

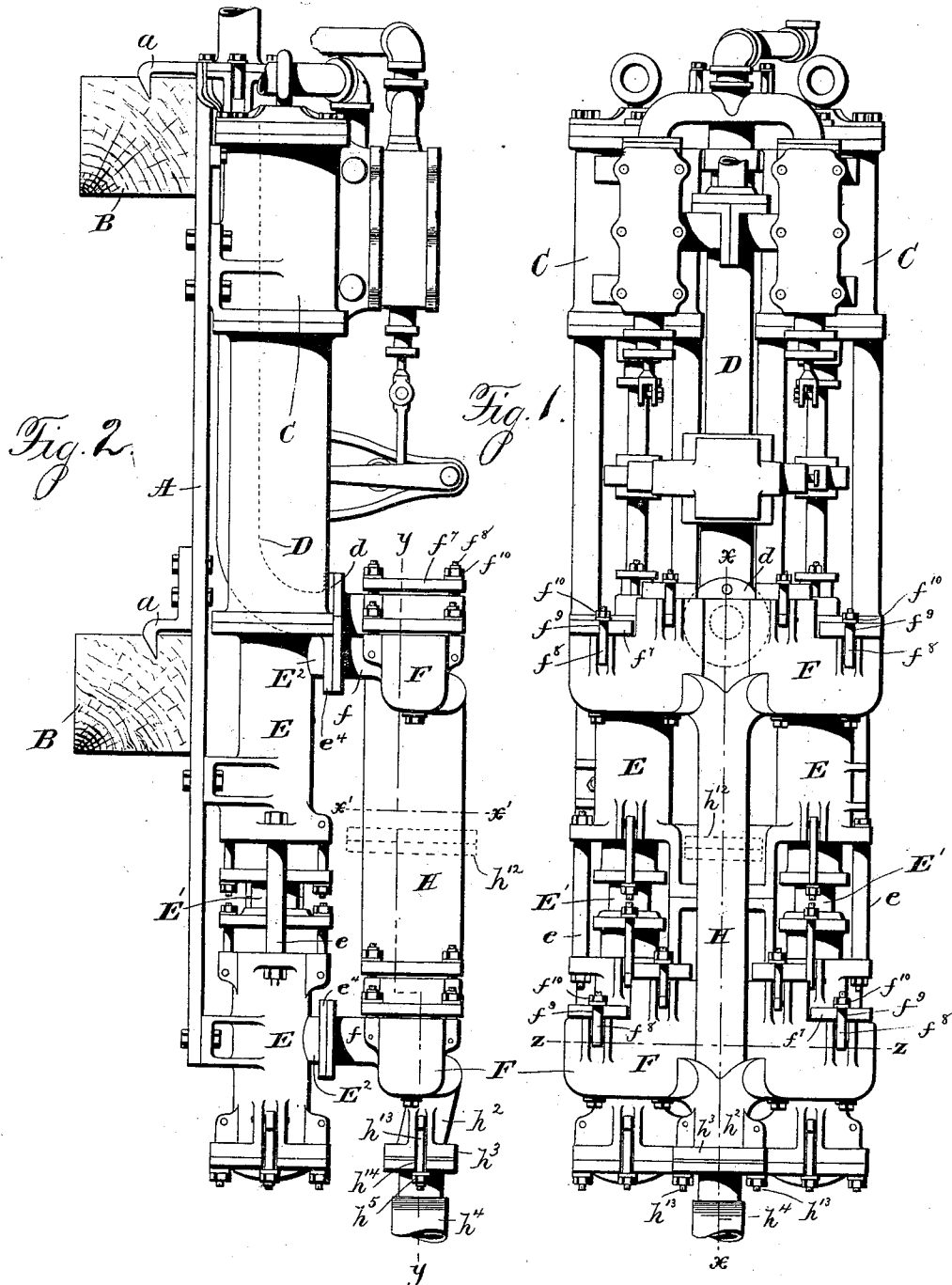
(No Model.)

