

(No Model.)

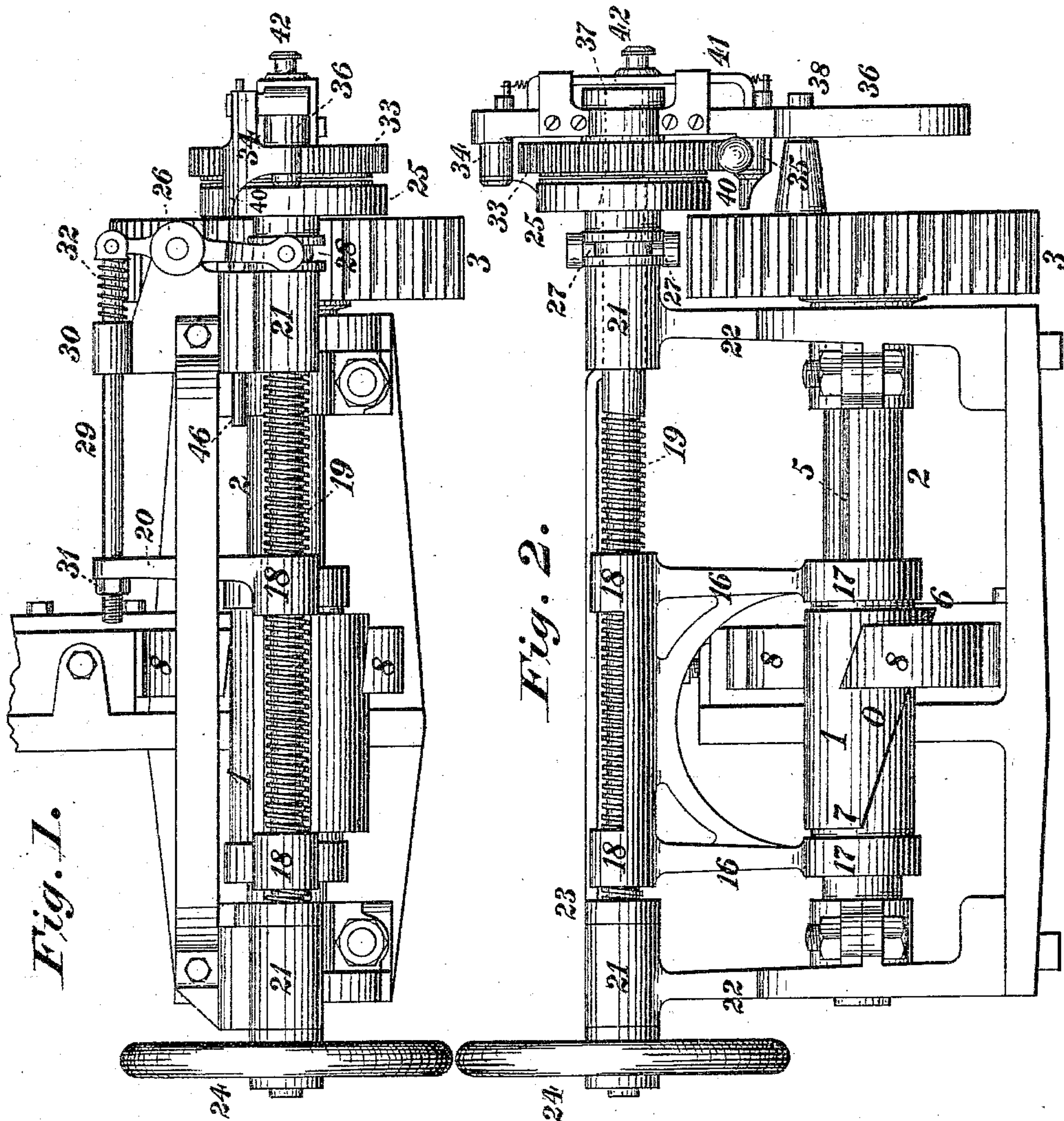
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N. F. BURNHAM.

CUT-OFF MECHANISM FOR STEAM ENGINES.

No. 274,559.

Patented Mar. 27, 1883.



