T. Hansbrow,

Governor.

No. 85,817. Patented Jan. 12, 1869.

Fig. 1.

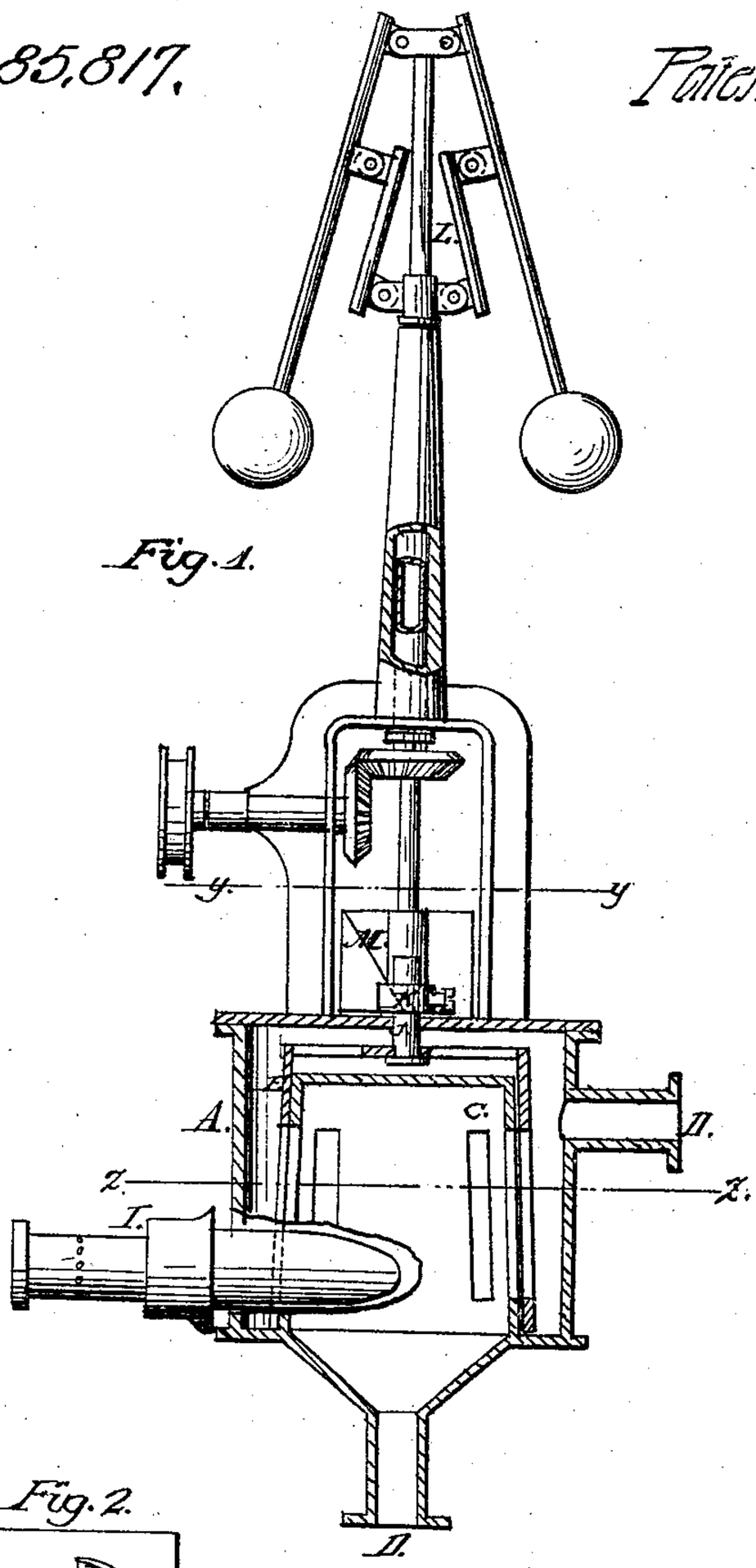


Fig. 2.

