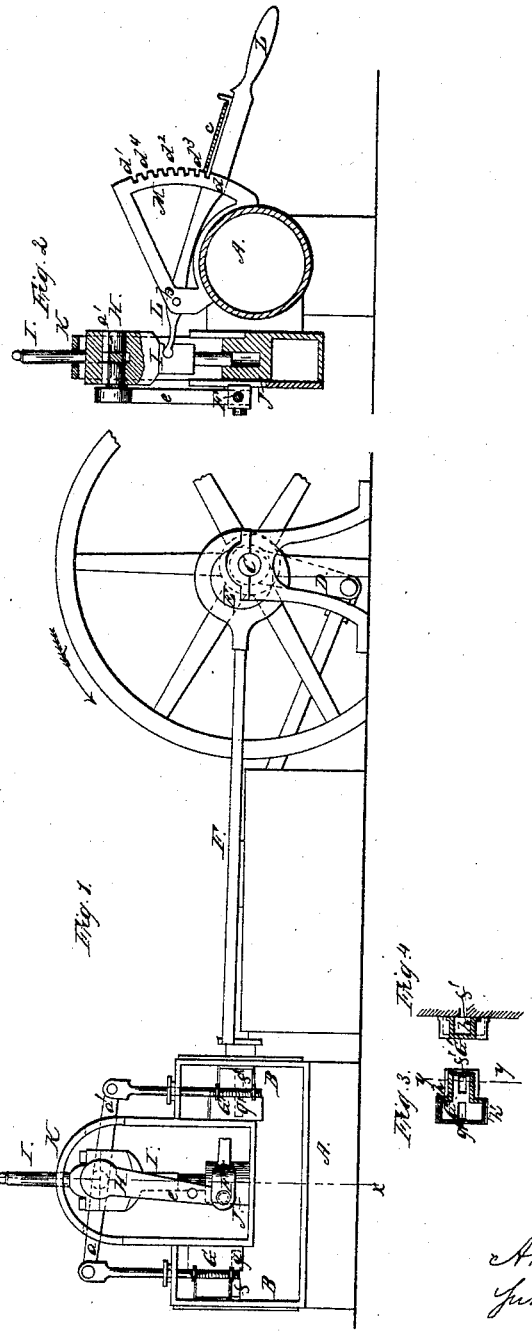
A. H. Woodruff,

Steam-Engine Valve-Gear.

No. 45,663. Patented Dec. 27, 1864.



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A. H. WOODRUFF, OF LANSING, IOWA.

IMPROVEMENT IN VALVE-GEAR OF STEAM-ENGINES.

Specification forming part of Letters Patent No. **45,663**, dated December 27, 1864.

To all whom it may concern:

Be it known that I, A. H. WOODRUFF, of Lansing, in the county of Allemakee and State of Iowa, have invented a new and useful Improvement in the Valves and Valve-Gear of Steam-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 drawings, forming part of this specification, in which—

Figure 1 is a side view of a steam-engine having my invention applied, the cover of the steam-chest being omitted to show the valves. Fig. 2 is a transverse vertical section in the plane indicated by the line *x x*, Fig. 1. Fig. 3 exhibits a section of one of the valves in a plane parallel with Fig. 1, and shows the arrangement of the ports in the seat. Fig. 4 is a vertical section of the valve in the plane indicated by the line *y y* in Fig. 3.

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

This invention consists in a novel construction and arrangement of the valves and ports by and through which the induction and eduction of steam to and from the cylinder of an engine are effected, and a novel mode of operating the valves, whereby I am enabled to work the valves for running the engine in either direction with one eccentric, and to effect the stopping, starting, and reversing of the engine by means of one lever.

To enable those skilled in the art to make and use my invention, I will proceed to describe its construction and operation.

A is the cylinder of the engine; B, the valve-chest; C, the crank-shaft; D, the crank; E, the valve-eccentric, and F the eccentric-rod, all constructed and arranged substantially as in horizontal steam-engines now in common use.

