

(No Model.)

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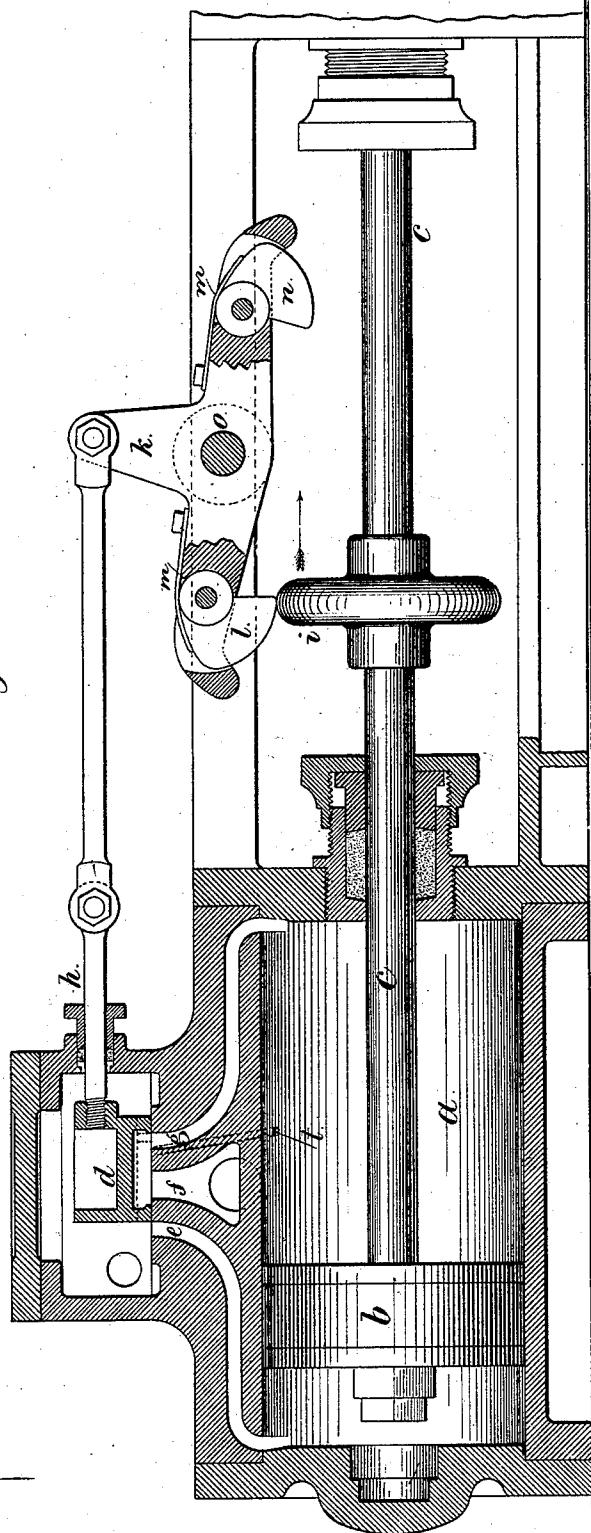
L. B. CARRICABURU.

VALVE GEAR FOR STEAM ENGINES.

No. 303,706.

Patented Aug. 19, 1884.

Fig. 1.



Witnesses

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(No Model.)

2 Sheets—Sheet 2.

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Fig. 3.

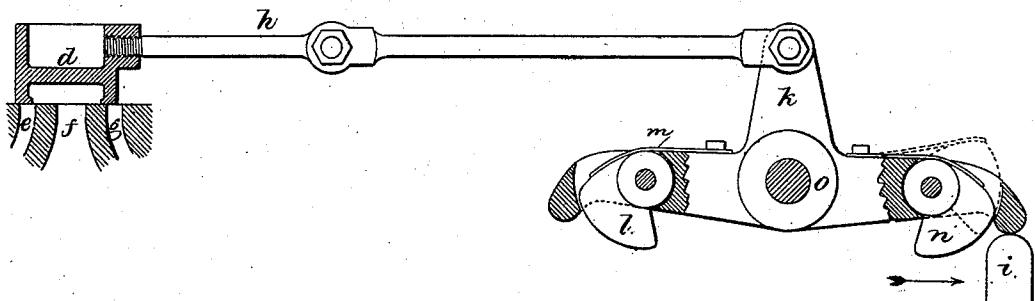


Fig. 4

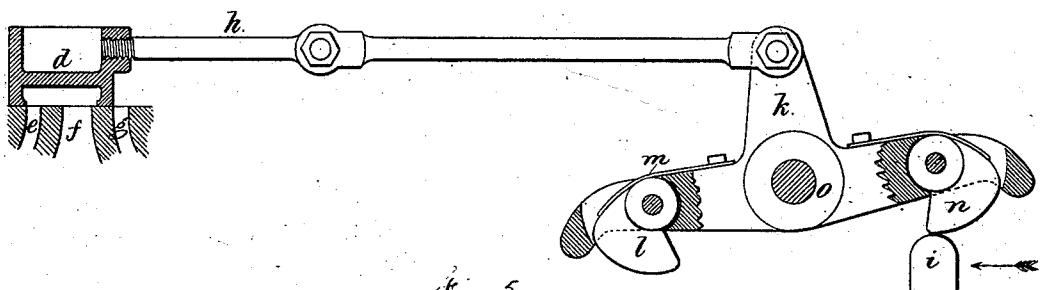


Fig. 5.

