

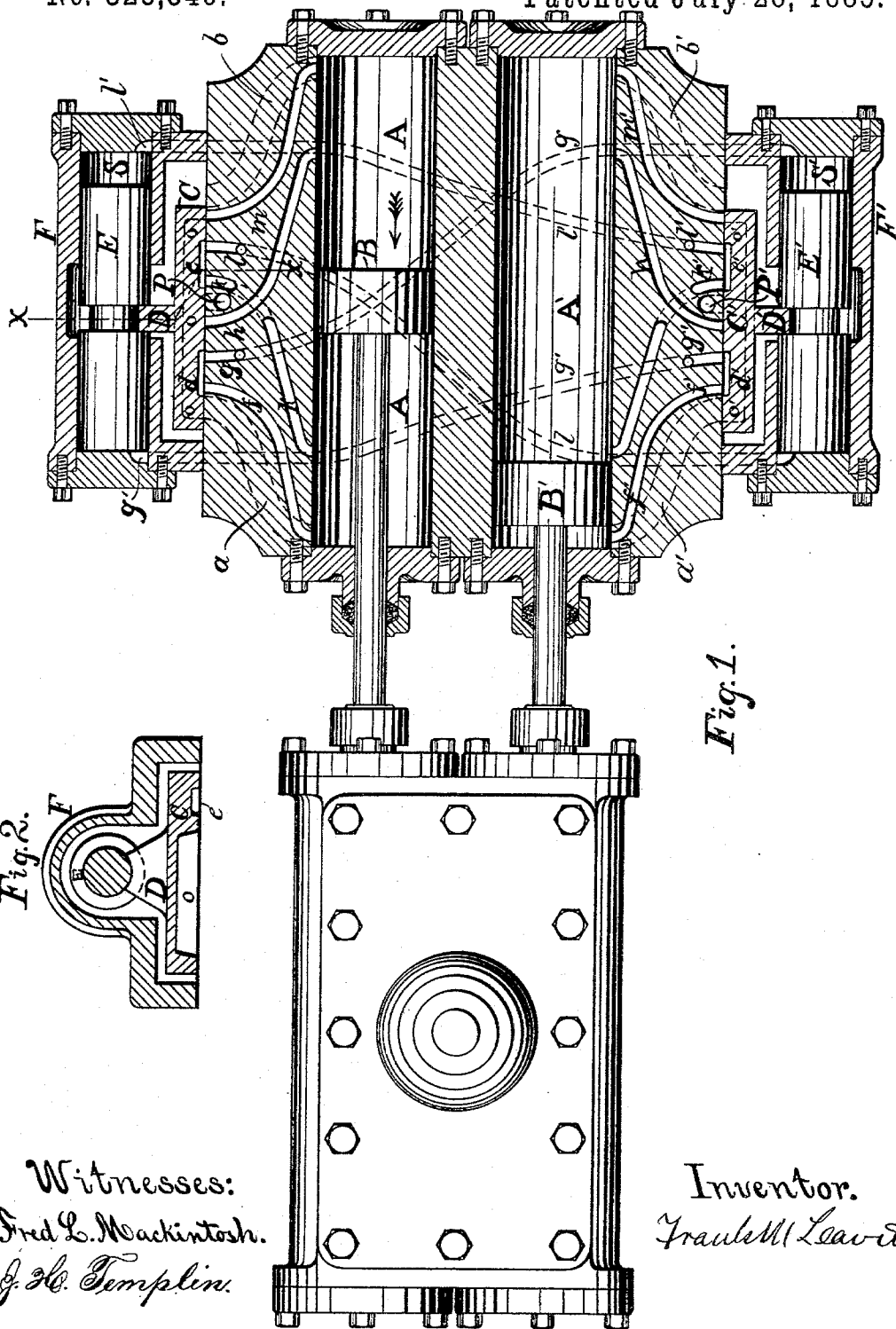
(No Model.)

F. M. LEAVITT.

STEAM PUMP.

No. 323,346.

Patented July 28, 1885.



Witnesses:

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STEAM-PUMP.

SPECIFICATION forming part of Letters Patent No. 323,346, dated July 28, 1885.

