

(No Model.)

J. S. ASH.
VALVE MOTION.

No. 337,293.

Patented Mar. 2, 1886.

Fig. 1.

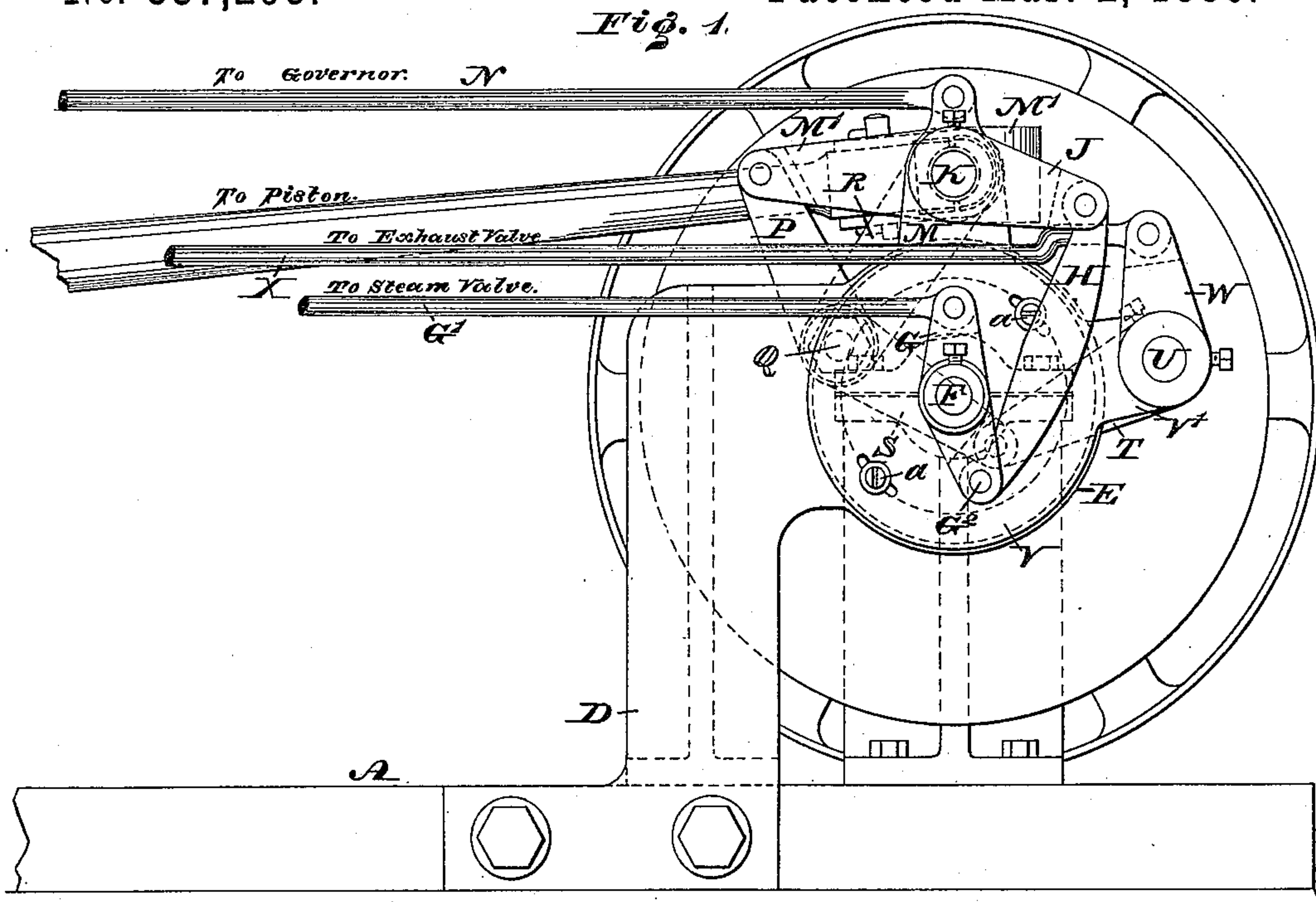
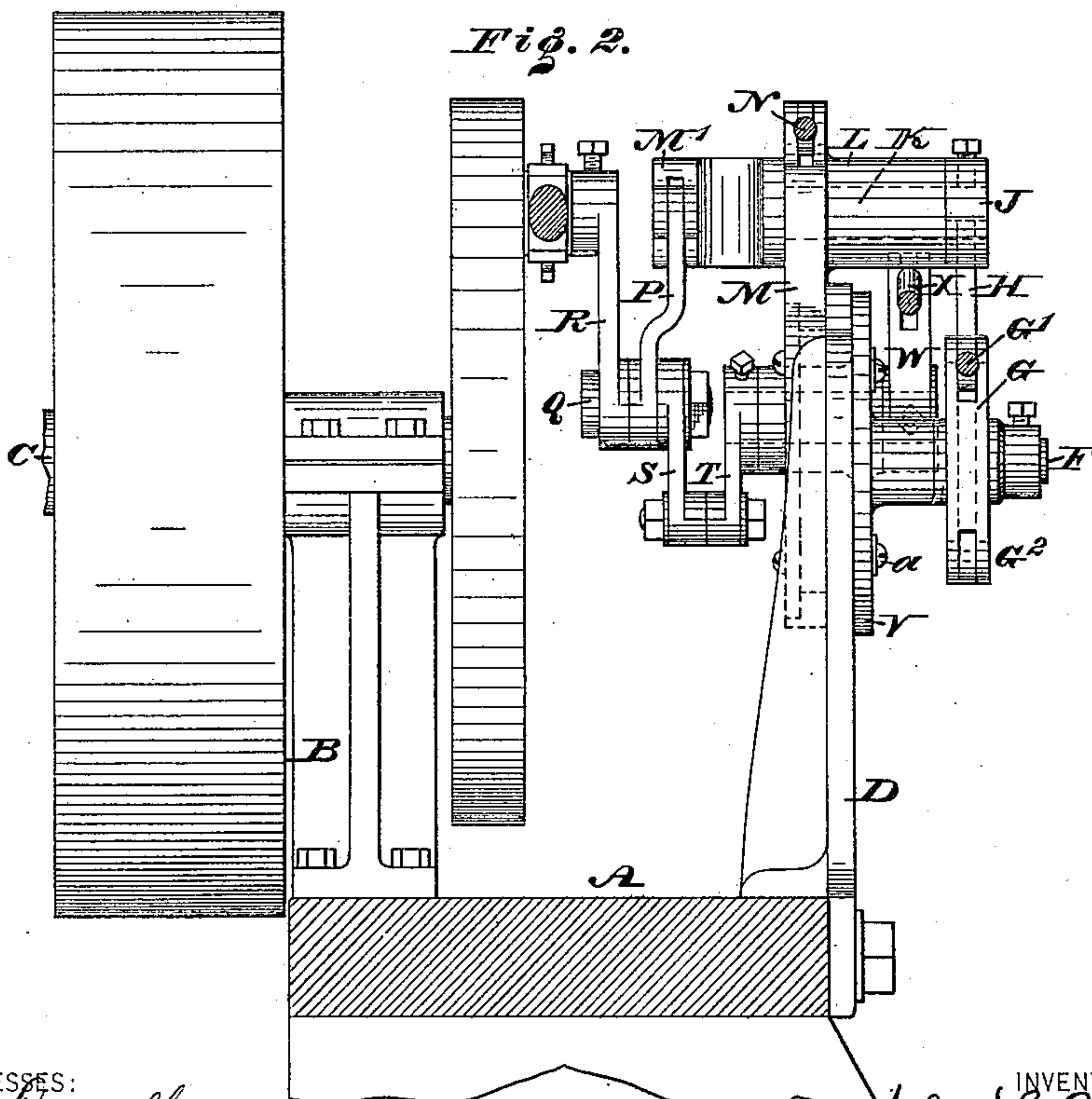


