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W. WILLS.

CUT-OFF AND REVERSING VALVE MECHANISM FOR ENGINES.

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Fig. 5.

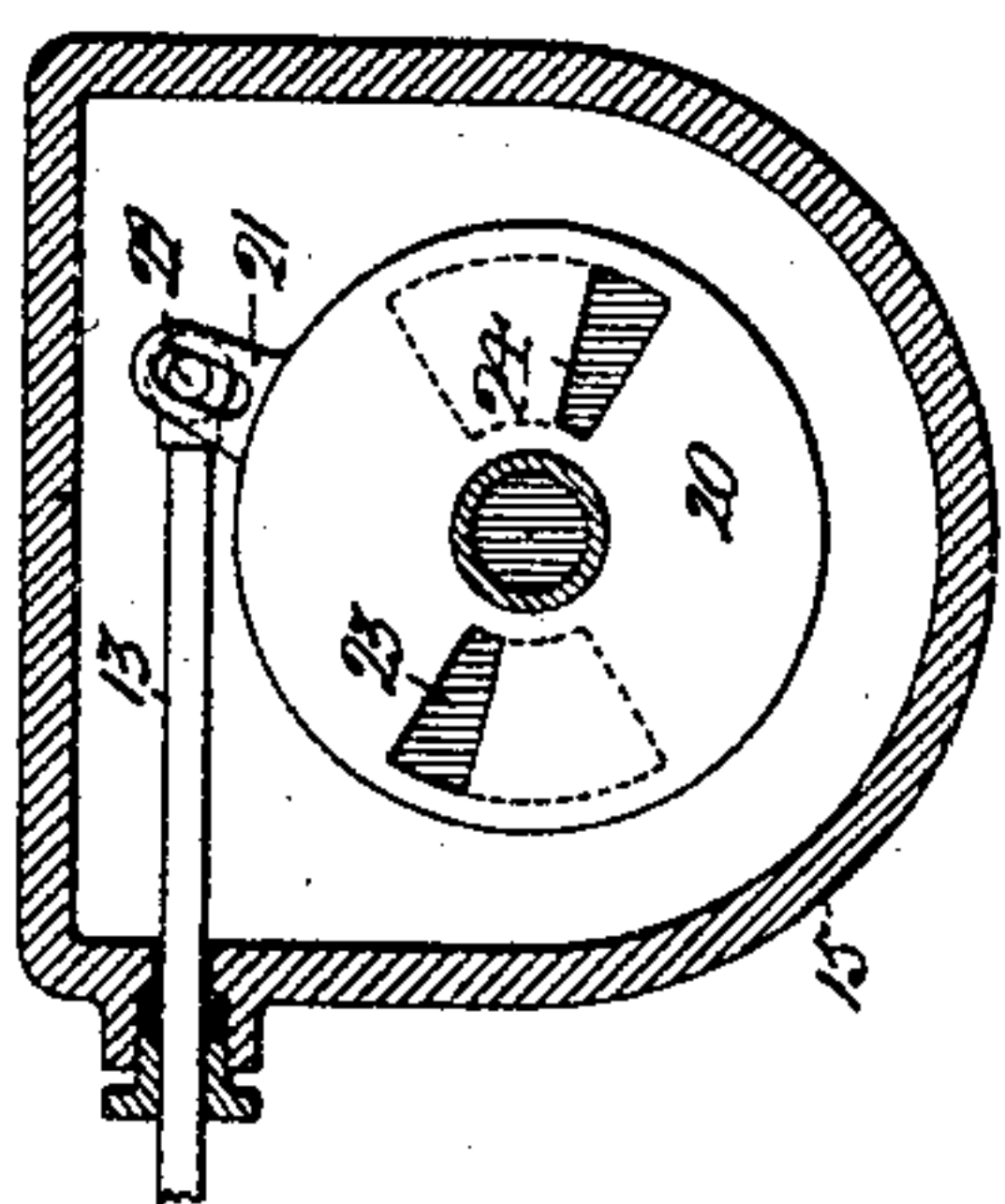


Fig. 4.