Application filed August 16, 1884. (No model.)

To all whom it may concern:

Be it known that I, FRANK M. LEAVITT, of the city, county, and State of New York, have invented a new and useful Improvement in Steam-Pumps, of which the following is a clear and exact specification, reference being had to the accompanying drawings, and to the letters and figures marked thereon.

My invention relates to a direct-acting steam-pump, where the valves are actuated by direct steam-pressure, exhausted through passage-ways leading from each end of the valve-plunger cylinders into the end of the main cylinders, such passage-way being controlled by a valve, as hereinafter more fully described and claimed.

Figure 1 represents a plan view of a direct-acting duplex steam-pump, the steam cylinder and chest being shown in horizontal section. Fig. 2 represents a cross-section of the steam chest valve and plunger, taken at the line X X, Fig. 1.

Having described my invention by reference to the figures illustrated in the accompanying drawings, I will now proceed to describe it by reference to the letters marked thereon, in which—

A represents a steam-cylinder; A', a corresponding steam-cylinder. In these cylinders pistons B and B', respectively, move reciprocally. Steam is alternately admitted to and exhausted from each end of the cylinder A through ports *a* and *b*, (shown in dotted lines,) by means of slide valve C in the ordinary manner. Steam is alternately admitted to and exhausted from cylinder A' through ports *a'* and *b'*, (shown in dotted lines,) by means of slide-valve C'.

D and D' represent projecting lugs on the outer surface of each of the valves C and C'. These lugs engage, respectively, in a groove in steam-actuated plungers E and E' in such a manner as to make valves C and C' to move in unison with them.

d and *e* and *d'* and *e'* represent recesses in the faces of valves C and C'.

F and F' represent steam-chests, in which the valves C and C' respectively operate, the said chests being provided with suitable cylinders, S and S', in which the plungers E and E' move.

l' represents a port or passage-way for steam—one end connecting with the right-hand end of the plunger-cylinder S and the opposite end with the steam-chest F', in such a position that this end of the port is always open into recess *e'* at whichever end of its stroke the valve C' may be.

k' and *m'* represent steam-ports or passage-ways, one end of each entering cylinder A' and the other ends entering the steam-chest F', in such a position that when the valve C' is at the extreme left of its throw, the port *k'* is in communication with port *l'* through recess *e'*, and the port *m'* is closed by the valve C, and conversely, when the said valve is at the extreme right of its throw, the port *m'* communicates with port *l'* through recess *e'*, and port *k'* is closed by valve C. The port *k'* enters cylinder A' at a point distant from the left-hand end of said cylinder somewhat greater than the thickness of the piston B', and the port *m'* enters at or near the right-hand end of the cylinder A.

It will be seen that the three ports *k'*, *l'* and *m'*, together with recess *e'*, form a system of steam-ports to control the steam in the right-hand end of cylinder S. The left-hand end of cylinder S is controlled in a similar manner by the three ports *f'*, *g'* and *h'*, together with recess *d'*, and likewise the two ends of cylinder S' are controlled by the system of ports *f*, *g*, and *h* and recess *d*, and the system *k*, *l*, and *m* and recess *e*, respectively. Care must be taken that the ports *f* and *f'*, *m* and *m'* enter the cylinders A and A' at their respective ends beyond the travel of the piston-valves B and B', so that these ports are never covered or stopped by said pistons. These ports may communicate with main cylinders by being connected with the main ports *a*, *b*, *a'*, *b'*, respectively, though by preference are connected directly with said cylinders, as hereinabove described.

