping cylinder and protruding through the fluid conduit, means for maintaining a fluid-tight sliding fit between the piston rod and the said fluid conduit, a crank shaft journaled exteriorly to the pump adjacent the opposite end of the pumping cylinder, a connecting rod extending from the crank shaft to the exposed end of said piston rod, and means for actuating said crank shaft.

30. A pump of the nature disclosed comprising, in combination, a tubular fluid conduit having an opening at one end in alinement with the bore thereof, a valve mounted

in said conduit adjacent said opening, a cap normally closing said opening and adapted to be removed to gain access to said valve, a valve arranged at the opposite end of said conduit, a pumping cylinder transversely extending from said conduit at a point intermediate the ends thereof, a piston arranged in said pumping cylinder and having a piston rod extending through the side of the fluid conduit, means for maintaining a fluid-tight sliding fit between the piston rod and the wall of said conduit, a crank shaft externally mounted adjacent the end of said cylinder remote from said conduit, a connecting rod connected at one end to the piston rod and the other end to said crank shaft, and means for rotating said crank shaft.

31. A pump of the nature disclosed comprising, in combination, a body casting having a tubular portion serving as a fluid conduit, an integral portion transversely extending from said tubular portion at a point intermediate the ends thereof and forming a pumping cylinder, inlet and outlet valves arranged at the respective ends of said tubular portion, one end of said tubular portion having an opening in alinement with the bore thereof, a cap normally closing said opening, a piston arranged within said pumping cylinder and having a piston rod extending through the wall of said tubular portion, said wall having an opening coextensive in diameter with the bore of said pumping cylinder, a cylinder head centrally apertured for said piston rod and detachably closing said opening, a guide extending parallel with said piston rod and supported by said cylinder, a cross head having a bearing on said guide and secured to said piston rod, a crank shaft carried adjacent the end of the cylinder remote from said tubular portion, a connecting rod pivoted to said crank shaft and also to said cross head, and means for actuating said crank shaft.

32. A pump of the nature disclosed comprising, in combination, a body casting comprising a vertical tubular portion serving as a fluid conduit, the lower part of said portion extending at right angles for a short distance and leading to an inlet opening, an opening arranged at the side of said portion adjacent the lower end thereof, an inlet valve positioned within said tubular portion adjacent said opening, a cover normally closing said opening and adapted to be removed to replace said valve, said opening in said cover portion being adapted to permit direct access to said valve, the upper end of said tubular portion having an opening in registry with the bore of the same, a discharge conduit leading at right angles from said tubular portion adjacent the upper end thereof, a valve seated in said tubular portion adjacent said discharge, a cover

closing the opening in the upper end of said tubular portion and adapted to be removed to gain access to said valve, a pumping cylinder extending transversely from said tubular portion intermediate the ends thereof, a piston arranged in said pumping cylinder and having a piston rod extending through an opening in the wall of the tubular portion, a cylinder head centrally apertured for said piston rod and normally closing said opening, a crank shaft journaled on the body casting at the end of the cylinder remote from the tubular portion and in line with the axis of the cylinder, a connecting rod connecting said crank shaft with said piston rod, and means for actuating said crank shaft.

33. A pump of the nature disclosed comprising, in combination, a body casting comprising a vertical tubular portion serving as a fluid conduit, the lower end of said portion extending at right angles for a short distance and leading to an inlet opening, an opening arranged at the side of said portion adjacent the lower end thereof, an inlet valve positioned within said tubular portion adjacent said opening, a cover normally closing said opening and adapted to be removed to replace said valve, said opening in said cover portion being adapted to permit direct access to said valve, the upper end of said tubular portion having an opening in registry with the bore of the same, a discharge conduit leading at right angles from said tubular portion adjacent the upper end thereof, a valve seated in said tubular portion adjacent said discharge, a cover closing the opening in the upper end of said tubular portion and adapted to be removed to gain access to said valve, a pumping cylinder extending transversely from said tubular portion intermediate the ends thereof and opposite an opening through the wall of the tubular portion coextensive in diameter with the bore of the cylinder, a piston arranged in said pumping cylinder and having a piston rod extending through the opening in the tubular portion, a cylinder head apertured for said piston rod and normally closing said opening, a crank shaft journaled on the body casting adjacent the other end of the cylinder and substantially in line with the axis thereof, a connecting rod connecting said crank shaft with said piston rod, an actuating shaft positioned on the cylinder side of said tubular portion above said cylinder, and driving mechanism intervening between said actuating shaft and said crank shaft.

34. A pump of the nature disclosed comprising, in combination, a body casting having a tubular portion adapted to serve as a conduit for fluid, the upper end of said portion terminating in an opening in regis-

try with the bore thereof, a cover detachably closing said opening, a valve arranged in the end of said tubular portion adjacent said top opening, a port adjacent said valve, an opening in the side of said tubular portion adjacent its lower end, a valve arranged adjacent said opening, a cover plate adapted to normally close said opening, said opening in said cover portion being adapted to permit direct access to said valve, a pumping cylinder integrally extending transversely from said tubular portion at a point intermediate its ends, an opening in the side of said tubular portion directly opposite its connection with said pumping cylinder, said opening being in registry with the latter, a piston in said pumping cylinder having a piston rod extending through said opening, a cover apertured for said piston rod and normally closing said opening, a crank shaft mounted adjacent the opposite end of said cylinder, and a connecting rod connecting said crank shaft with said piston rod to enable the former to actuate the latter.

35. A pump of the nature disclosed comprising, in combination, a body casting having a tubular portion adapted to serve as a conduit for fluid, the upper end of said portion having an opening in registry with the bore thereof, a cover detachably closing said opening, a valve arranged in the end of said tubular portion adjacent said top opening, a port adjacent said valve, an opening in the side of said tubular portion adjacent its lower end, a valve arranged adjacent said opening, a cover plate adapted to normally close said opening, said opening in said cover portion being adapted to permit direct access to said valve, a pumping cylinder integrally extending transversely from said tubular portion at a point intermediate its ends, an opening in the side of said tubular portion directly opposite its connection with said pumping cylinder, said opening being in concentric registry with the latter, a piston in said pumping cylinder having a piston rod extending through said opening, a cover apertured for said piston rod and normally closing said opening, a crank shaft mounted adjacent the opposite end of said cylinder, a connecting rod connecting said crank shaft with said piston rod to enable the former to actuate the latter, an actuating shaft mounted above said pumping cylinder adjacent the upper end of said tubular conduit, and operative connections intervening between said actuating shaft and said crank shaft to enable the latter to be actuated by the former.

36. A pump of the nature disclosed, comprising in combination, a horizontal pumping cylinder, passageways arranged at the ends thereof, valves located in said passageways, said passageways being provided with

hand-holes adjacent to and through which
the valves may be removed, cover-plates for
said hand-holes, and means adapted to hold
said cover-plates in position, comprising a
5 yoke provided with abutment balls adapted
to bear against recesses in said cover-plate,
a tension bolt passing through an aperture
in said yoke, a flange member provided with
a recess adapted to hold the tension bolt,

and a member adapted to move along said 10
bolt and to thereby move said yoke.

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

SIDNEY S. SMITH.

Witnesses:

N. G. GOULD,

H. S. FREDENBURGH.

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Washington, D. C."