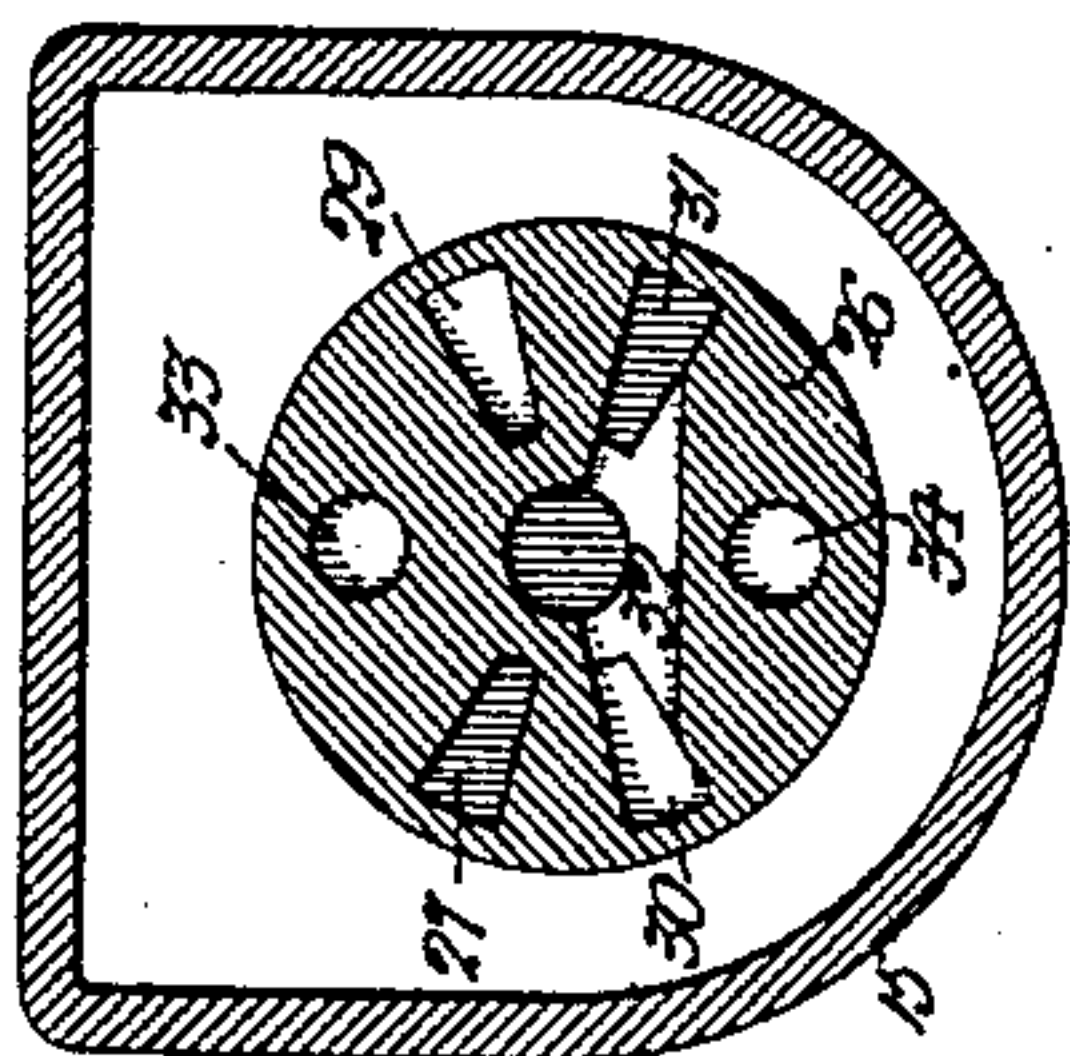


Fig. 3.

