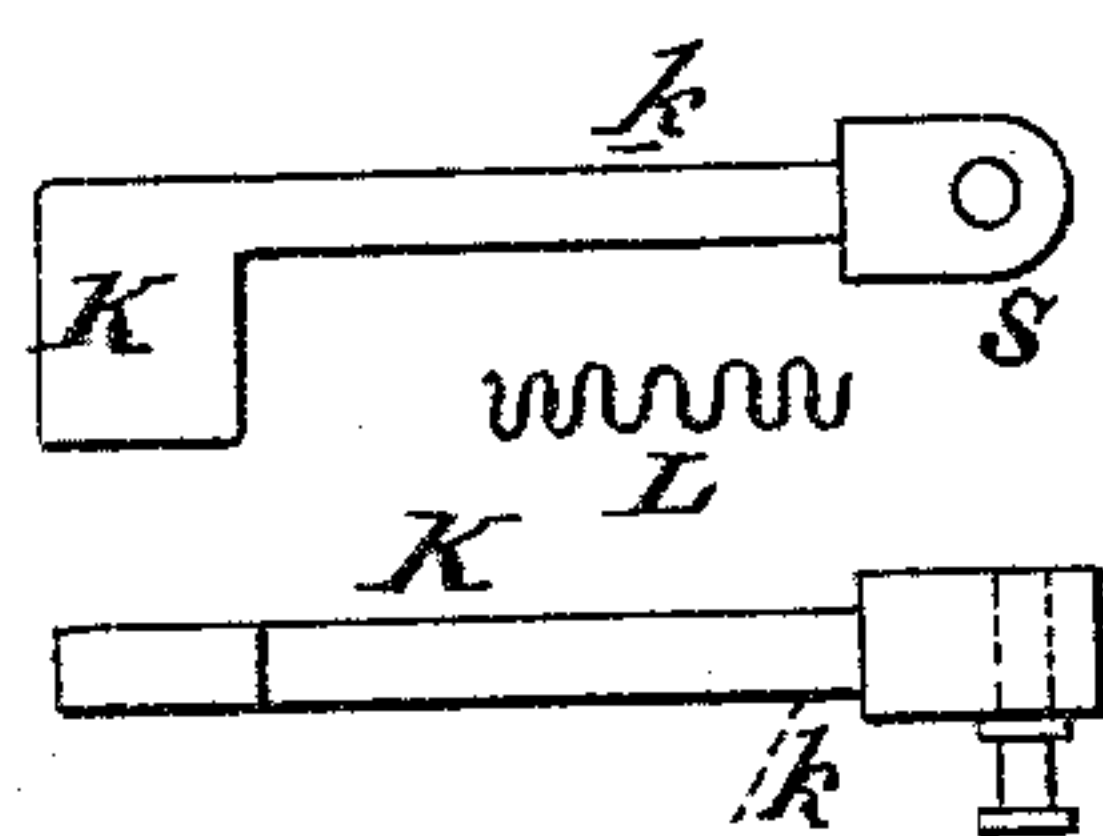
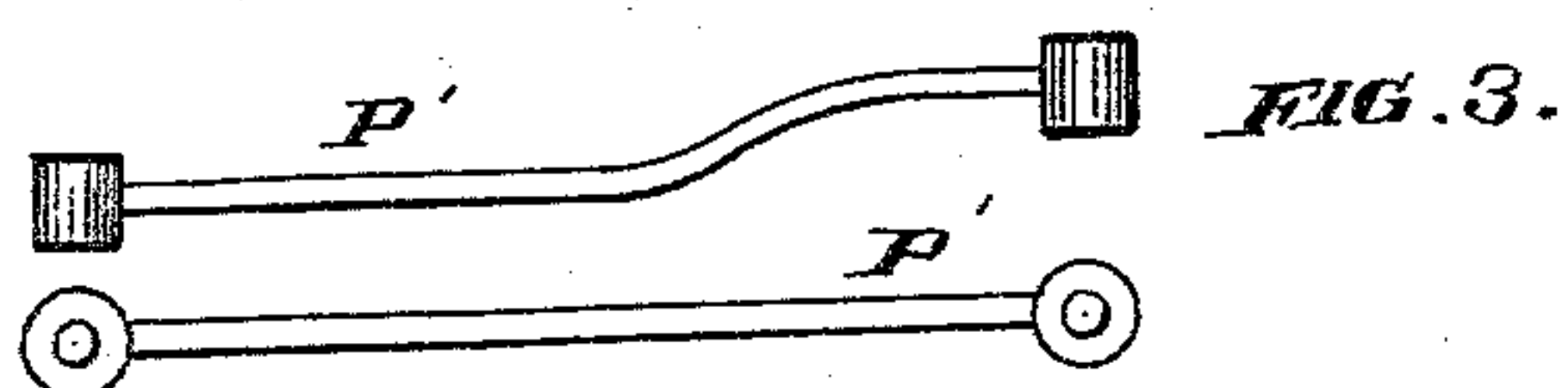
