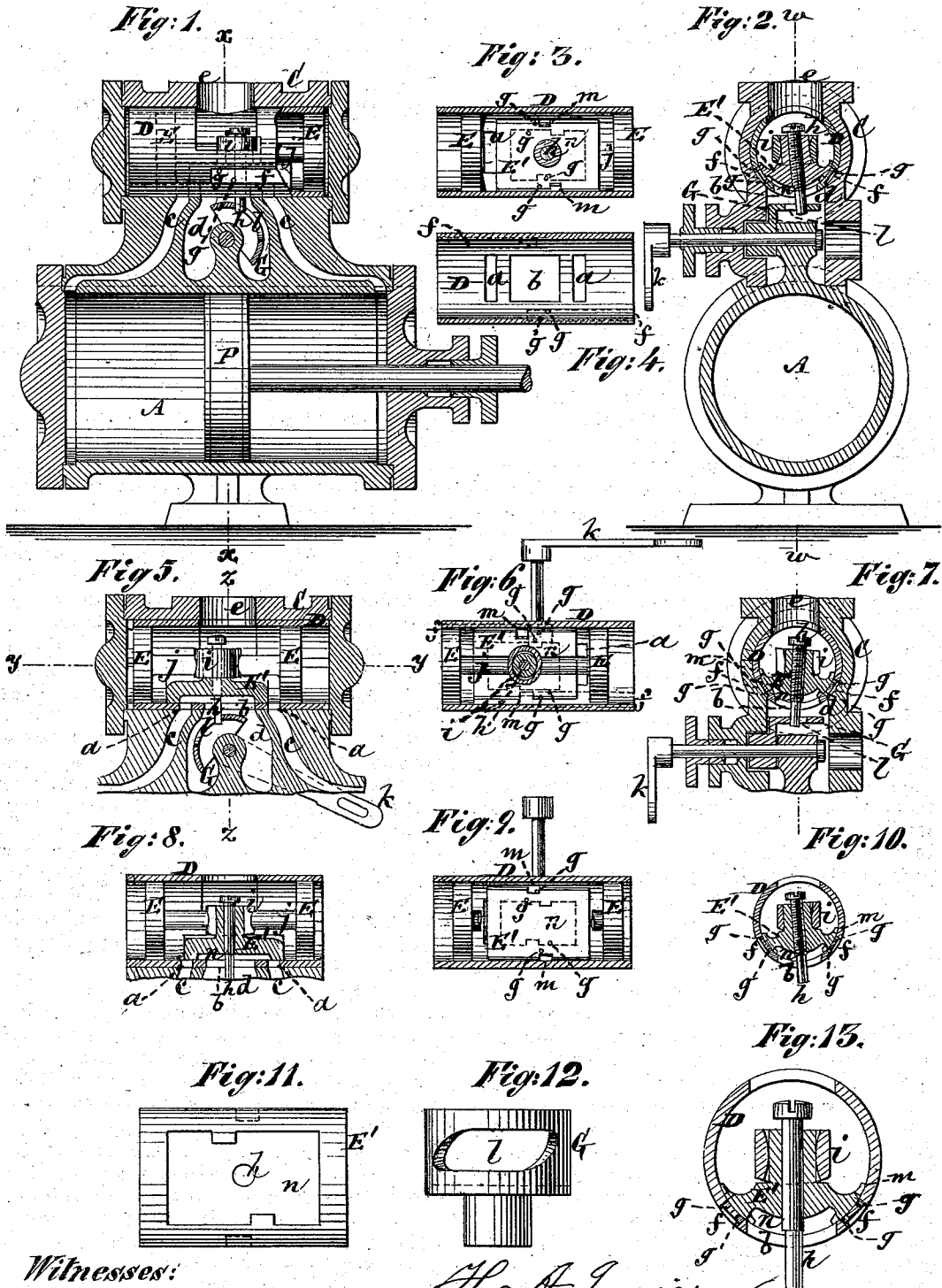


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Valves for Direct-Acting Engines.

No. 155,728.

Patented Oct. 6, 1874.



Witnesses:

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HENRY A. JAMIESON, OF BROOKLYN, NEW YORK.

IMPROVEMENT IN VALVES FOR DIRECT-ACTING ENGINES.

Specification forming part of Letters Patent No. **155,728**, dated October 6, 1874; application filed March 17, 1874.

