(No Model.) 3 Sheets—Sheet 1.

D. P. DAVIS.

GOVERNOR FOR ENGINES.

No. 395,882. Patented Jan. 8, 1889.

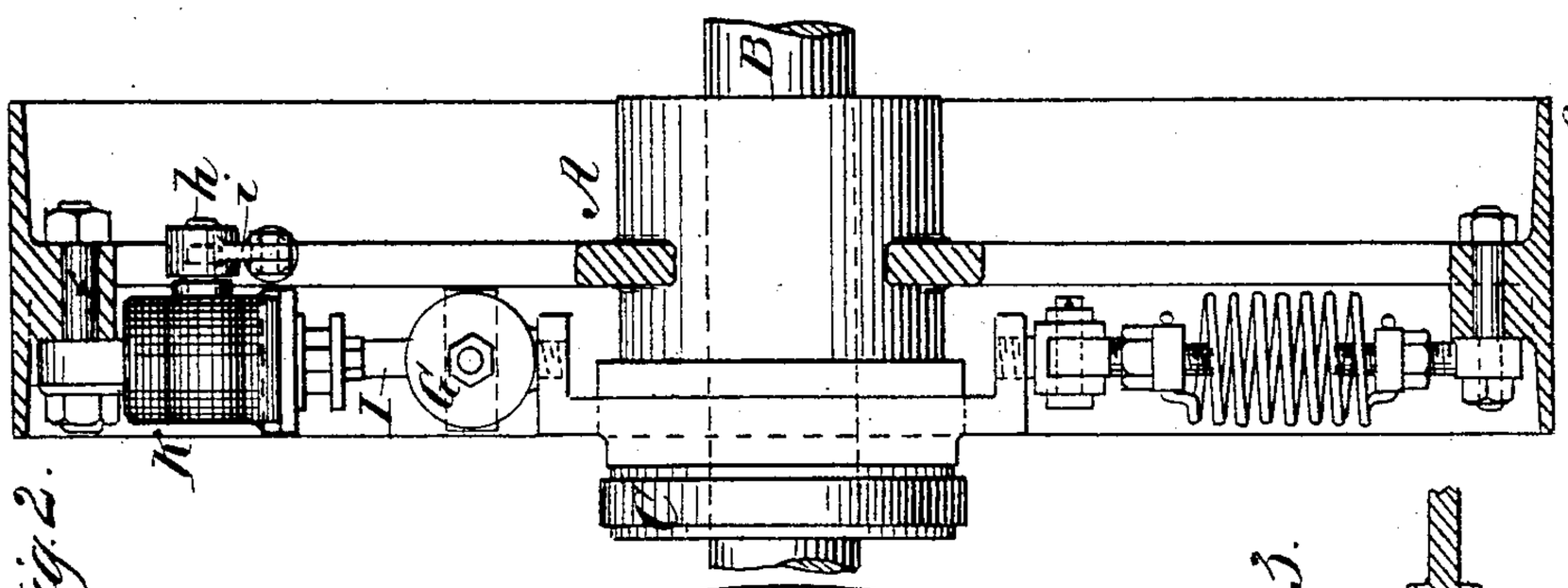

Fig. 2.

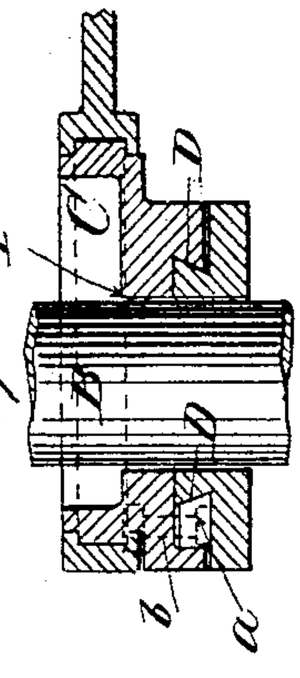

Fig. 3.

Fig. 1.

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(No Model.)

