(No Model.)

J. W. THOMPSON.

ECCENTRIC FOR STEAM ENGINES.

No. 265,994. Patented Oct. 17, 1882.

Fig. 1.

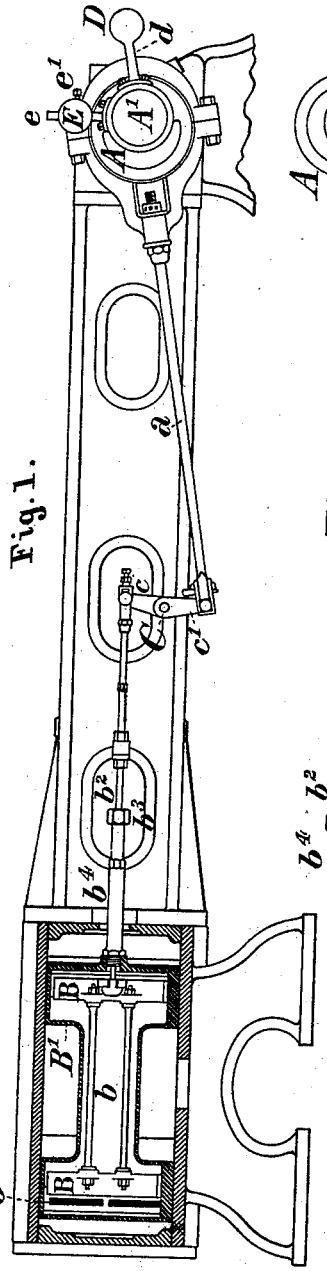


Fig. 2.

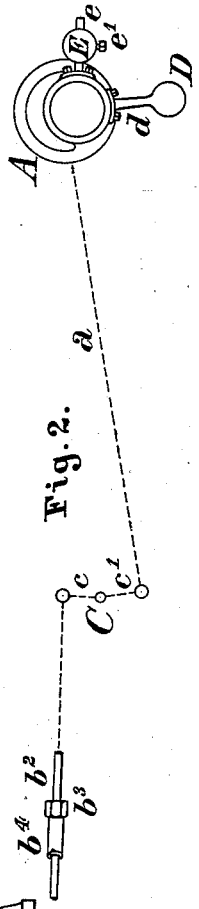


Fig. 3.

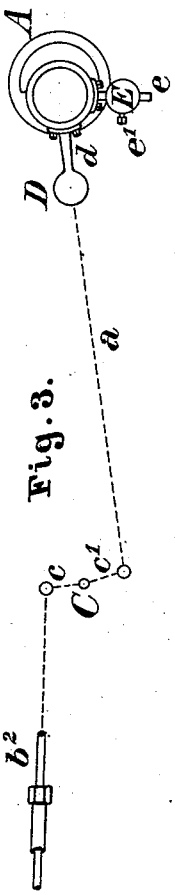


Fig. 4.

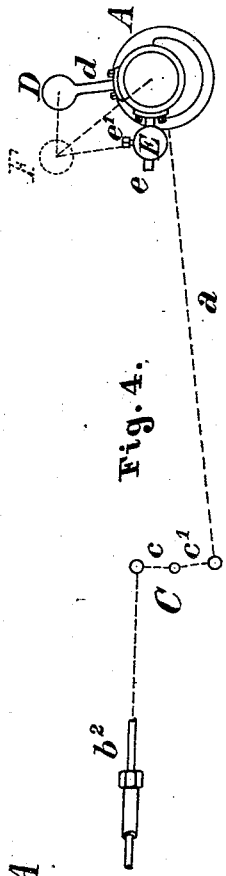
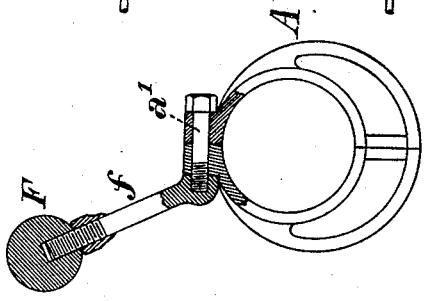


Fig. 5.