To all whom it may concern:

Be it known that I, HENRY A. JAMIESON, of the city of Brooklyn, in the county of Kings and State of New York, have invented certain Improvements in Valves of Direct-Acting Steam-Engines for Operating Pumps and other purposes, of which the following is a specification:

This invention relates to valves of the description referred to in Letters Patent Nos. 144,545 and 146,683, issued to me August 4, 1873, and in which the valve has a compound movement—namely, a longitudinally reciprocating or sliding one and a transversely-oscillating action; also, in which the valve is partly thrown by the direct pressure of the steam, and in part, by mechanical means, deriving their motion from the engine.

The invention consists in an independent sleeve fitted within the steam-chest for the valve to work within, whereby the general construction is facilitated and the ports or passages may be more readily and accurately made than when formed in the steam-chest itself. The invention also generally consists in a certain motion of the valve and arrangement of the vents and passages, whereby the valve is first rocked by the mechanical means employed, then slid forward a given distance by the same means, and afterward its longitudinal movement completed by the direct action of the steam, thus insuring a proper relative action of the valve and engine-piston under all conditions of the latter as regards speed, &c.; also, whereby the steam is fully exhausted from the one end of the valve in advance of its being admitted to the other end thereof, and such admission not effected till just before the valve crosses its center or closes the main ports, and so that in case of a very sudden or rapid motion of the engine-piston, which travels faster than the valve, the latter will always be full open or reversed toward the close of the engine-stroke, thus preventing the piston striking the heads of the cylinder. The invention, furthermore, comprises a certain construction of the valve, whereby the port-controlling portion of it is free to rock without oscillating the piston-heads of the valve.

In the accompanying drawing, Figure 1 rep-

resents a vertical longitudinal section mainly on the line *w w* of the steam-cylinder and steam-chest of a pump with my improvements in valves applied. Fig. 2 is a transverse vertical section of the same on the line *x x*. Fig. 3 is a horizontal section of the sleeve in which the valve works with the valve in the same position as in Figs. 1 and 2—that is, just as it has completed its longitudinal movement to the right and before it is rocked to reverse its action. Fig. 4 is a horizontal section of the sleeve with the valve removed. Fig. 5 is a vertical longitudinal section, showing the valve as just having completed its longitudinal movement to the left, but before it is rocked to reverse its action. Fig. 6, a horizontal section of the same on the line *y y*. Fig. 7 is a vertical transverse section thereof on the line *z z*. Figs. 8, 9, and 10 represent a vertical longitudinal section, a horizontal section, and a transverse section, respectively, of the valve and sleeve in which it works, showing the valve when about crossing its center to the left. Fig. 11 is an under view of the rocking or central portion of the valve. Fig. 12 is a top view of the slotted valve-shifter; and Fig. 13, a transverse vertical section of the valve and its sleeve when the valve is in the act of being rocked.

Similar letters of reference indicate corresponding parts.

A is the steam-cylinder of a pump, and P its piston. C is the steam-chest, which is a plain casting arranged on the top of the cylinder A, and of cylindrical contour on the inside, but not requiring any special dressing as regards the valve surfaces or ports immediately controlled by the valve, the same only forming a case, as it were, to receive within it a cylindrical sleeve, D, that is easily dressed, both as regards its interior or valve surface, and as regards the squaring or adjustment, by filing, of its ports *a a* and exhaust-opening *b*, the two former communicating with the passages *c c*, that lead to opposite ends of the engine-cylinder and the opening *b* connecting with the general exhaust-opening *d*. This sleeve D is arranged to fit closely within the chest C, and is in open communication above with the steam-inlet *e*. It is constructed with open ends and

made to stop short of the heads of the steam-chest, and is furnished with exterior longitudinal grooves *ff*, one on either side of its lower portion. These grooves extend a little beyond the middle of the length of the sleeve from opposite ends of the latter, the same opening at their outer ends, respectively, into the spaces intervening between the open ends of the sleeve B and the heads of the chest B. Vents *g g* are made through the sleeve within the grooves *ff*, at or near their inner ends, for the purpose of alternately admitting steam to and exhausting steam from the backs of the heads or pistons E E of the valve proper E', which, in addition to having a sliding motion, in common with the heads or pistons E E, to control the main ports or openings *a a b*, has an oscillating or rocking motion independently of the pistons E E, to control the vents *g g*.

This is a great advantage over oscillating the pistons along with the valve, or that portion of it which controls the ports, inasmuch as it takes less power, reduces wear, and provides for the valve more readily accommodating itself to its seat.

