I. W. FORBES.

Improvement in Valve-Gears for Steam Engines.

No. 115,300. Patented May 30, 1871.

FIGURE 1.

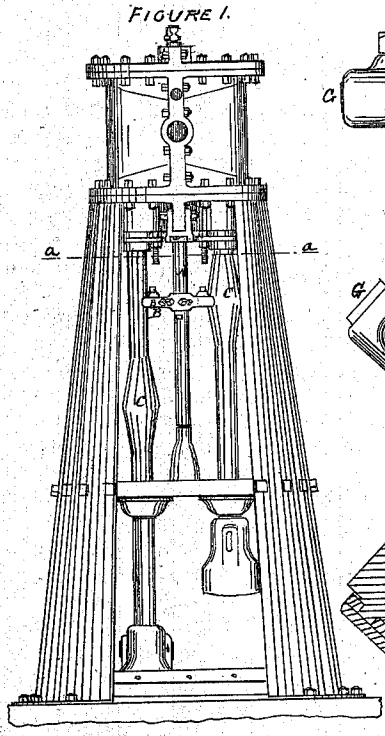


FIGURE 5.

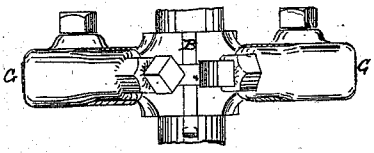


FIGURE 6.

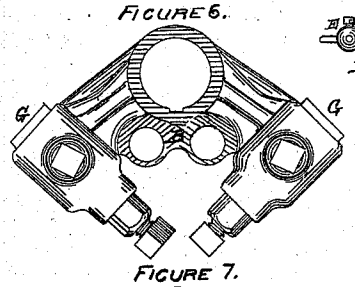


FIGURE 7.

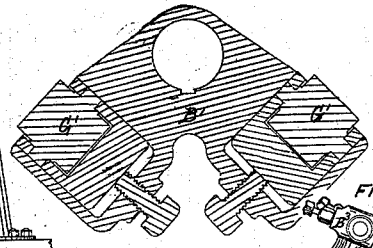


FIG. 9

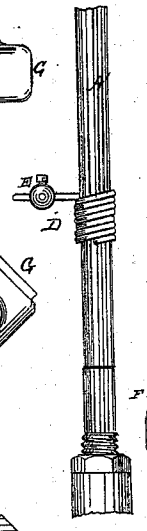


FIGURE 10.

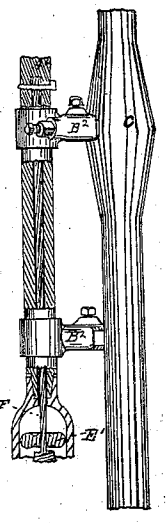


FIGURE 11.

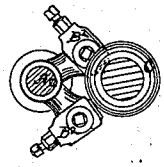


FIG. 12.

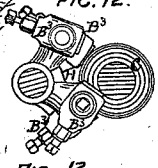


FIGURE 8

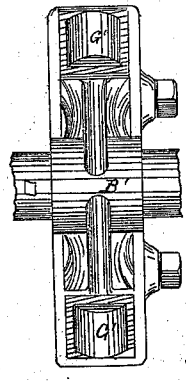


FIG. 13.

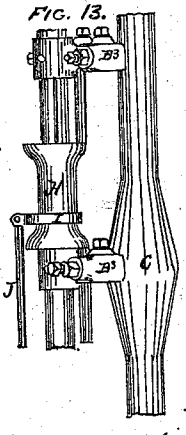


FIG. 14.

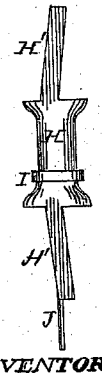


FIGURE 2.

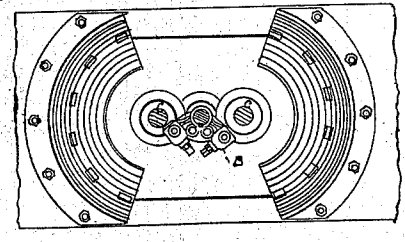


FIGURE 3.

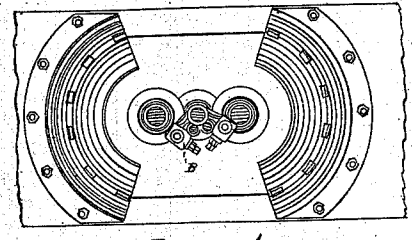
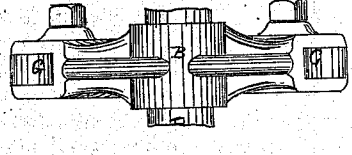


FIGURE 4.



