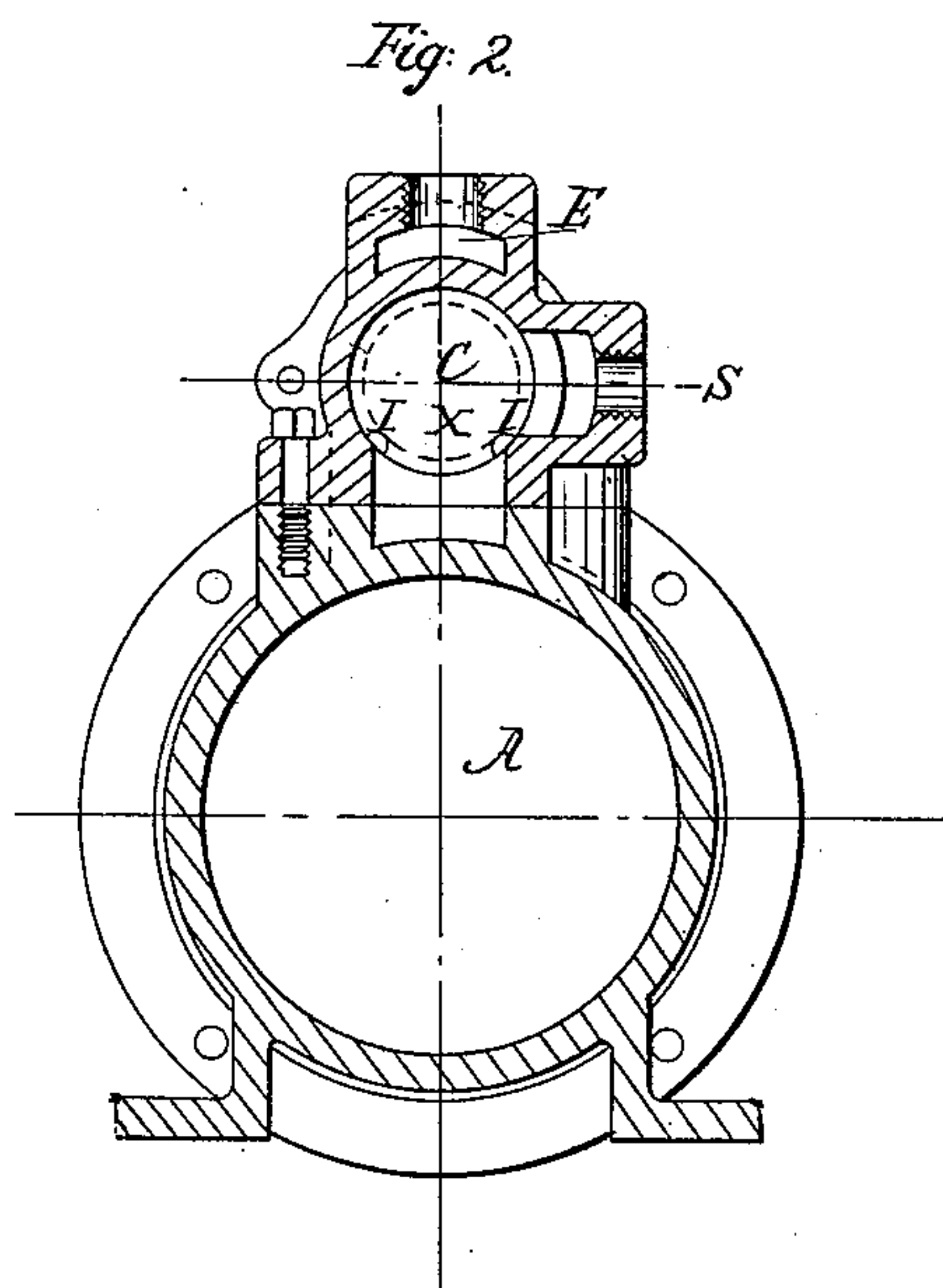
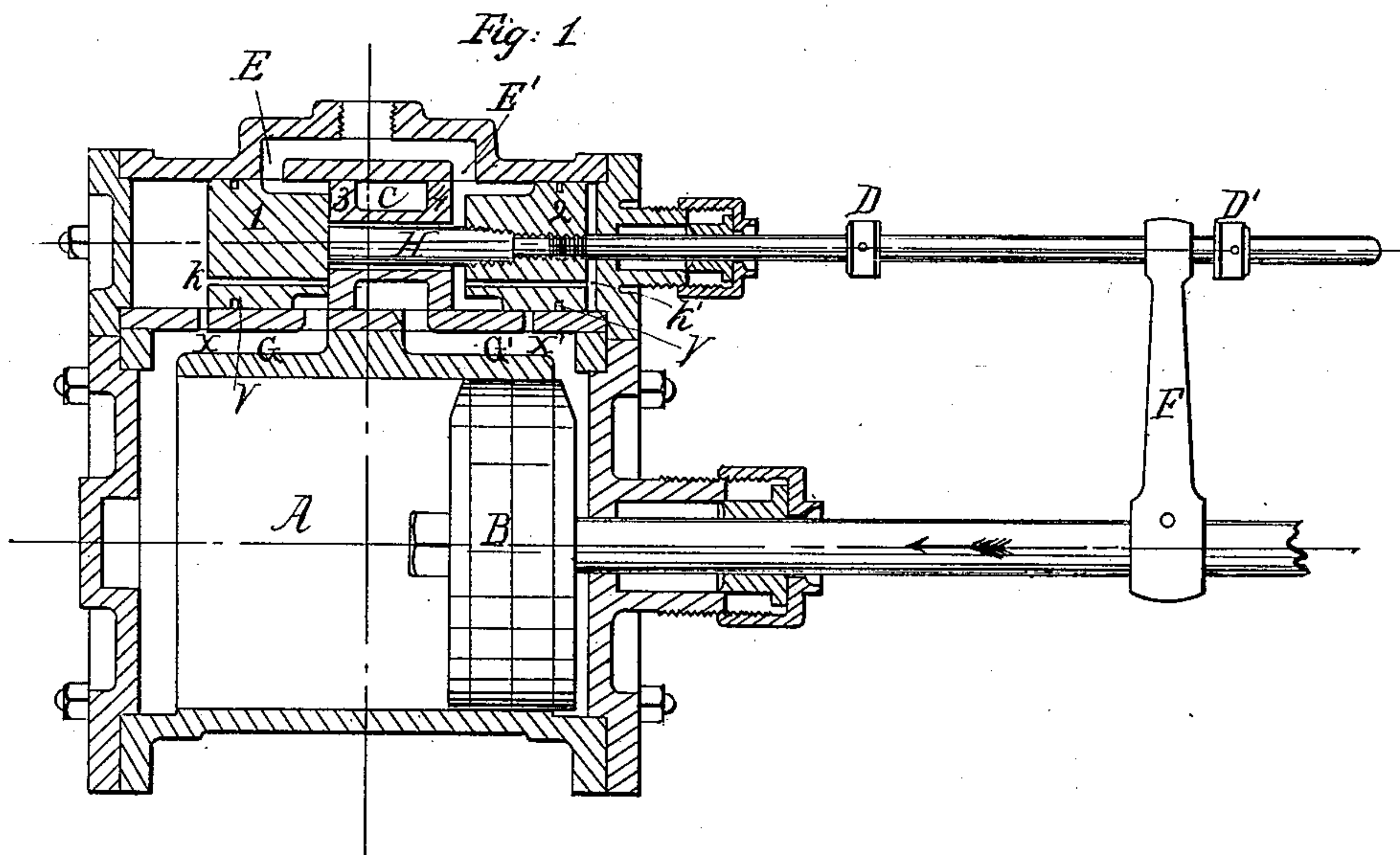


