

E. PENNEY.

Valve-Gears for Steam-Engines.

No. 151,242.

Patented May 26, 1874.

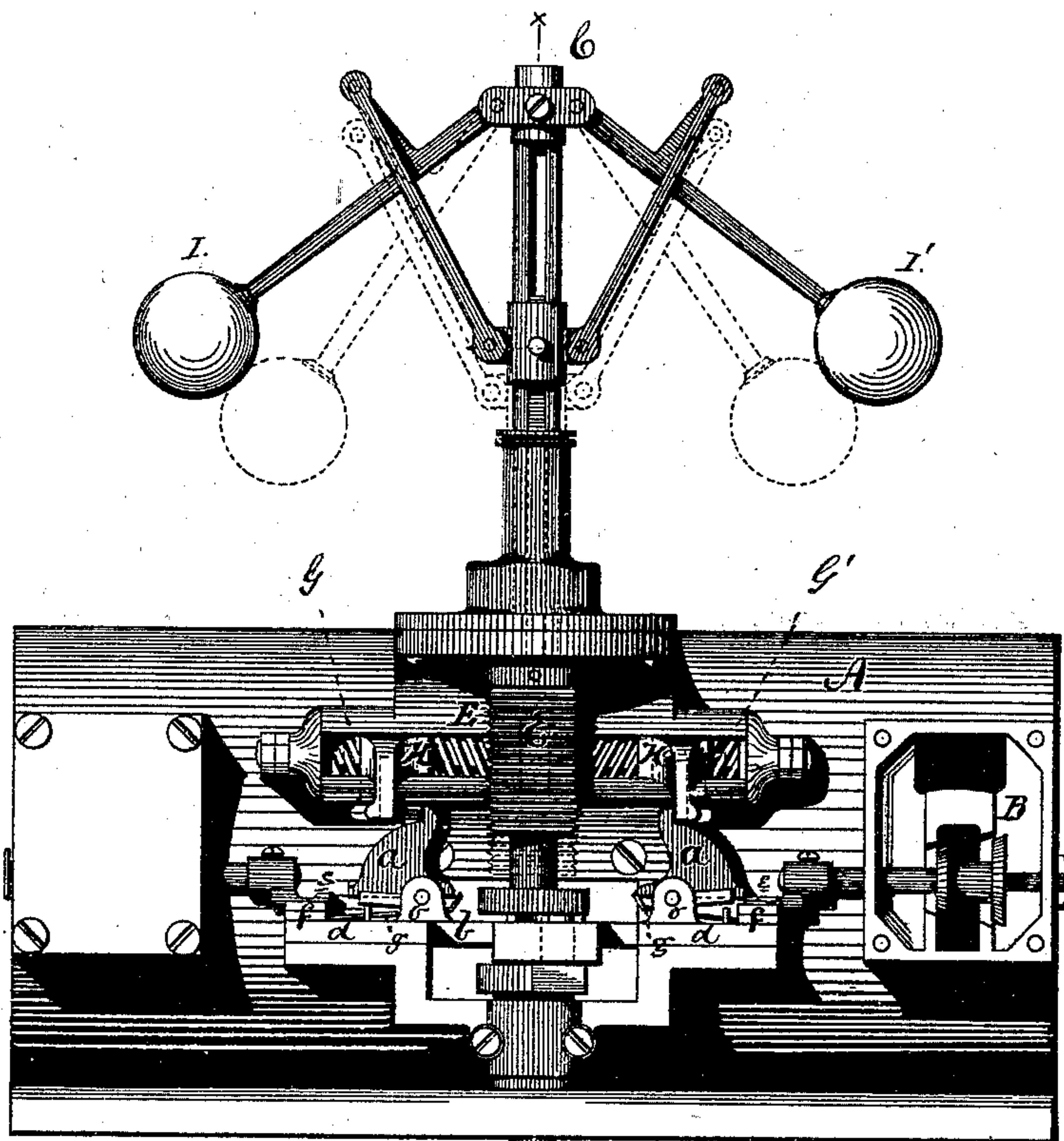


FIG. 1.