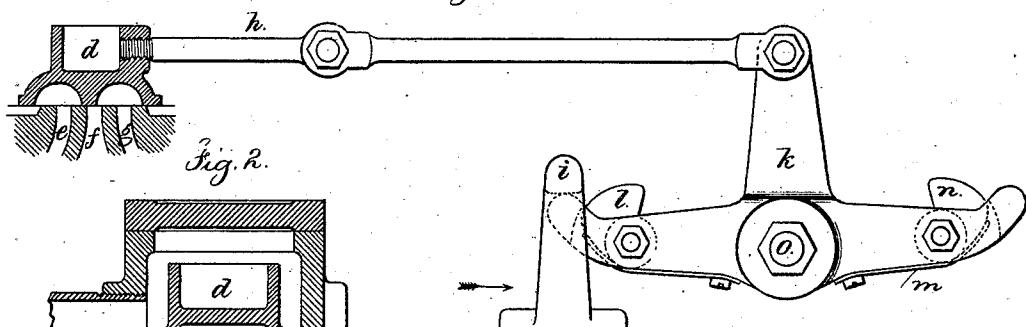
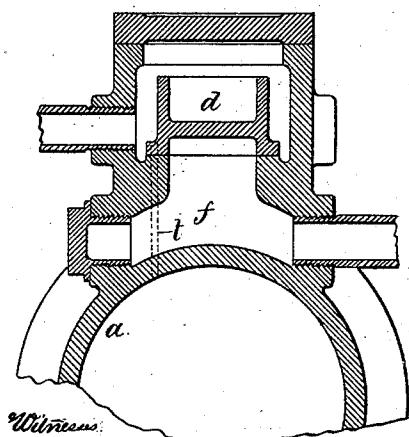


Fig. 2.



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# UNITED STATES PATENT OFFICE.

LEON B. CARRICABURU, OF NEW YORK, N. Y.

## VALVE-GEAR FOR STEAM-ENGINES.

SPECIFICATION forming part of Letters Patent No. 303,706, dated August 19, 1884.

Application filed March 10, 1884. (No model.)

*To all whom it may concern:*

Be it known that I, LEON B. CARRICABURU, of the city and State of New York, have invented an Improvement in Valve-Gears for 5 Steam-Engines, of which the following is a specification.

Slide-valves in steam-engines have been moved by a rocker-lever and a collar upon the piston-rod. This device is often employed 10 in direct-acting steam-pumps. In practice it is sometimes found that the rocker will not receive its full movement, especially when the engine is running slowly, and in this case the valve will open just enough to admit live steam 15 on one side and to open the exhaust on the other side; hence the engine will move but slowly, and sometimes stop. Efforts have been made to remedy this difficulty by the use of springs and latches.

20 My invention relates to the combination, with the valve and rocker-lever, of a drop-cam near each end, that is lifted by the collar or tappet as it moves in one direction, and it drops behind the tappet before the valve has 25 been moved sufficiently to admit the live steam on the other side of the piston; hence as soon as said steam is so admitted and the engine-piston commences to move in the other direction the cam is acted upon by the collar and 30 the movement of the valve is completed. I also employ with the valve and ordinary ports one or more small additional steam-ports, that are opened momentarily at the time both the steam-ports are covered by the valve, 35 so that steam may be admitted into the already-filled steam-space in the cylinder, to insure the further movement of the valve in the proper direction to open the steam-port.

In the drawings, Figure 1 is a sectional elevation of my improvement. Fig. 2 is a cross-section of the valve and chest. Fig. 3 is a diagram of the valve and rocker as the steam-valve is commencing to open the steam-port. Fig. 4 is a similar diagram with the valve entirely open. Fig. 5 shows my improvement 45 applied to a **B** slide-valve.