INVENTOR.

Isaac W. Forbes

Witnesses.

W. H. Finckel

Geo. L. Poulton

UNITED STATES PATENT OFFICE.

ISAAC WILLIAM FORBES, OF LA PORTE, INDIANA.

IMPROVEMENT IN VALVE-GEARS FOR STEAM-ENGINES.

Specification forming part of Letters Patent No. 115,300, dated May 30, 1871.

To all whom it may concern:

Be it known that I, ISAAC WILLIAM FORBES, of La Porte, in the county of La Porte and State of Indiana, have invented certain new and useful Improvements in Valve-Gear for Steam or Air Engines; and I do hereby declare the following to be a clear and exact description thereof, sufficient to enable others skilled in the art to which my invention appertains to make and use the same, reference being had to the accompanying drawing making part of this specification, in which—

Figure 1 is a full front view, with portions omitted, of a double-stamp battery, with this gear for producing valve-motion for the same. Fig. 2 is a cross-sectional view of Fig. 1, shown by dotted lines *a a* in that figure. Fig. 3 is a representation of the same thing as Fig. 2 with the left-hand stamp up and the right-hand one down, which has moved the valve-lever and valve by means of the left-hand incline the full distance from left to right. Fig. 4 is the double valve-lever keyed upon the valve-stem, designed to move the valve by the inclines upon the stamp-stems or piston-rods, working alternately against each end of it, viewed from that side which works against the inclines, and representing a portion of the stem broken off at each end as it passes through the lever. Fig. 5 is the same thing viewed from the opposite side to that in Fig. 4. Fig. 6 is a top view of Figs. 4 and 5, with the valve-stem and key removed. Fig. 7 is a central section of a similar lever with rollers inserted in solid blocks to work against the inclines instead of the blocks themselves. Fig. 8 is a front view of the same kind of lever as represented in Fig. 7, as seen from that side which works against the stamp-stems. Fig. 9 is a view of a valve-stem and bearing with a momentum spring-lever and balance-ball attached, intended to work with a single engine, also applicable to a double or other engine. Fig. 10 is a view of this gear when but a single stamp or engine is used. It has two single arms instead of a double arm, one above and the other below, and at opposite sides of the stamp-stem and at opposite ends of the inclines, showing a valve-stem and single levers placed in a position to be worked by a single engine. It has a momentum-spring and balance-weight attached. This view is partly sectional and partly full. Fig. 11 is a top view of Fig. 10. Fig. 12 is an end view of a piston-rod with inclines, with two double movable arms for reversing steam, when required, with a sleeve which slides endwise upon a valve-stem, with inclines passing between the double levers at each end. This is designed to work an engine that requires to be run either backward or forward. Fig. 13 is a side view of the same. Fig. 14 is a view of the shifting-sleeve with a shifting-lever attached, as in Fig. 13. This figure shows a view of that side of the sleeve next to the piston-rod with inclines upon each end, which pass between the levers and shift them from right to left or left to right, as required; hence reversing the steam and the engine from forward backward, or backward forward, as required.

This invention consists in a valve-stem which runs parallel with the piston-rod or piston-rods, and which has single or double levers secured thereto or connected therewith, in the manner substantially as hereinafter described; the object of the invention being to produce a simple, effective, and durable means of producing valve-motion without having to reduce a reciprocating to a rotary motion for the purpose of obtaining valve-motion.

In the drawing, A is the valve-stem. A^1 is valve-stem with spring-lever and balance-ball attached. A^2 is a valve-stem of the same sort, with a longitudinal opening to allow the insertion of a spring bar or rod. B is the valve-lever. B^1 is the valve-lever with the rollers inserted in the guide-blocks. B^2 are single levers, the upper one right-hand, the lower one left-hand, designed to be used with one cylinder at opposite sides of the piston-rod and at opposite ends of the inclines.

These levers may be reversed from the way they now stand, the upper one where the lower one is, and the lower one where the upper one is, when the valve would be reversed. Hence steam would be reversed in the cylinder by the same motion of the piston which it now has, provided the construction of the engine was so designed. These levers, when desired, may be so constructed as to be under the control of the operator for sliding apart or together one or both, when used for steam-hammers or anything of that nature which requires the blows to be given according to the will of the operator

B^3 B^3 are double levers of a different kind.