Witnesses

Geo. B. Collier

Geo. T. Kelly.

Inventor

Jas. W. Thompson,

by Collier & Bell,

attys.

UNITED STATES PATENT OFFICE.

JOSEPH W. THOMPSON, OF SALEM, OHIO, ASSIGNOR OF ONE-HALF TO THE BUCKEYE ENGINE COMPANY, OF SAME PLACE.

ECCENTRIC FOR STEAM-ENGINES.

SPECIFICATION forming part of Letters Patent No. 265,994, dated October 17, 1882.

Application filed August 15, 1882. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH W. THOMPSON, of Salem, in the county of Columbiana and State of Ohio, have invented certain new and useful Improvements in Eccentrics for Steam-Engines, of which improvements the following is a specification.

My invention relates to an adjustable eccentric mounted loosely upon its shaft and varied in position angularly about the center thereof by a governor or regulator, for the purpose of maintaining uniformity of speed of an engine under variations of load and steam-pressure by causing the valve which it actuates to cut off steam earlier or later in the stroke in correspondence with said variations. For an illustration and description of such device and its operative relation to the cut-off valve of an automatic cut-off engine reference may be had to Reissued Letters Patent of the United States Nos. 8,432, 8,433, and 8,434, granted and issued to myself and the Buckeye Engine Company (as my assignee) under date of September 24, 1878.

The object of my present invention is to promote the normal and accurate location of an eccentric of the above class for each different degree of cut-off that may be required to be effected in the operation of the engine by eliminating, as far as may be, forces tending to disturb an equilibrium between the centrifugal and centripetal forces acting upon the regulator.

To this end my improvements consist in the combination of an adjustable eccentric and a counter-weight or balance acting upon said eccentric in opposition to the action induced by the steam-pressure upon the stem of the valve operated by said eccentric; also, in the combination of an adjustable eccentric, balanced as set forth, with a cut-off valve and an intermediate connection for operating said valve. The improvements claimed are hereinafter more fully set forth.

In the accompanying drawings, Figure 1 is a side view, partly in section, of so much of a steam-engine as is necessary to exhibit the application of my invention. Figs. 2, 3, and 4 are diagrams illustrating different positions of the eccentric in the revolution of the shaft; and Fig. 5, a view partly in elevation and partly in section of a split or divided eccentric embodying my invention.

The eccentric A is fitted freely upon the main or crank shaft A′ of the engine, so as to be movable thereon angularly to the crank, such movement being imparted by a governor or regulator of any suitable and preferred construction, to which the eccentric A is connected, as described and shown in Reissues Nos. 8,432 and 8,433 aforesaid. The cut-off valve B, which consists of two plates united by rods or bars b, works within a box or chambered main distribution-valve, B′, having ports b' adjacent to each of its ends, which ports are opened and closed by the cut-off valve B in its traverse, the earlier or later closure of each of them relatively to the traverse of the piston being determined by the variations of the position of the eccentric induced by the governor. The stem b^2 of the cut-off valve B passes out through a stuffing-box, b^3, on the stem b^4 of the main valve B′, and is connected, in this instance through the intermediation of a rock-shaft, C, and arms c c', to the rod a of the eccentric A. The details of the valve construction, which do not, however, *per se*, constitute part of my present invention, are fully set forth in Reissue No. 8,434 aforesaid. To facilitate the movement of the eccentric by the governor, a counter-weight, D, sufficient to balance the weight of the eccentric and so much of the weight of the rod as is not supported by the rocker-arm, is connected to the eccentric A, said weight projecting radially from the eccentric in the line of its radius of eccentricity, and on the side adjacent to the center of its shaft opening or bore.