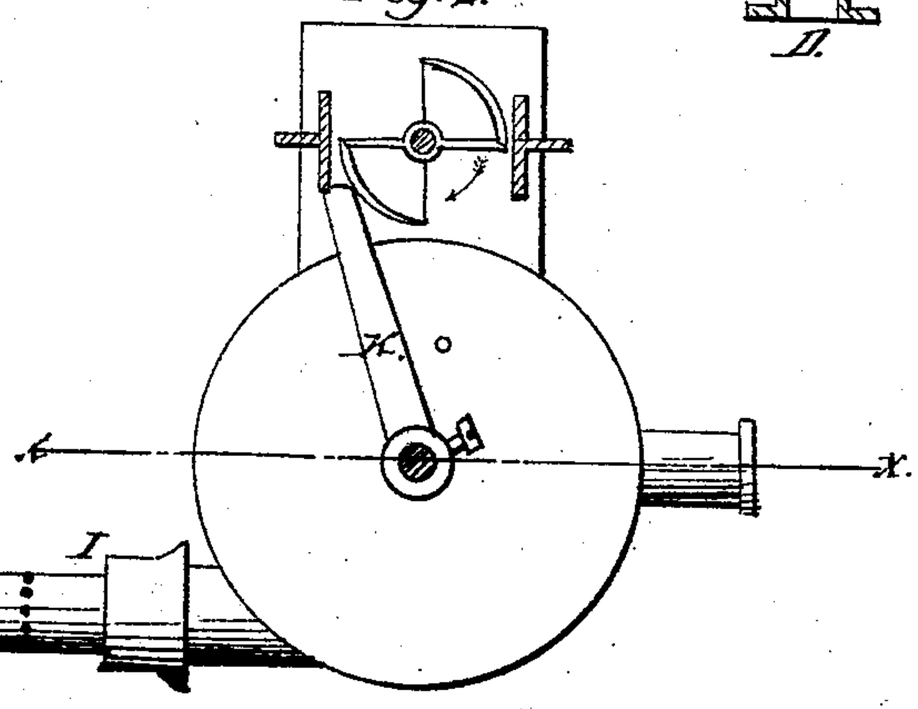
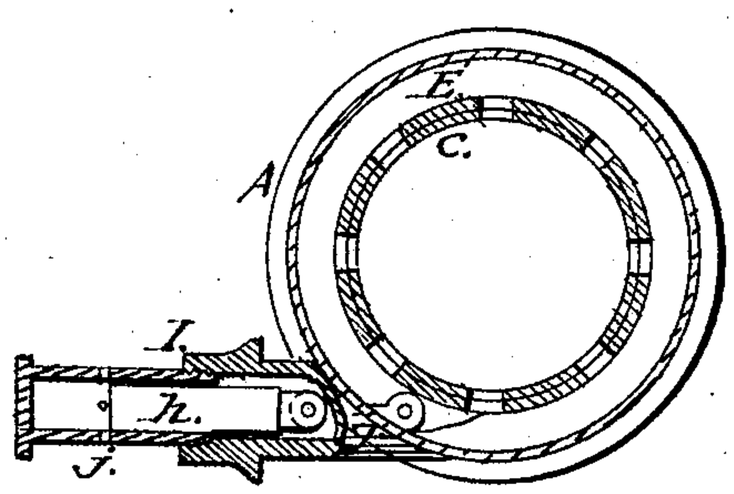


Fig. 3.



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THOMAS HANSBROW, DECEASED, (LUCY A. HANSBROW AND B. B. REDDING, EXECUTORS,) OF SACRAMENTO, CALIFORNIA.

Letters Patent No. 85,817, *dated January* 12, 1869.

IMPROVEMENT IN STEAM-ENGINE CUT-OFFS.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that I, THOMAS HANSBROW, of Sacramento, in the county of Sacramento, and State of California, have invented a new and useful Improvement in Variable Cut-Off for Steam-Engines; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable those skilled in the art to make and use the same, reference being had to the accompanying drawings, forming part of this specification.

This invention relates to a new and improved method of controlling the speed and action of steam-engines, whereby the quantity of steam supplied to the cylinder is proportioned to the work required of the engine; and

The invention consists in the combination of the small cylinder and plunger with the cut-off valve, and in the general arrangement of parts, as will be hereinafter more fully described.

Figure 1 represents a sectional elevation of the arrangement, showing the general construction and operation of the parts, the section being through the line *x x* of fig. 2.