3 Sheets—Sheet 2.

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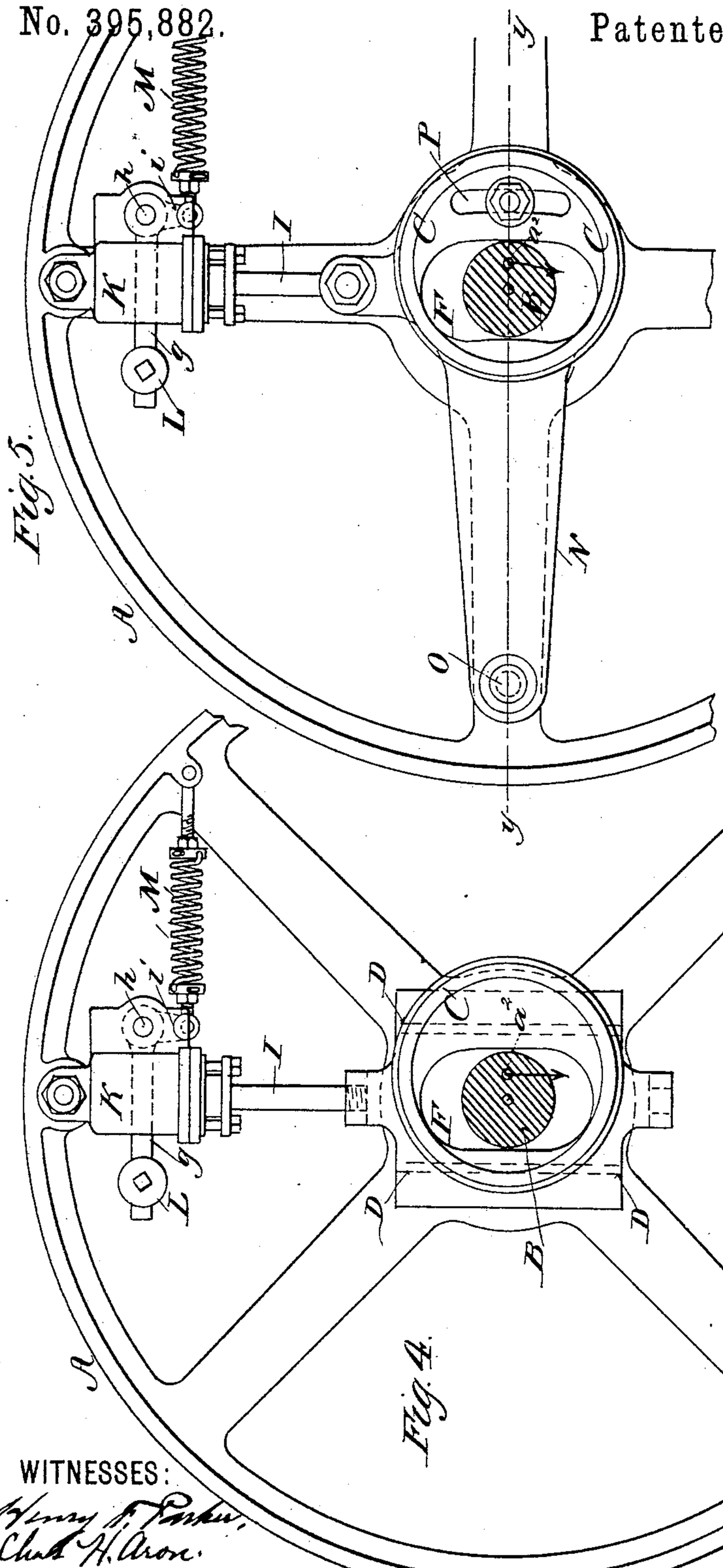

Fig. 5.

