No. 826,274. PATENTED JULY 17, 1906.

R. RICHARDSON.

STEAM ACTUATED VALVE.

APPLICATION FILED SEPT. 29, 1905.

Fig. 2.

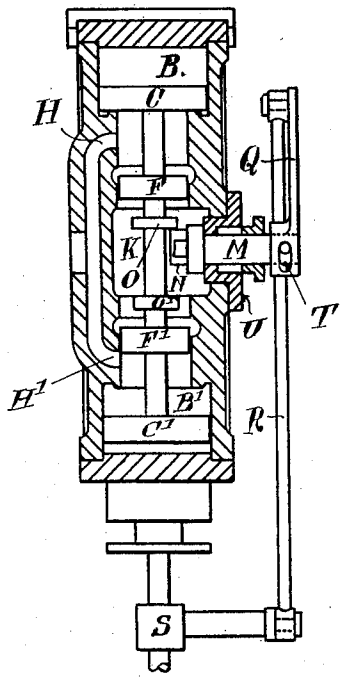


Fig. 1.

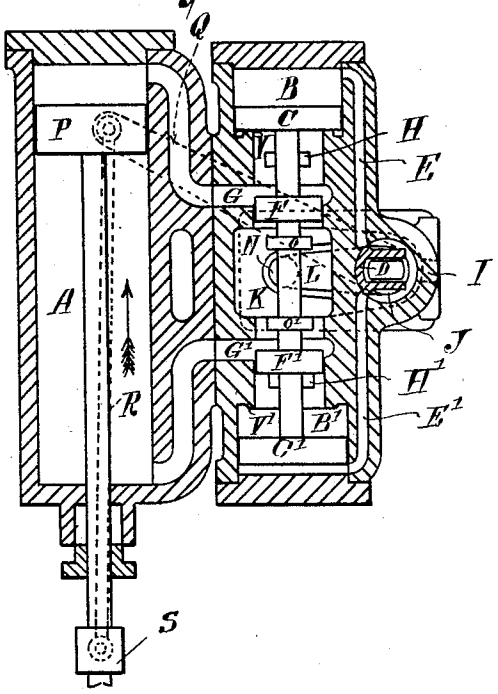
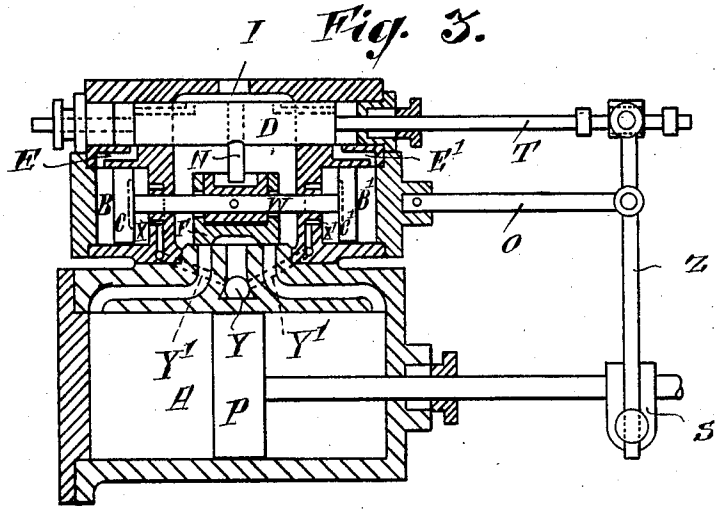


Fig. 3.



Witnesses:
P. F. Nagle.
L. Dowville.

Inventor:
Robert Richardson.
By Wiedersheim & Fairbanks.
Attorneys.

UNITED STATES PATENT OFFICE.

ROBERT RICHARDSON, OF GLASGOW, SCOTLAND.

STEAM-ACTUATED VALVE.

No. 826,274. Specification of Letters Patent. Patented July 17, 1906.

Application filed September 29, 1905. Serial No. 280,615.

To all whom it may concern:

Be it known that I, ROBERT RICHARDSON, engineer, a subject of the King of Great Britain, residing at 65 South Cromwell road, Strathbungo, Glasgow, Scotland, have invented certain new and useful Improvements in Steam-Actuated Valves, of which the following is a specification.

My invention relates to the auxiliary portion of direct-acting engines, and has for its object to minimize the shock which at present takes place when the main valve is reversed, due to the high velocity imparted to said valve.

Engines of the type herein referred to have commonly a pair of auxiliary pistons or plungers connected together with the main valve between them, which is inclosed by the valve-casing, and the pistons work in cylindrical extensions of said casing. Steam is admitted to the interior of the casing, and therefore to the inner sides of the pistons. The pistons are caused to reciprocate by supplying fluid-pressure to the outer side of the one and exhausting it from the outer side of the other, usually by means of a valve positively moved; but owing to the fluid-pressure leaking past the pistons it has been found impracticable to graduate the exhaust and supply so as to give an easy movement to the main valve without causing the engine to stick.