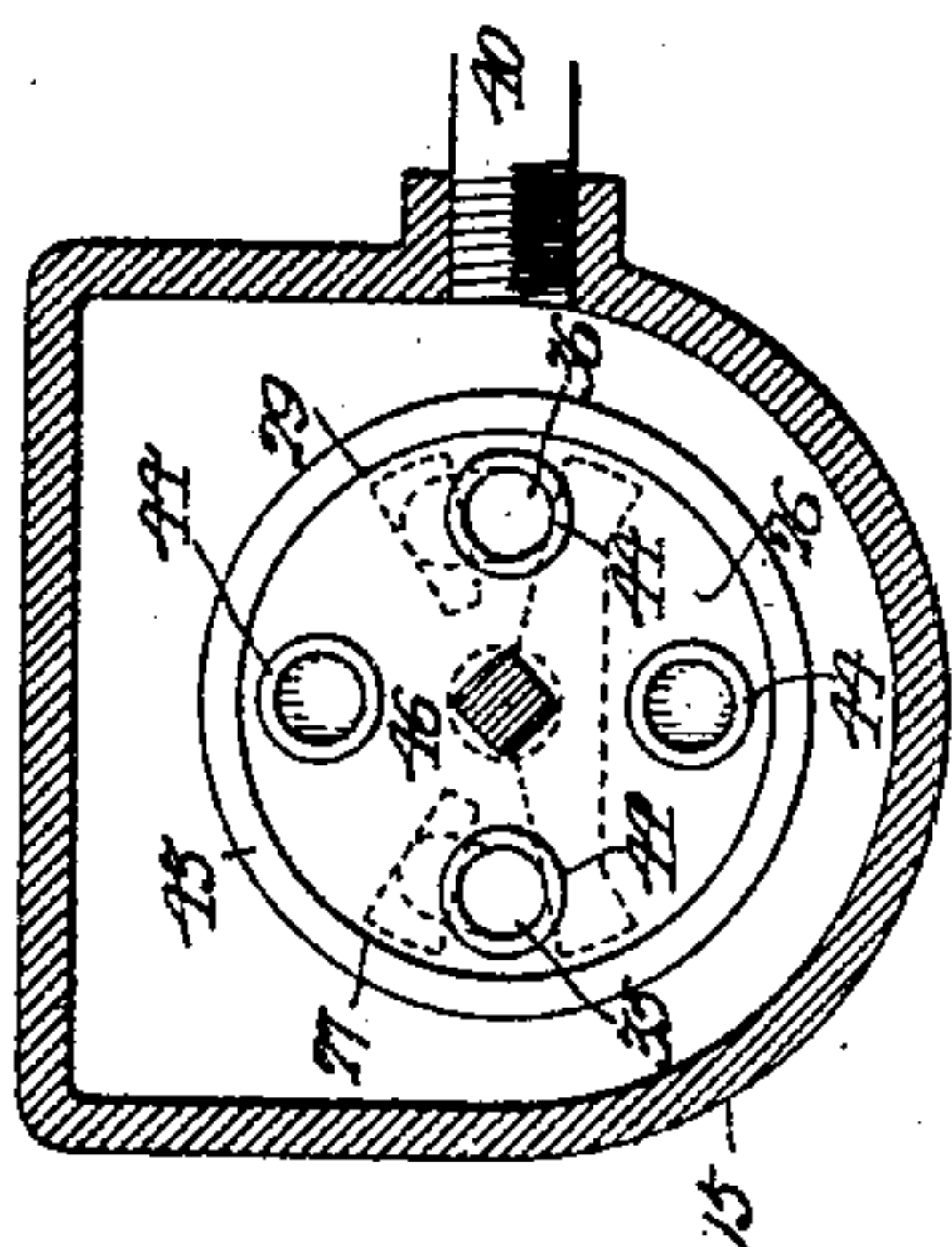