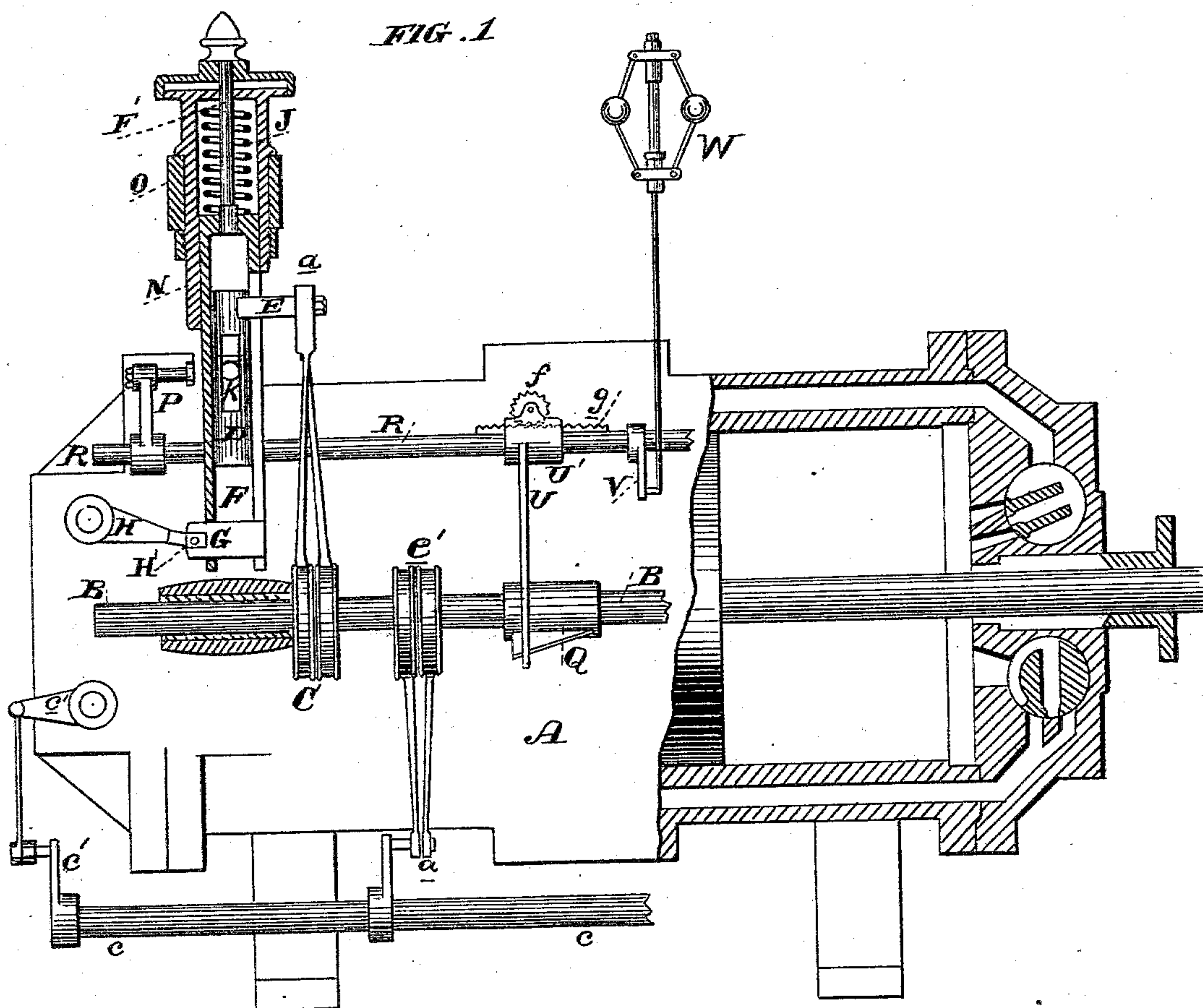