Fig. 2.



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VALVE-MOTION.

SPECIFICATION forming part of Letters Patent No. 337,293, dated March 2, 1886.

Application filed August 1, 1885. Serial No. 173,237. (No model.)

To all whom it may concern:

Be it known that I, JOHN S. ASH, a citizen of the United States, residing at Buckingham, in the county of Bucks, State of Pennsylvania, have invented a new and useful Improvement in Valve-Motions and Cut-Offs, which improvement is fully set forth in the following specification and accompanying drawings, in which—

Figure 1 represents a side elevation of a valve-motion and cut-off embodying my invention. Fig. 2 represents a front view thereof.

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

My invention relates to that class of engines in which separate valves are employed for the admission and release of steam; and the objects of my improvements are, first, to secure an automatic cut-off for the steam-valve having a wide range; second, to maintain a nearly constant lead throughout the entire range of cut-off; third, to secure a rapid cut-off, (preventing wire-drawing;) fourth, to give decision to all the events of the travel for both the steam and the exhaust valves; fifth, to secure small travel of the valves, especially during the time they remain closed.

Its objects are further to dispense with the release-gear common on this class of engines, and to secure certain other advantages of construction and detail, to be hereinafter described.

With these ends in view my invention essentially consists in a rocker-arm for operating the steam-valve, deriving its movement through a connecting-bar from a crank on the main or crank shaft of the engine, and communicating this motion through suitable connections to the valve, regard being had to a change of cut-off, which is effected by moving the rocker-arm support and to constant lead. The latter is secured by additional mechanism, to be described. The rocker-arm referred to is placed very near the crank giving it motion, and the connecting-bar made very short, thereby increasing the irregularity of the reciprocating motion derived from eccentric and crank connections. A similar rocker-arm imparts motion to the exhaust-valve.

For simplicity I shall confine my description to the case of a single-acting engine, as the parts may be readily duplicated, as desired.

Referring to the drawings, A represents the bed-plate of an engine, B the pillow-block, and C the main shaft thereof. A bracket or support, D, is firmly bolted to the bed-plate A of the engine, and carries the pin F, the axis of which coincides with the axis of the main or crank shaft C of the engine.

Oscillating on the pin F is the lever G, to the upper end of which is pivoted the rod G', running to the steam-valve, and to the lower end, at G², is pivoted the bar H, and this to the rocker-arm J, keyed on the rocker-shaft K.

On the inner end of the rocker-shaft K is the rocker-arm M', to the outer end of which is pivoted the connecting-bar P, which turns on the pin Q, said pin Q passing through a crank or connecting-piece, R, which latter is also firmly attached to the main crank of the engine, leaving the connecting-rod of the engine free to operate in the ordinary way.

The crank R is designed to lessen the throw of the valve-movement, and its length may be varied, as required. When its length is reduced to zero, the pin Q and the main crank-pin of the engine become identical.

Also loosely placed on the pin F is the armed disk M, the upper end of the arm of which is attached to the rod N, running to the governor. This disk carries in the boss L the rocker-shaft K, above mentioned. Turning on the pin Q is also a connecting-bar, S, pivoted at the end opposite to the pin Q to the rocker-arm T. This rocker-arm T is secured to the shaft U, to which is also firmly secured another arm, W, to which is pivoted the rod X, running to the exhaust-valve.

In an engine having a crank-shaft bearing on each side of the crank the crank-shaft may serve the purpose of the pin F, motion being derived from a small crank on its outer end.

In certain constructions the rocker-arm M' and rocker-arm J or rocker-arm T and arm W may be made to coincide.

The construction here represented may be varied to suit different styles of engine at the will of the designer, the essential characteristics remaining the same.

The bearing V' of the rocker-shaft U is preferably placed on a disk, V, and is capable of adjustment by the set-screws a.

Having described the construction and relative arrangement of the several parts of my valve-movement, I will now describe its operation. The crank R, being rigidly attached to the main crank of the engine, gives to the pin Q, and consequently to the end of the connecting-bar P attached thereto, a rotary motion. The other end of the bar P, being attached to the rocker-arm M', imparts an oscillatory motion to said rocker-arm, and consequently to the shaft K and arm J. This being connected by the bar H with the lever G imparts a similar motion to the latter, which is communicated by the rod G' to the steam-valve. The bearing L for the shaft K, which is in a boss on the armed disk M, being free to rotate about the pin F, is under the control of the governor, and thus controls the point of cut-off. The connecting-bar S, having one end attached to the pin Q, has imparted to this end a rotary motion, and the other end, being confined by its connection to the arc described by the rocker-arm T, imparts an oscillatory movement to the latter, and hence to the rocker-shaft U. The arm W, being secured to the same shaft U, also receives an oscillatory movement, and, as the rod X is attached to the arm W and runs to the exhaust-valve, gives a reciprocating motion to the exhaust-valve. It is clear that the steam and exhaust valves work quite independently and have no necessary connection with one another. When the angular position, as effected by the governor on the disk-arm M, changes with reference to the crank, since the arc described by the rocker-arm M' is the same whatever its position, it is evident that to maintain a constant lead the valve-opening should take place at times corresponding to different points in said arc, such points agreeing with the position occupied by said rocker-arm when the crank occupies the position representing the desired lead, and also agreeing with the different points of cut-off.