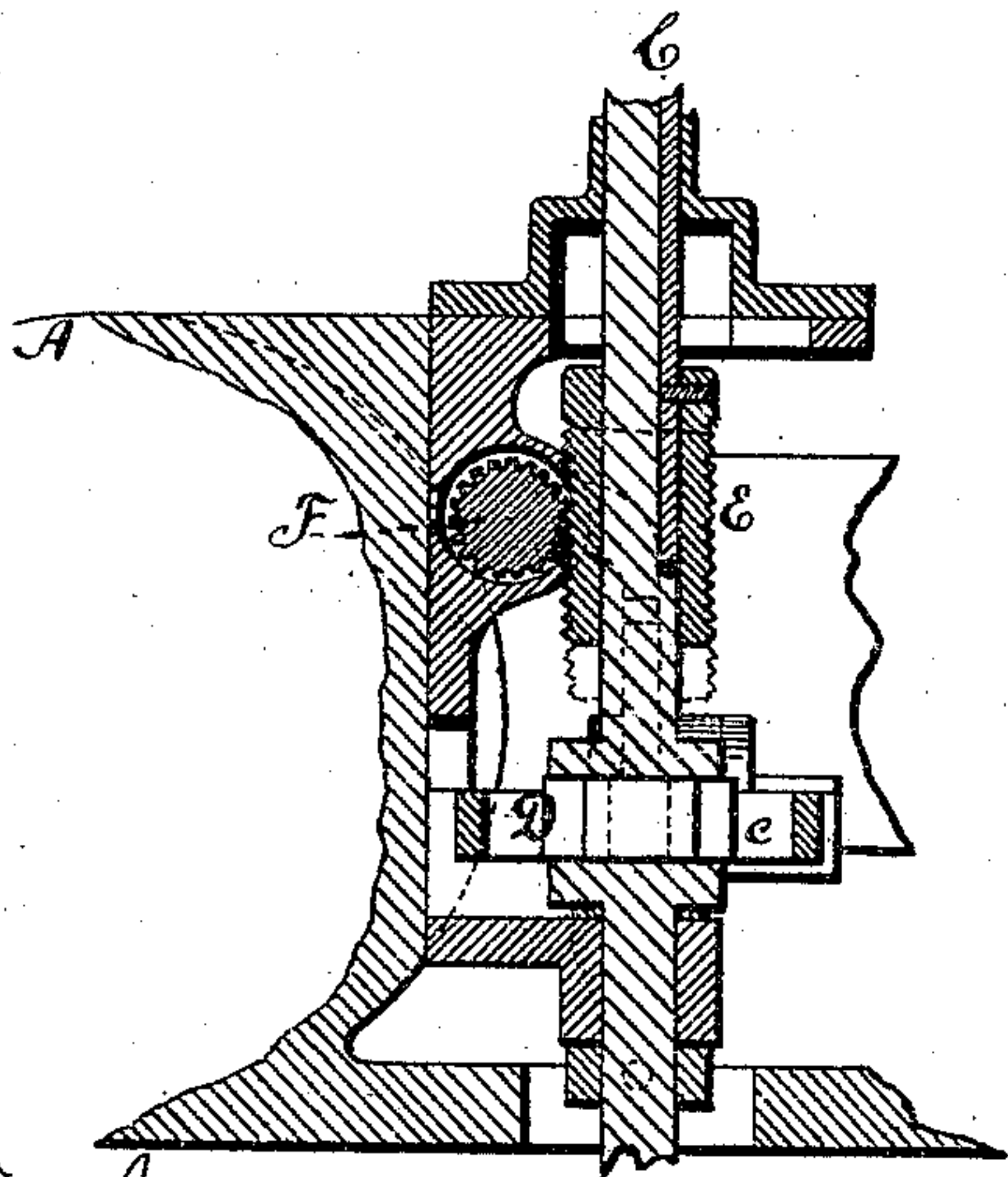


FIG. 2.

WITNESSES

Robert Whitcomb  
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# UNITED STATES PATENT OFFICE.

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## IMPROVEMENT IN VALVE-GEARS FOR STEAM-ENGINES.

Specification forming part of Letters Patent No. 151,242, dated May 26, 1874; application filed  
April 2, 1874.

*To all whom it may concern:*

Be it known that I, EDGAR PENNEY, of Newburg, in the county of Orange and State of New York, have invented certain new and useful Improvements in Valve-Gear for Steam-Engines; and I do hereby declare that the following specification, taken in connection with the drawings making a part of the same, is a full, clear, and exact description thereof.

Figure 1 is a side elevation. Fig. 2 is a transverse section in a plane on the line  $x x$  of Fig. 1.

My invention relates to an improvement in the means for operating the cut-off valves of a steam-engine, and in the combination of the valve-gear with the regulator for automatically determining the period of cut-off variably, according to the resistance to be overcome by the engine. The valve-gear employed is of the class known as "liberating" valve-gear—that is to say, a gear which opens the valves for the admission of steam to the engine at a rate of speed proportioned to the speed of the piston, but permits them to be detached from the mechanism which opens them, and close with a speed due to an independent force, as the gravity of a weight, the reactionary power of a spring, or the excess of unbalanced pressure of steam upon the valves.