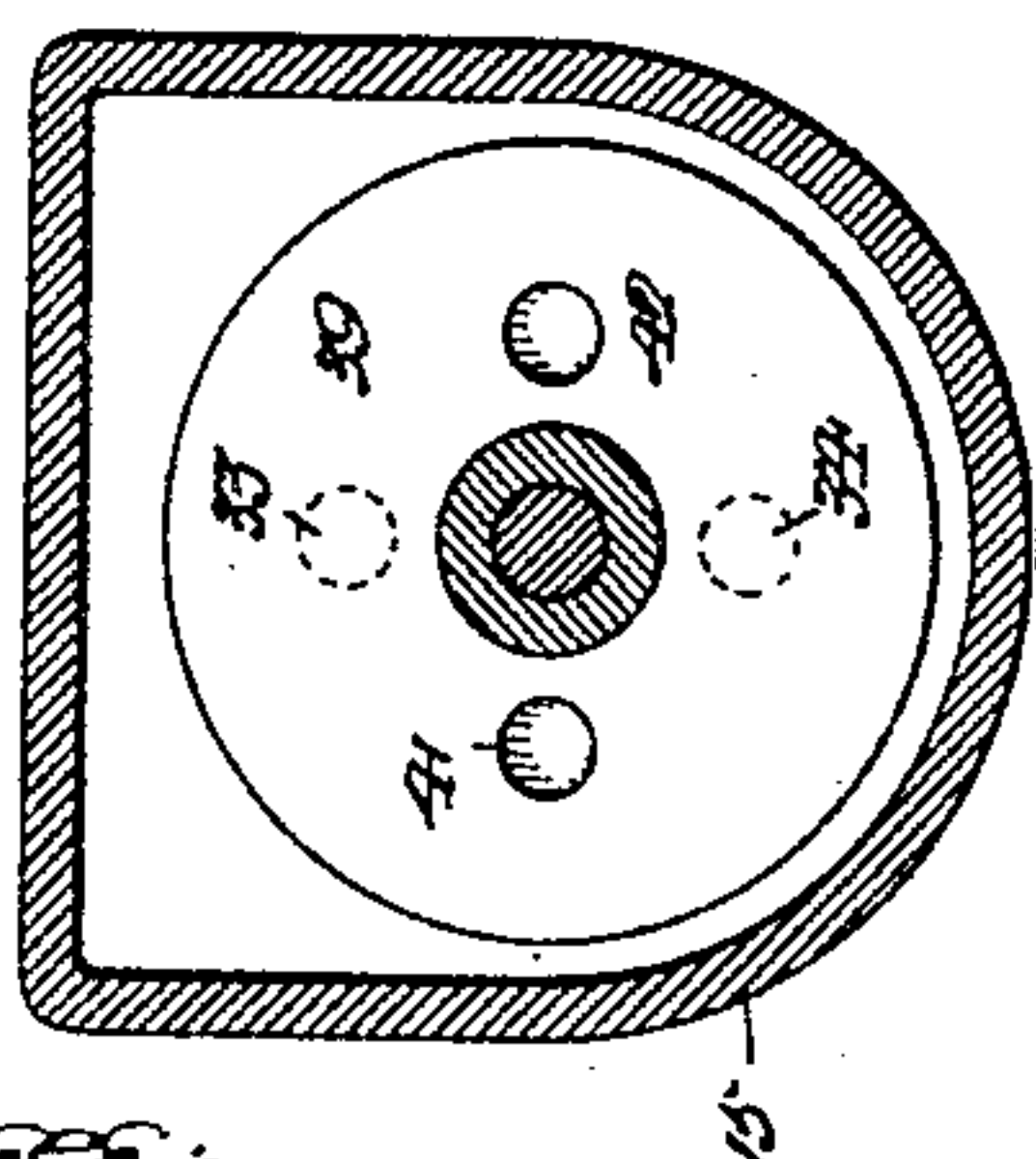