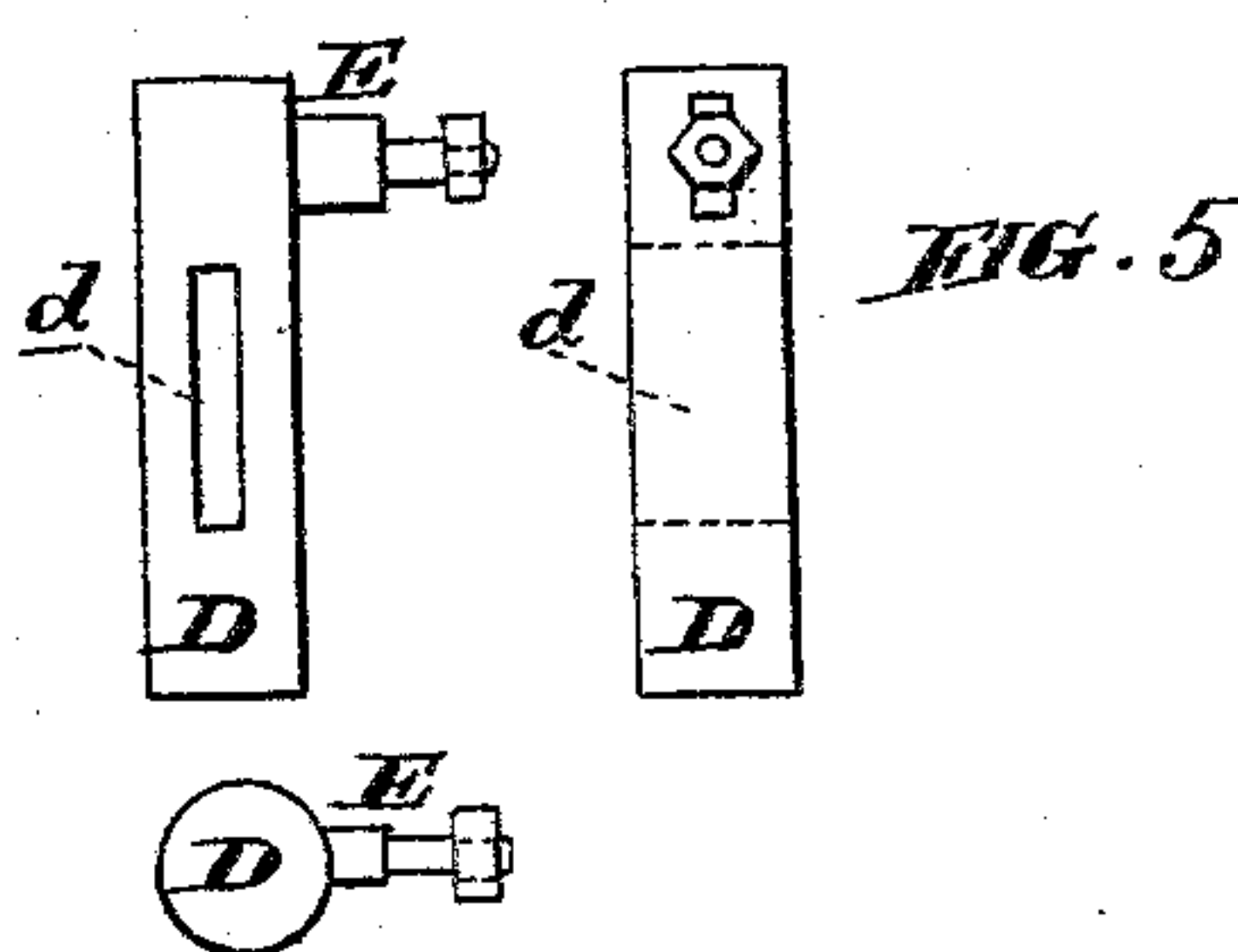
2 Sheets—Sheet 1.