Operation: When the pistons and valves are in the position shown in Fig. 1, port *l'* is uncovered by valve C'. In consequence, live steam is admitted from steam-space in chest F' into the right-hand end of the cylinder A', holding the piston B' against the left-hand end of its stroke, as shown, the left-hand end of the said cylinder being connected with the

main exhaust P' through port *a'* and recess O' in valve C'. Ports *m'* and *h'* are closed by valve C', as shown. Live steam passes from cylinder A' through port *k'*, recess *e'* in valve C', and passage *l'*, into the right-hand end of the valve or plunger cylinder S, operating against plunger E, holding said plunger, and with it valve C, at the left-hand end of their throw, the left-hand end of cylinder S, having connection with the main exhaust-port P' through passage *g'*, recess *d'*, passage *f'*, left-hand end of the cylinder A', main port *a'*, and recess O', main port *b* is thus uncovered, allowing live steam to pass from chest F through said port into the right-hand end of the cylinder A, moving piston B in the direction of the arrow from right to left, the opposite end of the said cylinder being connected with the main exhaust P through port *a* and recess O in valve C. While piston B is making this stroke, the ports *h* and *m* are closed by the valve C, and the right-hand end of cylinder S' is connected with main exhaust P through port *g*, recess *d*, and port *f*, left-hand end of the cylinder A, port *a*, and recess O in valve C, and the left hand end of said cylinder S' is connected with the same exhaust-port P through port *l*, recess *e*, port *k*, left-hand end of cylinder A, port *a*, and recess O. The pressure against each end of the plunger E' is thereby balanced, and the plunger remains stationary, whatever back pressure there may be in the left-hand end of the cylinder A. When piston B reaches the left-hand end of its stroke, it passes port *k*, bringing the same into communication with live steam in the right-hand end of the cylinder A. Steam passes through ports *k*, recess *e* in valve C, port *l*, into the left-hand end of the cylinder S', causing plunger E', and with it valve C', to move to the opposite or right-hand end of its stroke, the right-hand end of cylinder S' being still in communication with the main exhaust-port P, as before described. Port *a'* is by this movement of the valve C' brought in communication with live steam in chest F', and port *b'* with main exhaust-port P', forcing piston B' toward the right-hand end of its stroke. At the end of each stroke of the pistons B and B', a similar cycle of operations is gone through, producing a continuous alternate action of the pistons.

The purpose of exhausting the steam from the plunger-cylinders S and S' into the ends of the cylinders A and A', and thence through the main ports into the main exhaust-ports P and P', instead of directly into the said main exhaust-ports is, that when either piston reaches the end of its stroke—as, for example, when piston B reaches the left-hand end of the cylinder A and steam is admitted through port *k* into the left-hand end of the valve-cylinder, as described, causing the plunger E',

and with it the valve C', to pass to the right-hand end of their stroke—the right-hand end of cylinder A' is placed in communication with the left-hand end of the valve-cylinder S through port *h'*, recess *d'*, and port *g'*, and if the opposite or right-hand end of cylinder S were at the same time connected direct with the main exhaust, whatever steam did not pass out of the right-hand end of the cylinder A' through the main port *b'* would operate against the left-hand end of plunger E, tending to throw this plunger before the proper time, and cause irregular strokes of main piston. Whether the irregular action occurs or not will depend on whether there is sufficient back pressure in the main cylinder to overcome the friction on the main valve. By leading the exhaust-passages into the end of the cylinders A and A', or into the exhaust-ports *a* and *b*, *a'* and *b'*, respectively, in close proximity to the end of the main cylinders, the valve-plungers will receive the same pressure on both ends when the main pistons, governing their action, are at any part of their stroke, except between the two ports at the same end of the cylinder. In consequence of this arrangement it is impossible for either valve to throw, no matter how much the back pressure in the main cylinders may be, until the piston governing its action has reached the extreme end of its stroke.

It is obvious that a similar arrangement of ports may be applied to the piston or balance-valve instead of the slide or flat valve shown, and it is equally obvious that the same system of exhaust-ports and valve-motion can be applied to a single or duplex pump, or to a pump with any increased number of cylinders.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a direct-acting duplex steam-pump, having its valves operated by direct steam-pressure, exhaust-ports or passage-ways leading from each end of the valve-plunger cylinders into the ends of the main cylinders, as described, each passage-way controlled by a valve arranged substantially as described, as and for the purposes stated.

2. In a direct-acting duplex steam-pump, having its valves operated by direct steam-pressure, exhaust-ports or passage-ways leading from the ends of the valve-plunger cylinders into ports leading from the ends of the main cylinders into the recess O and O' in main valves, each passage-way controlled by a valve combined and arranged as described, as and for the purposes stated.

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Witnesses:

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