It will be seen that the pressure of the steam in which the cut-off valve works tends constantly to move said valve outwardly in the direction of the crank-shaft A′ with a force equal to the transverse area of the cut-off-valve stem multiplied by the pressure of steam per square inch, and such action, which proportionately interferes with close and accurate regulation by the governor, has prior to my invention been neglected and unprovided for. To counteract the disturbing influence induced by said unbalanced steam-pressure upon the cut-

off-valve stem, and thereby to relieve the governor from the abnormal action thereof, I attach to the adjustable eccentric A a counter-weight or gravity-balance, E, connected to a stem, *e*, and so located as to act equivalently in effect, as nearly as may be, and oppositely in direction to the pressure exerted by the steam upon the area of the cut-off-valve stem b^2, the stem of said counter-weight consequently projecting radially from the eccentric at an angle approximating a right angle with the line of projection of the stem *d* of the main counter-weight D, the variation from a right angle being due to and corresponding with the inclination of the eccentric-rod.

As shown in Figs. 1 and 3, the eccentric A is on its dead-centers—that is to say, in positions corresponding to the termination of the traverse of the cut-off valve which it actuates—and inasmuch as when in said positions the steam-pressure upon the stem is not effective as a disturbing agent upon the equilibrium of the regulator, the counter-weight E then stands in vertical position and exerts no effect upon the regulator. When the eccentric is in the positions shown in Figs. 2 and 4 the steam-pressure upon the valve-stem and the gravity of the counter-weight each act with maximum effectiveness and in opposite directions, respectively, upon the eccentric, and these forces may obviously be made to exactly balance each other at any determined pressure, which in practice should be fixed at or slightly above the average working pressure. Where the cut-off valve is worked directly by the eccentric—that is, without the interposition of a rock-shaft—the counter-weight E should project from the eccentric in opposite direction to that shown, and as in such case the eccentric-rod and valve-stem would be substantially in line, its line of projection should be at right angles to that of the main counter-weight D.

If desired, a single counter-weight, F, Figs. 4 and 5, may be employed as the resultant of the effects of the two separate counter-weights D and E and as an equivalent in substitution thereof. In such case the location of said counter-weight F would be upon the diagonal of the parallelogram formed by two lines drawn from the center of the shaft to the centers of the counter-weights D and E and two lines respectively parallel to said first-named lines, and the center of the counter-weight F would either coincide with the point of intersection of said two last-named lines or be within or without said point, according as the substituted counter-weight F is of equal or of different amount to the counter-weight D. The single counter-weight F, shown in Fig. 5 as applied to a split or divided eccentric, is secured thereto by the engagement of one of the bolts *a'*, which connect the two halves of the eccentric, with the stem *f* of the counter-weight. The employment of a single counter-weight is advantageous in point of simplicity and economy; but I prefer the use of separate counter-weights to balance the weight of the eccentric and the steam-pressure on the stem, respectively, as first hereinabove described, as such construction embodies the capacity of adjusting the effect of the pressure counter-weight in correspondence with varying working pressures of steam independently of the eccentric-balance, which should necessarily remain constant. The adjustment referred to is here shown as provided for by connecting the pressure counter-weight E to its stem *e* by a set-screw, *e'*, so that the weight may be moved toward or from the center of the shaft and fixed in any desired position upon its stem.

I claim as my invention and desire to secure by Letters Patent—

1. The combination, substantially as set forth, of an adjustable eccentric and a balance or counter-weight secured thereto in such position as to exert its gravity upon the eccentric in a reverse direction to the action of the steam-pressure upon the stem of the valve actuated by said eccentric.

2. The combination, substantially as set forth, of an adjustable eccentric, a balance or counter-weight acting in reverse direction to the preponderance of weight of the eccentric upon the shaft, and a counter-weight acting in reverse direction to the pressure of steam upon the stem of the valve actuated by the eccentric.

3. The combination, substantially as set forth, of an adjustable eccentric, a valve actuated thereby through an intermediate connection, and a balance or counter-weight acting upon the eccentric in reverse direction to the pressure of steam upon the stem of said valve.

JOSEPH W. THOMPSON.

Witnesses:
PETER AMBLER,
ALBERT CAMERON.