M. J. Stevens,

Steam Pump.

No. 44,232. Patented Sep. 13, 1864.

Fig. 3.

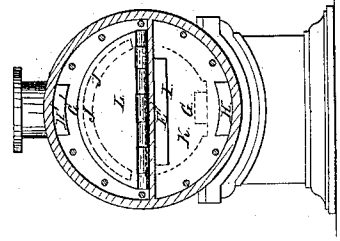


Fig. 1.

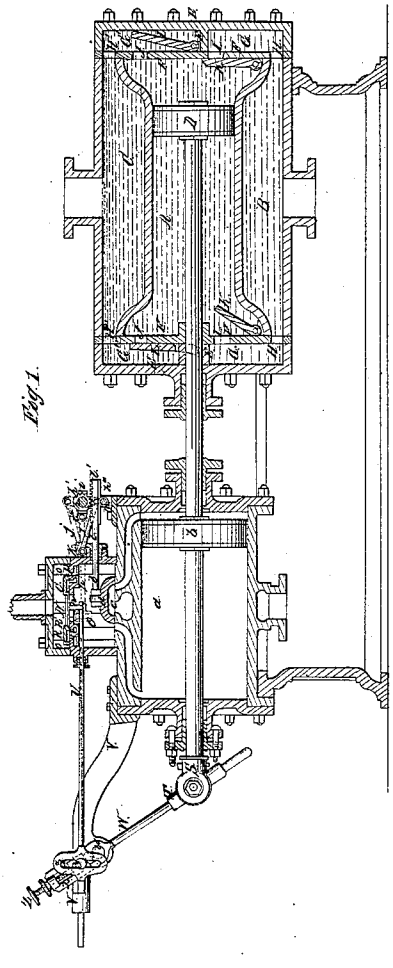
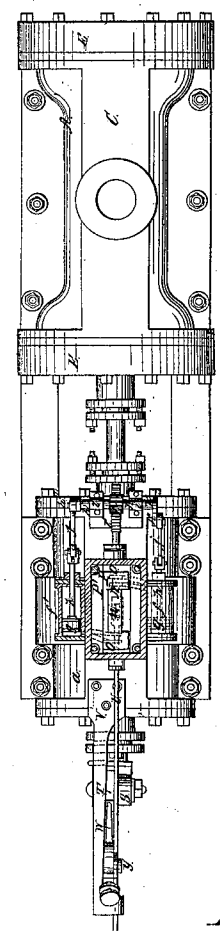


Fig. 2.



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UNITED STATES PATENT OFFICE.

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IMPROVEMENT IN PUMPING-ENGINES.

Specification forming par's of Letters Patent No. **44,232**, dated September 13, 1864.

To all whom it may concern:

Be it known that I, WILLIAM J. STEVENS, of the city, county, and State of New York, have invented certain new and useful Improvements in Reciprocating Direct-Acting Steam-Pumps; and I hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 represents a central vertical section of my invention. Fig. 2 is a top view of the same, a portion of the steam-chest and one of the small cylinders for operating the main steam-valve being removed. Fig. 3 is a rear view of the same, the rear head of the water-cylinder being removed.

Similar letters of reference indicate corresponding parts in the several figures.

This invention consists in the arrangement and means of operating and regulating while in motion the "lead" and motion of the main steam-valve relatively to the speed of the steam-piston, and affording a quick and and certain return-motion of the latter.

To enable others skilled in the art to make and use my invention, I will now proceed to describe its construction and operation, with reference to the drawings.

In order to more clearly explain the application and harmony of operation of this invention when used with reciprocating pumps, I deem it necessary to describe a pump operating and in connection with it.

A, Fig. 1, represents the water-cylinder, which is formed with enlarged bell-shaped ends and with a supply-chamber, B, along its lower surface, and a discharge chamber, C, along its upper surface.

D is the piston and E E the cylinder-heads, and F F are disk-shaped valve-seats, placed vertically at the ends of the water-cylinder A, between the ends of the same and cylinder-heads E E. The cylinder-heads E E are made cap or bowl shaped, with a horizontal partition, E′, to each, as shown in Figs. 1 and 3. Thus two distinct chambers, G and G′, are formed in each cylinder-head E.

H H are openings in the valve-seats F F, by which the chambers G communicate with the supply-chamber B, and H′ H′ are openings to communicate the chambers G′ G′ with the discharge-chamber C.

I I are the valve-openings in valve-seats F F, through which the supply is conducted from the chambers G G to the inside of the ends of the cylinder A, and J J are the valve-openings through which the discharge from the ends of the cylinder A is made to the chambers G′ G′.

