D. A. Woodbury,

Cut Off Valve.

No. 103,698. Patented May 31. 1870.

Fig 1.

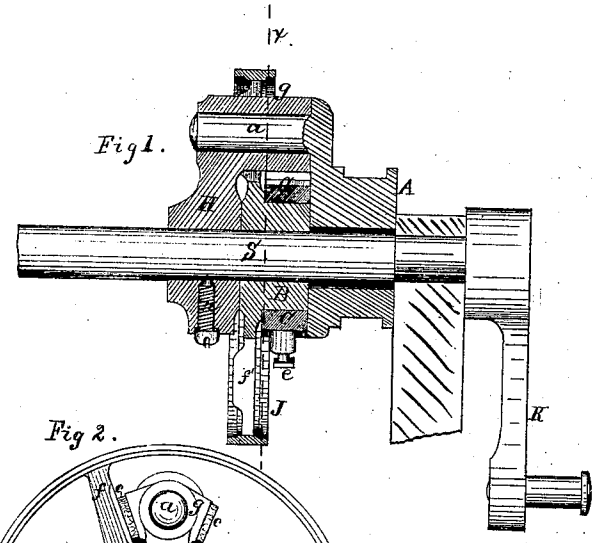


Fig 2.

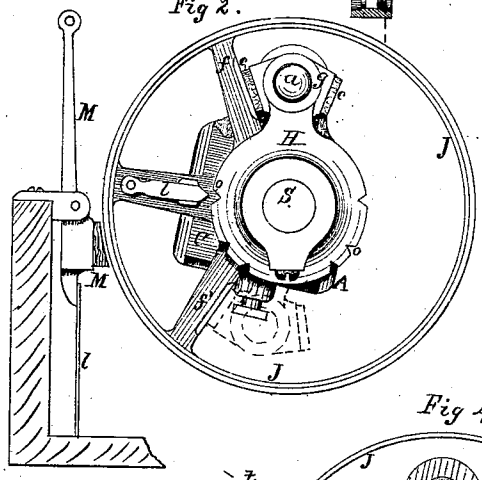


Fig 3.

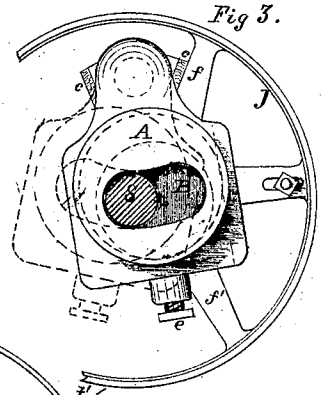
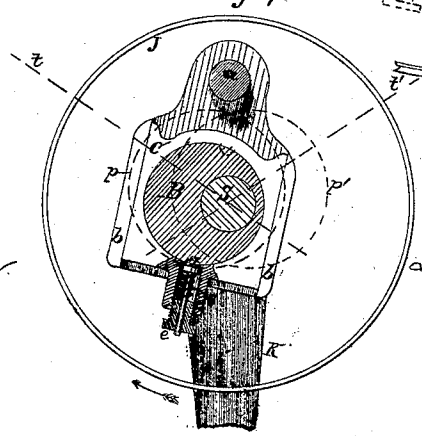


Fig 4.



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DANIEL A. WOODBURY, OF ROCHESTER, NEW YORK.

Letters Patent No. 103,698, *dated May* 31, 1870.

REVERSING AND CUT-OFF APPARATUS FOR STEAM-ENGINES.

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

I, DANIEL A. WOODBURY, of Rochester, in the county of Monroe and State of New York, have invented certain Improvements in "Cut-off and Reversing-Gear" for Steam-Engines, of which the following is a specification.

My invention consists chiefly in a novel mode of shifting the eccentric of a steam-engine, whereby the valve may be made to work the engine in either direction, or to cut off at different points, or both.

In the drawing—

Figure 1 is a vertical central section of my invention.

Figures 2 and 3 are side elevations.

Figure 4 is a sectional elevation of those parts to the right of the dotted line *x*, fig. 1.

The main eccentric A is swung from a stud or gudgeon, *a*, which has a bearing in an arm, *g*, of the hub H, at a suitable distance from the center of the crank-shaft S.

The collar H is adjusted at the proper point upon the shaft by the set-screw *n*, fig. 1, or an equivalent device.

The crank-shaft passes through a slotted opening in the eccentric A, (shown in fig. 3,) whereby the latter is allowed a considerable lateral movement about the center *a*, which center, as will be seen by reference to fig. 3, is located in the line of eccentricity of the eccentric.

To control the lateral adjustment of this eccentric I provide an auxiliary eccentric, B, figs. 1 and 4, fitted loosely to the crank-shaft and revolving easily in a sliding-plate, C.

The slide C works between or upon lugs *b*, so formed upon one side of the main eccentric as to allow the slide a reciprocating motion nearly or quite in the line of the centers of the main eccentric and stud *a*.

The object of the slide C is to provide an ample bearing for the auxiliary eccentric on the lugs *b*, but it is not a necessary part of my invention.

It will thus be seen that, by revolving the auxiliary eccentric, the main eccentric is swung laterally upon the stud *a*, and its throw correspondingly increased; while at the same time the position of its center with relation to the crank K is changed, as indicated by dotted lines *t* and *t'*, fig. 4.