AUTOMATIC CUT-OFF FOR ENGINES.

Patented Aug. 21, 1883.



**FIG: 4.**



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(No Model.)

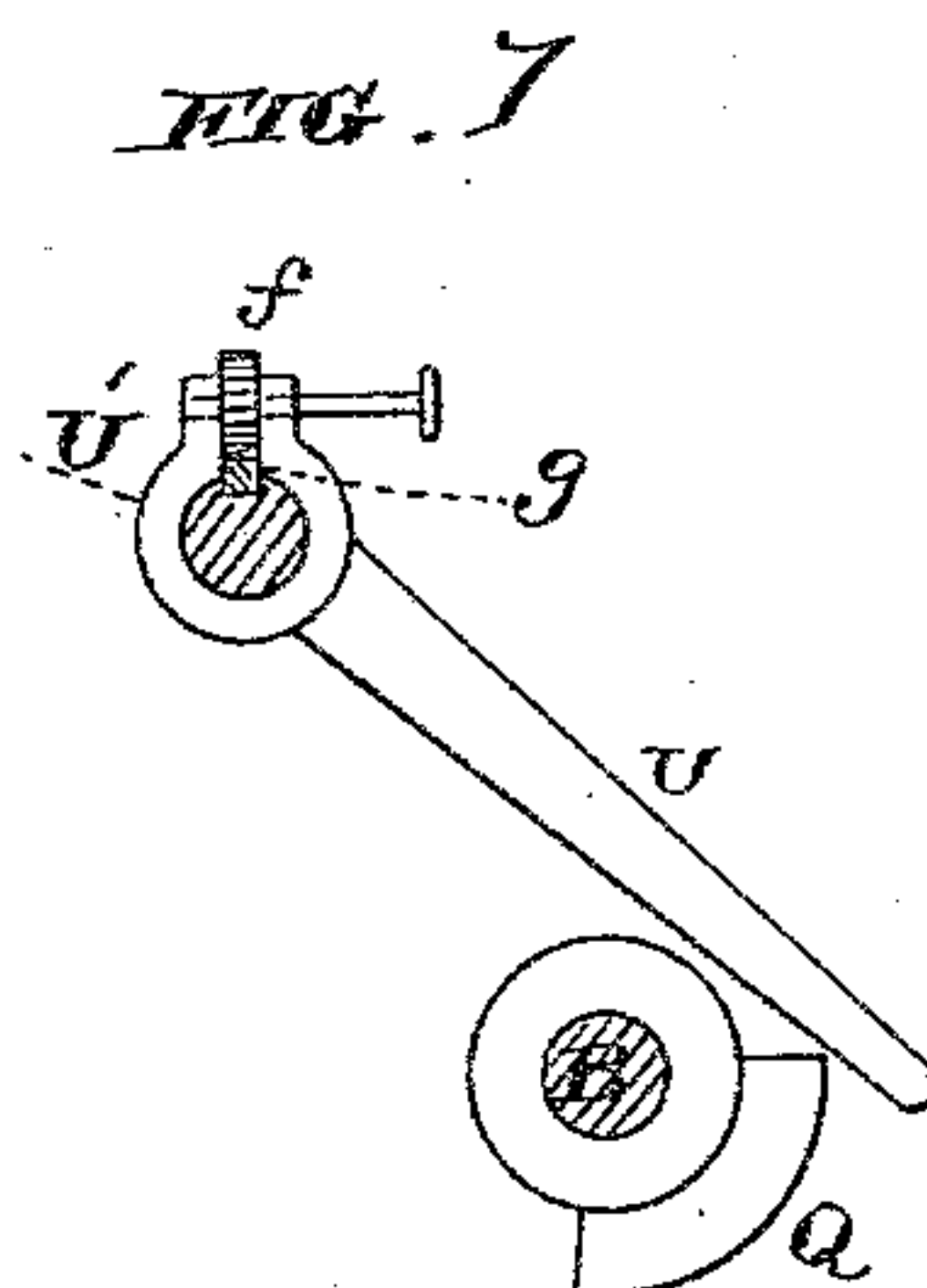
