

No. 646,079.

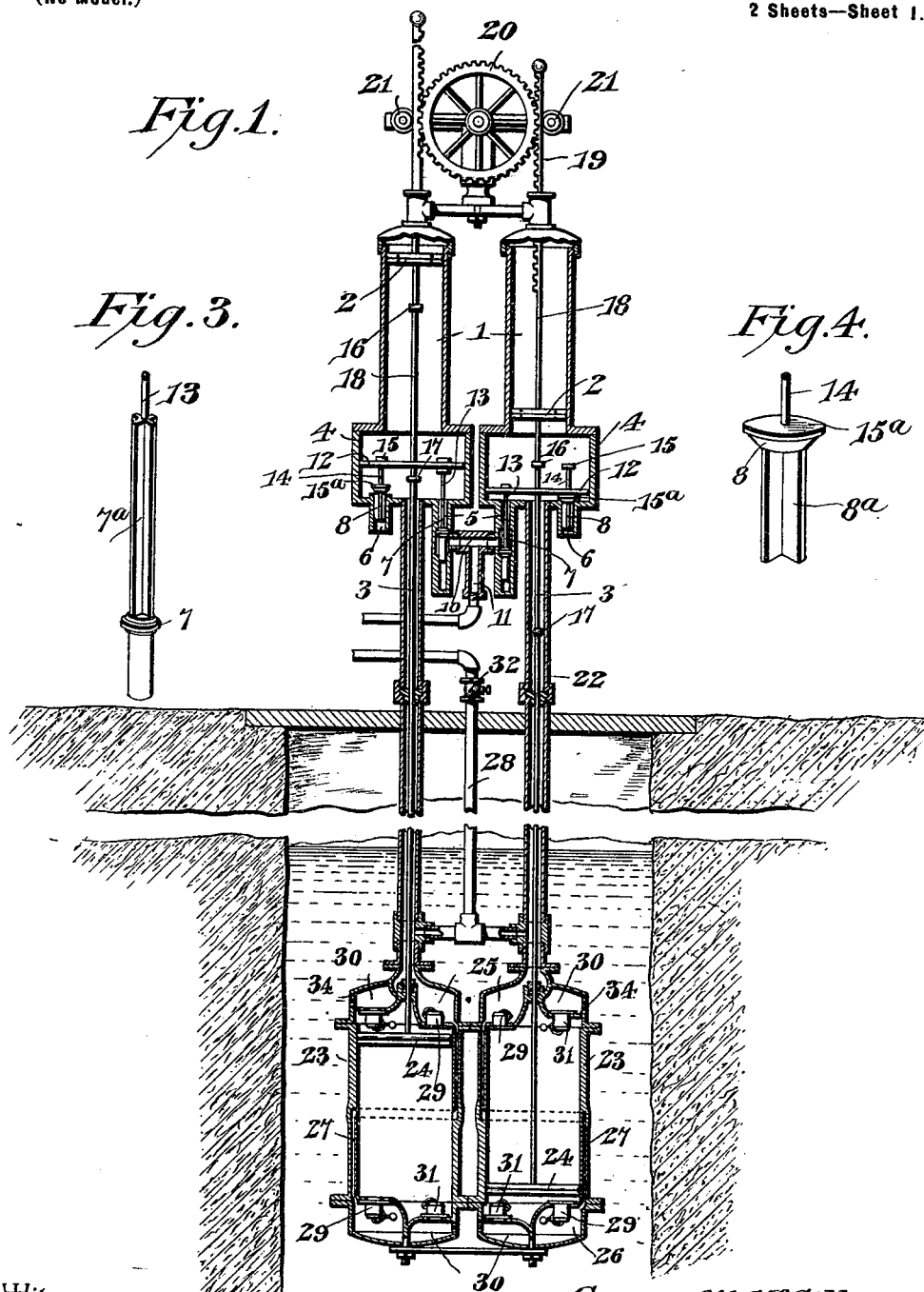
Patented Mar. 27, 1900.

