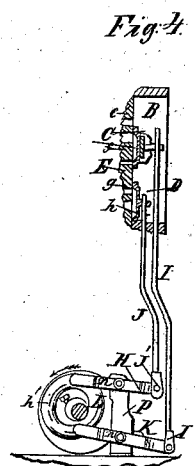
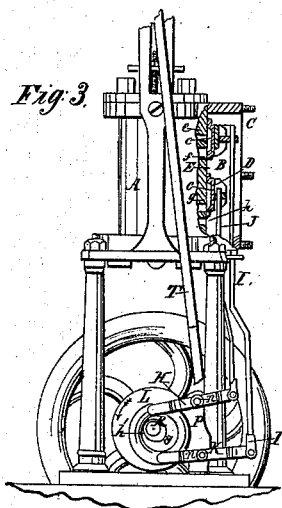
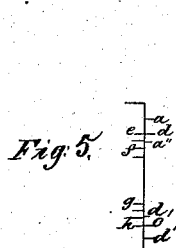
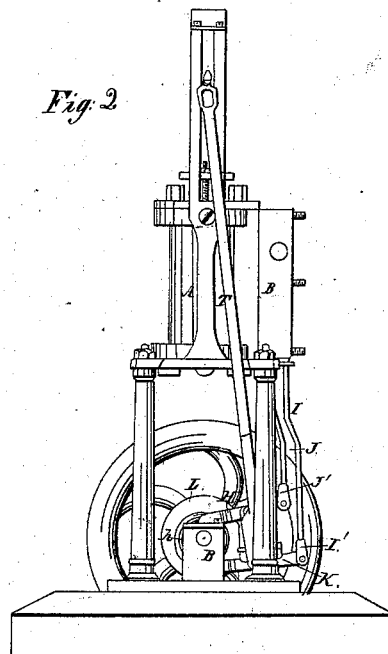
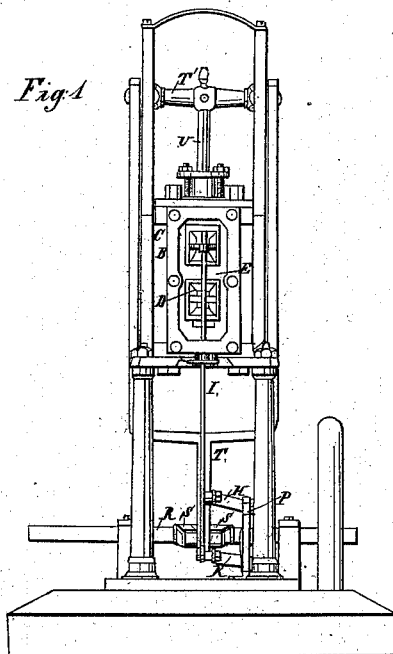


Demming & Porter,
Reciprocating Steam Engine,
No 48,529, Patented July 4, 1865.



Witnesses:

W. H. Burridge

W. M. C. Leland

Inventors:

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UNITED STATES PATENT OFFICE.

B. DEMMING AND D'ARCY PORTER, OF CLEVELAND, OHIO.

IMPROVEMENT IN STEAM-ENGINES.

Specification forming part of Letters Patent No. 48,529, dated July 4, 1865.

To all whom it may concern:

Be it known that we, B. DEMMING and D'ARCY PORTER, of Cleveland, in the county of Cuyahoga, and State of Ohio, have invented certain new and useful Improvements in Steam-Engines; and we do hereby declare that the following is a full and complete description of the construction and operation of the same, reference being had to the accompanying drawings, making a part of this specification, in which—

Figure 1 is a front elevation of the engine. Fig. 2 is a side elevation. Fig. 3 is a sectional view. Fig. 4 is a detached section. Figs. 5 and 6 will be referred to in the description.

Similar letters of reference denote like parts in the different views.

Our improvement relates to the herein described arrangement of devices for operating the valves of steam-engines for receiving and exhausting steam, thereby using steam in the most economical manner.

The steam-engine represented in Figs. 1, 2, and 3, is of the ordinary construction of engines of this class, excepting the mode of operating the valves and the manner of receiving and exhausting steam.