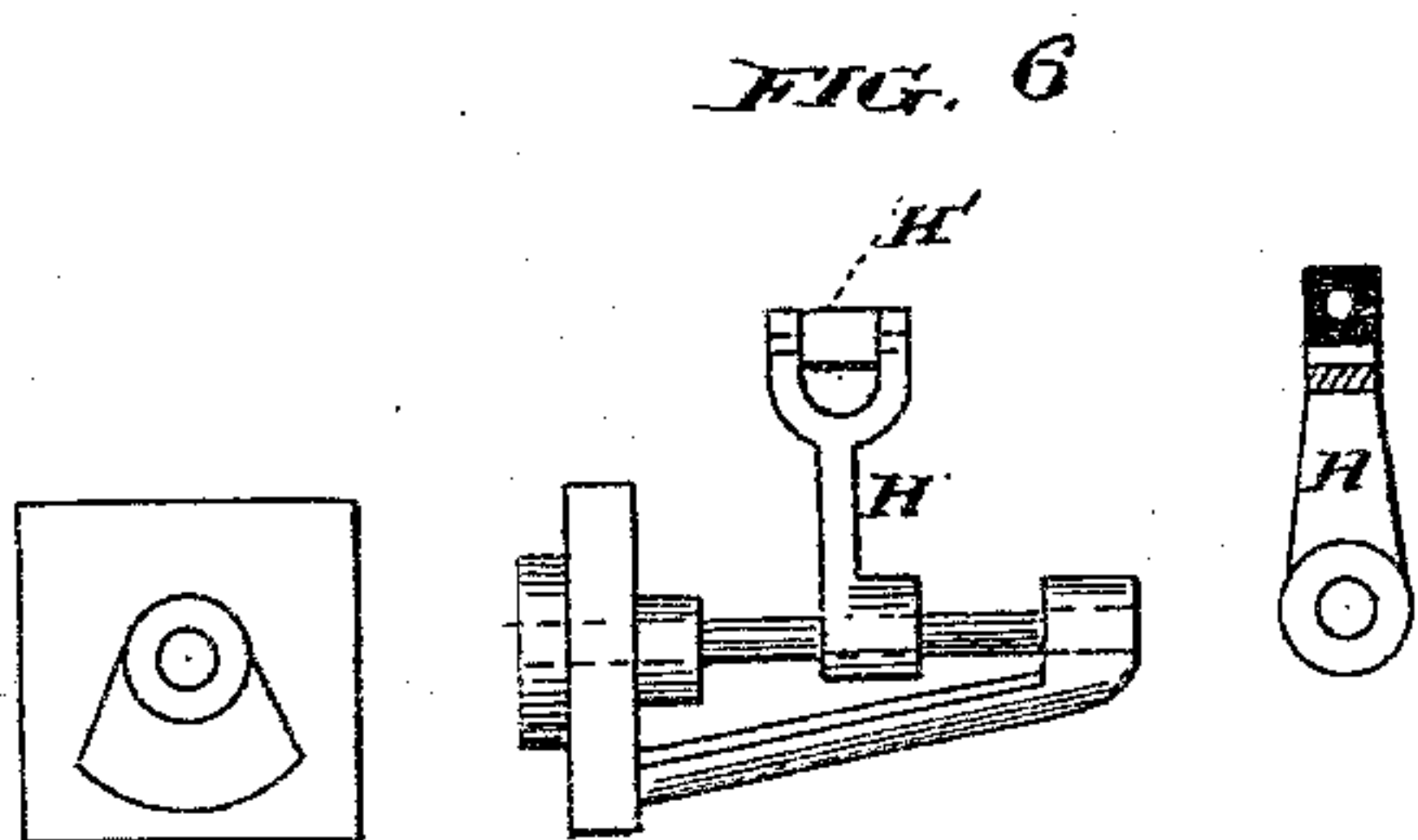
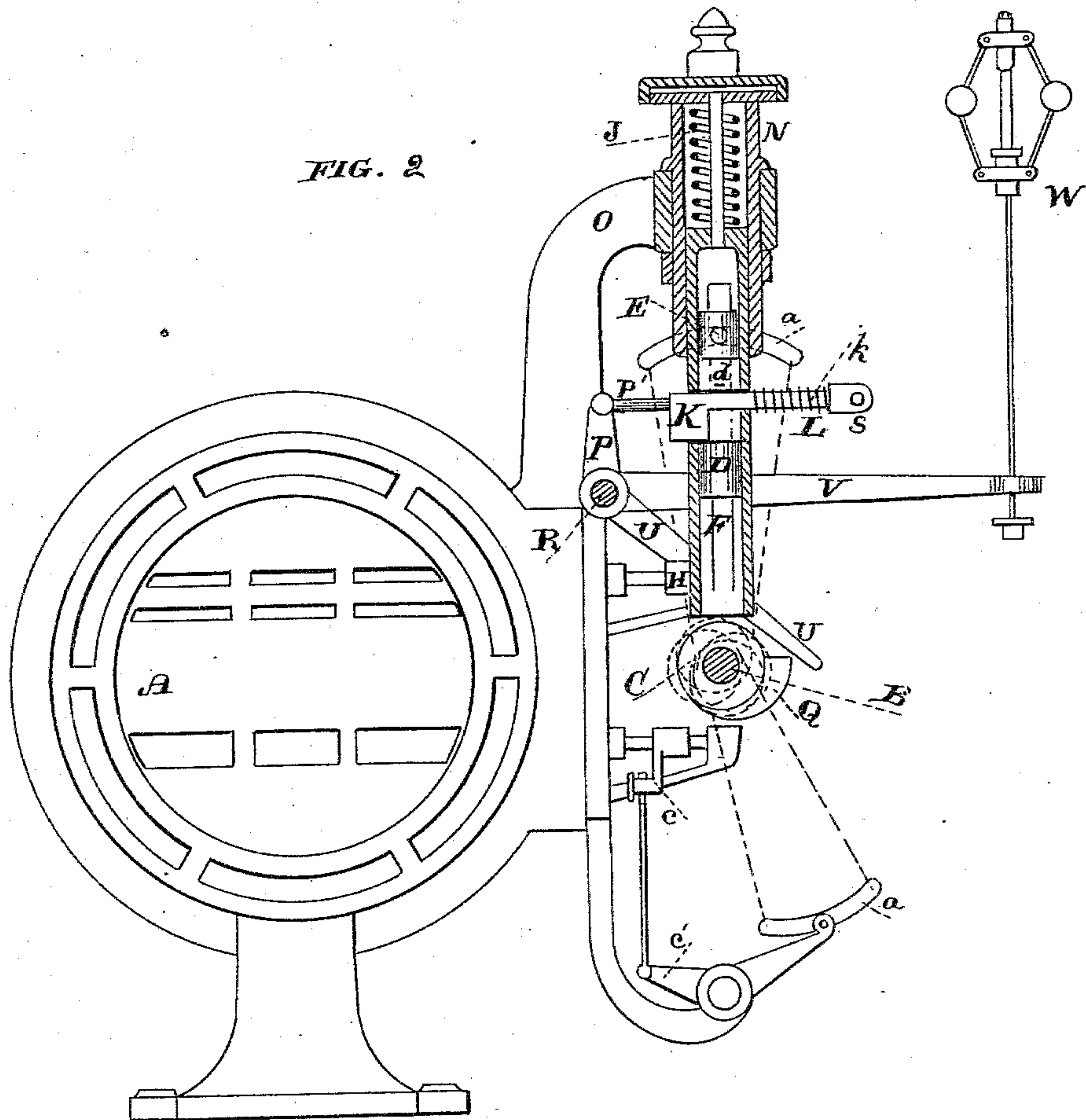
2 Sheets—Sheet 2.