G. W. MCGILL.
PUMPING ENGINE.

(Application filed May 1, 1899.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses

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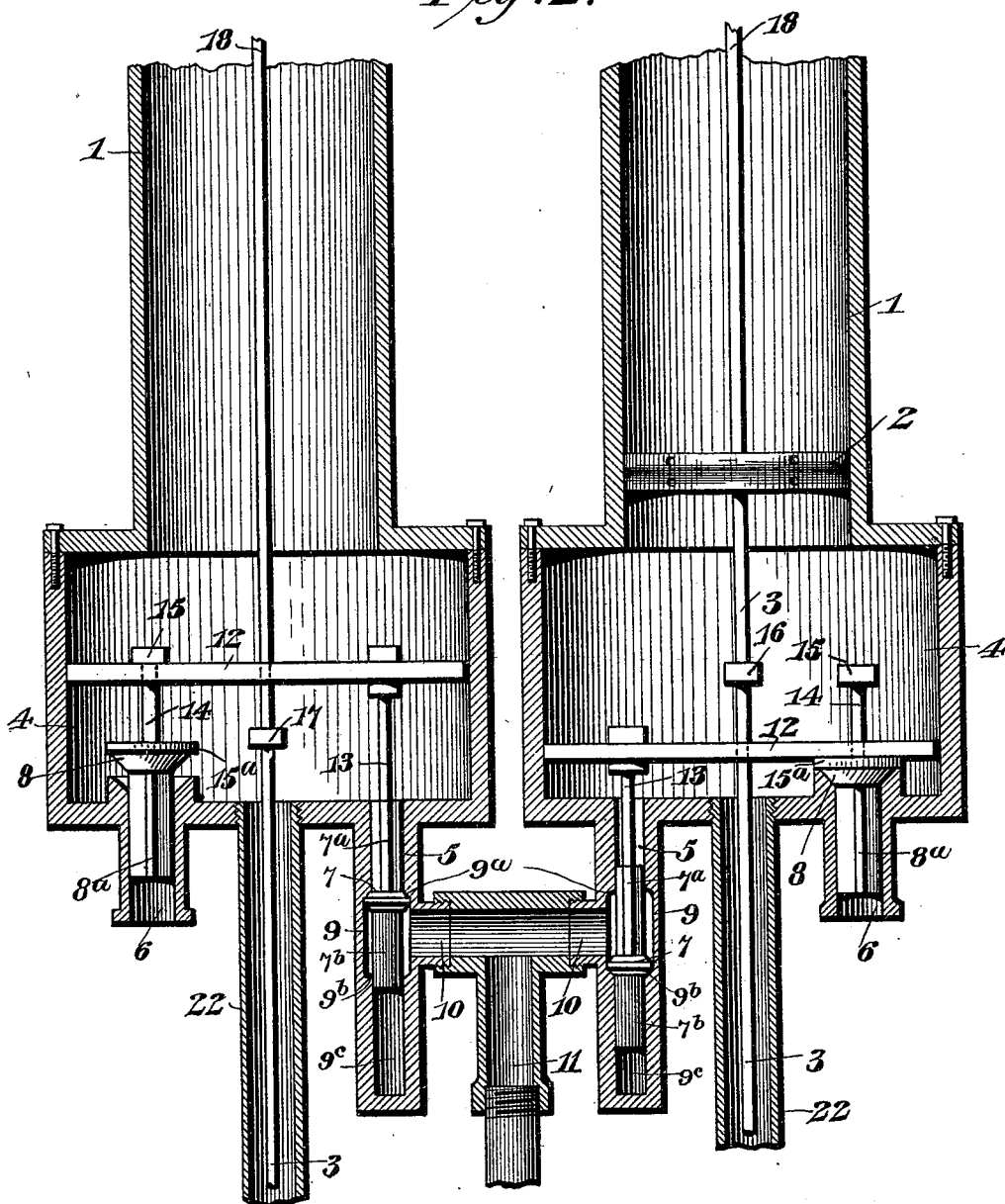
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2 Sheets—Sheet 2.