In the drawings, A is the cylinder of the engine, and B the steam-valves, which, in this instance, are balanced puppet-valves, but for which slide-valves may be substituted. The arrangement of the valve-chests and the passages for the steam is well understood, and needs no particular description. The valves (one for each end of the cylinder) are operated alternately for their opening movements by means of rocking tappets  $a a$ , which are pivoted at  $o$  to a plate or bar,  $b$ , which obtains a regular reciprocating movement from the revolution of a crank upon the vertical shaft C, which supports the regulator, said crank being arranged to work a box, D, Fig. 2, which, being fitted to guides  $c$  set in the bar  $b$ , and transversely to the line of movement of the latter, causes the said bar to have a reciprocating movement in its guides  $d d$ . The ends of the valve-rods are furnished with adjustable feet  $e$ , which slide in guides  $f$ , and are ar-

ranged in a line coincident with the line of movement of the tappets when acting to open the valves. The toes of the tappets  $a a$  are held down by springs  $g$  to a fixed plane, so that each will, as the bar  $b$  is reciprocated, come into contact with the end of the foot  $e$  of its appropriate valve-rod, whereby the steam-valves will be alternately opened. It is necessary, however, that at or before the completion of each stroke of the piston the engagement between the tappet-toe and the valve-rod foot should be broken, to allow the valve to close before steam is admitted for the next stroke. Accordingly, it is intended that the said tappets shall come into contact with stops, which shall have the effect to raise the toes of the tappets above the plane in which the feet of the valve-rods slide, and thus allow the valves to be closed. Furthermore, in order that the period of closing the valves shall be variable, according to the resistance which the engine has to overcome, it is necessary that these stops shall be set in position by the regulator, and be under its control. The regulator-shaft C is supposed in this instance to be driven by a shaft, connecting the regulator-shaft with the main shaft by means of suitable bevel-gears at each end. Around the regulator-shaft C is a cylindrical rack, E, which engages with a gear pinion-wheel, F, Fig. 2. This gear pinion-wheel is set upon a shaft, (shown at Fig. 1 as set in journal-bearings on the side of the cylinder,) and is intermediate between a right and a left handed screw,  $G G'$ , cut in the said shaft. The screws  $G G'$ , respectively, engage with corresponding threads on the stops  $H H'$ , in a way well understood, whereby, as the gear pinion-wheel F is caused by the revolving rack E to turn the shaft in one direction, the said stops will be moved toward each other, and, by the turning of the shaft in the opposite direction, will become farther separated. The changes in the position of the stops are effected by the regulator thus: As the balls  $I I'$  rise to a higher plane by centrifugal action, the cylindrical rack E, by means of suitable levers connecting it with the arms of the regulator, is raised to a higher position on the revolving regulator-shaft C, and causes the screw-shaft to turn



in its bearings, and the stops  $H H'$  to approach each other. Upon the balls falling to a lower plane, the opposite results follow.

The tappets  $a a$  may be of any preferred form, so long as they are so constructed that they shall be brought into contact with their appropriate stops at or before the completion of the stroke, and be rocked on their pivots, so as to effect their disconnection with the valve-rods which they respectively operate.

While I have described the reciprocating bar upon which the rocking tappets are mounted as worked by a crank or eccentric on the regulator-shaft, which latter is driven by gearing deriving movement from the main shaft, it is evident, to practical constructors of steam-engines, that the said reciprocating bar may be operated by an eccentric on the main shaft through a connecting-rod, and the regulator may be driven independently by a belt.

I am aware that before my invention the cut-off valves of steam-engines have been operated by tappets mounted on a sliding bar; but in such instance the extent of the engagement of the faces of the tappets with the rocking toes working the valve-rods was made variable by the regulator, and the connection between the parts of the valve-gear to allow the

closing the valve was broken by the divergence of their paths of movement. I am also aware that revolving cams of various shapes have been set upon a shaft and made to approach toward or recede from each other, so as to present larger or smaller sections of their surfaces to levers or arms operating the valves, and that such cams have been controlled, as to their positions, by the regulator. Disclaiming the inclusion of such devices,

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

1. The combination of a reciprocating bar,  $b$ , upon which rocking tappets  $a a$  are mounted, right-and-left-hand screws  $G G'$ , working stops  $H H'$ , and a rack and gear,  $E F$ , for operating the screws which adjust the position of the stops, substantially as described, constituting a cut-off valve-gear, as specified.

2. The cut-off valve-gear specified, consisting of the reciprocating bar with rocking tappets, the screws  $G G'$ , stops  $H H'$ , and the rack and gear  $E F$ , in combination with a regulator, substantially in the manner set forth.

EDGAR PENNEY.

Witnesses:

ROBERT WHITEHILL,  
EDWARD P. CORWIN.