2 Sheets—Sheet 1.

J. RENSHAW.
SINKING PUMP.

No. 512,991.

Patented Jan. 16, 1894.



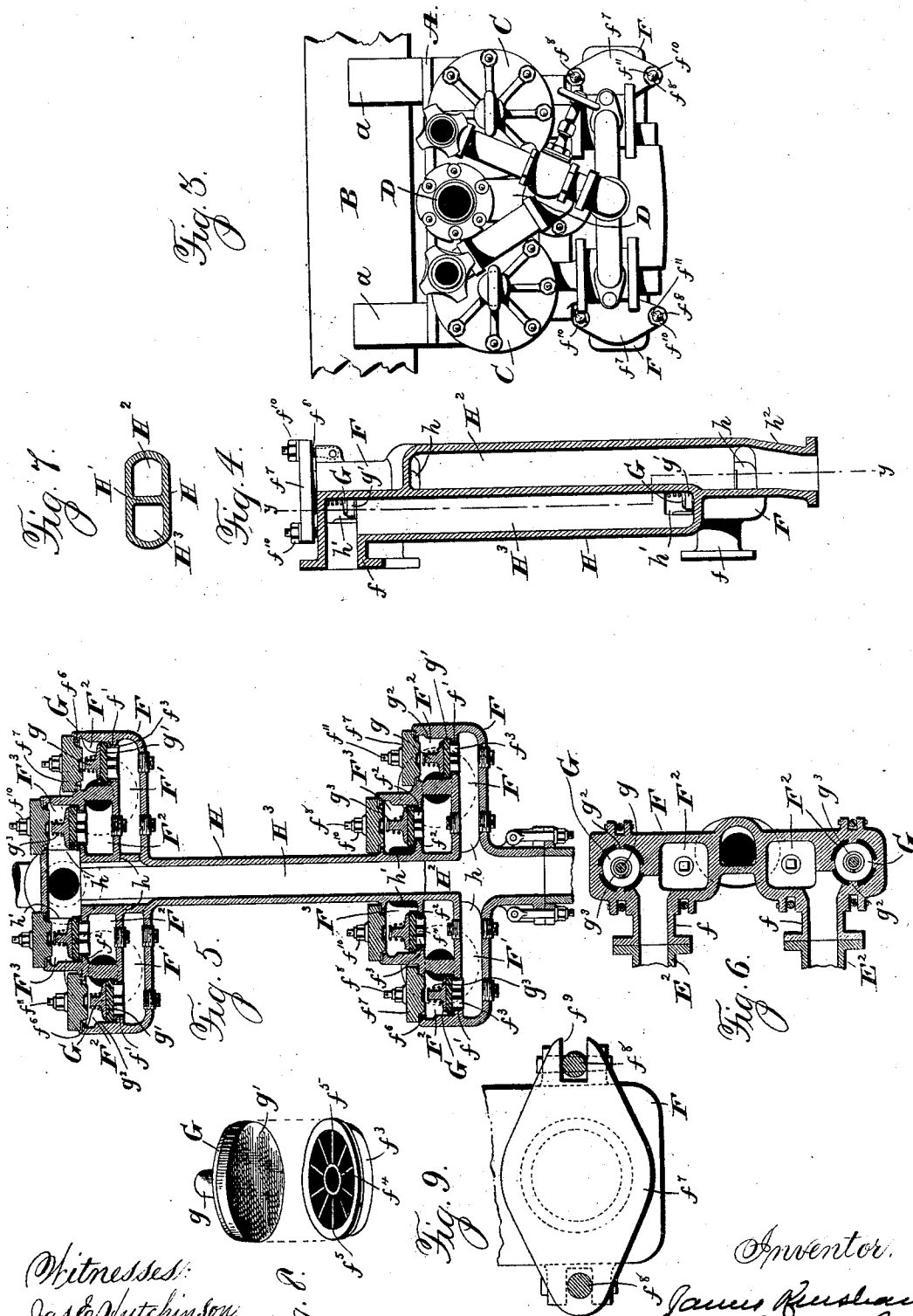
Witnesses:
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UNITED STATES PATENT OFFICE.