Fig. 2.

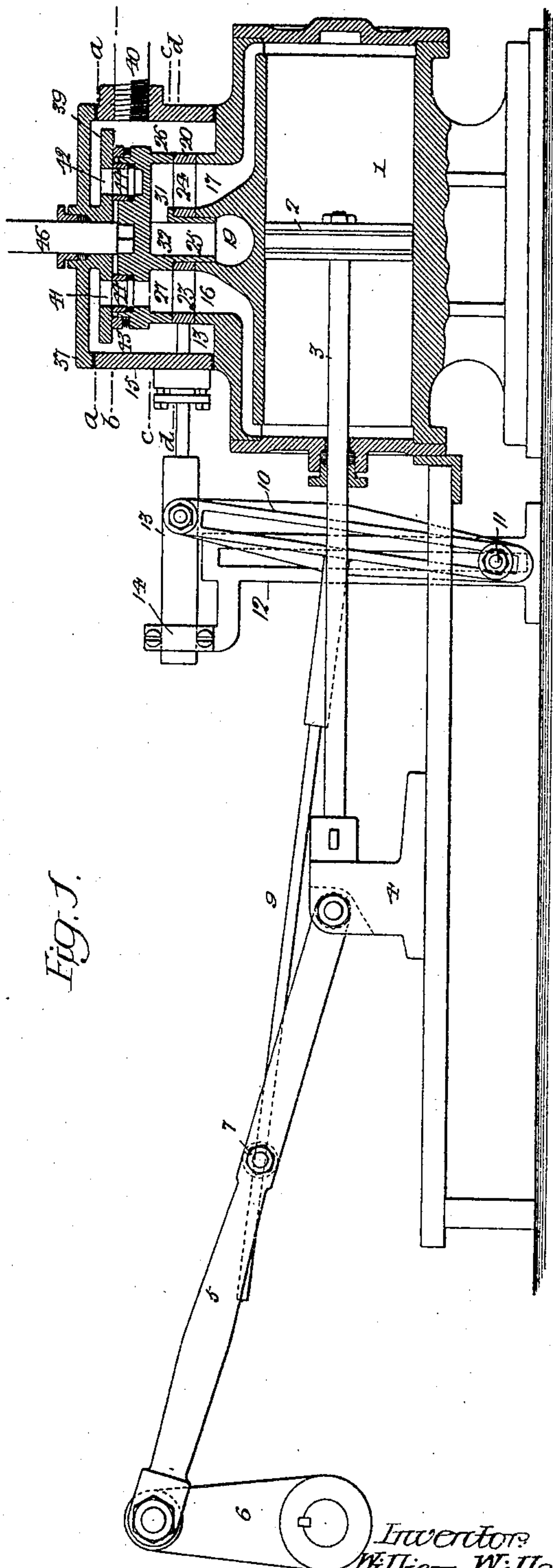


Witnesses:

Hamilton D. Dummer

Titus H. Leeds.

Fig. 1.



Inventor:
William Wills.
by his Attorneys,
Hansen & Howson

UNITED STATES PATENT OFFICE.

WILLIAM WILLS, OF PHILADELPHIA, PENNSYLVANIA.

CUT-OFF AND REVERSING VALVE MECHANISM FOR ENGINES.

No. 814,493.

Specification of Letters Patent.

Patented March 6, 1906.

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To all whom it may concern:

Be it known that I, WILLIAM WILLS, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain
5 Improvements in Cut-Off and Reversing Valve Mechanism for Engines, of which the following is a specification.

The object of my invention is to provide simple and efficient variable cut-off and reversing mechanism for steam or other motive-power engines.