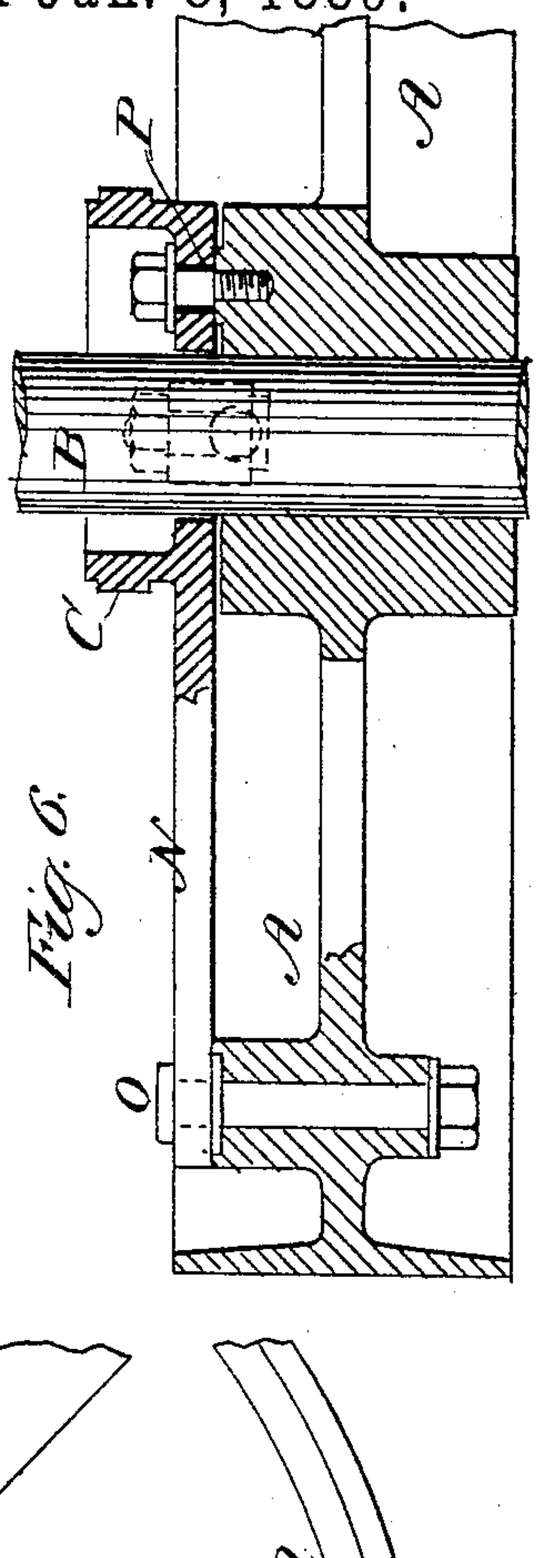

Fig. 6.

Fig. 4.