JAMES RENSHAW, OF DENVER, COLORADO.

SINKING PUMP.

SPECIFICATION forming part of Letters Patent No. 512,991, dated January 16, 1894.

Application filed May 15, 1893. Serial No. 474,271. (No model.)

To all whom it may concern:

Be it known that I, JAMES RENSHAW, a citizen of the United States, residing at Denver, in the county of Arapahoe, and in the State of Colorado, have invented certain new and useful Improvements in Sinking Pumps; and I do declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, in which—

Figure 1 shows a view of my pump in front elevation; Fig. 2, a view of the same in side elevation; Fig. 3, a plan view of the same; Figs. 4, 5, 6 and 7, views of sections on lines $x, x, -y, y, -z, z,$ —and $x', x',$ respectively, and Fig. 8, a detail perspective view of the valve and valve-seat, which I prefer to use in the water chests. Fig. 9 is a top plan view of one of the valve chest covers.

Letters of like name and kind refer to like parts in each of the figures.

The object of my invention has been to provide an improved sinking pump, for removing water from mines and other shafts, which shall take up less room horizontally in the shaft, have its valves more readily accessible, for cleaning or replacing, and have a much smaller number of joints in the water-end, than the pumps heretofore made and used for the same purpose, and to this end my invention consists in the pump with its parts constructed, arranged and combined as hereinafter specified.

As will be seen from the description and the drawings, the pump, to which my invention especially relates, belongs to the "vertical sinking" class, and is of the duplex double plunger kind, the mechanism for actuating the plungers and moving the steam-valves, and the general construction of the cylinders, with which such plungers act, being substantially like those used in the well known "Worthington" pump.

In the drawings A designates the supporting plate or bed, to which the various parts of the pump are to be secured, having the usual sharpened hooks $a, a,$ which are employed with vertical sinking pumps, to engage the cross-timbers or other supports B, B, from which the pump is to be hung, while being operated.

Fastened to the bed-plate A, in any desired way, are the steam and water-cylinders of a

duplex double acting pump of the Worthington type.

As my present invention has nothing to do with the construction of the steam and water-cylinders, or the valve-mechanism used with the steam-cylinders, to secure the desired alternate action of the pump pistons, I need not describe such parts at length herein; for their construction and operation will be fully understood by those familiar with pumps of this class.

The steam-cylinders C, C, are situated just far enough apart, to accommodate, between them, the water-eduction-pipe D, which has its lower end turned outward or forward and provided with a coupling flange $d,$ for a purpose to be described.

The water-cylinders E E, shown, are of the well-known divided kind used in the Worthington pump, each consisting of two parts, one for each end of the respective plunger or pump-piston E'. Such parts are bolted to the bed plate A, and are, at their inner ends, connected together by the bolt-rods $e, e.$ Each cylinder E has a pipe E^2 extending directly outward or forward from each of its end portions, to allow the passage of water into and out of the water spaces within such portions, and, on the outer end of this pipe, is a coupling flange $e^4.$ The corresponding water-chests F, F, at each end of the two pump-cylinders E, E, being connected with the pipes $E^2, E^2,$ from their respective cylinders, by the flanged connections $f, f,$ bolted or otherwise secured to the flanges on said pipes, I have cast in one piece, as shown. Each of these chests has within it, the three chambers $F', F^2,$ and $F^3,$ of which F' is the lowest, formed by horizontal partitions dividing the interior of the chest. Of these chambers, the intermediate one F^2 is connected with the pipe E^2 from the respective pump-cylinder E, through the connection f described above. Of these chambers, the uppermost one F^3 is made smaller than the intermediate one $F^2,$ in order that the latter may project out to one side, beyond the former, so as to leave a considerable portion of its top exposed, for a purpose to be explained.

