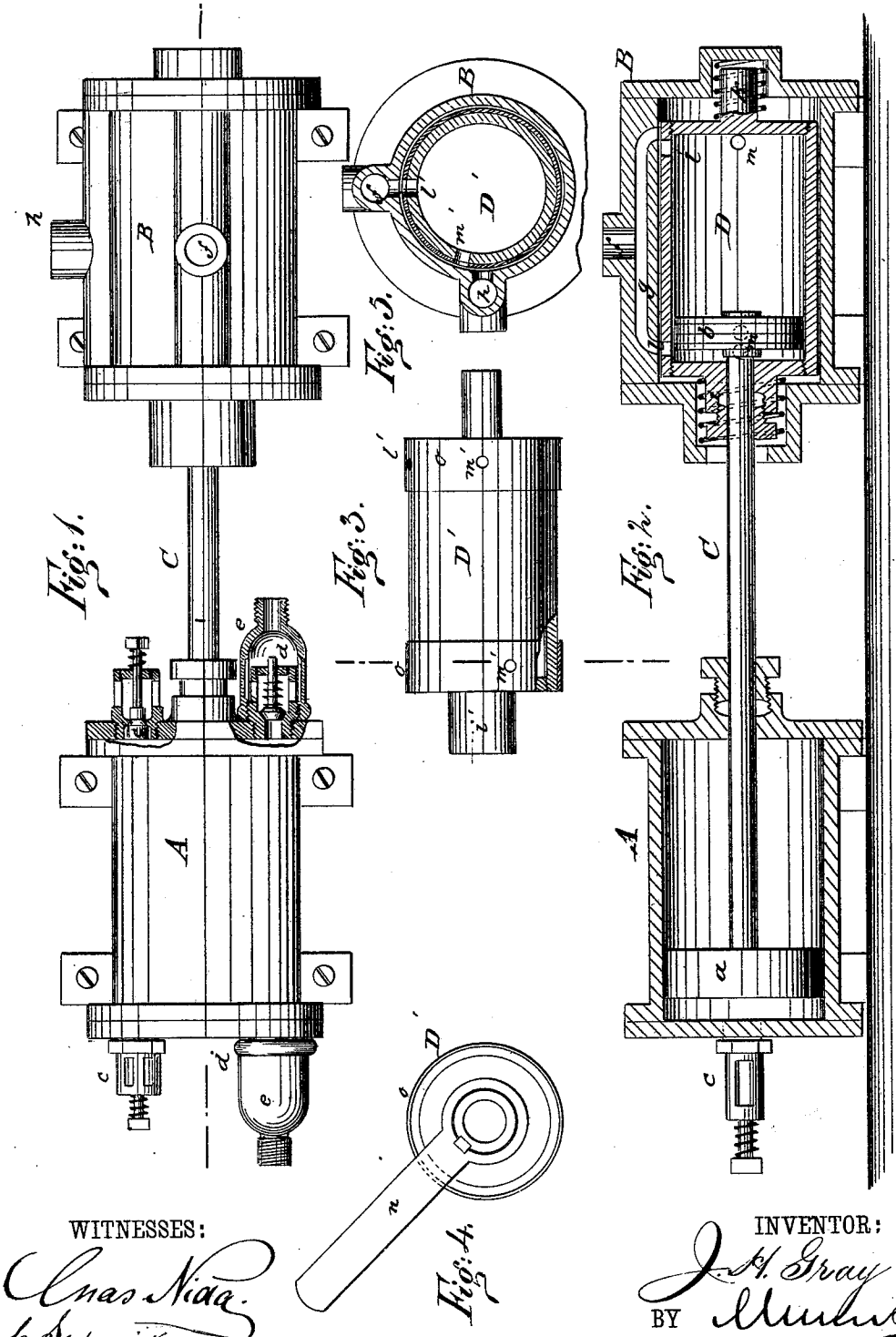
J. H. GRAY.

Direct-Acting Pump.

No. 218,731. Patented Aug. 19, 1879.



WITNESSES:

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JAMES H. GRAY, OF CONNELLSVILLE, PENNSYLVANIA.