Fig. 2.



Witnesses

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UNITED STATES PATENT OFFICE.

GEORGE W. MCGILL, OF KEARNEY, NEBRASKA.

PUMPING-ENGINE.

SPECIFICATION forming part of Letters Patent No. 646,079, dated March 27, 1900.

Application filed May 1, 1899. Serial No. 715,187. (No model.)

To all whom it may concern:

Be it known that I, GEORGE W. MCGILL, a citizen of the United States, residing at Kearney, in the county of Buffalo and State of Nebraska, have invented a new and useful Pumping-Engine, of which the following is a specification.

My invention relates to pumping apparatus, and particularly to a pumping or pump-operating engine wherein the operating parts are adapted for actuation by the motive agent under a constant tension, the feed and exhaust valves being actuated by means controlled by the discharge-valve of the pump.

Further objects and advantages of this invention will appear in the following description, and the novel features thereof will be particularly pointed out in the appended claims.

In the drawings, Figure 1 is a sectional view of a pumping apparatus, including a pump-operating engine, constructed in accordance with my invention, the engine illustrated being of the double-cylinder reciprocatory-piston type. Fig. 2 is an enlarged section of the engine. Figs. 3 and 4 are detail views, respectively, of the feed and exhaust valves.

Similar reference characters indicate corresponding parts in all the figures of the drawings.

In the double-cylinder form of engine illustrated in the drawings, 1 designates the cylinders, in which operate reciprocatory pistons 2, having rods or stems 3, and communicating with one end of each cylinder is a valve-chamber 4, having a feed-port 5 and an exhaust-port 6. Said ports are controlled, respectively, by a feed-valve 7 and an exhaust-valve 8. (Shown in detail, respectively, in Figs. 3 and 4.) The feed-valve operates in a tubular guide 9, with which communicates a branch 10 of a supply-pipe 11, in which is maintained a uniform pressure of the motive agent, such as compressed air. When the feed-valve of one of the cylinders is unseated, compressed air passes through the branch 10 and guide 9 to the feed-port 5, thence entering the valve-chamber and acting upon the adjacent surface of the piston 2, and when the piston reaches the limit of its stroke the seating of said feed-valve and the simulta-

neous unseating of the exhaust-valve 8 will allow the escape of the fluid contents of the cylinder and chamber 4 to relieve the piston for return movement. To accomplish the operation and alternate reversal of the valves, I employ a tappet-bar 12, connected to and carried by the piston-rod 3 and having the stem 13 of the feed-valve attached thereto, and I also connect a stem 14 of the exhaust-valve to a tappet 15, which is arranged in the path of movement in one direction of the tappet-bar. Thus as the piston moves outward in the cylinder under the pressure of the motive agent entering the same the tappet-bar approaches the tappet 15 as the feed-valve in turn approaches its seat, and when the tappet-bar comes in contact with said tappet to unseat the exhaust-valve the feed-valve is simultaneously seated to cut off an influx of the motive agent. The exhaust-port now being open to allow the escape of the motive agent within the cylinder, the piston is free to move inward, and when the tappet-bar comes in contact with a second tappet 15^a, formed by the head of the exhaust-valve, the latter is seated as the feed-valve is unseated to again admit the motive agent. The feed and exhaust valves are provided, respectively, with webs 7^a and 8^a, which fit frictionally in the valve-ports, and the piston-rod 3 slides loosely through the tappet-bar and is in turn provided with outer and inner tappets 16 and 17, which alternately come into contact with the tappet-bar to actuate the same as the piston approaches the limits of its stroke in opposite directions.

In practice I prefer to duplicate the cylinder and valve mechanism, as above described and as illustrated in the drawings, and provide the pistons with piston-rod extensions 18, carrying racks 19, of which the teeth mesh with those of a reversing-gear 20, whereby the outward movement of one piston communicates motion through the gear to cause inward movement of the piston in the other cylinder, bearing-rollers 21 being employed to maintain said racks in operative relation with the gear.