W. M. Henderson,
Steam Slide Valve.

N^o 53,613.

Patented Apr. 3, 1866.



Witnesses;
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UNITED STATES PATENT OFFICE.

WILLIAM M. HENDERSON, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN STEAM-ENGINES.

Specification forming part of Letters Patent No. 53,613, dated April 3, 1866.

To all whom it may concern:

Be it known that I, WILLIAM M. HENDERSON, of the city of Philadelphia and State of Pennsylvania, have invented certain Improvements in the Mode of Constructing and Operating Direct-Action Independent Steam-Engines; and I do hereby declare the following to be a full and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, in which—

Figure 1 represents a longitudinal section through the engine, showing the steam-cylinder, valve-chest, and valve, with arrangement of ports and passages and means of operation; and Fig. 2, a transverse section of the same.

The object of this improvement is to simplify the construction and operation of direct-action independent steam-engines, or that class where a reciprocating movement of the piston is maintained without the intervention of a rotating shaft and fly-wheel.

The improvement consists in the arrangement of the steam-valve, ports, and passages, and in the manner of attaching the valve-chest to the steam-cylinder, as hereinafter more fully described.

A is a steam-cylinder; B, the piston. The piston-rod passes through a stuffing-box in the front head, and can be employed to operate any mechanism requiring a reciprocating motion, as a pump, blowing-cylinder, or reciprocating saw, &c.

C is a piston-valve accurately turned to work within a cylindrical valve-chest. The valve-stem passes through a stuffing-box in the front head, and on it are secured collars D D' at a distance apart corresponding to the stroke of the engine.

F is an arm keyed on the middle of the piston-rod, for reversing the valve.