G G′ are the valves, one for effecting the induction and eduction of steam to and from one end of the cylinder, and the other for effecting the induction and eduction to and from the other end. These valves are of the sliding kind and work vertically or at right angles with the piston. They are attached to opposite arms *a a′* of a rock-shaft, H, which works in a bearing in a column, I, which is movable lengthwise or in a direction parallel with the movements of the valves and at right angles to the movement of the piston, as will be hereinafter more fully described, for the purpose of starting, stopping, and reversing the engine. The lower part of this column works in a stationary cylindrical guide, J, and the upper part in a guide in a stationary arch, K. The said column is connected with a hand-lever, L, Fig. 2, which works on a fixed fulcrum, *b*, and this lever works in a stationary notched segment, M, to which it can be locked by a sliding bolt, *c*, attached to the lever and entering one of the notches *d d* of the segment. The valve rock-shaft H has a third arm, *e*, with which the eccentric-rod is connected to give it the proper movement to work the valves. The column I does not move in the ordinary operation of the valves, when the engine is running steadily in one direction.

f f′ are the two ports through which the induction of steam from the valve-chest into the cylinder and the eduction from the cylinder into the exhaust-cavities of the valves are effected. *g g′* are the two ports through which the eduction of the steam from the cavities of the valves to the eduction or exhaust pipe is effected. Each of the ports *f f′* and its respective port, *g* or *g′*, are arranged side by side at right angles to the movement of the valves, as shown in Figs. 1 and 3. The valves G G′ are made with cavities *h h* in their faces, substantially like the common short D-slide valve; but the said valves are wide enough to work over the two ports *f g* or *f′ g′*, and the portion which works over the port *g* or *g′* is longer than that which works over the port *f* or *f′*. When made without "lap," the whole length of the portion of the face which works over the port *f* or *f′* is equal to four times the width of the port, and the length of the corresponding portion of the opening in the face equal to twice the width of the port, and the length of the opening in that portion of the face which works over the ports *g* or *g′* is five times the width of the port. The length of stroke of the valve is the same as that of an ordinary short slide-valve—viz., equal to twice the length of the port *f* or *f*, or enough to open the port full to the steam and to the cavity of the valve by turns.

In the operation of the valves produced by the operation of the eccentric on the rock-shaft H the port *f* or *f′* is uncovered to admit steam at the same time that the other port, *f′* or *f*, is brought into communication with the interior

of the valve. When the column I is raised by bringing the lever L down to the lowest notch, d, of the segment M, the rock-shaft and valves are raised to such a position that the induction is effected under the lower edge of the valves; but when the said column is lowered by bringing the lever L up to the highest notch, d', the rock-shaft and valves are lowered to such a position that the induction is effected under the upper edges of the valves. The movement of the column necessary to effect this change is equal to twice the width of the ports, and by giving the column this movement by means of the lever L, or by any other suitable means, the direction of the engine is reversed. The drawings show the column in its highest position and the induction to be effected under the lower edges of the valves and the revolution of the shaft of the engine in the direction of the arrow shown in it in Fig. 1.

By bringing the lever to the central notch, d^2, and so bringing the column I and rock-shaft H to a central position, the valves are brought to such a position that by the operation of the eccentric and rock-shaft the ports ff' will not be uncovered and the engine will be stopped. The engine may then be started in either direction by raising or lowering the lever, according to the direction desired. By bringing the connection of the eccentric-rod F with the arm e nearer to the rock-shaft, and so giving the valves an increased movement, the shifting of the lever L to a notch, d^3 or d^4, of the segment above the lower notch, d, or below the upper notch, d', will be made to reduce the opening of the ports, and thereby slow the engine.

In very large engines the column, rock-shaft, and valves may be raised by admitting steam into the cylinder J below it, and lowered by opening an exhaust-cock to let out the steam from the said cylinder and permit the descent of the column, rock-shaft, and valves by their own weight.

I am aware that a movable column and rock-shaft have before been applied to a cut-off-valve gear. My claim is therefore limited to the combination of devices by which I am enabled to effect the stopping, starting, and reversing of the engine all by means of a single lever.

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

The attachment of the valve-operating rock-shaft and valves to a movable column, I, by which they may be raised or lowered or otherwise moved in such a manner as to effect the induction at one or other edge of the valves, substantially as and for the purposes herein specified.

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Witnesses:
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