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Fig. 7

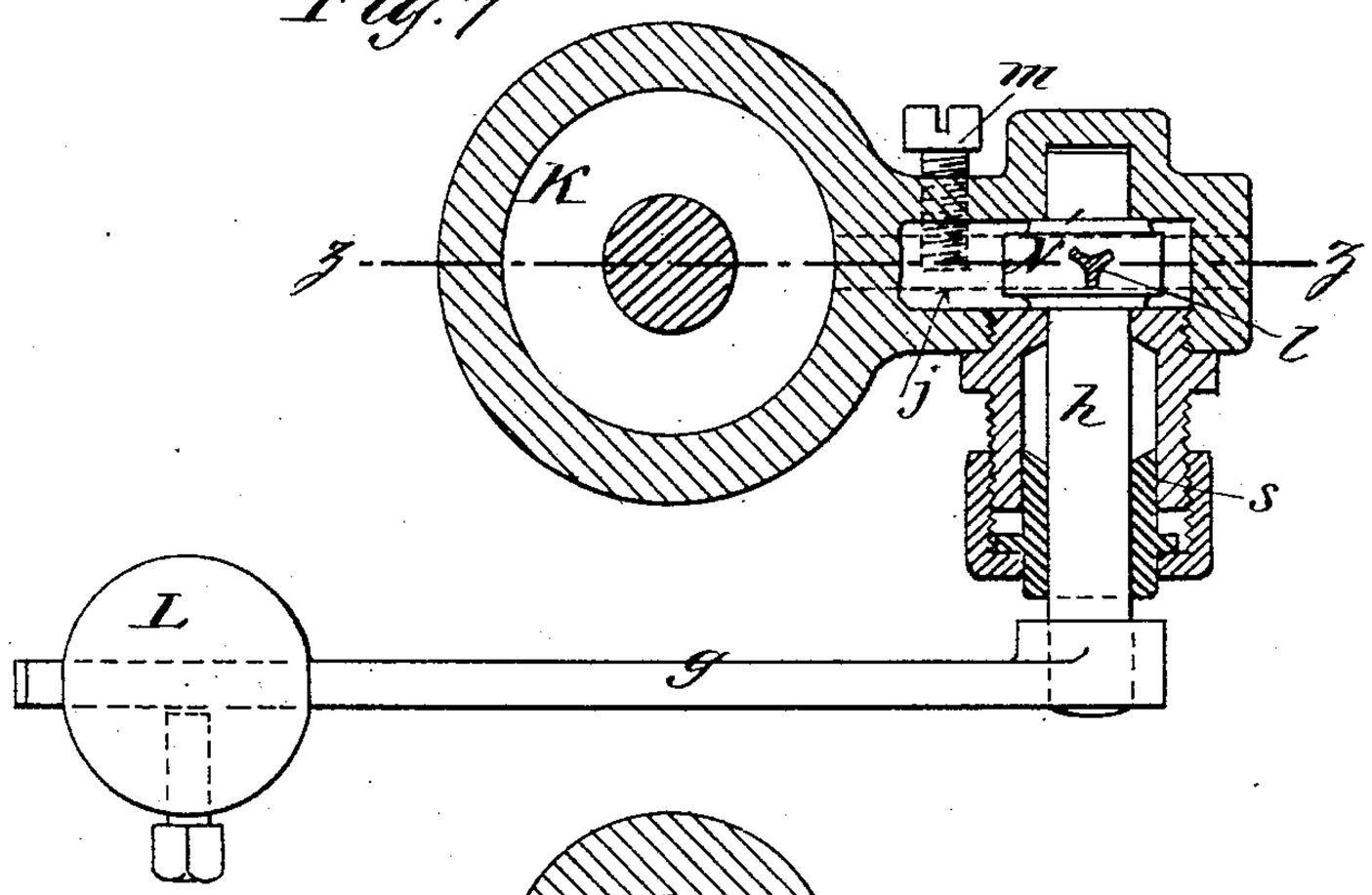
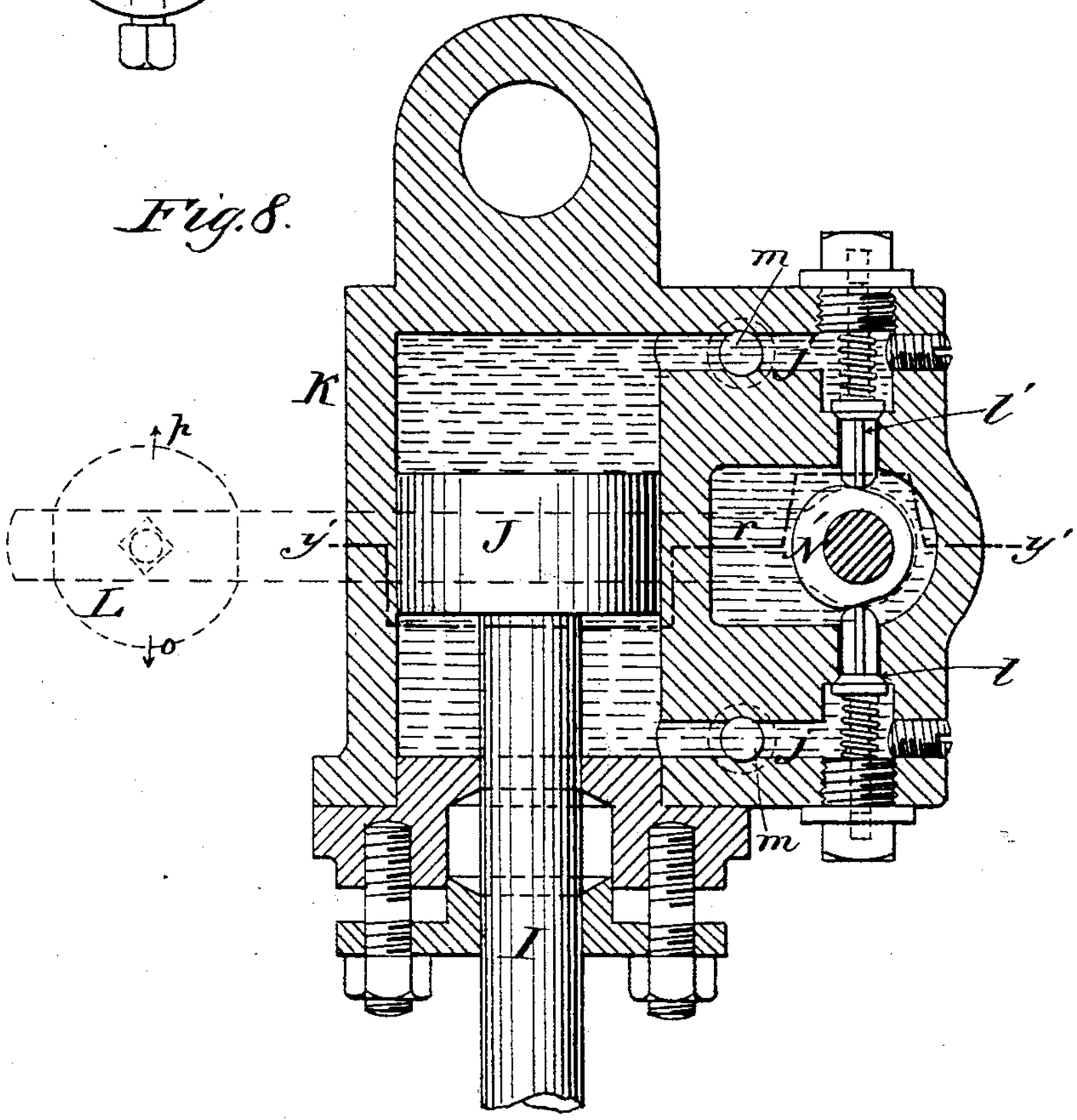


Fig. 8.



