

O.T. Earle,  
 Valves for Steam Engines,  
 No 45,820,  
 Patented Jan. 10, 1865.

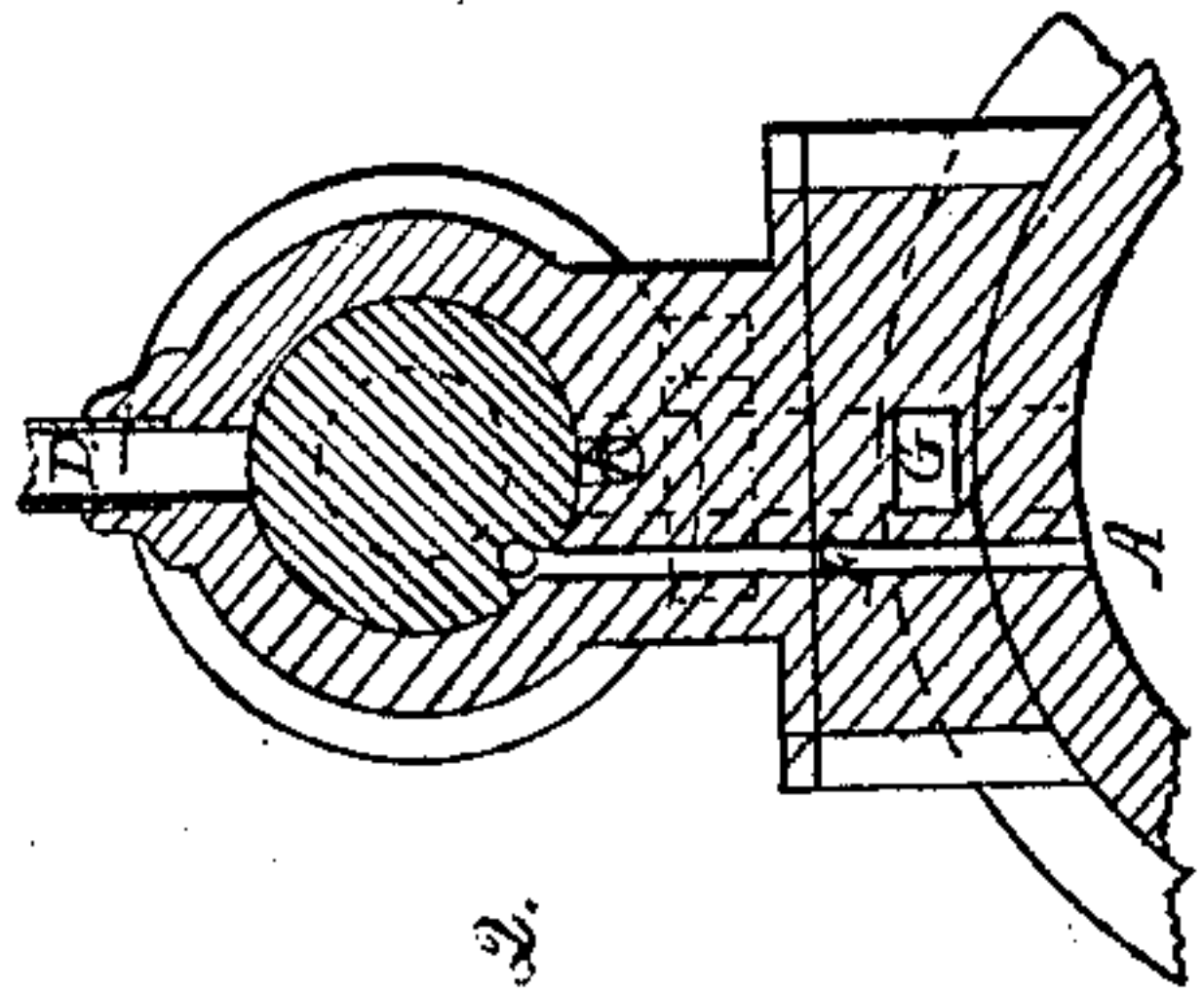


Fig. 2.