IMPROVEMENT IN DIRECT-ACTING PUMPS.

Specification forming part of Letters Patent No. **218,731**, dated August 19, 1879; application filed April 24, 1879.

To all whom it may concern:

Be it known that I, JAMES H. GRAY, of Connellsville, in the county of Fayette and State of Pennsylvania, have invented a new and useful Improvement in Direct-Acting Pumps, of which the following is a specification.

My improvements relate to direct-acting pumps wherein a steam or water pump and steam-cylinder are operated in connection with a single piston; and the invention consists in an improved construction of valves, whereby a steam-chest is dispensed with and a cheap effective pump produced.

The construction and operation will be explained in connection with the accompanying drawings, wherein—

Figure 1 is a plan view, partially in section, of the complete apparatus. Fig. 2 is a vertical longitudinal section. Fig. 3 is a side elevation of the valve in modified form. Fig. 4 is an end view of the same. Fig. 5 is a cross-section of the steam-cylinder fitted with the valve last named.

Similar letters of reference indicate corresponding parts.

The pump-cylinder A and steam-cylinder B are secured upon a suitable bed. C is the piston-rod, carrying at one end the head *a*, within cylinder A, and at the other end the head *b*, within cylinder B.

The pump-cylinder A is adapted for air or water, and is formed with an inlet-valve, *c*, and outlet-valve *d* in each head. These valves are covered by screw-caps *e*, to which pipes may be coupled for conveying the air or water. By this construction the pump is rendered double-acting.

The steam-cylinder B is formed with an aperture at *f* for live steam, which aperture connects with the steam-passage *g*, that extends to both ends of the cylinder. It is also formed with an exhaust-aperture, *h*, connecting with the interior of the cylinder in the same manner.

The valves of cylinder B consist of an inner concentric cylinder, D, fitted steam-tight, and forming a slide-valve, within which the piston-head *b* moves, and which is operated by contact of the piston-head at the extremes of movement.

The valve D is formed at one end with a stem, *i*, and packing-gland for piston C, and at the opposite end with a projection, *k*, that moves in a recess formed in the head of cylinder B. Around stem *i* and projection *k* are spiral springs, which act as buffers to prevent shock.

l l are steam-ports, and *m m* exhaust-ports in valve D, in such positions that they coincide properly with the steam and exhaust passages by the described movement of valve D. The valve D′ (shown in Figs. 3, 4, and 5) is adapted for application to the steam-cylinder B in the same manner, and acts by circular reciprocation instead of longitudinal movement.

l′ l′ are the steam-ports, and *m′ m′* the exhaust-ports. The stem *i′* will project through the head of cylinder B, and the projecting portion is fitted with an arm, *n*, that is to be moved by the piston C at the proper time, and to the required extent, for turning the valve D′ and changing the ports. Around each end of valve D′ is a soft-metal packing-ring, *o*, so that the valve will fit steam-tight.

The operation will be as follows: Steam being admitted by aperture *f*, the passage *g* will contain steam under pressure, which will pass to the inside of valve D by the port *l* at one end and drive the piston and head in one direction. Before the head *b* has reached the extreme of motion it comes in contact with the head of D, moves that in B, and thereby opens the steam-port *l* at that end, and the steam enters to arrest the piston and start it in the opposite direction. The described movement of D closes the steam-port first opened and opens the exhaust *m* for the escape of the steam. The movement of the piston by the steam operates the pump. This acts to discharge a continuous stream by means of the valves before described.

This construction furnishes an effective pump, not liable to derangement, easily repaired, and inexpensive to manufacture.

The valves shown and described can be applied to locomotive, marine, and other engines, thereby dispensing with the eccentrics, rock-shafts, tumblers, and similar devices generally used for operating the valves.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

The sliding tubular valve D, having ports *l m*, reciprocated by the piston *b*, and provided with end stems or projections *i k*, arranged in recesses of cylinder B, and surrounded by buffer-springs, as shown and described.

JAMES HARISON GRAY.

Witnesses:

WILLIAM VANCE,

JNO. H. BURNHAM.