The steam-cylinder *a*, piston *b*, piston-rod *c*, valve *d*, ports *e f g*, valve-rod *h*, and rocker *k* are the same as have heretofore been used, except in the particulars hereinafter named. The 50 collar or tappet *i* is upon the piston-rod *c*, and acts against the ends of the rocker *k* to move

the same upon the pivot *o* and to change the position of the valve. To this extent the valve motions heretofore employed correspond to 55 those in my apparatus. Upon the rocker *k* there are two drop-cams or sectors, *l n*, one near each end. I prefer to pivot such drop-cams and to employ springs *m* to insure the dropping of the cams; but springs might be 60 dispensed with. The positions and shapes of these drop-cams are such that when the collar or tappet *i* is approaching one end of its stroke it underruns the drop-cam near that end of the lever, lifting the same without moving the rocker itself. The tappet then comes 65 into contact with the curved or inclined end of the rocker-lever and raises the same, and in so doing the valve is moved into the position shown in Fig. 3, to close the previously-70 open steam-port and partially open the port to the opposite end of the steam-cylinder.

It is generally preferable to shape the rocker-lever so that it will not give to the valve the entire movement; hence the steam-port will 75 be only partially open, and the starting of the piston in the reverse direction will be gradual. Before the valve is moved sufficiently to close one port and open the other, the cam *n* drops down behind the tappet; hence the cam is 80 acted upon as soon as the steam is admitted and the movement is reversed. The tappet or collar running under the cam upon the rocker gives to the said rocker a further movement 85 in the same direction, thus completing the stroke of the valve and opening the steam-port wide, as shown in Fig. 4. This movement takes place at each end of the stroke.

It will be apparent that if the rocker-lever is the same as those heretofore constructed the 90 valve may be moved its entire stroke by the contact of the tappet with the rocker itself, and that the cams will then only come into use in case of failure to give the complete movement; but usually it is preferable to only 95 partially open the valve by the movement in one direction and complete the opening of the valve on the return-stroke.

In cases where a **B** slide-valve is used in 100 place of a **D** slide-valve the rocker might be pivoted below the piston and collar; but usually it will be arranged as in Fig. 5. In the rocker for this **B**-valve the cams will rise above the horizontal part of the rocker, and

instead of a collar a finger is used extending out over the rocker, so as to act in the manner before described.

The rocker-lever is preferably made with 5 mortises for the reception of the cams, and one side of each cam acts as a stop to limit the swinging or dropping movement, such side coming into contact with the rocker or with a stop upon the same.

10 The cams may be made of any suitable shape, and the place of attachment to the rocker-lever may be varied, if desired.

In my applications Serial Nos. 118,152 and 118,151 the valves are shown with openings 15 that allow steam to pass into the steam-cylinder at the time the valve covers the steam-port, so that the steam passes from the steam-cylinder to the cylinder that contains the valve-moving piston. In my present invention I 20 combine with the valve-moving mechanism and the steam-engine piston and rod that give motion to the valve, ports in the valve and valve-seat, which coincide at the time, and only at the time, that the valve covers both the 25 ordinary steam-ports entirely, so as to admit sufficient steam into the steam-cylinder in addition to that already in it to continue the movement of the steam-piston and the valve which is moved by the same in the direction 30 necessary to uncover the inlet-port and open the exhaust. This effectually prevents the parts coming to a standstill; but so soon as the live steam acts and gives motion in the other direction to the piston the valve is 35 opened full by the tappet acting against the cam, as before described.

In Fig. 2 the small port *t* passes from the valve-seat to the cylinder *a*, and there is a hole or small groove through the valve or in the 40 face of it which corresponds with the port at the time the valve covers both the ordinary ports, so that the further movement of the

piston and the valve will be insured until the valve opens at the other end for the steam, as aforesaid. This prevents the valve stopping, 45 and it is available whenever the valve receives its motion from the piston and rod.

I claim as my invention—

1. The combination, with the valve, the stem, rocker-lever, and collar or tappet, of 50 cams movably connected with the rocker-lever, and acting with the collar to complete the movement of the rocker and valve after the stroke of the engine has been completed and the piston commences to move in the other 55 direction, substantially as set forth.

2. In an engine valve-motion, the combination, with the rocker-lever, of two cams pivoted to the rocker-lever near its ends and swinging freely by pressure from the collar or 60 tappet when approaching the end of the stroke, and falling behind the collar so as to complete the movement of the valve after the piston commences to move in the reverse direction, substantially as specified. 65

3. The combination, with the valve and rocker-lever, of two cams introduced into mortises in the rocker-lever, and pivots and springs for said cams, substantially as set forth.

4. The combination, with the steam-piston, 70 piston-rod, and direct-acting mechanism for moving the valve, of a valve having one or more small ports that coincide with similar ports passing into the steam-cylinder at the time that the valve covers both the ordinary 75 steam-ports, substantially as and for the purposes set forth.

Signed by me this 5th day of March, A. D. 1884.

L. B. CARRICABURU.

Witnesses:

GEO. T. PINCKNEY,  
WILLIAM G. MOTT.