C. S. LOCKE.

Governors for Steam-Engines.

No. 211,335. Patented Jan. 14, 1879.

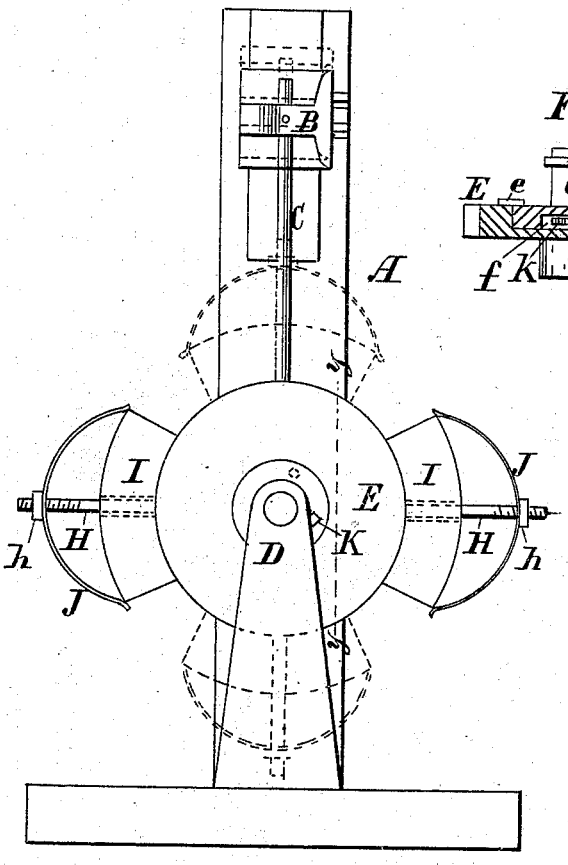

Fig 1

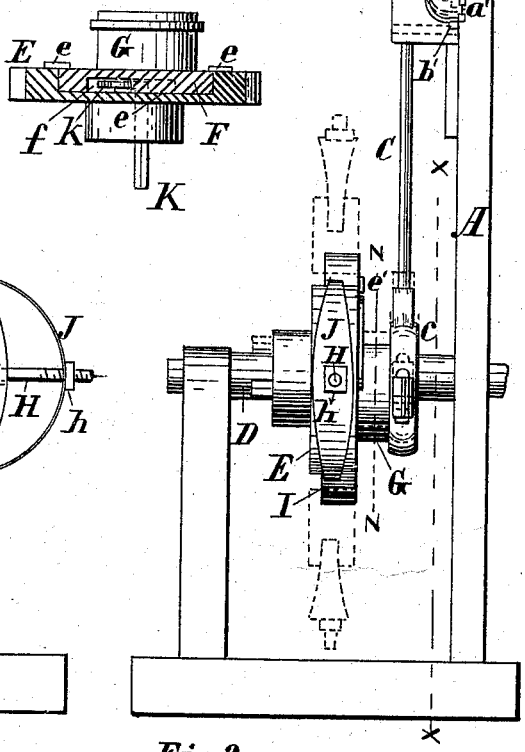

Fig 2

Fig. 4.

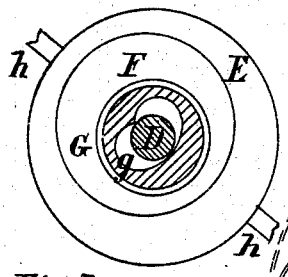

Fig 5

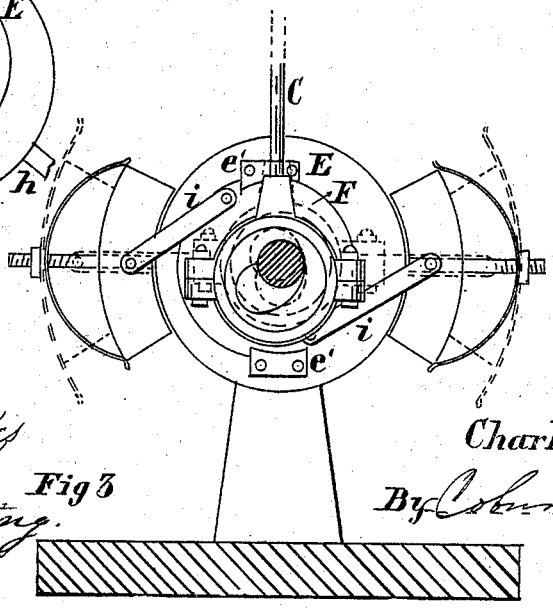

Fig 3

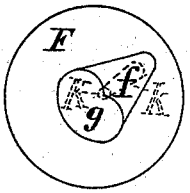

Fig 6

Witnesses

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UNITED STATES PATENT OFFICE.