The piston-rods 3 extend through tubular guides or housings 22 to a submerged pump having cylinders 23, containing reciprocatory plungers 24, attached to said piston-rods, and

provided with terminal discharge-chambers 25 and 26, which are in connection by means of a conveyer 27, and of which the upper chambers are in communication by the lower portions of the guides 22 with a distributing-pipe 28. Communication between the cylinders and said discharge-chambers is controlled by weighted discharge-valves 29, opening into the said chambers, while the inlet of liquid into the cylinder from receiving-chambers 30 is controlled by inlet-valves 31. The distributing-pipe 28 is provided with a cock or cut-off valve (indicated at 32) and adapted to be of any preferred construction, and it is obvious that while this valve is open the reciprocatory movement of the pistons 2 will be communicated to the plungers 24 to cause an inlet of water through the receiving-chambers 30 to the pump-cylinders 23 and a discharge from said cylinders through the distributing-pipe, whereas upon closing the cock or cut-off 32 the motion of the plungers will be checked by the pressure of water in the pump-cylinders, thus checking the piston-rod 3 and preventing the actuation of the valves 7 and 8, which control the feed and exhaust of the compressed air or other motive agent. Thus by employing a constant pressure of motive agent in a feed-pipe in connection with an engine constructed substantially as above described I am enabled by means of a valve in a distributing-pipe which is in connection with the pump mechanism to control the operation of the engine, whereby the engine operates only when a supply of liquid is required. Furthermore, it will be seen from the foregoing description that the construction and arrangement of the parts are simple and direct and that the mechanism, which may be constructed at a comparatively small cost, may be maintained in operative condition at the minimum expense for repairs.

The construction herein disclosed of the pump proper forms the subject-matter of a copending application filed by me of even date herewith.

As a means of insuring the proper adjustment of the valves 7 and 8 I have arranged the parts in such relations as to cause the actuation thereof to a certain extent by the pressure of the motive agent. As hereinbefore described, the piston-rod is provided with spaced tappets, between which is arranged a tappet-bar, which is connected fixedly to the stem of the feed-valve, but is arranged between spaced tappets on the stem of the exhaust-valve. In addition to this, however, I preferably arrange the feed-valve to operate between spaced outer and inner seats 9^a 9^b, arranged upon opposite sides of a lateral inlet-port formed in the construction illustrated by the branch 10, through which the air under pressure is admitted to the feed-valve guide. Also I preferably construct the feed-valve with exposed outer and inner surfaces of different areas, wherein the differ-

tial is sufficient, when both surfaces are exposed, to cause the positive movement in one direction of the valve by fluid-pressure. To accomplish this the valve is provided not only with the outwardly-extending guide wings or webs 7^a, but an inwardly-extending extension 7^b, forming a piston which operates in the pocket or cavity 9^c, in which it fits snugly to prevent the communication thereto of direct motive pressure. Hence with the feed-valve arranged upon the outer seat 9^a and the exhaust-valve unseated, as indicated at the left in Fig. 2, the inward movement of the piston causing the contact of the outer tappet 16 with the tappet-bar 12 must be sufficient to expose the outer or larger surface of the feed-valve to the action of the fluid-pressure by exposing said valve in the port 10, whereupon the continuation of the movement of the feed-valve toward its inner seat 9^b will be caused by the fluid-pressure, and in so moving the valve will carry with it the tappet-bar 12 until the latter comes in contact with the tappet 15^a and seats the exhaust-valve just as the feed-valve reaches its inner seat.

Various changes in the form, proportion, size, and minor details of construction within the scope of the appended claims may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

Having described my invention, what I claim is—

1. In a pumping mechanism, the combination, with two cylinders, one of which is provided with a valve-chamber and the other one is provided with two communicating chambers, of a tubular guide connecting said cylinders, and communicating with the two chambers of one of them, a piston-rod through the guide, a piston-head upon one end of the rod within one of the cylinders and a piston-head and tappets upon the other end of the rod, a tappet-bar in the valve-chamber in position to be operated by the tappets upon the piston-rod, an inlet-valve rigidly secured to the bar and an outlet-valve, the stem of which passes through the tappet-bar and is provided with tappets in position to be operated by said bar, and a distributing-pipe communicating with the tubular guide and provided with means for closing the same.