J. B. PITCHFORD.

AUTOMATIC CUT-OFF FOR ENGINES.

No. 283,656.

Patented Aug. 21, 1883.



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# UNITED STATES PATENT OFFICE.

JOHN B. PITCHFORD, OF SAN FRANCISCO, CALIFORNIA.

## AUTOMATIC CUT-OFF FOR ENGINES.

SPECIFICATION forming part of Letters Patent No. 283,656, dated August 21, 1883.

Application filed March 22, 1883. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN B. PITCHFORD, of the city and county of San Francisco, State of California, have invented an improved Adjustable Automatic Cut-Off for Engines; and I hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to certain improvements in steam-engines, and it refers more especially to the valve-gear and a cut-off mechanism which is applied thereto.

Referring to the accompanying drawings for a more complete explanation of my invention, Figure 1 is a longitudinal view of the steam-cylinder and cut-off gear attached. Fig. 2 is an end view of the cylinder, showing application of cut-off gear. Fig. 3 is the pitman-rod that connects the rocker-arm P with the key K. Fig. 4 is the key K and spring L. Fig. 5 is the sliding block D. Fig. 6 is the valve-stem, bracket, and lever H. Fig. 7 is the arm U, with pinion f and cut-off cam Q.

In the present case I have shown my invention as applied to an engine having rotary valves at opposite ends of the cylinder, or what is known as a "Corliss" engine, and double eccentrics and link, so that it may be reversed; but it will be seen that it is also applicable to any other form of engine or valve-gear.

A is the steam-cylinder, having the usual piston and piston-rod, and B is a shaft, which is parallel with the cylinder and has the eccentrics C fixed to it in the proper relative position. The shaft B has a bevel-gear wheel (not shown) fixed to its end nearest the main shaft, and a similar gear-wheel upon the shaft drives it in the usual manner.

A single eccentric may be used for the valves, if the engine is to run in one direction only, and two eccentrics, which are connected with links a, may be employed when the engine is to be made reversible. The valves here illustrated are of the Corliss or rotary pattern, and the exhaust-valves may be moved by rods from the valve-levers c, which connect with similar levers or rocker-arms, c', upon the shaft e. This shaft is moved from the eccentrics e' upon the shaft B.

The steam-valves have lever-arms H fixed to their stems, and these arms are connected

with a block, H', which slides in a jaw, G, fixed to the reciprocating sleeve F, so as to accommodate the reciprocating movement of the sleeve to the circular movement of the lever-arm.

Within the sleeve F is a sliding block, D, which has a pin, E, connected with the eccentric-rod, when but one is used, or with the link when double eccentrics are employed. The movement of the eccentric causes this block to reciprocate, and when the block is not connected it moves freely within the sleeve F. When it is connected with the sleeve the latter is moved with it and the valve is opened and closed through the arm H.

In order to connect the block D and the sleeve F, a transverse sliding key, K, extends through a slot in the sleeve F, in which it fits closely, and into an elongated keyway, d, in the block D. When the key is drawn out from the keyway, the block D having been lifted by the action of the eccentric, the sleeve, which had also been lifted by its connection with the block, will be allowed to drop and the valve will be instantly closed. The movement of this key K thus determines the exact point in the stroke of the piston at which the valve closes and the steam is cut off. The key has an arm, k, projecting from it in line, so as to extend out through the opposite side of the sleeve F, and the outer end, S, is connected by a pitman, P', with a rocker-arm, P, which is keyed to a horizontal shaft, R. This shaft is parallel with and above the shaft B, and has an arm, U, adjustably fixed to it, which extends down to or beyond the shaft B.

Upon the shaft B is fixed a spiral flange, Q, which acts as a cam, and as the shaft B rotates this cam comes in contact with the lever-arm U and lifts it, thus rotating the shaft R slightly, and through the rocker-arm P and the pitman P' the key K is withdrawn from the keyway d in the block, so as to allow the sleeve and key to drop and the steam-valve to close, as before described.

When the revolution of the shaft B has carried the cam Q beyond the arm U, it is ready to drop, and, when the continued movement of the eccentric has drawn the block D down until its keyway d coincides with the key K, a spring, L, upon the extension-arm k draws the



key into the keyway, thus connecting the sleeve F and block D, so that both will be lifted together by the next stroke of the eccentric.

