H. J. BEHRENS.

Valve-Gear.

No. 168,215. Patented Sept. 28, 1875.

Fig. 1

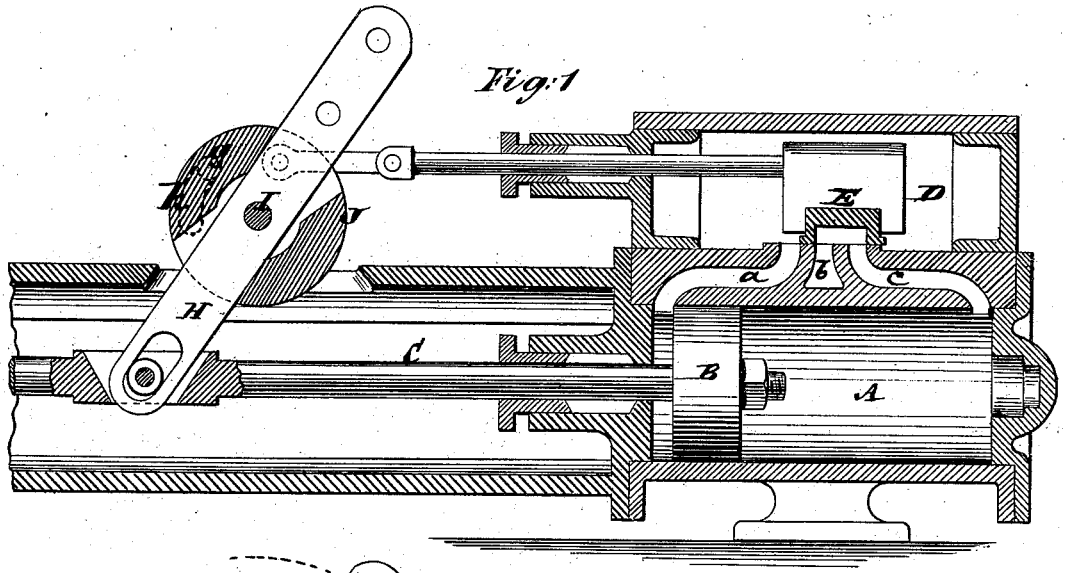


Fig. 2

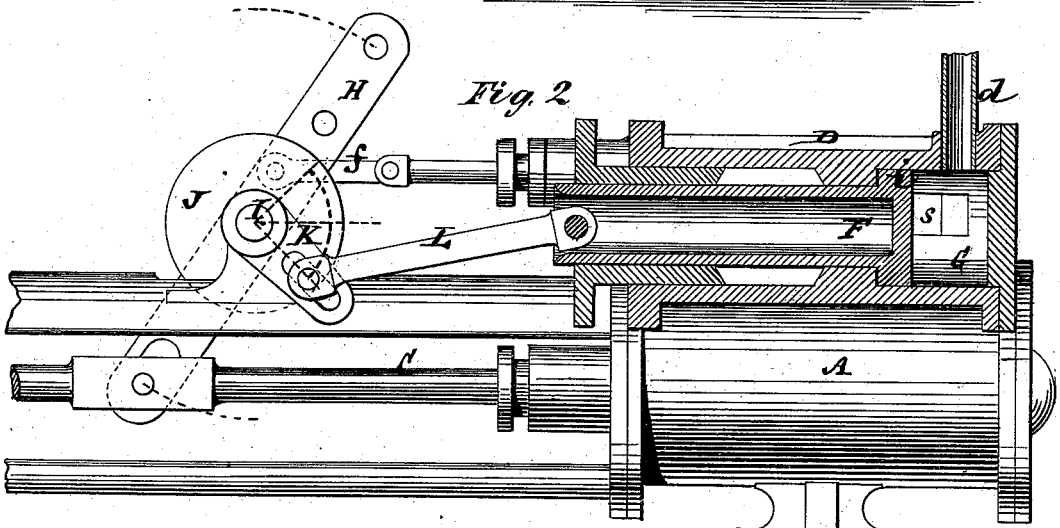
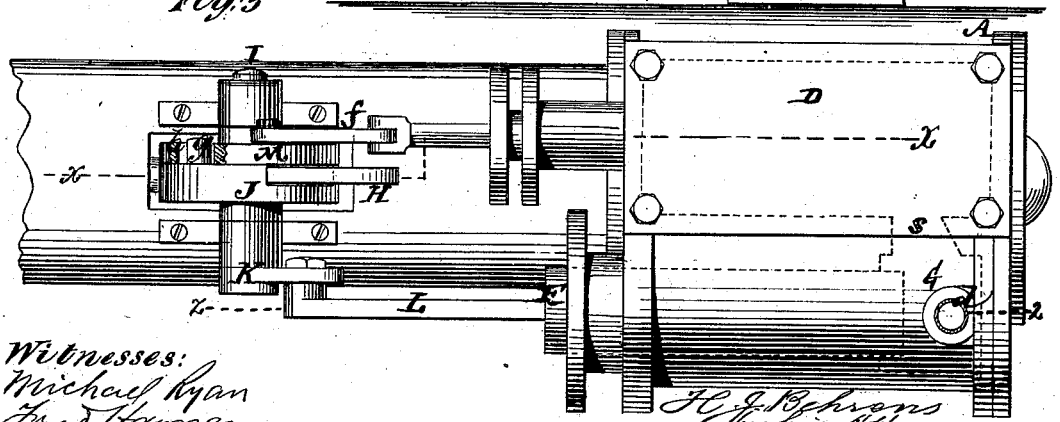


Fig. 3



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UNITED STATES PATENT OFFICE.