In the accompanying drawings, Figure 1 is a longitudinal section of a steam-engine provided with variable cut-off and reversing
15 mechanism in accordance with my invention. Fig. 2 is a sectional plan view of the same on the line *a a*, Fig. 1. Fig. 3 is a sectional plan view on the line *b b*, Fig. 1. Fig. 4 is a sectional plan view on the line *c c*, Fig. 1; and
20 Fig. 5 is a sectional plan view on the line *d d*, Fig. 1.

1 represents the cylinder of the engine; 2, the piston; 3, the piston-rod; 4, the cross-head; 5, the connecting-rod, and 6 the crank-arm,
25 to which and to the cross-head the connecting-rod 5 is attached. Upon the connecting-rod 5 is mounted so as to be free to turn about its axis a bolt 7, through which can pass freely an arm 9, which projects forwardly from a yoke 10, the latter being ful-
30 crumed at its lower end upon a block 11, which is free to slide in a slotted vertical standard 12, rigidly mounted alongside the piston-rod of the engine. The upper end of the
35 yoke 10 is pivotally connected to a sliding-rod 13, which is guided at its outer end in a bracket 14 on the standard 12 and passes through a stuffing-box on the valve-chest 15.

The cylinder of the engine has a forward
40 induction and eduction passage 16, a rear induction and eduction passage 17, and an exhaust-passage 19.

Resting upon the valve-face of the cylinder is a cut-off valve consisting of a disk 20,
45 which has a slotted and projecting arm 21 engaging a pin 22 at the inner end of that portion of the rod 13 which projects into the valve-chest, so that as the rod is reciprocated rocking movement will be imparted to the
50 cut-off valve 20. The cut-off valve has a forward port 23, which is constantly in communication with the passage 16 of the engine, and a rear port 24, which is constantly in communication with the passage 17, and
55 said cut-off valve also has a central opening, whereby it is pivotally mounted upon a tubu-

lar stem 25, which projects downwardly from a reversing-valve 26, the latter being located above and in contact with the cut-off valve, and the stem 25 being pivotally mounted in a
60 bearing in the valve-face of the cylinder 1, so that said reversing-valve is susceptible of rotating movement in the valve-chest. The hollow stem 25 is in constant communication with the exhaust-passage 19 of the cylinder. 65
The reversing-valve has a forward passage 27, extending through the same from top to bottom, and a like passage 29 at the rear, and it also has a forward passage 30 and a rear passage 31, these passages extending from
70 the base of the valve to a cross-passage 32, which is in communication with the hollow stem 25, and thence with the exhaust-passage of the cylinder, as shown in Fig. 1. The reversing-valve also has extending
75 through it other passages 33 and 34, located intermediate of the passages before described.

Ont he back of the reversing-valve are shallow passages 35 and 36, one at the front of the valve and the other at the rear of the
80 same, these passages being in communication respectively with the through-passages 27 and 29 of the valve as shown by dotted lines in Fig. 3.

The cover-plate 37 of the valve-chest 15 85 has an internal plate 39, which serves as a balancing-plate for the valves and measurably relieves the same from the pressure of steam which is introduced into the chest through the supply-pipe 40, as shown in Figs. 90
1 and 3. The balancing-plate 39 has formed in it two passages 41 and 42, which are normally in communication with the passages 35 and 36 of the reversing-valve, and in order to prevent leakage of steam between the bal- 95
ancing-plate 39 and the back of the reversing-valve 26 the latter has a spring-actuated peripheral packing-ring 43, bearing against the under side of the balancing-plate, and other spring-actuated packing-rings 44, 100
which likewise bear against the under side of the balancing-plate and surround the openings 33, 34, 35, and 36, as shown in Figs. 1 and 3. A stem 46 passes through a stuffing-box in the valve-chest cover 37, this stem en- 105
gaging at its inner end with the back of the reversing-valve 26, so as to impart movement to the latter.