They are designed to work with one piston-rod instead of two. They are reversed levers. The ends work against opposite sides of the piston-rods and inclines, and are designed to run the engine either way, backward or forward, at the will of the engineer. These levers are not keyed fast to the valve-stem, but work loose on the same. They are, however, secured so they shall not move endwise upon the stem, but may turn laterally, as required. They are connected with a movable sleeve, H, which slides endwise on the stem. This sleeve being secured to the stem by key and key-seat. The key may be fast to the sleeve and slide in the stem, or fast to the valve-stem and slide in the sleeve, as may be desired. At each end of this sleeve are inclines H′ H′, which work between the levers and shift them, according to requirement, as the sleeve is carried endwise. These inclines, instead of being arms, as they are represented in Figs. 13 and 14, which work between the levers only, may form tubes or be an extension of the sleeve, extending entirely around the valve-stem, with two inclined slots in each, giving the same inclines as the arms to allow the levers to pass in the slots, which would have the same effect but greater bearings, and hence might be more durable and more desirable than inclined arms only. This sleeve is moved endwise by the band I and stem J. This stem J may be attached directly to the sleeve, if necessary, and dispense with the band. C C are inclined swells on the piston rod or rods or stamp stem or stems. D is a momentum spring-lever, which coils around the valve-stem, with balance-ball attached. The design of this lever and balance is two-fold: first, to hold the valve in its position until the stroke of the piston is made, or would have time to be made, to prevent the valve from moving too quick by the mere touch of the inclines upon the lever; second, if the piston-rod should not go its full length and the inclines fail to move the levers, and hence the valve-stem, then the momentum given by the reaction of the spring-lever and balance will reverse the valve-stem, hence the steam in the cylinder, and drive the piston the opposite way. If the momentum should not be sufficient the ball may be carried out; or if too great, the ball may be carried in; or a greater or lesser weighty ball may be used instead. E is a balance-ball. E′ is a balance-weight. F, a spring-rod. This rod passes through the end of the valve-stem, in the same, a sufficient distance to give a sufficient length to spring F, with its balance-weight E, to produce the same effect as that produced by spring-lever D with its balance-ball. This method may be preferred, as the spring and the weight are more compact, and may be kept out of sight and out of the way of the levers B B or anything else that might come in contact. The end which passes in the valve-stem, which is bored out to receive the same, is made fast to the stem by key, bolt, rivet, or set-screw. From that to the outer end it is loose and plays free and easy. At or near the outer end there should be a bearing in which this spring may play with ease. Balance-weight E, being secured to the spring F at or near its end, produces the same results as the momentum-ball upon spring-lever D. G G are guide-blocks which belong in the ends of levers B B^2 B^3. They are carried in or out at will, and held in their position by the set-screw. G′ G′ are rollers inserted in the slide-blocks which belong in the lever B^1. These rollers are used in place of the ends of the blocks themselves.

If a double engine is used but one double lever is required, which is used for controlling steam by the motion of pistons in one direction only, as in case of quartz-mills or rock-drills, or anything of a similar character. (See Figs. 1, 2, 3, 4, 5, 6, 7, and 8.)

When several cylinders are used with but one valve and this valve-gear, they should be placed in a circle, and the number of arms of the valve-lever should correspond with the number of piston-rods with inclines which drive the same, as will be more fully seen in my application for Letters Patent for improved steam-engine of same date with this.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The valve-stem A, lever B, blocks G G, in combination with inclines C C, as and for the purpose set forth.

2. Valve-stem A^1, spring-lever D, balance-ball E, and lever B, in combination with inclines C C, as and for the purpose set forth.

3. Valve-stem A^2, spring-shaft or rod F, balance-weight E′, lever B, in combination with inclines C C, as and for the purpose set forth.

4. Valve-stem A, levers B^2 B^2, in combination with inclines C C, as and for the purpose set forth.

5. Valve-stem A, levers B^3 B^3, sleeve H, in combination with inclines C C, as and for the purposes set forth.

6. Valve-stem A^1, spring-lever D, balance-ball E, levers B^2 B^2, in combination with inclines C, as and for the purpose set forth.

7. Valve-stem A^1, with its parts, levers B^3 B^3, sleeve H, as and for the purpose set forth.

8. Valve-stem A^2, spring shaft or bar F, balance-weight E′, levers B^2 B^2, in combination with inclines C C, as and for the purpose set forth.

9. Valve-stem A^2, spring shaft or rod F, balance-weight E′, levers B^3 B^3, sleeve H, in combination with inclines C, as and for the purpose set forth.

To the above specification I have signed my name this 18th day of November, 1870.

I. W. FORBES.

Witnesses:
W. H. FINCKEL,
WM. J. PEYTON.