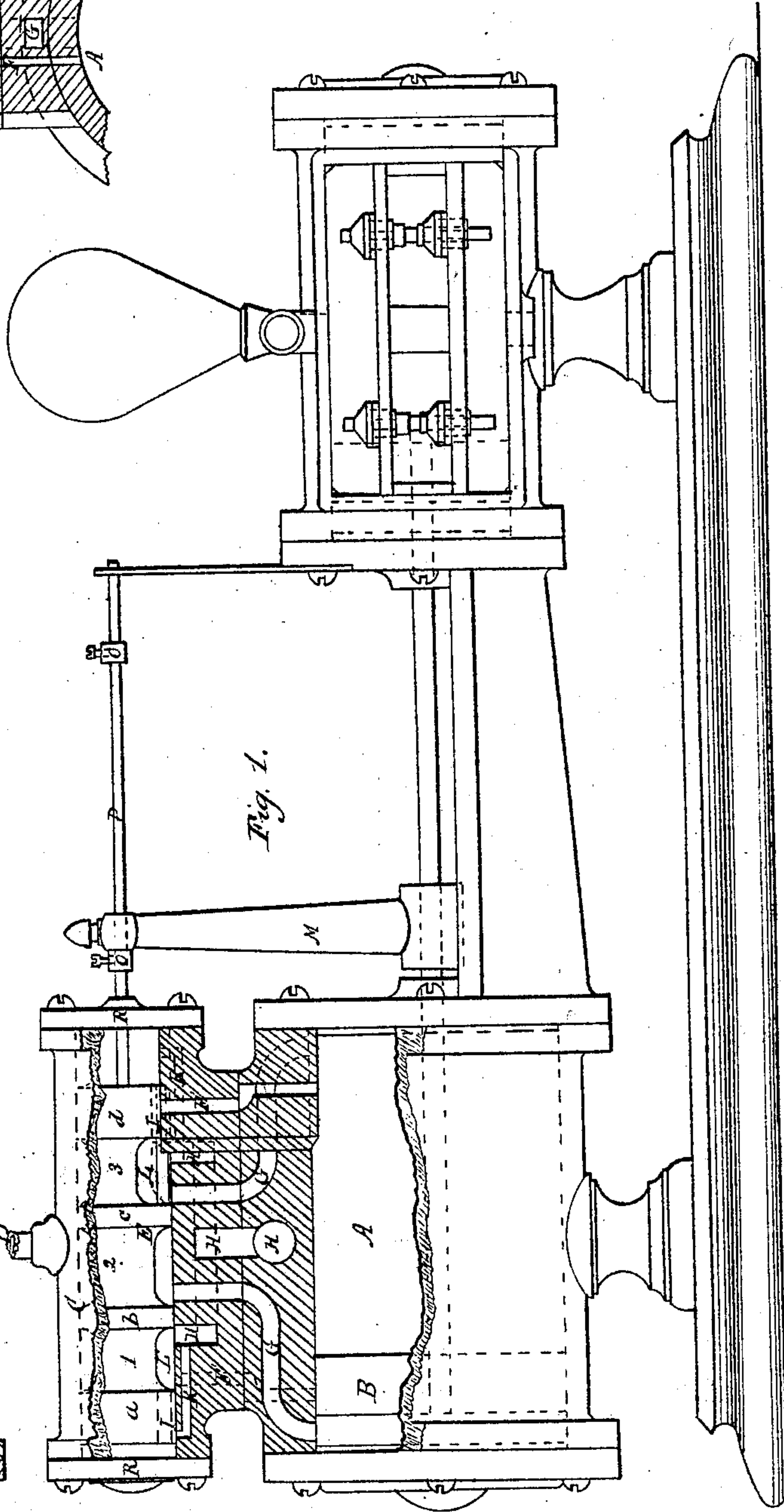


Fig. 1.