With the parts in the position shown in the drawings the operation of the engine is as fol- 110
lows: As the connecting-rod 5 rises and falls in following the path of the crank-pin it

causes a rocking movement to be imparted to the yoke 10, which therefore imparts reciprocating movement to the sliding-rod 13 and rocking movement to the cut-off valve 20. The extent of this movement depends upon the position of the fulcrum-block 11 of the lever on the slotted vertical standard 12, which position can be varied by any appropriate devices. When the fulcrum-block is in the position shown in Fig. 1, the cut-off valve 20 has the maximum amount of movement; but as the fulcrum-block 11 is lifted in the slotted standard 12 and approaches closer and closer to the connection of the yoke 10 with the sliding-rod 13 the rocking movement of the cut-off valve correspondingly diminishes, reaching a minimum when the fulcrum-block 11 is at the top of said slotted standard 12. As the cut-off valve rocks its port 23 communicates first with the steam-passage 27 of the reversing-valve to admit steam to the front end of the cylinder 1 and then on the reverse movement first cuts off this steam-supply and then opens communication between the front end of the cylinder and the exhaust-passage 19 through the passages 30 and 32 of the reversing-valve, and in like manner the port 24 of the cut-off valve operates in conjunction with the passages 29, 31, and 32 of the reversing-valve to alternately admit steam into and exhaust it from the rear end of the cylinder. When it is desired to reverse the direction of movement of the engine, a half-turn is imparted to the reversing-valve 26 by power applied to its stem 46. The effect of this operation is to bring the steam-supply passage 29 into the position formerly occupied by the exhaust-passage 30 and the steam-supply passage 27 into the position formerly occupied by the exhaust-passage 31, and in like manner the exhaust-passages 30 and 31 are moved into the positions formerly occupied by the steam-passages 29 and 27, respectively, the result being to open to the exhaust that end of the cylinder which was formerly receiving steam and to the steam-supply that end of the cylinder which was formerly open to the exhaust. When the reversing-valve 26 occupies a position midway between its two extremes during the reversing movement, the passages 33 and 34 are brought into communication with the ports 23 and 24 of the cut-off valve, and the steam-space of the valve-chest is thus permitted to communicate with the opposite ends of the cylinder for a brief fraction of time, so as to permit of an equalization of pressure in said opposite ends of the cylinder before accomplishing the reversal of

conditions as above noted. This provides for a relatively slow stoppage in the movement of the piston 2 before effecting the reversal in the direction of such movement caused by the change in the position of the reversing-valve.

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

1. The combination of the cut-off valve, and means for operating the same, with the reversing-valve coöperating with the cut-off valve and having oppositely-disposed pairs of steam supply and exhaust passages, and intermediate passages for causing equalization of pressure in opposite ends of the cylinder as the reversing movement of the valve is being effected, substantially as specified.

2. The combination of the cylinder and its passages, the cut-off valve, the reversing-valve on the back of the same, and a balancing-plate in the steam-chest against which the back of said reversing-valve has its bearing, substantially as specified.

3. The combination of the cylinder and its passages, the cut-off valve, the reversing-valve on the back of the same, a balancing-plate in the steam-chest against which the back of said reversing-valve has its bearing, and packing-rings surrounding passages of the reversing-valve and bearing against the backing-plate, substantially as specified.

4. The combination of the cylinder and its passages, the cut-off valve, the reversing-valve on the back of the same, and a stem passing through a stuffing-box on the back of the valve-chest and engaging said reversing-valve, substantially as specified.

5. The combination of the cylinder and its passages, the cut-off valve, the reversing-valve on the back of the same, a balancing-plate against which said reversing-valve has its bearing, and a stem passing through said balancing-plate and through the valve-chest cover, and serving to operate the reversing-valve, substantially as specified.

6. The combination of the cylinder and its passages, the cut-off valve, and the reversing-valve on the back of the same having a tubular stem adapted to a bearing in the cylinder and also providing a bearing for the cut-off valve, substantially as specified.

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

WILLIAM WILLS.

Witnesses:

WM. BROWN, Jr.,
WALTER CHISM.