CHARLES S. LOCKE, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-HALF HIS RIGHT TO JOHN A. SEAMAN, OF SAME PLACE.

IMPROVEMENT IN GOVERNORS FOR STEAM-ENGINES.

Specification forming part of Letters Patent No. **211,335**, dated January 14, 1879; application filed February 27, 1878.

To all whom it may concern:

Be it known that I, CHARLES S. LOCKE, of Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Automatic Cut-Offs and Governors for Steam-Engines, which is fully described in the following specification, reference being had to the accompanying drawings, in which—

Figure 1 represents a front elevation of my improved attachment; Fig. 2, a side elevation of the same; Fig. 3, a rear section taken on the line *x x*, Fig. 2; Fig. 4, a cross-section taken on the line *y y*, Fig. 1; Fig. 5, a section taken on the line *z z*, Fig. 2; and Fig. 6, a rear elevation of the adjustable compound cam.

My invention relates to mechanism adapted to use in connection with the valve of a steam-engine, which performs the functions of a governor and an automatic cut-off, and constitutes the means for reversing the engine.

The invention consists in constructing and arranging the adjusting-eccentric, in connection with the governor-weights, so that the former may be turned from one side of the shaft to the other, thereby reversing the engine.

It also consists in special combinations of devices, all of which will be hereinafter more fully set forth.

My improvement is applicable to engines of all kinds; hence it is not necessary to describe any particular construction of engine, or to describe and show all the different parts of an engine. I shall, therefore, illustrate and describe herein only so much of an engine as is necessary to an understanding of the construction and operation of my improvement.

In the drawings, A represents any supporting-frame, and B a sliding-valve, which is provided with ports *b b'*, and arranged in relation to the cylinder-ports *a a'* in any well-known way. The stem C connects the valve in the usual way to an eccentric-strap, *c*, surrounding an eccentric of peculiar construction and arrangement.

The shaft D is the ordinary eccentric-shaft, upon which the valve is operated. On this shaft is mounted a disk, E, which is rigidly attached to the shaft and revolves with it. In the inner face of the disk a circular recess, *e*, is cut, which is arranged eccentrically to the shaft, as shown in Fig. 5 of the drawings.

A circular disk or cam, F, is constructed of a size and shape to exactly fit into the recess *e*, and an eccentric-hub, G, projects from its outer face, which is arranged eccentrically to the disk itself, and to which the strap *c* is fitted, as shown in Fig. 5 of the drawings.

The disk F is held within the disk E by small plates *e'*, attached to the latter and extending over the edge of the former; but the disk F is free to revolve within the recess in either direction. The shaft D passes through an opening, *g*, extending through the eccentric-hub G and disk F. This opening is shaped something like a heart, as shown in Figs 5 and 6 of the drawings, and permits the disk F, with its eccentric-hub, to be rotated freely about the shaft. The parts are all constructed and so arranged relatively that the disk E may be centered on the shaft D by turning disk F into the proper position in its recess, and when this is done the eccentric-hub G will also be centered on the shaft, so that its rotation will have no effect upon the valve.

This is the position of the several devices named shown in Fig. 5 of the drawings.

It is evident, however, that if the disk F is turned in either direction, when in the position shown in Fig. 5 of the drawings the hub G will be turned around the shaft D and become eccentric thereto, the elongation of the opening *e* permitting this movement of the hub; hence the hub will now act upon the eccentric-strap to reciprocate the valve-stem, whether the disk is turned to throw the eccentric on one side or the other of the shaft.

The extent of movement given to the disk F will, of course, determine the degree of motion communicated to the valve-stem, thereby regulating the port-openings through which steam is admitted to the cylinder.

The above construction and arrangement of the devices, as above described, are such, however, that the adjustment of the eccentric-hub does not change its general relation to the shaft and valve. In other words, the adjustment being effected by the rotation of another eccentric, F, about the same shaft, the relation of the hub to the valve and cylinder ports is always maintained, so that the opening or closing of the ports will be precisely the same in degree in each, and there will be no difference between the ports in taking steam what-

ever may be the adjustment of the eccentric. The pulsations of the engine will therefore be perfectly regular, instead of irregular and jerky, as is usually the case. The disk F must, of course, be connected to the disk E in some way, so as to revolve with the shaft, and the connection must be such as to permit the adjustment above mentioned.