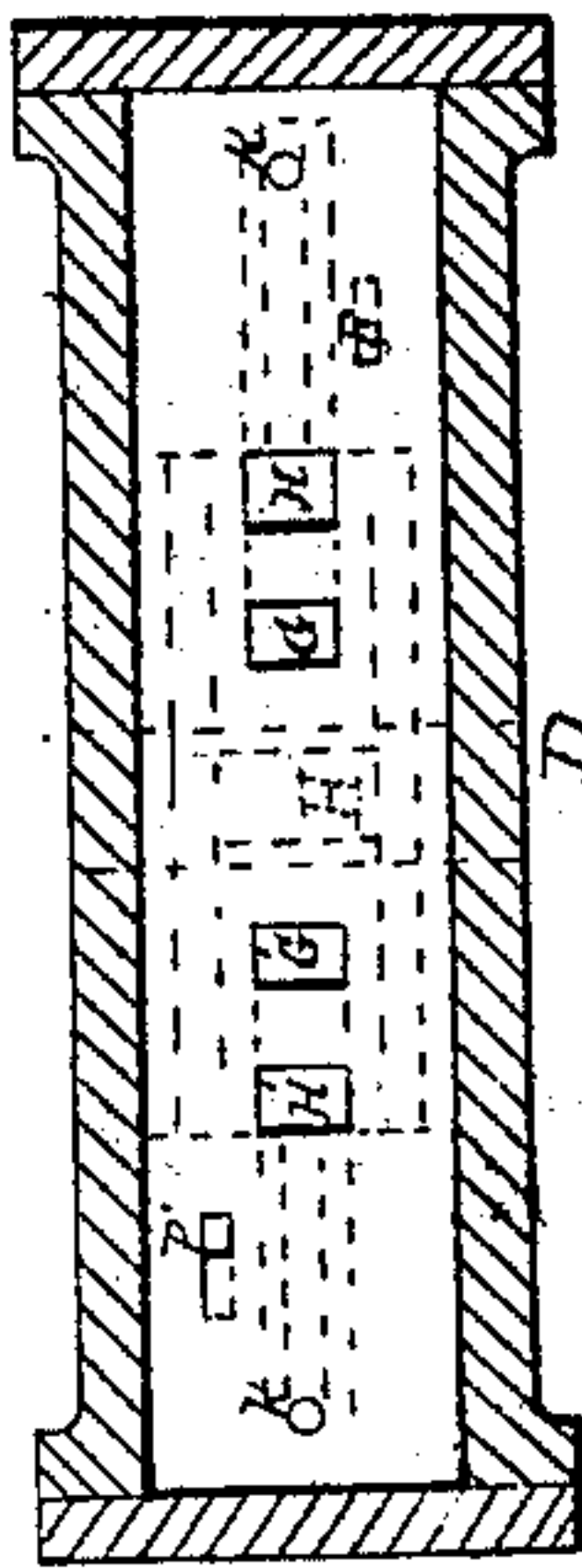


Fig. 3.

Witnesses.  
 Jacob C. Lutz  
 Milton Bradley.

Inventor.  
 Oscar T. Earle



# UNITED STATES PATENT OFFICE.

OSCAR T. EARLE, OF SPRINGFIELD, MASSACHUSETTS.

## IMPROVEMENT IN VALVES FOR STEAM-ENGINES.

Specification forming part of Letters Patent No. 45,820, dated January 10, 1865.

*To all whom it may concern:*

Be it known that I, OSCAR T. EARLE, of Springfield, in the county of Hampden and Commonwealth of Massachusetts, have invented a new and Improved Method of Operating the Valve of a Steam-Engine; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings.

It has been the endeavor of many inventors to produce a steam-valve for direct-acting engines, such that it could be operated by steam without the use of an eccentric or other similar device requiring a crank and fly wheel.

This has been accomplished by certain combinations of steam-ports with a slide-valve forming a part of or connected to a piston, which receives a partial rotary motion sufficient to change the relative positions of certain ports, and thus give motion to the valve by means of steam operating on this said piston. One such arrangement was invented by George S. Faulkner, for which he obtained Letters Patent, bearing date January 27, 1863, and which Letters Patent were assigned to me; but the above-described arrangement has this disadvantage: Some mechanism is necessary to obtain the partial rotary motion from the reciprocating motion of the piston-rod, and this mechanism is necessarily of such a nature as to wear rapidly, and any wear, however slight, materially effects the successful operation of the valve.

Now, I have invented an arrangement of ports, in conjunction with a plain cylindrical slide-valve having one or more grooves or recesses on its surface, that requires no other motion except the simple reciprocating motion obtainable directly from the piston-rod. This feature, in connection with the perfect balance-valve which I obtain, constitutes the principal advantages which I claim for my invention over others in use.

To enable any person skilled in the use of steam to construct and operate my invention, I will proceed to describe it, reference being had to the accompanying drawings, in which—

Figure 1 is a side view in partial section of a steam-pump provided with my improved valve. Fig. 2 is a cross-section of valve and chest. Fig. 3 is a horizontal longitudinal section of the steam-chest with valve removed, showing the plan of valve-seat with ports.

Like letters indicate corresponding parts in each of the several figures.