Under my invention the inner sides of the auxiliary pistons are open to the exhaust, and the positive valve supplies pressure fluid to the outer side of the one auxiliary piston and shuts it off from the outside of the other. As a result pressure fluid is locked in the cylinder which is shut off, and this pressure fluid is ejected or forced past the piston of that cylinder to the exhaust, as the live fluid acting on the outer side of the opposing piston causes the valve to reciprocate. The live fluid is supplied alternately to the outside surfaces of the pistons, so as to operate the valve. The pistons are not brought to rest by cushioning, as is the common method, but by the inner side of each alternately coming against a seat, which may be of smaller diameter than the piston.

The positive valve may be in the form of a cylinder whose ends cover and uncover the auxiliary ports and having an arm fixed through it and projecting into the main valve, so as to give a positive motion to said valve when the engine is working at high speed. Other forms of positive valve-gear may be used.

In order that my invention may be easily understood, I append a sheet of drawings, which show convenient forms of the apparatus.

Figure 1 is a section of an engine-cylinder and showing the valves and pistons. Fig. 2 is a section taken through the main-valve casing at right angles to the section Fig. 1. The section of the cover U is taken on a different plane. Fig. 3 is a section of an engine, showing the application of a slide-valve F instead of the piston-valves F F′, Figs. 1 and 2.

Referring to Figs. 1 and 2, I is the steam-inlet and supplies steam to the spaces J and K. F F′ are piston-valves and work over the main ports G G′. H H′ are the exhaust-ports. The lever Q (see dotted lines, Fig. 1) is operated by the rod R from the cross-head S and has lost motion at T, so that valve D and spindle M are moved near the end of stroke only. E E′ are the auxiliary ports, B B′ the auxiliary cylinders. P is the main piston, and A the main cylinder. O O′ are collars with which the pin N on the arm L of the rocking spindle engages to give the positive motion hereinbefore stated. V V′ are the piston-seats. The positions of the parts are shown at the point of reversing when any further movement would shut off the steam from port E and give pressure to the outer side of piston C′. The steam therefore shut in the cylinder B must leak past the piston C, and by the pressure acting on the piston C′ the inclosed steam is compressed during the travel and forms a dispersing-cushion, and so gives an easy motion to the main valve, while by this means the action of the engine is absolutely certain. The pistons C C′ are fitted so as to work freely in their cylinders B B′.

In the arrangement Fig. 3, I is the steam-inlet, and otherwise the same reference-letters indicate similar parts to those in Figs. 1 and 2. In this case, however, a slide-valve F is shown, and a round block D acts as the positive valve, the pin N in said block being the positive mover. The ports X X′ convey the leakage from the pistons and past the valve-spindle W to the main exhaust Y by the passage Y′. (Indicated in dotted lines.) The rocking lever Z, connected with the cross-

head S and acting on the valve-spindle T, positively operates the valve D. The lever Z is fulcrumed on the pillar O.

Having now fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. A direct-acting engine having a main valve provided with a pair of auxiliary pistons in which the pressure fluid is admitted to the external surface of the one piston and is shut off from the external surface of the other the pistons being acted on alternately, the internal surfaces of the auxiliary pistons being open to the exhaust and the shut-in pressure fluid being ejected or forced, as the valve reciprocates, past the pistons which latter are adapted to close alternately against valve-seats, substantially as described.

2. In a direct-acting engine, the combination of the main piston, a rod actuated thereby, a main valve having a pair of auxiliary pistons working in cylinders, a lever actuated by said rod, a valve actuated by said lever for alternately admitting pressure fluid to the external surface of the one piston and shutting it off from the external surface of the other, the internal surfaces of the pistons being open to the exhaust, and a member operatively connected with said lever, and adapted to actuate said auxiliary pistons.

3. In a direct-acting engine, the combination of a main valve, a spindle therefor, a piston at each end of the spindle, chambers in which the pistons work, having fluid-pressure ports leading to the external surfaces of the pistons, and exhaust-ports leading from the inner surfaces of the pistons, a valve for alternately cutting off fluid-pressure to each piston, collars mounted on said spindle, a pin adapted to engage said collars to actuate said pistons, an arm on which said pin is mounted, a rocking spindle adapted to actuate said arm, a main piston, and means actuated thereby for operating said rocking spindle.

4. In a direct-acting engine, the combination with a main valve, a spindle therefor, a piston at each end of the spindle, chambers in which the pistons work, having fluid-pressure ports leading to the external surfaces of the pistons, and exhaust-ports leading from the inner surfaces of the pistons, a valve for alternately cutting off fluid-pressure to each piston, collars mounted on said spindle, a pin adapted to engage said collars to actuate the pistons, an arm on which said pin is mounted, a rocking spindle adapted to actuate said arm, a main piston, a rod actuated thereby, a lever actuated by said rod and operatively connected with said spindle, and means for permitting lost motion between said spindle and said lever, to cause said valve and rocking spindle to be moved only near the end of the stroke.

In testimony whereof I affix my signature in presence of two witnesses.

ROBERT RICHARDSON.

Witnesses:
WILLIAM FLEMING,
JOHN BOWMAN.