The arm U has a sleeve, U', upon the shaft R, and a pinion, *f*, is fitted into a slot in its upper part, so as to engage with a toothed rack, *g*, cut in the upper part of the fixed feather, upon which the sleeve moves upon the shaft. By means of this rack and pinion the arm U may be moved upon the shaft R, so as to be lifted by the cam Q sooner or later, and the point of cut off is thus regulated arbitrarily by this device. The sleeve F moves in a guide, N, which is supported by a bracket, O.

In the upper part of the guide N is a spring, J, which presses upon the sleeve F and forces it down quickly, when it is released by the movement of the key K. A stem, F', extends upward from the sleeve F, and has fixed to its upper end the usual or any suitable air-cushioning device or dash-pot to relieve the valve from shock in closing, if it be of the puppet variety, or to prevent its going too far in the case of a rotary valve.

The automatic adjustment of the cut-off mechanism is effected by the action of the governor W upon an arm, V, which also projects from shaft R. This arm is lifted, when the engine runs too fast, by disk upon the governor-spindle, and thus rotates the shaft R and moves the rocker-arm P, and withdraws the key in the same manner as before explained. This latter arm may be set to the latest point of cut off desired, and the governor may also be adjusted independent of it.

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

1. In an engine having the horizontal revolving shaft B and the eccentrics C fixed to it, the sleeves F, moving in the guides N, and having the blocks D, sliding independently within the sleeves and moved by the eccentrics, as shown, in combination with the transversely-sliding keys K, passing through the sleeves, and keyways in the blocks, whereby the sleeves and blocks may be moved together or detached, so that the sleeves may fall independently of the blocks, substantially as herein described.

2. The sleeves F, connected with the steam-valves, so as to open and close them by the rise and fall of the sleeves, in combination with the blocks D, sliding independently within the sleeves, the keys K, sliding through the sleeves, and a mechanism connected with the eccentric shaft, whereby the keys may be withdrawn after the valves have been opened to allow the valves to close independent of the movement of the eccentrics, substantially as herein described.

3. The reciprocating sleeves F, connected with the steam-valves, the blocks D, moving inside the sleeves and connected with the eccentrics C, and the keys K, sliding transversely through slots in the sleeves and in the blocks, in combination with the rocker-arms P, connected with the key, and the arms U and the spiral flanges or cams Q, fixed to the eccentric shaft B, whereby the keys are withdrawn and the sleeves allowed to fall, substantially as herein described.

4. The arm U, projecting from the sleeve U', the pinion *f*, and the feather fixed to the shaft R, and having the teeth *g*, in combination with the spiral flange or cam Q upon the shaft B, substantially as herein described.

5. The sleeves F, connected with the steam-valves and moving in the guides N, and the springs J, pressing upon the sleeves, in combination with the blocks D, connected with the eccentrics C, and sliding within the sleeves, and the keys K, sliding through transverse slots in the sleeves and the blocks, said keys being connected with cams Q upon the eccentric shaft by mechanism substantially as herein described.

6. The sleeves F, connected with the steam-valves and moving in guides N, and the blocks D, eccentrics C, keys K, and cams Q, as shown, in combination with the air-cushions or dash-pot M, and the stems F', connecting them with the sleeves F, substantially as herein described.

7. The sleeves F, connected with the steam-valves of an engine, the blocks D, sliding independently within the sleeves and actuated by the eccentrics C, in combination with the keys K, connected with the rocker-arms P upon the shaft R, and the arm V, extending from the shaft to the governor-spindle, so as to be raised or lowered by it, substantially as herein described.

8. The sleeves F, connected with the steam-valves of an engine, the blocks D, sliding independently within the sleeves, and connected with the eccentrics C, in combination with the keys K, connected with the rocker-arms P upon the shaft R, the arms U V, which are lifted by the cam Q on the governor-spindle to withdraw the keys and release the sleeves from the blocks, and the springs L, acting upon the keys to return them into the keyways or slots when they again correspond, substantially as herein described.

In witness whereof I hereunto set my hand.

JOHN B. PITCHFORD.

Witnesses:

S. H. NOURSE,  
J. H. BLOOD.