J. FELBER,

GOVERNOR CUT-OFF FOR STEAM ENGINES.

No. 61,528. Patented Jan. 29, 1867.

Fig: 1.

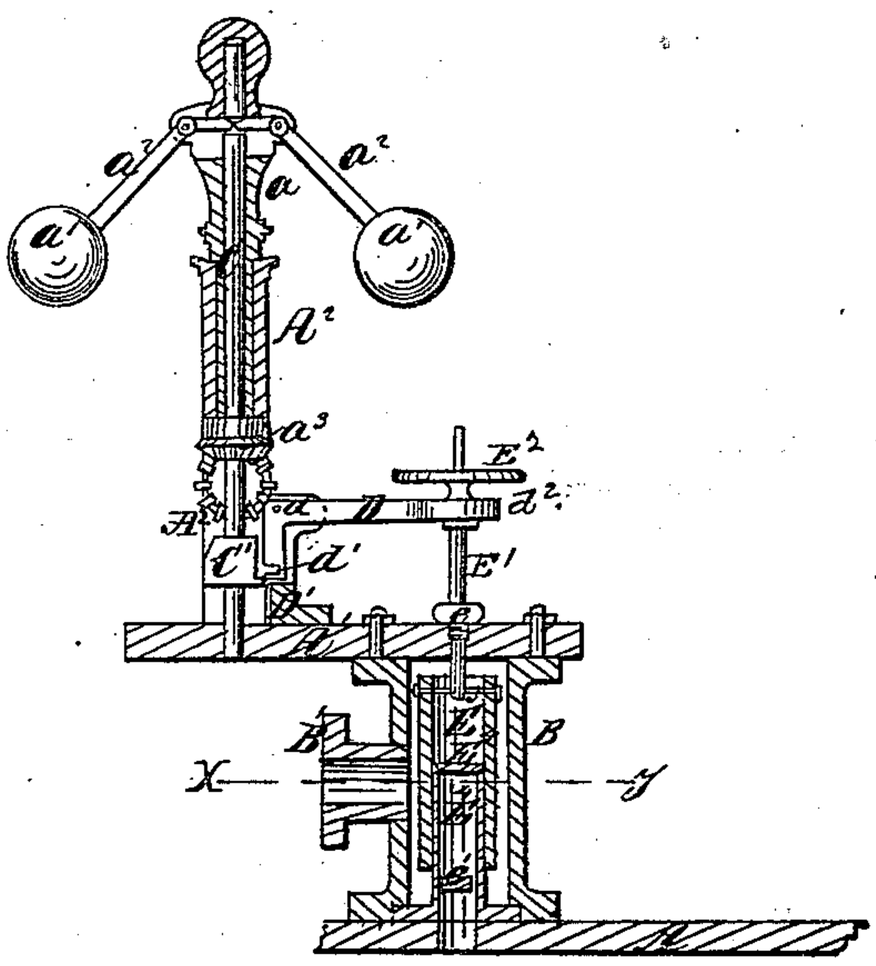


Fig: 2.