A is the steam-cylinder proper; B, the piston-head. C is the steam-chest; D, the induction steam-pipe. E is the valve, which is fitted to the cylindrical chest C. F is a steam-port connecting the interior of cylinder A with valve-chest C. F', shown by dotted lines, is another similar port at the other end of cylinder. G and G' are the ordinary receiving-ports for cylinder A and chest C. H H are the exhaust-ports for cylinder A and chest C. The relative positions of the several ports are shown more clearly in Figs. 2 and 3.

I is a small port in the valve E communicating between the end of the valve and port F when the valve is in a certain position.

I' is a similar port in the other end of valve and communicating with port F'.

K is a small exhaust-port communicating with end of chest E and exhaust-port H. The valve E is formed with three grooves of sufficient depth as to give room for both the supply and exhaust steam and passing nearly around the valve, leaving the bridges L and L', also the heads or rings *a b c d*, that fit to the cylindrical chest C. Now, as these grooves or spaces between these heads or rings perform important offices, I will designate them as 1 2 3.

Now, the operation is as follows: In Fig. 1 the valve is shown as having just been thrown to the left, and the piston B is ready to move to the right. As the piston B now stands it covers the port F', which is closed at the top by small bridge L' on valve E between heads *a* and *b*; but as the piston B moves to the right the lower end of port F' is uncovered and live steam fills the port. Now, as the piston B moves to the right, and just as the port F is covered by it, the arm M comes in contact with the collar O on the rod P and moves valve E until the port I' covers over the port F'; then the steam passing through F' and I' operates on end of head *a* of valve E and throws it to the right, the steam at the other end of valve E exhausting through the port K till said port is covered by head *d* of valve E, leaving the remaining steam confined by the closing of port K before the piston has completed its stroke to serve as a cushion to prevent the valve E from coming in violent contact



with the head R of chest C. The port K is made very small in proportion to port F. Now, it will be seen that the piston B acts a very important part in the movement of the valve E, as, if in the movement of the piston B to the right, just described, it had not covered the port F by the time steam was let on to the end *a* of the valve E, the valve would have moved to a position a little past the center, at which time steam would pass through ports G and F to the other end of valve E, and there it would remain vibrating nearly in that position; but as the port F is covered by piston B at the instant that port I passes over the upper end of port of F, no obstruction is offered to the movement of the valve. The valve E is perfectly free to move, for, as the steam is only received through the pipe D, it is confined in the groove or space 2 between the heads *b* and *c* of valve E, and, as it surrounds the valve, the pressure is balanced and a perfect balanced valve is thereby obtained, (which is also obtainable by admitting the steam through ports into the ends of valve-chest C and operating valve E by means of eccentric or cranks,) and thus a certainty of operation secured which is not attainable with any slide valve that receives the pressure of the steam on its back. As regards the balancing of the valve and its operation, in this place it would be as well if the grooves 1 and 3 were filled solid, making one longer head, having a recess on its lower side for an exhaust port, on the supposition that the valve E exactly fits the chest; but if the valve should become slightly imperfect, by reason of wear or other cause, any steam that may escape through from compartment or groove 2 by the heads *b* and *c* to the ends of the valve might interfere with the successful and perfect operation of the valve. To avoid this the grooves 1 and 3 are made in the valve, so that any steam leaking from 2 past heads C or

*b* is received into 1 or 3, each of which is in constant communication with exhaust-ports H H, and thus it is impossible for any steam to pass from 2 to either end of valve E. The valve E may also be provided with peculiarly-constructed spring packing-rings, to produce a perfect fit in very large cylinders.

As regards economy of construction, this valve excels all others heretofore constructed, inasmuch as it is one simple piece of round cast-iron fitting into a straight cylindrical valve-chest, and consequently involves little besides lathe-work in its construction.

Steam-pumps provided with this valve are at present, and have been for several months, in successful operation in many factories and public institutions.

I am aware that steam has been admitted behind the forward and rear ends of a circular slide-valve from ports of the seat, but I am not aware that a port has been made through the valve itself in the manner I have shown and described; therefore

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

1. A cylindrical slide-valve constructed with one or more ports through it, the said port or ports leading behind the ends of the valve into the steam-chest, and at proper intervals coinciding with ports of the valve-seat, substantially as and for the purposes set forth.

2. The arrangement of ports F and F' with piston B and valve E, when operating substantially in the manner and for the purpose herein described.

3. The arrangement of the ports K and K' with the ports I and I' and valve E, when operating substantially as herein described.

OSCAR T. EARLE.

Witnesses:

HARLEY HASKELL,  
W. T. CORNING.