

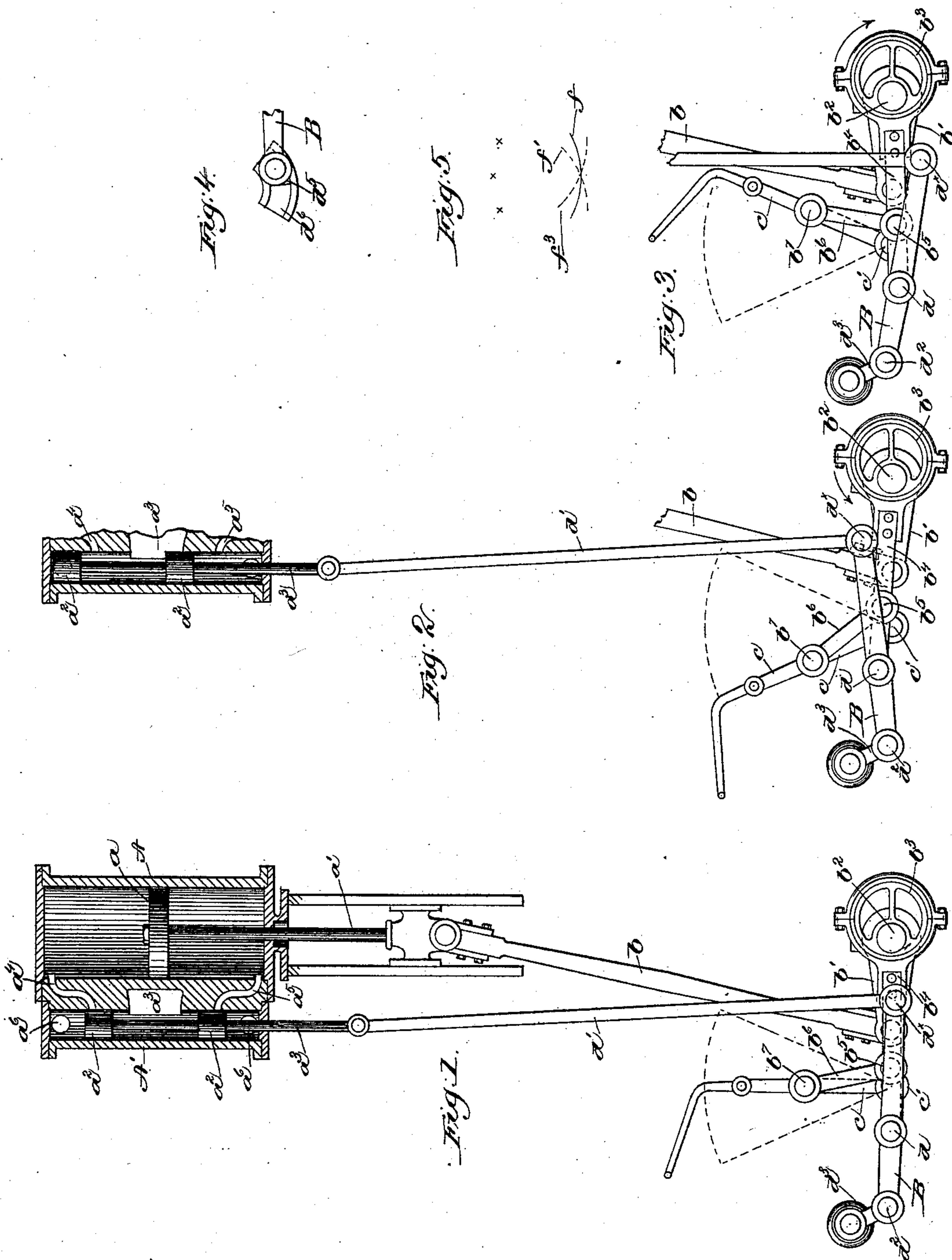
(No Model.)

W. L. TOBEY.

VALVE REVERSING MECHANISM.

No. 359,649.

Patented Mar. 22, 1887.



Witnesses  
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# UNITED STATES PATENT OFFICE.

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## VALVE-REVERSING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 359,649, dated March 22, 1887.

Application filed July 23, 1886. Serial No. 208,841. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM L. TOBEY, of Boston, county of Suffolk, and State of Massachusetts, have invented an Improvement in Valve-Reversing Mechanisms, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

This invention has for its object to provide steam-engines with a valve-motion to take the place of the link-motion now commonly used to reverse the rotation of the crank-shaft.

My valve-motion is an improvement upon the valve-motion known to engineers as the "Marshall" or "Hackworth" valve-reversing gearing, and has for its primary object to obtain equal opening and closing of the valve at each end of the stroke of the piston with equal points of cut-off, my improved valve-gearing being simple in construction and easy of adjustment.