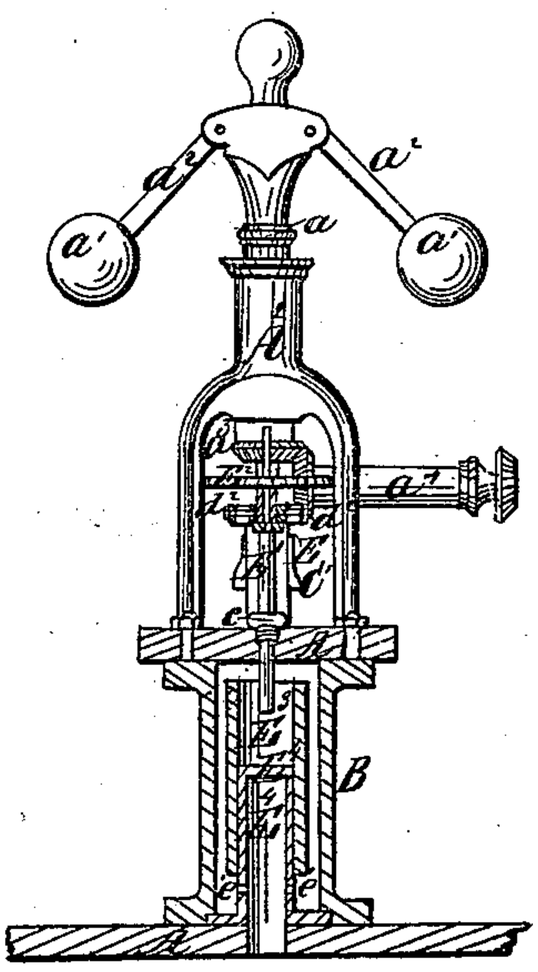
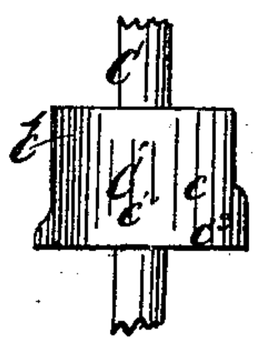
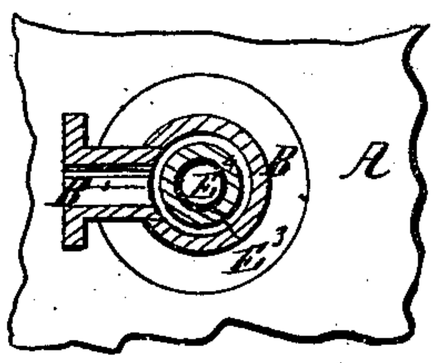


Fig: 3.





Witnesses:
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Letters Patent No. 61,528, *dated January* 29, 1867.

IMPROVEMENT IN GOVERNOR CUT-OFFS FOR STEAM ENGINES.

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, JACOB FELBER, of the city and county of St. Louis, and State of Missouri, have invented a new and useful Improvement in Combined Governor and Cut-Off for Steam Engines; and I do hereby declare that the following is a full and clear description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

The nature of this invention consists in so constructing a governor and a cut-off valve that the former will act upon the latter in such a manner as to produce the cutting-off operation in variable times and in exact accordance with the amount of power required, thereby resulting in an immense economy of power and fuel.

Figure 1 of the drawings is a longitudinal sectional elevation.

Figure 2 is a transverse sectional elevation.

Figure 3 a horizontal section, taken on the line *x y* in fig. 1.

To enable those skilled in the art to make and use my improved governor and cut-off, I will proceed to describe its construction and operation.

A represents the top plate of a steam chest, and A^1 represents the governor platform; B is the cut-off valve-chamber, and is in open communication with the steam pipe B^1, and also with the steam chest below the plate A, but not shown. The governor pedestal A^2, erected upon its platform A^1, is not materially different from those in common use; neither is the vertical hollow shaft *a*, or the centrifugal balls a^1, or their arms a^2. The shaft *a* is to be driven by means of the cog-wheel a^3 on its lower end, and this wheel from the short horizontal shaft a^4. It will be necessary to use cog-gearing throughout for the purpose of transmitting motion from the engine to the governor, as the motion of the governor, owing to its connection with the cut-off, must be in exact harmony with that of the engine; that is, the governor must make two revolutions to each stroke of the engine, so it will be able to cut off at each opening of an induction port. The vertical shaft C, with the hollow shaft *a*, receives its rotating motion from its enveloping shaft in the usual manner. The upper end of this shaft is connected with the inner or adjacent ends of the arms a^2, and these give to the said shaft a vertical rise and fall dependent on the position of the centrifugal balls. On the lower end of the shaft C there is a vertical cam C^1. The periphery of this cam increases in size from top to bottom in a spiral form. The general contour of this cam is shown more clearly in a detail drawing of it, wherein it is shown that the inclined plane *c*, running spirally up the periphery of the cam, terminates abruptly in the vertical ridge c^1, thus forming the face of the cam into two distinct fields, c^2 and c^3, the smaller of which, c^2, is a cylinder whose radius is equal to the radius of the cam at its upper end, and the cylindrical field c^3 has a radius equal to the radius of the lower end of the cam. The bent lever D is pivoted at *d* to its fulcrum D^1, the latter having for its base some convenient stationary support, as for instance the platform A^1. The lower or vertical arm of this lever is provided with a friction-roller, d^1, which rests against the face of the cam C^1. The horizontal arm of the lever is forked so as to receive the adjusting-nut E of the cut-off valve-rod E^1. This adjusting-nut has a groove in its periphery, into which the pin d^2 of the lever enters, so as to form a connection between these parts, and permit the screw to be turned around within the forked end of the lever, but at the same time to elevate or depress that end of the lever, or of the rod E^1 within the nut, which is relatively equivalent. A female thread, cut within the nut E, receives the male threads of the screw on the rod E^1. A hand-wheel, E^2, on the top end of the nut, furnishes a ready means of adjustment of these parts, for the purpose hereinafter more fully explained. The valve-rod E^1 passes through the stuffing-box *e*, on the top end of the valve-chamber B, and within the said valve-chamber it is attached to the valve E^3, which it is intended to operate. This valve is a hollow cylinder, open at both ends, and placed so as to envelope its seat E^4. This seat is a cylindrical piece, closed at its upper end, and having a cylindrical chamber within it, which chamber is in open communication with the steam chest below the plate A. There are two steam ports e^1, which, when not closed by the valve E^3, admit steam into the chamber within the seat-piece E^4. The valve E^3 is placed within its circular chamber B, so as to leave an annular opening entirely around it for the passage of the steam, which will thereby act upon all sides of it equally, and so the steam is also permitted to press equally upon both ends of the said valve; a perfectly balanced valve will be the result of this construction. Steam is taken from the boiler through the steam pipe B^1 into the annular chamber in B surrounding the valve, and from thence is passed through the ports e^1 down into the steam chest at every upward