The stroke of the eccentric A, when at the central point of its adjustment, is made about equal to the lap of the valve, and the hub H is so adjusted upon the shaft that the bearing for the stud *a*, and consequently the heavy or stroke-side of the eccentric shall be opposite the crank K, as shown in fig. 1, whereby the valve moves through only a short central portion of its travel, and neither port is uncovered, an action similar to that caused by the well-known link when at or near its center.

The stroke of the auxiliary eccentric B is such as to increase the eccentricity of A to correspond with the full travel of the valve.

For convenience in operating the auxiliary eccentric, a friction-wheel J is fixed to it, upon the periphery of which a brake, M, is made to bear, when desired.

The bearing *g* of the stud *a* extends through the wheel J, and the circumferential movement of the latter is limited by its arms *f f'* coming in contact with said bearing, as shown in figs. 2 and 3.

The location of the arms *f f'* is such that said movement of the wheel and auxiliary eccentric is about one-half a revolution, which consequently swings the main eccentric A to the extremity of its adjustment either way; and this action is sufficient to change it from the full backward to the forward position, or *vice versa*, as indicated by the dotted circles *p* and *p'*, fig. 4.

The blow upon the arms *f f'*, when the motion of the wheel J is suddenly arrested, is relieved by the elastic cushions *c*, suitably attached to each side of the bearing *g*, and it will be observed that, since the wheel and eccentric B have slightly more than one-half a revolution upon the crank-shaft, the auxiliary being on "dead points" with relation to the swing of the main eccentric A, a considerable difference in the thickness of the cushions *c* will not be perceptible in the adjustment of the valve.

Upon one edge of the slide C I provide the check-bolt *d*, shown in section in fig. 4, turned conical upon the inner extremity so as to drop into corresponding countersinks in the periphery of the eccentric B. This bolt is fitted accurately to a hole bored through the edge of the slide, while its outer end is guided by a nut, *e*, screwed into or upon a boss formed upon the slide.

Between the nut and the head of the check-bolt a spiral spring, *s*, is located, by means of which the bolt is retained in contact with the eccentric.

Notches *o* are formed in the periphery of fixed collar H, into which the latch *l* may be dropped when desired. The latch is secured to an arm of the wheel, J, and may be pivoted thereon, or arranged to slide between guides, and held in position by a bolt.

The brake M is hinged to a suitable portion of the engine-bed, and is retained out of contact with the wheel J by spring *l*.

A cord may be attached to the brake-lever and carried to any desired point away from the engine.

The operation of my invention is as follows:

When the crank K is moving in the direction of the arrow, fig. 4, the main eccentric is in the position indicated by the dotted circle *p*. If, however, the brake M is applied to the wheel J, the motion of the latter ceases momentarily, while that of the crank-shaft and hub H continues till the arm *f'* comes in contact with the arm *g* of the hub.

The auxiliary B is thus given about half a revolu-

tion, which swings the main eccentric over to the reverse position indicated by the dotted circle *p'*, fig. 4, and dotted lines in fig. 3, and the engine is consequently caused to move in the opposite direction. The application of the brake again reverses the main eccentric and the engine in a similar manner.

The check-bolt *d* operates to prevent the wheel J and eccentric B from being shifted by the friction of the parts, or any accidental slight pressure upon the brake-lever; while a sharp, quick pull upon the latter forces the bolt out of the recesses in the eccentric.

The tension of the spring *s* and the consequent pressure necessary to shift the wheel is regulated by the nut *e*.

When the reversing-gear is not in use, the eccentric A may be set at any intermediate point between its extreme adjustments by means of the latch *l* entering the notches *o* on the fixed hub H, thereby decreasing the travel of the valve and regulating its point of cut-off, the effect being similar to that caused by the use of the link and two eccentrics. This adjustment may be also made by the check-bolt *d* entering countersinks in the periphery of the auxiliary eccentric, such recesses corresponding in relative position with the notches *o*.

The stroke side of the eccentric A may be upon the opposite side of the crank-shaft from the center *a*, if desirable, as its action will be the same so long as the center *a* is in the line of eccentricity.

Instead of the auxiliary eccentric B I may use a link or combination of links, suitably pivoted to the hub of the wheel J, and to the swinging eccentric A.

The valve may be reversed when the engine is at rest, by turning the wheel J with the hand, in the proper direction.

It is obvious that my invention is cheap and simple, and not likely to get out of order; that it combines a reversing-gear and variable cut-off at only a fraction of the expense of the ordinary link motion, while, at the same time, it is more easily operated, and is capable of being reversed at any distance from the engine.

What I claim as my invention is—

1. An eccentric, swung upon a center outside of the crank-shaft, and having its lateral adjustment controlled by an auxiliary eccentric, or a similarly operating-device, for the purposes set forth.

2. The swinging eccentric A and auxiliary eccentric B, in combination with a suitable device for locking them at the extremity or any intermediate point of the lateral adjustment of the former, for the purposes specified.

3. The friction-wheel J attached to the auxiliary eccentric B, in combination with the swinging-eccentric A, with or without the slide C, operating substantially as described.

4. The elastic cushions *c*, in combination with the fixed hub H and stops *f* and *f'* on the wheel J, for the purposes set forth.

5. The adjustable spring check *d*, in combination with the swinging eccentric A, or slide C, and auxiliary eccentric B, operating substantially as set forth.

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Witnesses:

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