In order to effect the necessary adjustment of the disk F, I connect it with the governor, and in carrying out my improvement in one way I mount the governor on the disk E, which is attached to the shaft. This is accomplished by providing the disk with the radial arms H, projecting from the periphery on opposite sides of the disk. On these arms are arranged weights I, preferably of circular form on their inner faces to fit the periphery of the disk. The weights are fitted loosely on the arms, so as to slide back and forth thereon, and are held in position by springs J, fastened to the outer ends of the arms, and made adjustable in tension by means of nuts *h*, turned upon the extreme outer ends of the radial arms. I prefer elliptical springs, as shown in the drawings, though some other form of spring may be used instead.

The weights I are connected, respectively, to the disk F by means of straps or links *i*, pivoted, respectively, to the weights and to the disk, the pivots on the disk being arranged on opposite sides of the shaft D, as shown in Fig. 3 of the drawings.

Now it is evident that whenever the speed of the engine is increased so that the centripetal force of the weights overcomes the resistance of the springs the former will slide outward upon the arms, which movement will turn the disk F by means of the connecting-links *i*, the arrangement of which causes them to operate in the same direction upon the disk.

The rotation of the disk thus caused adjusts the eccentric-hub, thereby changing the movement of the valve so as to cut off a portion of the steam, as heretofore described, and when the speed slackens the springs force the weights I inward, thereby causing an adjustment in the contrary direction, and with a contrary effect. Hence, with this mechanism we have an adjustable cut-off combined with a governor, by means of which the cut-off is automatically regulated.

I have shown and described one way of carrying out my invention; but I do not limit myself to this particular construction of a governor, as the double-cam eccentric may be connected with a governor of different construction.

The inner face of the eccentric-disk F is provided with a tapering or V-shaped recess, *f*, as shown in Fig. 6 of the drawings. A shaft, *k*, the outer end of which projects outside the hub of the disk E, as shown in Fig. 4 of the drawings, extends through the latter, and is provided with a crank-arm, *k*, on its inner end, which enters the recess *f* above described.

By turning the shaft by any suitable device attached to its outer end, it is evident that the disk F will be thrown around the shaft D to one side or the other thereof. The length of the crank-arm *k* and its range of motion are such that the disk F may be thrown entirely around, so as to reverse the position of the pivotal connections of the links *i* with reference to the shaft D—that is, change them to opposite sides of the shaft from those they previously occupied. This movement of the eccentric-disk reverses the position of the eccentric-hub in the strap *c*, and hence reverses the direction in which it operates upon the valve-stem, thereby reversing the engine.

It is evident, therefore, that the engine may be reversed by vibrating the disk F in the required direction, as above described.

I have shown and described a disk, E, in which the eccentric-disk is received and held; but this particular construction is not necessary, as the device may be made in the shape of an ordinary strap, it being necessary only to provide a seat for the eccentric-disk arranged eccentrically to the shaft D, within which the eccentric may be turned.

When the parts are all mounted and arranged upon the shaft D, as heretofore described, it is evident that what has been described as the disk E and eccentric-hub G constitute together a kind of double or compound cam or eccentric, on account of the eccentric arrangement of the seat of the former.

It is the equalizing or compensating effect of one of these eccentrics upon the other, as they are adjusted together about the shaft, which enables me to cut off steam in the same degree at each of the ports, so that the same amount of steam will be taken by each under all circumstances.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A compound or double valve-eccentric composed of the eccentric-seat E, disk F, and hub G, in combination with a governor and mechanism connecting the parts, whereby the device is adapted to operate as a cut-off, governor, and engine-reverser, substantially as described.

2. The eccentric-seat E, in combination with the double disk F G, the governor-weights I, and the pivoted links *i*, pivoted to the disk F on opposite sides of the shaft, and arranged so that their position may be reversed by the rotation of the eccentrics to reverse the engine, substantially as described.

3. The eccentric-seat E, in combination with the disk F and eccentric G, both provided with the slot *g'* and crank-shaft K, for reversing the engine, substantially as described.

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Witnesses:
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