motion of the valve E^3. The circular form above described for the chamber B and the valve E^3 is, of course, not absolutely necessary to the proper construction of these parts, but it is preferred as being the most simple and inexpensive. So also the words "up" and "down" in the foregoing description, are only relative terms, and are not to be understood as limiting or circumscribing the nature of this invention. As has already been mentioned, the governor is to make two revolutions to each stroke of the engine, and at each revolution of the governor, the elevated field c^3 of the cam C^1 will strike the roller d^1 of the lever D, and so act upon the said lever as to raise its other end, and with it the valve E^3, sufficiently to uncover the ports e^1 the required amount to admit the steam necessary to once fill the cylinder. As the field c^3 is largest at the bottom and decreases regularly toward the top of the cylinder by the inclined plane c, and as the vertical position of the cam C^1 is dependent upon the elevation or depression of the centrifugal balls a^1, and this position of the said balls is in turn dependent upon the speed with which they revolve, and as it furthermore appears in the foregoing description that the vertical position of the roller d^1 is fixed; therefore it is evident that when the speed is the slowest and the centrifugal balls are down, the drum C^1 will be up, and the largest part of the field c^3 will then have a bearing upon the lever, and consequently the ports e^1 will remain open the longest; and when the speed of the governor is fastest, the cam C^1 will be down to its lowest point, and consequently the top, or smallest portion of the field c^3, will then be bearing upon the lever, and the ports e^1 will thereby remain open only a minimum of time. As the area of the field c^3 is diminished from bottom to top regularly by the inclined plane or spiral curve c, it is evident that a nice gradation of the cut-off may thus be arranged, and the steam will always be cut off in the time that will be directly proportionate with the amount of power required. By screwing up or down the nut E, the valve may be set to uncover more or less of the ports e^1, and a nice adjustment of the steam admitted to the cylinder, and always proportionate to the amount of power required, will thereby be secured. This is a valuable point in works where more power is required at some times than at others. As the steam is cut off at each stroke, before the movement of the slide-valve within the steam chest, it is evident there will be no pressure upon the slide-valve during its motion, and one fruitful source of annoyance and expenditure of power will thereby be removed. By using two of the valves E^3, the steam chest and slide-valve might be dispensed with entirely. For high speed engines, two cams C^1, or a longer one with two curves, might be employed, so as not to run the governor at too high a speed.

Having described my invention, what I claim, is—

1. The cam C^1, when constructed substantially as herein set forth, so as to produce a variable cut-off.

2. I claim the construction and arrangement of the balanced cut-off valve E^3 as described.

3. I claim the adjusting nut E, in combination with the valve-rod E^1, for the purpose of regulating the opening of the ports e^1 as herein set forth.

4. I claim the combination and arrangement of the cam C^1, the lever D, and the valve E^3, substantially as herein set forth.

JACOB FELBER.

Witnesses:

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