Such joint and separate actions are obtained by causing the pin *h*, by which the valve is mechanically operated, or a swell around said pin, to enter a yoke, *i*, of the rod *j*, which connects the pistons E E, the valve proper, or portion E', being a separate segment-shaped piece fitting between the pistons, and free to rock independently of them, and the pin *h* projecting below through the exhaust-opening *b*, and into the general exhaust-chamber *d*, where it gears with or enters a slotted valve-driver, G, that is rocked at intervals through a lever, *k*, on the outside of the steam-chest by any suitable link mechanism.

Unlike the slotted driver or drum in my patent No. 144,545, of August 4, 1873, the slot *l* is not wholly an oblique one, but mainly straight, with one oblique side at each end, on opposite sides to each other, and the general action of the valve is different.

The opposite upper edges of the portion E' are each formed with an aperture or cut-away portion, *m*, to pass the steam, as required, from the interior of the valve-space through either set of vents *g*, along either of the grooves *f*, to the back of either piston E.

The operation is as follows: Supposing the whole valve to be at the end of its stroke in the sleeve D, the lever *k* is rocked in the reverse direction it is required to next throw the valve. This causes the one straight edge of the slot *l* in the driver G to pass freely by the pin *h* without moving it, and afterward, as the oblique extremity of said edge of the slot comes in contact with the pin *h*, it rocks the valve proper E' to the right or left, as the case may be, and so brings an under exhaust-cavity, *n*, in it, in communication, by the one set of vents *g*, with the one groove *f* in the sleeve leading to the back of

the one piston E, which occupies a forward or inner position, thus exhausting the spent steam used in previously throwing the valve. This exhausting of the steam from the one end of the valve, before admitting steam to the other end of it, is an important feature of the action.

A continued motion of the lever *k* in the same direction next causes the end of the slot *l* of the driver, which has been brought into contact with the pin *h*, to move the whole valve longitudinally in the reverse direction to which it had previously been thrown, until the valve is about crossing its center, or nearly closing the ports, as represented in Fig. 8, when the rocked valve or portion E' establishes communication through the aperture *m* on its lowest edge, first with one, and ultimately with both of the vents *g* on said side, between the steam-space of the valve, and by the one longitudinal groove *f*, the back of that piston E, which is the rear one in motion. This brings steam pressure to act directly upon the valve to complete its throw. During this action, the other aperture *m* in the opposite edge of the valve being raised out of line with the vents *g* on said side, live steam is prevented from passing through the same, and the vents *g* on such side remain in communication with the exhaust.

A like action takes place during the opposite throw of the valve, the portion E' being first rocked to the opposite side to reverse the action of the vents *g*, apertures *m*, and grooves *f*.

The herein-described mechanical action, combined with the direct pressure of the steam to throw the valve, produces a proper relative action of the valve and engine piston under all circumstances of variation in speed, and so forth, while, by fully exhausting from the one end of the valve before admitting steam to the opposite end thereof, and admitting steam just before the valve crosses its center to complete the throw of the valve, all liability to accident or breakage, consequent on a reduction of engine-piston resistance, causing the latter to move at an unusual rapid rate, and endangering the piston striking the heads of the cylinder, is avoided, for the reason that, notwithstanding that the piston moves faster than the valve, the latter is full open or reversed toward the close of the engine-piston's stroke.

I claim—

1. The combination, with a double piston-headed valve, of the sleeve D, fitted within the steam-chest, and provided with main ports *a a b*, and side openings in communication, by longitudinal grooves *ff*, with the opposite ends of the chest and interior of the sleeve, substantially as specified.

2. The grooved or slotted oscillating valve-driver G, having its slot *l* made straight, with oblique terminations on opposite sides, in combination with the pin *h*, by which the

valve is first rocked, and subsequently moved longitudinally, essentially as described.

3. The longitudinally - sliding and transversely - oscillating valve, constructed of an independent rocking portion or valve proper, E' , and sliding pistons E E , in combination with the yoke i , and operating-pin h , substantially as specified.

4. The longitudinally - sliding and transversely - oscillating valve E E E' , provided with side apertures m m , in combination with the vents g g , the longitudinal grooves f f ,

and the main ports a a b , the whole being arranged substantially as described, whereby steam is exhausted from one end of the valve before it is admitted to the other end thereof, and the steam admitted, as the valve is about crossing its center, to complete the throw of the valve.

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