Reference to the drawings, Fig. 1, will show that when the crank is near the end nearest the cylinder, the pin Q and the end of the rocker-arm M' will move through nearly equal distances, the parts being so arranged and proportioned that at this time the rocker-arm M' and the connecting-bar P are nearly perpendicular to each other. This enables me to keep the lead constant by transferring the motion of the rocker-arm M' through the connections above named to the lever G, and allowing the lead-opening to take place when the end of said lever is traveling in a direction nearly parallel to the motion of the valve, and consequently imparting a movement to the latter which is nearly the same, or having a direct proportion to the movement of the lever G, as also of the parts from which it derives its motion. In other words, the movement imparted by the governor to the armed disk M about the pin F, measured at the distance of the pin Q from the center of the crank-shaft, and of the bearing supported by said disk

about the shaft K, measured at the end of the rocker-arm M', are equal, and they are also equal to the movement of the disk with reference to the lever G, (also measured at the distance Q from the center,) said lever being held by the bar H.

The following proportions must be observed: Length of rocker-arm M' : half the throw of pin Q :: length of arm J : length of arm G'. The effect of this is to allow any motion imparted by the governor to take place without affecting the lead, and at the same time allow a very quick valve-opening.

I do not confine myself to placing the pin F in line with the crank-shaft of the engine, but it may be placed at any convenient point, movement being communicated to the parts by suitable gearing; nor do I wish to confine myself to the exact construction above given, as it is evident that this may to some extent be altered without departing from the spirit and scope of my invention.

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

1. The support D, carrying the pin F, the axis of which coincides with the main shaft C, in combination with the lever G, connected to the rod G', the lever G', connected by the rod H to the rocker-arm J, the rocker-arm M', the connecting-bar P, and crank R, turning on the pin Q, said crank R being firmly attached to the main crank of the engine, armed disk M, and rod N, connecting-bar S, turning on the pin Q, and rocker-arm T, secured to the shaft U, having adjustable bearing V', both bar S and arm T being connected by a pin-arm, W, having the rod X pivoted thereto, and disk V, all of said parts being arranged, combined, and operated substantially as described.

2. The pin Q, connected by the crank R with the main crank of the engine, in combination with the bar P, rocker-arm M', rocker-shaft K, rocker-arm J, bar H, and lever G, communicating motion to the steam-valve, as specified.

3. The crank R and pin Q, connected with the crank, in combination with the bar S, rocker-arm T, rocker-shaft U, and rocker-arm W, communicating motion to the exhaust-valve, the rocker-shaft being placed close to the center, as and for the purpose specified.

4. The support D, carrying the pin F, in combination with the slotted disk V, rocker-shaft U, having adjustable bearing V', and set-screws a, substantially as and for the purpose set forth.

5. The pin Q, connected with the crank-shaft, as described, in combination with the bar P, rocker-arm M', rocker-shaft K, and rocker-arm J, said rocker-shaft being placed close to the center F and designed to originate a movement suitable for the travel of the steam-valve, such movement being characterized by a point for the beginning of the stroke at which its advance nearly agrees with the advance of the crank, and at the farther end

by a nearly stationary point, which extends over a considerable portion of the crank-revolution, said travel being communicated to the steam-valve by suitable intermediate parts.

- 5 6. The disk M, having its position about the center F determined by the action of the governor, in combination with the lever G, moving about the same center, the rocker-arm J and bar H, and rocker-shaft K, supported on

said disk, and having motion communicated thereto by suitable mechanism from the crank-shaft of the engine, and imparting through other suitable connections motion to the steam-valve, as and for the purpose specified.

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Witnesses:

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