K K are vertically-arranged flap-valves attached to the insides of the valve-seats F F, to work over the valve-openings I I, and they may be hinged, when made of metal or made of rubber, and each riveted to its seat, but always to open to the piston D.

L L are similar flap-valves, but attached to the outsides of the valve-seats F F, and to open from the piston over the openings J J.

It will be clearly seen from the foregoing that the flap-valves K K and L L, being arranged to work upon vertical seats F F, will open or close very readily.

a represents the steam-cylinder, and *b* the steam-piston, fixed upon the same rod with the piston D in the water-cylinder A.

c is the steam-chest, and *d* is the main valve, which is the commonly-known short three port valve, working upon the seat *e*, formed on the steam-cylinder *a*.

To either side of the steam-chest *c* are small single-acting cylinders, *f* and *f′*, provided with pistons *g g′*, attached as shown in Fig. 2.

h is a horizontal shaft, placed at right angles and in line with the small cylinders *f f′*, forward of the steam-chest *c*, and working in bearings *i i*, fixed upon the inner end of the steam cylinder *a*.

h′ is a portion of a toothed pinion, formed at the central portion and between bearings *i i* of the shaft *h*, and *h″ h‴* are cranks on the ends of the same shaft *h*, they being placed at right angles to each other and at a proper distance to work with connecting-rods *j j*, attached to the ends of piston-rods *k k* of the pistons *g g′* in the small cylinders *f f′*.

l is the valve-rod to the main valve *d*, which works through a stuffing-box on the steam-chest *c*, opposite the toothed pinion *h′* upon the shaft *h*. Upon the end of this valve-rod *l* is formed a toothed rack-bar, *l′*, extending under and gearing with the aforesaid pinion *h′*.

m is a roller, under the rack-bar *l′*, which is supported between the bearings *i i*, and prevents the rack-bar *l′* from disengaging.

N is a secondary assistant valve, placed in

the same steam-chest *c*, but working upon two small seats, O O, formed in the upper portion of the steam-chest *c*.

P and P′ are eduction-ports, which lead to the small cylinder *f*, and R and R′ are eduction-ports leading to cylinder *f′*.

S is a cross-head at the rear end of the piston-rod of the piston *b*.

T is a sleeve, fixed with trunnions working in the cross-head S.

U is a valve-rod to the assistant valve N, which works through a stuffing-box at the rear of the steam-chest *c*, and is supported and guided by an arm, V, fixed upon the rear end of the steam-cylinder *a*. The inner end of the valve-rod U is formed with a slotted head, *u*, in which a stud, *n*, fixed to the assistant valve N, works with a certain lost motion.

W is a lever working on a fulcrum, *w*, fixed on the arm V, having its lower arm made to slide in the sleeve T. The upper arm is provided with a slot, *x*, in which a pin, Y, is arranged so as to slide to or from the fulcrum *w*, and which is held or moved at any time, while in motion, by a screw, Z, working it, fixed in the end of the upper arm of the lever W.

z is a vertical slot formed on the valve-rod U, to fit the pin or stud Y.

The operation of the steam-pump is as follows: The steam and water piston *b* and D are supposed to have arrived near the end of their stroke, as shown in Fig. 1. The assistant valve N has been moved quickly by its stud *n*, valve-rod U, pin Y, lever W, and the cross head S, off the port P. Steam is now entering from the port P into the fore part of the small cylinder *f*, and pushing its piston and the crank *h″*, (which latter is at right angles to it,) as shown in red lines, rapidly back to a position shown in black dotted lines, Figs. 1 and 2, thus rotating the shaft *h*, moving the rack-bar *l′*, and so the main valve *d*, until said crank *h″* is in line with the piston of the cylinder *f*, and the opposite crank, *h‴*, is at right angles, as shown in Fig. 2, when, suddenly stopping at this position, the main valve *d* has been thus changed to expose the eduction port, before closed, to be full open. The steam acting on the opposite side of the main steam-piston *b*, the valve K of the rear end, and the valve L of the fore end, of the water-cylinder are opened, the opposite valves closed, and thus the return of the steam and water pistons *b* and D reverse their motion. When arrived at the opposite end of the cylinders A and *a*, the assistant valve N has opened the port R to the small cylinder *f′*, when the piston to the same changes the crank *h‴* and *h″* and the main valve *d* to the original position. Now, it will be clearly seen that by moving the pin Y farther from or nearer to the fulcrum *w* of the lever W, the lead of the main valve is changed and may be regulated so as to correspond to the speed of the piston while in motion.

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

The employment and arrangement of the secondary or assistant valve N, the lever W, the screw Z, pin Y, and valve-rod U, in combination with the small single-acting cylinders *f f′*, the cranks *h″ h‴*, the pinion *h′*, and the main valve *b*, for the purpose herein described.

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