2. In a pumping mechanism, the combination, with two pairs of cylinders, the upper cylinders of one pair being each provided with a valve-chamber and the lower cylinders of the other pair being each provided with two communicating chambers, of a tubular guide connecting the upper and lower cylinders of each pair, each guide communicating with one of the chambers of the lower cylinder, a distributing-pipe common to and connected with said guides, a piston-rod through each guide and provided with a piston-head at each end and having a geared rack above the upper cylinder, a reversing-gear between said racks, valves within each valved cham-

ber, and means of supplying each pair of cylinders with means for operating said mechanism.

3. The combination with a vertical cylinder, and a reciprocatory piston mounted therein, said piston having a rod provided with spaced tappets, of a pressure-supply pipe, feed and exhaust valves, of which the former controls a port in communication with said supply-pipe, a tappet-bar fixed to and movable with the feed-valve and arranged in the paths of said tappets on the piston-rod, and an exhaust-valve stem having a tappet arranged in the path of said tappet-bar, and with respect to which exhaust-valve stem the tappet-bar is independently movable for a portion of the length of the stem, to operate the exhaust-valve subsequent to the operation of the feed-valve, substantially as specified.

4. The combination of reciprocatory pistons, and means for causing simultaneous movement thereof in opposite directions, said pistons having rods provided with spaced tappets, of a branched pressure-supply pipe, feed and exhaust valves, tappet-bars fixed respectively to said feed-valves and arranged in the paths of the tappets carried respectively by said piston-rods, and tappets on the exhaust-valve stems arranged in the paths of said tappet-bars, and with respect to which exhaust-valve stem the tappet-bar is independently movable for a portion of the length of the stem, to operate the exhaust-valve subsequent to the operation of the feed-valve, substantially as specified.

5. The combination with a piston-cylinder and piston, of a valve-casing, a pressure-supply pipe in communication by a feed-port with said valve-casing, a feed-valve, an exhaust-valve controlling an exhaust-port in communication with said casing, a tappet-bar arranged for reciprocatory movement in said valve-casing and having a fixed connection with the stem of the feed-valve, tappets carried by the piston-rod for alternate engagement with said tappet-bar, and an exhaust-valve stem extending through said tappet-bar and having a terminal tappet arranged in the path of movement in one direction of

said bar for engagement to move it from its seat, substantially as specified.

6. In a pumping mechanism, the combination, with a cylinder provided with a valve-chamber, said chamber being provided with an inlet and an outlet port, the inlet-port being provided with a pocket, of a piston-rod in the cylinder provided with a head, interdependent valves in position to be operated by said rod, the area of the inlet-valve being greater upon one side than upon the other, and means for exposing the greater area of the valve to the action of the motive agent for positively closing the outlet-valve.

7. In combination, a cylinder, a piston operating therein, means for supplying a motive agent to the cylinder, valve-controlled inlet and exhaust ports, a pump-cylinder having independent terminal receiving and discharge chambers, the latter being in communication, valved openings between said chambers and the pump-cylinder, a tubular guide connecting the two cylinders and in communication with the said discharge-chambers of the pump-cylinder, a piston in the pump-cylinder, a rod passing through the tubular guide and connecting the two pistons, and a valved distributing-pipe connected with the said tubular guide, substantially as described.

8. In a pumping mechanism, the combination, with a cylinder provided with a valve-chamber, the inlet of said chamber being provided with a recessed portion opposite the entrance thereto and with a pocket below said recess, of a valve in said inlet provided with a piston, the head of the valve fitting within the recess and the piston fitting in the pocket, an outlet-valve, a bar for connecting said valves, a piston-rod provided with a head in the cylinder, and means for introducing a motive agent to the cylinder.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

GEORGE W. MCGILL.

Witnesses:

JOHN H. SIGGERS,
FRANCES PEYTON SMITH.