Figure 2 is a horizontal section of fig. 1, through the line *y y*.

Figure 3 is a horizontal section through the line *z z* of fig. 1.

Similar letters of reference indicate corresponding parts.

A is a cylinder, which is in constant communication with the boiler through the steam-pipe B.

Connected with the bottom of this cylinder, is a cylindrical and slightly-conical valve-seat, C, through the sides of which are parallel and vertical slots or openings, by which steam passes to the interior of the valve-seat, and to the steam-pipe D, which conducts the steam to the engine.

Fitted to the valve-seat C, and encircling it, is a cylindrical valve, E, with openings which correspond with the openings in the seat.

This valve is attached to a vertical rod, and the ports for the passage of the steam into the valve-seat are opened and closed by its partial rotation back and forth to a distance equal to the width of the openings or ports in the valve-seat.

The valve-seat C is closed at its top, so that the pressure of steam on the valve is balanced.

Attached to the valve E, is a pitman or rod, *g*, (seen in fig. 3,) which is connected with a plunger or piston, *h*.

I is a small cylinder, in which the plunger works.

The cylinder is in free communication with the steam in the valve-cylinder A, and the steam-pressure acts upon the plunger, causing the valve E to revolve sufficiently to close the openings or ports in the valve-seat. Consequently, when not otherwise acted upon, the valve is kept closed by steam-pressure.

Air is admitted into the small cylinder I, through orifices, *j*, so that when the plunger is forced outward by the steam, it acts on an air-cushion.

J is the valve-rod of E, to which is attached, at right angles therewith, the arm K.

L is the spindle or shaft of the governor.

Attached to the shaft L, and revolving with it, is the cam M, by which the variable motion is imparted to the cut-off valve E.

This cam is formed of two longitudinal sections of a cylinder, cut parallel with the cylinder upon one side and oblique upon the other, the outer surface or face representing tapering arcs of circles.

The governor-shaft is actuated by gearing or positive motion, and is required to revolve simultaneously with the main engine-shaft.

In every half revolution of the governor-shaft, one face of the cam strikes the arm K, and this moves the valve E, opening the ports and permitting the steam to pass through the valve to the steam-chest of the engine.

When this face of the cam has passed the arm K, the pressure of steam on the plunger in the cylinder I revolves the valve, or turns it back and closes the ports, which remain closed until again opened by the other face of the arm, and so on at each revolution.

The cam, being attached to the governor-shaft L, rises and falls with it, its position being controlled by the position of the governor-balls or speed of the engine.

The face of the cam is perpendicular with the shaft, and its action on the arm K is to open the ports of the valve to their full extent instantaneously, and this occurs at the end of each stroke of the engine.

From the shape of the cam, it will be seen that the ports remain open, and the steam follows the piston of the engine the full length of the stroke, or the cut-off-valve ports are automatically closed by the pressure of the steam on the plunger *h* at any point during the stroke, and the steam is allowed to complete its work expansively.

This depends upon the power which the engine is, for the moment, required to exert.

If the work to be done requires the full force and power of the engine, or pressure of steam in the boiler during the whole length of the stroke, the revolving balls of the governor will remain in the position required by such exertion of power.

The face of the cam will hold the arm in the same position, and consequently keep the ports open until the stroke of the piston is completed, when the cam releases the arm, and the ports are instantaneously closed by the pressure of steam, as before stated.

If there is more steam-pressure than is required for the performance of the work, there will be an increase of motion. The governor-balls will be expanded, which lowers the cam. The valve-ports are still opened their whole width at each revolution, as before, but they are

not now held open by the arm during the full length of the stroke of the piston, as before.

The tapering form of the cam releases the arm and the ports are closed, when the steam completes the troke by acting expansively in the cylinder.

From the form of the cam, and from the fact that the cam rises and falls with the balls of the governor, the rate of speed and the amount of steam made use of must be in exact proportion to the work required of the engine.

I claim as new, and desire to secure by Letters Patent—

1. The cylinder I, and plunger *h*, in combination with the cut-off valve and seat, substantially as herein shown and described.

2. The arrangement of the cam M, arm K, governor-spindle L, valve-seat C, valve E, piston *h*, small cylinder I, and cylinder A, as herein shown and described.

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