G G' are the main steam-ports, the bottom and sides formed on the cylinder-casting, the roof made by the bottom of the valve-chest when bolted to the steam-cylinder.

S is where the steam enters the chest, and E E' the exhaust-ports.

The construction of the valve is as follows: 1 2 are two piston-heads, connected at a certain distance apart by a spindle, H. In each head a circular groove, V V', is turned at a distance from the end corresponding to the

throw of the valve, with channels cut from said grooves to the ends of the heads, as shown at I I on Fig. 2. These grooves play over secondary ports X X' drilled through the bottom of the valve-chest into the main steam-ports, the two in connection admitting and exhausting steam for operating the valve. There are also small air-holes K K' drilled through each head, for releasing any back-pressure which might interfere with the proper working of the valve. The valve proper, which admits and exhausts the steam for working the engine, is embraced between the heads 1 2, but entirely disconnected, with an amount of lost motion equal to the combined widths of the secondary ports X X'. It is composed of two disks, 3 4, connected on a barrel, the ends of said barrel also acting as a valve for closing and opening, at proper times, the air-holes K K'.

As regards the advantages of this arrangement and construction, special attention must be directed to the manner of securing the valve-chest to the steam-cylinder, for this peculiar feature properly becomes a part of the invention, it being important to have the secondary ports X X' as short and direct as possible, and so arranged that they can be marked off and cut through with the greatest exactitude, for upon the accuracy of their position with reference to the disks 3 4 and grooves V V' depends the entire success of the operation of the valve.

It will be readily seen that, as the bottom of the valve-chest is the roof of the main steam-ports, the marking and cutting through these short direct passages leading from the valve-chest at once to the steam-ports is a very simple matter. The joint of the chest is made on a line with the top of the steam-ports, instead of outside them, with an additional thickness of metal, as invariably the case, through which again corresponding ports would have to be cut, which extra labor in this case is done away with, producing the additional advantage of bringing the valve closer to the cylinder, reducing the leverage of the arm for operating the valve, and making the whole more compact.

The operation is as follows: By an inspection of the drawings it will be seen that the steam-piston is making the stroke to the left, the steam entering the cylinder by the port G'

and exhausting by the ports G and E. As it approaches the end of its stroke the arm F will come in contact with the collar D, at the first instant opening the air-hole K and relieving the left end of the chest from any pressure which might offer a resistance to the movement of the valve, and by the same movement the other air-hole, K', is closed by the head 2, thus preventing the passage of any steam from the right. The lost motion of the valve being taken up, the whole will be carried along by the arm F until the groove V' reaches the port X', when a part of the steam impelling the piston will pass through to the right of the valve by the channels I I and throw it over the steam-ports. Besides the closing and opening of the air-holes K K', the slip of the valve performs another important duty in retarding the changes of the steam and exhaust to and from the main piston until the proper time arrives, for it will be seen disk 3 will not close the exhaust on the left of the main piston or disk 4 shut off the steam from the right of it until steam has been fairly admitted to the valve, to insure the throwing of it when working at the slowest possible speed. It will also be observed that the port X will be closed again before disk 3 admits steam to the left of the main piston, and that port X' will also be closed before disk 4 opens the exhaust from the other side. Otherwise the valve would experience a resistance from steam passing to the left of it, while the steam from the right would escape before it had fulfilled its duty. This latter will not take place until the extreme edge of head 2 passes X', when the steam will exhaust through this passage into port G' and out of the exhaust-port E', and the valve will come to a state of rest. Steam will now be admitted to the left of the piston B by the port G, and the other side will be open to the exhaust-port E', by the port G',

and the stroke to the right will be made; and when the piston nears the end of its stroke the arm F will come in contact with collar D', reversing the action of the air-holes, taking up the lost motion, and carrying the valve along to the right until the steam catches the valve, as before described, and throws it over the ports, reversing the motion again, which, being alternately repeated, will cause an automatic reciprocation of the engine.

I do not claim, broadly, any improvement in the manner of constructing steam-cylinders, as I know of no other case where any advantage would be gained in making them as here represented; but

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

1. The union of the valve-chest with the steam-cylinder in such manner that the roof of the main steam-ports is formed by the bottom of the valve-chest, in the manner and for the purposes represented.

2. The connection of two piston-heads in a cylindrical valve-chest by a spindle or its equivalent, said heads being united in motion and carrying between them a sliding valve, to which is imparted a stroke less than that of the driving-heads, substantially for the purposes specified.

3. The described arrangement of the grooves V V' and channels I I in the piston-heads, with the passages X X' in the valve-seat, when operating as herein set forth.

4. The arrangement of the air-holes K K' through the piston-heads, operated by the action of the valve, in the manner and for the purposes herein described.

WILLIAM M. HENDERSON.

Witnesses:

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