The partition between the lowest and middle chambers is provided with a valve-port $f',$ situated in its outer part directly below the

projecting portion of the middle chamber, just above described, while the partition between the latter and the uppermost chamber F^3 has a similar valve-port f^2 . Each of these ports is provided with a removable valve-seat f^3 , in the form of an outer ring, fitting the port-opening, connected with a central smaller one f^4 , by the radial arms f^5 , f^6 . Resting upon each of the seats so formed, is an upwardly opening valve consisting of a disk-shaped body G , preferably, of metal, with an upright central stem g , on its upper side, and an elastic facing g' , preferably of rubber, on its under side adapted to cover the valve-seat when the valve is down. This elastic facing, consisting of a disk of rubber placed between the valve seat and body G , is especially desirable for use in sinking pumps, on account of the grit and sand which is apt to be drawn up with the water by the pump. Were the face of the valve, which is to rest on the valve-seat, made of metal or other unyielding substance, any sand or grit getting between it and the seat, would prevent such closing of the port, as is necessary to the proper action of the pump, and would cut and wear both valve and seat; while, when the elastic disk is used, the latter yields to any pieces of stone or particles of grit or sand, and engages the valve-seat all around them, so as to close the port properly, when the valve is down. As the valve rises again, the elasticity of the disk will cause the stone, sand, or grit particles to be thrown out, so that they will be carried away by the passing water.

For guiding each valve, in its movements to and from its seat, I provide the water-chest with upright guide-ribs g^2 , g^3 , preferably, but not necessarily, four in number, situated so as to engage the outer edge of the body G of the valve, while leaving sufficient space between them for the free passage of the water around the edge of the valve, when the latter is raised from its seat.

Each chamber F^2 , F^3 , has, in its top, directly over the valve within, an opening f^6 large enough to permit the valve and its valve-seat to be readily removed and replaced, as desired. A swinging cover f^7 is provided for each of these openings which, while serving to close its respective opening tightly, also serves as an abutment for the upper end of the valve-closing spring g^3 , which, surrounding the valve-stem g , bears at its lower end down upon the valve-body G , with a pressure sufficient to close the valve, and hold it normally closed, when water is not being drawn or forced, by the action of the pump, up through the respective valve-port. In order that each of these covers f^7 may be secured firmly and closely in place, and at the same time may be most readily raised when it is desired to get at the valve or valve seat below it, I use the two hinged bolts f^8 , f^9 , pivoted at their lower ends to suitable ears on the water chest casing. One of these bolts extends up through a bolt-hole in the respective cover, while the other passes

through an open-ended slot or notch f^9 in the side of the cover diametrically opposite to the hole for the other bolt. On the upper portion of each bolt, above the cover, is a nut f^{10} . With this construction the cover can be forced tightly down into its normal position to close the respective opening in the water chest top by screwing the nuts downward, while with the nuts loosened, the bolt engaging the notch or open-ended slot in the cover can be swung out of such notch or slot, and the cover can be swung with the other bolt as a hinge support so as to uncover the opening in the water chest top, without any danger of being dropped off or lost down the shaft being pumped out. The unclosed opening can be quickly closed again by swinging the cover into place, moving the disengaged bolt up into the cover notch again, and screwing down the notch.

To prevent the various nuts from being lost off of their respective bolts, I provide each of the latter with a pin or key f^{11} , so situated as to allow a sufficient unscrewing of the nut, while stopping it before it leaves the bolt end.