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UNITED STATES PATENT OFFICE.

DAVID P. DAVIS, OF ALLENDALE, NEW JERSEY.

GOVERNOR FOR ENGINES.

SPECIFICATION forming part of Letters Patent No. 395,882, dated January 8, 1889.

Application filed August 4, 1888. Serial No. 281,936. (No model.)

To all whom it may concern:

Be it known that I, DAVID P. DAVIS, a citizen of the United States, residing at Allendale, in the county of Bergen, State of New Jersey, have invented certain new and useful Improvements in Governors for Engines, of which the following is a specification.

My invention relates to governors that are adapted to act upon the eccentric of the cut-off mechanism of a steam-engine, so that the position of the center of the eccentric with relation to the axis of the shaft will be changed and a variation of stroke produced to govern the supply of steam by the period of cut-off, and thereby compensate for the varying loads put upon the engine.

Heretofore various devices have been employed to overcome the difficulty arising in holding the eccentric rigidly against displacement due to the frictional resistance of the slide-valve or other cut-off mechanism.

To accomplish this end is the object of my invention, and the object is also to promote the sensitiveness of the speed-regulation by the employment of a minimum-sized centrifugal governing-weight which the present invention admits of.

My improved mechanism consists of a liquid-confined piston adapted to hold the eccentric at such various positions as it may be caused to assume, and of valves that lock the flowing-ports through which the liquid is admitted or withdrawn from either side of said piston, the said valves being operated by means of the centrifugal governing-weight.

Referring to the accompanying drawings, forming a part of this specification, and in which similar letters of reference indicate corresponding parts throughout the several views, Figure 1 is a front elevation of a fly-wheel or driving-pulley bearing a movable eccentric, an eccentric shifting weight and spring, and the liquid locking device connected therewith. Fig. 2 is a central transverse section of Fig. 1; and Fig. 3, a sectional detail view on the line *x x*, Fig. 1. Fig. 4 is a view corresponding to Fig. 1, omitting the eccentric shifting weight and spring; Fig. 5, a front elevation illustrating the invention applied to a modified construction of the movable eccentric; Fig. 6, a transverse section on the line *y y*, Fig. 5. Fig. 7 is an enlarged detail view taken in cross-section on the line *y' y'*, Fig. 5; and Fig. 8, an enlarged detail view taken in section on the line *z z*, Fig. 7.

Referring to Figs. 1, 2, and 3, C is the eccentric operating the slide-valve or other cut-off mechanism of the steam-cylinder; D, guideways upon which the eccentric is made movable transversely, but rotatively carried with the driving-pulley A and shaft B.

The eccentric block C is slotted, as shown at F, to permit its movement over the shaft upon the guideways D, the latter being attached to the hub of the wheel. The guideways are preferably of beveled form, as shown, the wear of the same being taken up by a gib, *a*, having tightening-bolts *b*.

G is a centrifugal weight that actuates the eccentric block upon its guideways, and H an opposing contractile spring counteracting the centrifugal force of the said weight. Both the weight and the spring are made adjustable as to efficiency—the former by its sectional construction *c d e*, whereby it may be built up or decreased, as circumstances require, and the latter by its screw-shackle connections to the eccentric block and to the rim of the wheel, respectively, by right and left screw-threads provided with jam-nuts *k*.

I is a piston-rod extending from the weight G, bearing a piston, J, Fig. 8, within the cylinder K, which latter is swiveled to the rim of the wheel at a point, *f*, diametrically opposite the suspending-point of the spring H.

L is the centrifugal governing-weight, adjustable upon the lever *g*, fulcrumed as shown, carrying with it a cylinder-valve-operating shaft, *h*.

Counteracting the weight L is the contractile spring M, connected by adjustable screw-shackle connections similar to those of the spring H between the arm *i* of the lever *g* and the wheel-rim.

In Fig. 4 the piston-rod I is shown connected with the eccentric block C, operating in guideways D, similarly to Fig. 1. The centrifugal weight G is in this instance omitted, as also its counteracting spring, and the frictional resistance of the cut-off mechanism upon the eccentric is depended on to move the eccentric from one position to another when the piston in cylinder K is released.