HENRY J. BEHRENS, OF NEW YORK, N. Y.

IMPROVEMENT IN VALVE-GEARS.

Specification forming part of Letters Patent No. **168,215**, dated September 28, 1875; application filed June 16, 1875.

To all whom it may concern:

Be it known that I, HENRY J. BEHRENS, of Tremont, New York city, in the county and State of New York, have invented certain new and useful Improvements in Valve-Motions for Direct-Acting Engines; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawing, which forms part of this specification.

This invention consists in a valve-motion for direct-acting engines, in which the valve is quickly reversed, at the close of the engine's piston-stroke in either direction, by means of an independent plunger worked inward by a trip-motion against the pressure of the propelling gas or fluid during the engine-piston's stroke, and suddenly released at the close of said stroke, to throw or reverse the valve by the pressure of the gas or fluid operating on the plunger to return or force it outward again. This mode of action dispenses with an auxiliary valve to control the action of the main valve, wastes no steam or propelling fluid to effect the operation of the valve, and admits of an ordinary slide-valve being used. The invention also consists in mechanism of a peculiar construction for operating the plunger which controls the motion of the valve, either directly or indirectly from the piston-rod of the engine, and for releasing said plunger to throw the valve, whereby great simplicity and efficiency of action are obtained, and facility is afforded for working by hand, when required, the pump or other device driven by the engine.

In the accompanying drawing, Figure 1 represents a longitudinal vertical section, mainly on the irregular line *x x*, of a horizontal direct-acting engine having my invention applied. Fig. 2 is also a longitudinal vertical section of the same, mainly on the line *z z*; and Fig. 3, a plan of the same.

A is the engine-cylinder; B, its piston, and C the piston-rod, the outer end of which may be connected with a direct-acting pump, or with any other machine or device which the engine is designed to operate. D is the valve-chest of the engine, and E its valve, which latter may be an ordinary D slide-valve, and the ports or passages *a b c*, controlled by it, be the same as are commonly used in connection with such a valve. F is the independent plunger by which the valve is thrown. This plunger is arranged to work in a cylinder, G, as against and by, successively, the pressure of the steam or other propelling fluid on its back, and which may be supplied by an inlet, *d*, and the valve-chest D be supplied by a branch opening, *s'*, from the cylinder G. This plunger is consequently what may be termed a resistance-plunger, and is operated through or by trip mechanism, either directly from the piston-rod of the engine, or indirectly by any other reciprocating device actuated by said piston or its rod, and which mechanism likewise serves, when the resistance-plunger is liberated, to throw or reverse the valve. Thus, H is a lever having its fulcrum on a cross rock-shaft, I, and connected at its lower end with the piston-rod C, whereby it is oscillated by the reciprocating action of the piston-rod. This lever passes, preferably, in a free manner—that is, with a certain amount of lost motion—through a slotted disk, J, fast on the rock-shaft I, so that said lever, after the piston B has fairly started or moved a certain distance, is made to oscillate the disk J and its rock-shaft I. This movement of the rock-shaft I causes a crank, K, which is fast on the latter, to force inward, against the pressure of the steam in the cylinder G, the plunger F, by or through a rod, L, connecting said crank with the plunger. By the time the crank K reaches its dead-center, or has its wrist-pin in line with the longitudinal center of the plunger F, the engine-piston has nearly completed its stroke in either direction, and the disk J is brought into working or driving contact with a second disk, M, or its equivalent, which is loose on the rock-shaft I, and is connected with the valve-stem by a link-rod, *f*. After this, and as the disk J continues to move in the same direction and the engine-piston completes its stroke, the crank K, in being moved over its culminating point or dead-center, is suddenly shot by the plunger F, in its outward throw, through the pressure of the steam on its back, and the disk J made to drive or rapidly turn the disk M, and so reverse the position of the valve to change the direction in travel of the engine-piston. The same action takes place

during both strokes of the engine, the crank K crossing its dead-center in opposite directions, and the disk J not operating the valve-actuating disk M till said crank is on its dead-center, there being lost motion prior to that between said disks—as, for instance, by a stud, *g*, on the disk J passing through a slot, *h*, in the disk M, and only moving the latter when coming in contact with either end of the slot; or such lost motion may be otherwise produced, and the trip mechanism generally be variously modified or constructed, so long as the resistance-plunger is actuated by the engine-piston, and, when released, throws the valve by the pressure of the gas or fluid on the back of the said plunger, substantially as described. Thus, the lost motion might be restricted to the lever H, and an eccentric or cam might be substituted for the crank K; or instead of the lever H, a toothed sector, working into or driven by a rack, might be used. Furthermore, the plunger F may have a collar, *i*, upon it, to prevent the valve from being thrown too far, or any other suitable stop may be used.

The lever H is represented as extended upwardly through the disk J, whereby it forms a handle for operating by hand, when required, the pump or other device driven by the engine. For this purpose said extended portion of said lever is constructed to provide for the ready attachment, at pleasure, of an extension lever or handle.

I claim—

1. The combination, with the steam cylinder and piston in communication with the valve-chest, of an independent plunger, exposed on one side to the pressure of the propelling fluid from the valve-chest, and actuated by the engine-piston against said pressure, but released or tripped at the end of the piston's stroke to reverse the valve, substantially as described, and for the object herein set forth.

2. The combination, with the engine-piston B, its valve E, and the resistance-plunger F, of the following devices, constituting a trip mechanism having lost motion—namely, the lever H, the rock-shaft I, the crank K, and the disks J M, substantially as and for the purposes herein set forth.

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Witnesses:

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