The upper and lower pairs of water-chests are connected by the central hollow trunk H , which has its interior divided by the longitudinal partition H' , into the two passages H^2 and H^3 , of which the former is on the outer, and the latter is on the inner side or toward the front of the pump. These are, respectively, the suction and delivery-passages common to the different parts of the pump. The former, being the one designated by H^2 , is connected by ports h , h , with the lower chamber E' in all the water chests, while the latter, being the inner of the two passages, is connected, by ports h' , h' , with the several water-chest-chambers F^2 , F^3 , F^3 , F^3 . This trunk, connected with the chambers of the different water-chests, as described, I cast in one piece with such chests, as shown in full lines in the drawings. If desired, it can be divided, at or near its middle, as indicated in dotted lines (see Figs. 1 and 2), each half being cast in one piece with a pair of the water-chests, and provided, on its inner end, with a suitable coupling flange h^{12} , which can be bolted or clamped to the corresponding flange on the other half of the trunk.

In order that it may take up as little room as possible, and may not project beyond the front side of the water-chests, to any considerable extent, and that the covers of the openings in the tops of such chests may be left, so that access to them may be most free and unimpeded, I make the trunk of the shape shown, with flattened sides, and its greatest diameter running from the front to the rear, the passages within being correspondingly shaped. Such trunk is placed in line with the space between the water-cylinders E , E , and so that its partition H' , dividing the suction and delivery passages H^2 and H^3 , is about on a plane with the middle portions of the water-chests.

At the lower end of the trunk is a tubular

extension h^2 which, forming a continuation of the suction-passage H^2 , is provided with a flange h^3 , or other suitable means whereby it can be coupled to the suction-pipe h^4 leading
 5 down from the pump.

The form of coupling preferred is the hinged bolt one shown, which is like that used on the upper end of eduction-pipe D, and consists of bolts h^{13} hinged to one of the parts to be
 10 coupled, and passing through corresponding open slots or notches h^{14} in the two abutting flanges, and nuts h^5 , on the outer portions of such bolts, to draw the flanges together in the manner which will be understood from the
 15 drawings.

The operation of my pump, which will be understood from the foregoing description, and the drawings, is briefly, as follows:—
 With the steam turned on, and the plungers
 20 actuated alternately, as in the well known form of Worthington pump, each plunger will, as it is moved down into the lower end of its respective cylinder, force the water from the latter out into the intermediate
 25 chamber F^2 of the respective valve-chest, and past the valve closing the port into the uppermost chamber F^3 . From the latter, the water then flows into the delivery or eduction-passage H^3 , on the outer side of trunk H.
 30 In the meantime, the descent of the upper end of the plunger, in the upper end of its cylinder, draws water, from the common suction-passage H^2 of the trunk, through the lower chamber F' in the respective water-
 35 chest and the valve-port between such chamber and the intermediate chamber F^2 , to and into the cylinder, the valve, for closing said port, opening, to allow the passage of the water, and the other valve, for the port between
 40 the intermediate and uppermost chambers, closing, to prevent any back flow of water from the latter chamber into the intermediate one. As the plunger rises again, the water is forced, from the upper end of its cylinder,
 45 through the intermediate chamber connected therewith, and the uppermost chamber, into the common delivery passage H^3 in the trunk H, the valves automatically closing and opening, respectively, the ports leading from the
 50 intermediate to the lowest and highest chambers, and water is drawn from the common suction passage H^2 through the lowest and intermediate chambers in the respective lower
 55 water-chest, into the pump-cylinder, the valves for the ports leading from the intermediate to the uppermost and lowest chambers automatically closing and opening respectively. This operation goes on with each side of the pump, so that, with the alternately acting plungers
 60 of the two sides, a continuous flow of water through the suction pipe h^4 and passage H^2 to the pump cylinders, and from the latter to and through the delivery passage H^3 of the trunk, will be kept up.