A is the cylinder; B, the steam-chest, the front part or cap of which is removed to show the valves.

The steam and exhaust-pipes communicate with the engine in the usual way.

C and D are the valves that slide on the valve-seat E in the chest. The valves are hollowed out or cup-shaped on the under side, as shown at *e* in Figs. 3 and 4.

e h are the induction and *f g* the exhaust ports, that communicate with the cylinder and exhaust-pipe respectively, in the ordinary manner.

To the valves are secured rods I and J that extend down through the lower part of the chest through a stuffing-box, and are attached at the lower end to wrists I' J'. To these wrists are connected arms or levers H and K, that are pivoted at *n* to a standard, P. On the other end of the levers are wrists that extend into the groove *h'* in a cam, L, and are acted upon by it operating the valves. The cam is on the crank-shaft R, and turns with it. To the crank S is attached a connecting-rod, T, that has a cross-head, T', on the top, and operates the piston-rod U, as usual.

The peculiar manner in which the cam operates the valves as it revolves is described as follows: When the valves are in the position, shown in Fig. 3, the lower induction-port, *h*, is opened, and the upper one closed, which opens the upper exhaust-port, *f*, and closes the lower one. When the valves C and D are first moved into this position by the action of the cam on the arms H and K, the cam is in the position seen in Fig. 6, and the crank S is at its live center in the upward stroke of the piston. As the cam is turned around in the direction of the arrow, the valves remain almost stationary at this point, while the arms are acted upon by the curves of the cam from *r* to *r'*, and from *i* to *i'*, holding the exhaust-port at the upper end of the cylinder, and the induction-port at the lower end open, as represented. But as the lever H is moved by the curve *r' r''* of the cam as it turns, the outer end of the lever is lowered, which moves down the valve D, quickly closing the lower induction-port. At the same time the lever K of the valve C is acted upon by the portion of the cam from *r'* to *r*, so that the valve C begins to move downward a little after the lower valve commences its downward motion, traveling the distance from *a* to *a'*, as indicated in Fig. 5, very slow, while the lower valve descends faster from *d* to *d'* by the action of the curve *r' r''* on the lever H, so as to open the lower exhaust a little while before the upper induction-port is opened. The object of this is to overcome the resistance that the steam, if not thus exhausted, would produce. When the crank has reached its dead-center in the upward stroke of the piston and it begins to descend, the lever K, by the action of the curve from *r'* to *r* of the cam, gives an accelerated motion to the upper valve, C, in traveling from *a'* to *a''* of its downward movement, which opens the upper induction and lower exhaust ports, when the valves, levers, and cam are in the position represented by Fig. 4. In this movement of the valves, the lower valve, D, has nearly reached its lowest point, or *d'*, before the upper valve begins to open the induction-port *e*, and the lower valve is almost stationary while the upper valve is moving from *a'* to *a''*. When the valves are in this position, the crank is at its live center in the downward stroke. The valves are both nearly stationary at this point as before, the

levers being acted upon in the same manner by the curves of the cam, until the curve $r r''$ elevates the outer end of the lever, K, giving the valve U an accelerated motion upward, closing the induction-port e , and opening the exhaust f , while the lower valve travels slowly from d' to d , so that the upper exhaust-port will open to exhaust the steam before the lower induction-port is opened to receive it. Immediately after the crank-shaft moves past its dead-center in the upward stroke, the valve D moves from e' to d , opening the lower induction-port, while the upper valve, having nearly reached its highest point, is almost stationary, opening the exhaust previous to the induction port. Thus the valves are operated alike, alternately opening the exhaust and induction ports at the ends of the cylinder, and either valve as it travels to exhaust has an accelerated speed to the one moving to open the induction

ports; hence the steam is being exhausted before the induction-port is opened for the admission of steam. Consequently the whole expansive force of the steam is obtained without any resistance from the exhaustion, whereby the steam is used in the most economical manner.

What we claim as our improvement, and desire to secure by Letters Patent, is—

1. The valves CD, when arranged and operating in connection with four ports, in the manner and for the purpose before described.

2. The arrangement of the cam L and levers H K, in combination with the valves and valve-rods, substantially as and for the purpose set forth.

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Witnesses:

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