In Fig. 5 the piston-rod I is swiveled to

the eccentric C, and the said eccentric is moved upon a fulcrum at O of its arm N, in lieu of operating in guideways, as in the former instances. The slot F is curved to correspond with the center of movement, and a small curved slot, P, and a guiding-stud therein are also provided to retain the eccentric in its plane of movement and prevent its being displaced laterally.

The form illustrated in Fig. 5 may be used in connection with the invention with or without the centrifugal weight G and spring H.

Referring to Figs. 7 and 8, the opposite chambers of the cylinder K are filled with liquid—preferably such as oil and glycerine or other non-freezing compound—and they communicate by the run-around ports *j* through chamber *r* when the intercepting check-valves *l l'* are open. N' is a cam within the chamber *r*, fixed to the shaft *h*, which cam engages with the webbed stems of the check-valves *l l'*, so as to alternately lift the one or the other from its seat when the weight L is retracted toward or thrown from the center of the wheel, as the case may be. The reseating of the valves when released by the cam is assisted by the valve-springs *n*. The shaft *h* of the cam is packed tight through the gland *s*, being left free to rotate.

m are cramping screw-plugs, used to adjust the capacity of the ports and regulate the amount of retardation offered to the flow of the liquid and to the movement of the eccentric.

In Figs. 1 to 6, inclusive, the eccentric is shown in a position to give the minimum stroke and to cut off the admission of steam to the engine-cylinder at an early period of the stroke of the steam-piston. In operation, as the engine assumes its normal speed, the weight L arrives at its mid-position shown in the figures, wherein the cam N' is disengaged from both valves *l l'*, the said valves remaining seated, so as to lock the piston J inactively between the confined liquid. An increased load upon the engine will cause the retraction of the weight L in the direction of the arrow *o*, causing the cam N' to bear upon the check-valve *l*. The contractile action of the spring H then moves the piston J and weight G toward the axis of the shaft, carrying the center a^2 of the eccentric in the direction of the arrow to give an extended stroke. A decreased load is followed by the opposite action of the weight L in the direction of the arrow *p*, lifting the check-valve *l'*, causing an opposite automatic movement of the several parts until a normal speed is resumed. It is obvious that a similar operation will take place in the absence of the weight and spring G H, due to the frictional resistance on the eccentric, as aforesaid, the back and forward pressure of the eccentric-strap incident to each revolution being yielded to one way or the other at the successive turns, according as the check-valve *l* or *l'* may be raised. The slot F, being extended both ways across the eccentric disk, enables the direction of rotation in which the engine is driven to be reversed by disconnecting the piston I and reversing the position of the eccentric.

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

1. In a governor for engines, the combination of an eccentric operating the cut-off mechanism, capable of variable adjustment of its center to or from the axis of the shaft, with a liquid-confined locking-piston connected with said eccentric and adapted to hold the same against displacement during rotation or to release the eccentric by release of the liquid confining said piston.

2. In a governor for engines, the combination of an eccentric operating the cut-off mechanism, capable of variable adjustment of its center to or from the axis of the shaft, with a liquid-confined locking-piston connected with said eccentric, check-valves normally opposing the escape of the liquid confined upon either side of said piston, and an automatic check-valve-tripping mechanism, consisting, substantially, of a centrifugally-operated weighted lever, a retracting-spring, and a tripping cam or toe operated by said weighted lever and spring to release the confined liquid, in the manner set forth.

3. The combination, with an eccentric transversely movable in parallel guideways for the adjustment of its center at variable distances from the axis of the shaft, of the herein-described liquid-confined locking-piston, liquid-releasing valves, centrifugal valve-operating weight, and counteracting spring, adapted as and for the purposes herein set forth.

4. The combination, with an eccentric swiveled upon a fulcrum aside from its center to move transversely for the adjustment of its center at variable distances from the axis of the shaft, of the herein-described liquid-confined locking-piston, liquid-releasing valves, centrifugal valve-operating weight, and counteracting spring, adapted as and for the purposes herein set forth.

5. The combination, with an eccentric transversely movable for the adjustment of its center at variable distances from the axis of the shaft, a centrifugal eccentric moving weight, as G, and a retracting-spring, as H, of the herein-described liquid-confined locking-piston, liquid-releasing valves, centrifugal valve-operating weight, and counteracting spring, all adapted as and for the purposes set forth.

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Witnesses:
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