65 It will be noticed that in my construction of apparatus, all the delivery or water-valves are situated on the front or outer side of the

pump, so that they are in the most convenient position to be got at, when they or their seats are to be reached, for removal or re-
 70 placing, and that upon the removal of the caps or covers f^7, f^i alone, the valves and seats are left free to be removed directly upward, through the upwardly turned openings in the water-chest-tops. With the common
 75 suction and delivery-passages arranged in the single trunk, and the latter cast in one piece with the pairs of water-chests for the opposite ends of the pump-cylinders, I avoid the projecting joints and connections, which
 80 have been necessary in duplex double acting pumps, as heretofore made, and have been found very objectionable, where the pumps were to be used for sinking, because of their taking up too much space, horizontally, in a
 85 shaft.

Another advantage of my construction, combining the water-chests and delivery and suction-pipes or passages in one piece, is that, by it, I am enabled to very greatly re-
 90 duce the number of joints necessary; for, instead of having sixteen in the connections of the plunger-barrels or cylinders, and the water-chests, as in pumps of this class heretofore made, I have but four, which are so situ-
 95 ated and constructed, that they can easily be kept tight, even during long continued use of the pump.

Having thus described my invention, what I claim is—

1. In a duplex double plunger pump, in combination with the two cylinders or barrels, the water-chests connected with the correspond-
 100 ing ends of the cylinders or barrels, cast in one piece, and a trunk-pipe, connecting the chests and opposite ends of the cylinders, containing two passages forming, respect-
 105 ively, the common suction and delivery-passages for all the chests, substantially as and for the purpose specified.

2. In a duplex double plunger pump, in combination with the two cylinders or barrels, the water-chests connected with the ends of the cylinders or barrels, and the trunk-pipe, con-
 110 taining the common suction and delivery passages for the water-chests, cast in one piece with such chests, substantially as and for the purpose shown.

3. In a duplex double plunger pump in combination with the two cylinders, or barrels the water-chests connected with the cylinders or barrels having suitable water-chambers and valve-ports, and the trunk-pipe containing the two passages forming, respectively, the common suction and delivery-passages for the
 120 several chests, arranged opposite the space between the cylinders or barrels, and having its passages parallel to each other, in a plane at right angles to that in which the cylinders lie, substantially as and for the purpose set
 125 forth.

4. In a vertical duplex double plunger pump in combination with the two cylinders or barrels, the water-chests for the corresponding

ends of the cylinders arranged on the outer sides of the latter, and cast in one piece, and the trunk-pipe, connecting the chests at the opposite ends of the cylinders, containing the
5 two passages forming, respectively, the common suction and delivery-passages, connected with the several chests, substantially as and for the purpose described.

5. In a vertical duplex double plunger pump
10 in combination with the two water-cylinders or barrels, the water-chests for the corresponding ends of the cylinders or barrels situated on the outer or front side of the latter, and each containing three chambers with ports
15 for connecting the latter, the automatic check valves to allow passage of water from one of these chambers into another and from the latter into the third, and the common suction and eduction passages connected respectively,
20 with the first and third chambers of all the water chests, substantially as and for the purpose specified.

6. In a vertical duplex double plunger pump, in combination with the two water-cylinders
25 or barrels, the water-chests for the corresponding ends of the cylinders or barrels situated

on the outer or front sides of the latter, and each containing an inlet, an intermediate, and an outlet-chamber, of which the intermediate one is connected with the other two by
30 suitable valve-ports, the automatic check valves in the intermediate and outlet-chambers of each water-chest adapted to allow flow of water only into, and not from their respective chambers, removably fastened covers
35 for the tops of the outlet and intermediate chambers, through which the valves therein can be reached for removal or replacing, and the trunk-pipe cast in one piece with the water-chests, and containing the common suction and delivery passages connected, respectively,
40 with the inlet and outlet chambers of all the water-chests, substantially as and for the purpose shown.

In testimony that I claim the foregoing I
45 have hereunto set my hand this 3d day of April, 1893.

JAMES RENSHAW.

Witnesses:

DUNCAN BOND,
GEO. VOORHIES.