My invention consists, essentially, of a valve and valve-stem, and an eccentric-rod, a point in which moves in a path oblique to the length of the said eccentric-rod, combined with a lever fulcrumed to the said eccentric-rod, and having one end connected to the valve-stem and its other end moving in a fixed path, substantially as will be hereinafter described.

Figure 1, in section and elevation, shows a sufficient portion of a steam-engine to enable my invention to be understood; Figs. 2 and 3, diagrams showing different positions occupied by my improved valve-gearing to produce reverse rotations of the crank-shaft, and Figs. 4 and 5 details to be referred to.

The cylinder A, piston  $a$ , provided with the usual piston-rod,  $a'$ , the valve-chest A', and valve  $a^2$ , contained therein and having the valve-rod  $a^3$ , are and may be of common construction, they being herein shown as constituting part of an upright engine.

The valve-chest A', as shown, is provided with the steam-inlet  $a^{13}$  and the ports  $a^4$   $a^5$  and exhaust-outlets  $a^6$ , the latter being at the ends of the said valve-chest. The piston-rod  $a'$  is joined by a connecting-rod,  $b$ , to a crank,  $b'$ , on a crank-shaft,  $b^2$ . The crank-shaft  $b^2$  has mounted on it an eccentric,  $b^3$ , provided with an eccentric-rod,  $b^4$ , to which a link,  $b^5$ , is pivoted at a point intermediate of the ends of the

said eccentric-rod, as at  $b^5$ , the other end of the link  $b^5$  being pivoted, as at  $b^7$ , to a reversing-lever,  $c$ , pivotally secured, as at  $c'$ , to a fixed portion of the engine, the said lever being adapted to be turned on its pivot from the position Fig. 1 to the positions shown in Figs. 2 and 3, to reverse the movement of the valve  $a^2$  and thereby the rotation of the crank-shaft.

The parts thus far enumerated are the same as in the Marshall valve-reversing gearing, and also the same as the Hackworth, except in the latter the point  $b^5$  is a block pivoted to the eccentric-rod, the said block moving in a slide attached to the reversing-lever  $c$ ; but in both the said contrivances the valve-stem is connected by a valve-rod to the end of the eccentric-rod.

The Marshall gearing is objectionable, as it gives unequal opening at the top and bottom of the cylinder, and in order to secure equal openings to the cylinder it has been necessary to double-port the cylinder at one end.

The excessive friction created by the use of the slides in the Hackworth gearing renders the said gearing impracticable.

In accordance with my invention, I obviate the objections due to the use of the double ports at one end of the cylinder, as in the Marshall valve-gearing, and I overcome the excessive friction common to the Hackworth gearing by means of a lever, B, which, in accordance with my invention, is fulcrumed near its center, as at  $d$ , to the end, as herein shown, of the eccentric-rod  $b^4$ .

The lever B has one of its ends, as shown at  $d^x$ , connected by the valve-rod  $d'$  to the valve-stem  $a^3$ , and has its other end suspended, as at  $d^2$ , to an equalizing-link,  $d^3$ , pivoted to a fixed portion of the engine; but, instead of pivoting the lever B to the pivoted link  $d$ , the said lever may be pivoted in a block,  $d^5$ , moving in a stationary slide,  $d^6$ . (See Fig. 4.) The equalizing-link  $d^3$  gives to the point of the lever B where the latter is connected to the valve-rod substantially equal oscillation above and below the center, thereby securing substantially equal opening and closing of the valve at both ends of the stroke of the piston.

When the reversing-lever  $c$  occupies the central position shown in Fig. 1, the fulcrum  $b^5$  of the eccentric-rod  $b^4$  moves in a substan-

tially horizontal path, as shown in Fig. 5 by full line  $f$ . With the reversing-lever  $c$  thrown into the position Fig. 2, the path of movement of the fulcrum  $b^5$  is indicated by the dotted line  $f'$ , and when the reversing-lever  $c$  is thrown in the position shown in Fig. 3 to reverse the movement of the valves, and thereby the rotation of the crank-shaft, the path of movement of the fulcrum  $b^5$  is indicated by the dotted line  $f^3$ .

It will be noticed that the path of movement of the fulcrum  $b^5$  is in an oblique direction to the length of the eccentric-rod when the reversing-lever  $c$  is on either side of its central position.

I claim—

In a steam valve-motion, a valve and valve-stem, and an eccentric-rod, a point in which moves in a path oblique to the length of the said eccentric-rod, combined with a lever fulcrumed to the said eccentric-rod, and having one end connected to the valve-stem and its other end moving in a fixed path, substantially as and for the purpose set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM L. TOBEY.

Witnesses:

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