WITNESSES:

T. C. Brecht.
Geo. T. Kelly.

INVENTOR

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by Collier & Bell.
attys

(No Model.)

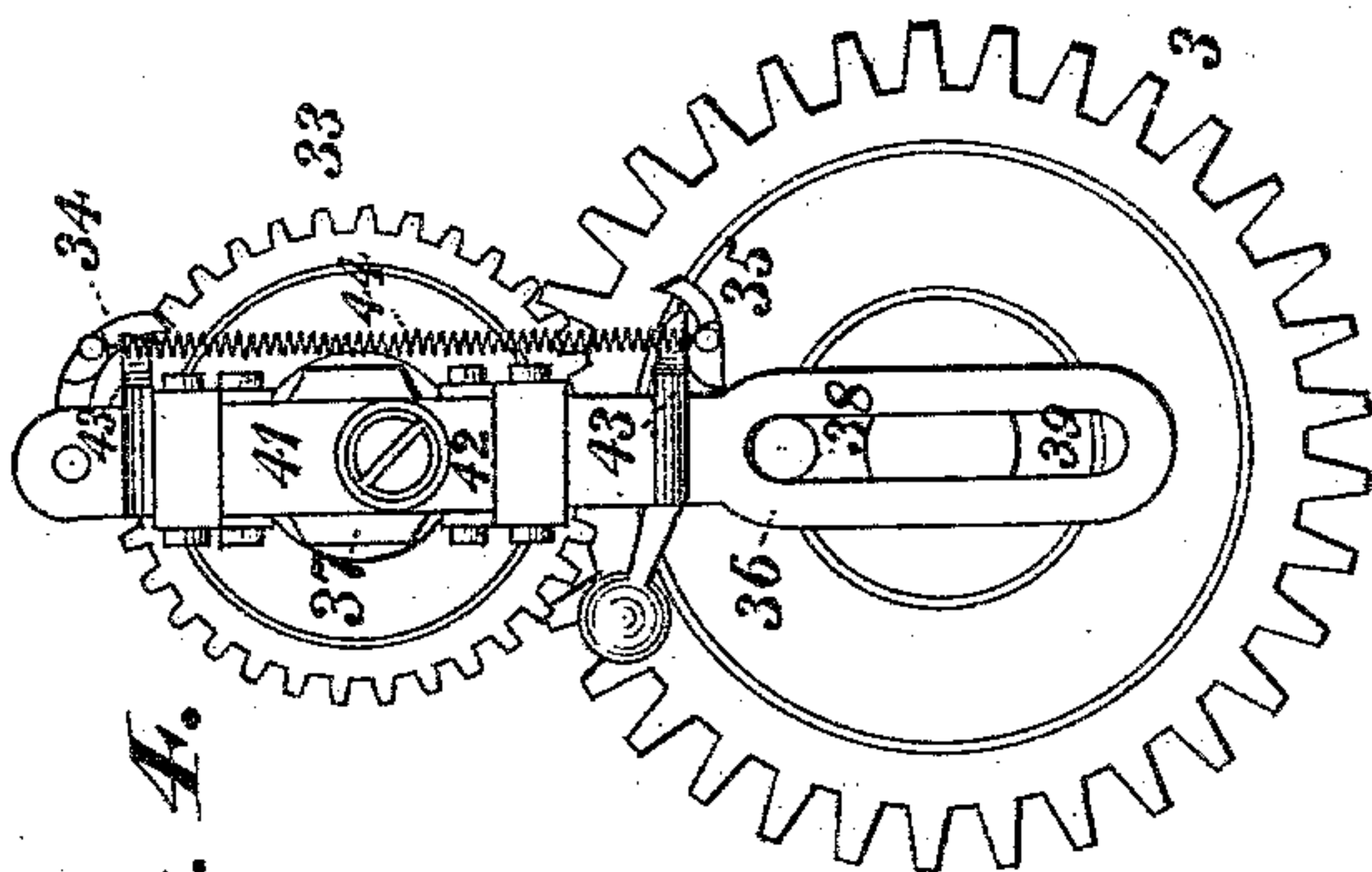
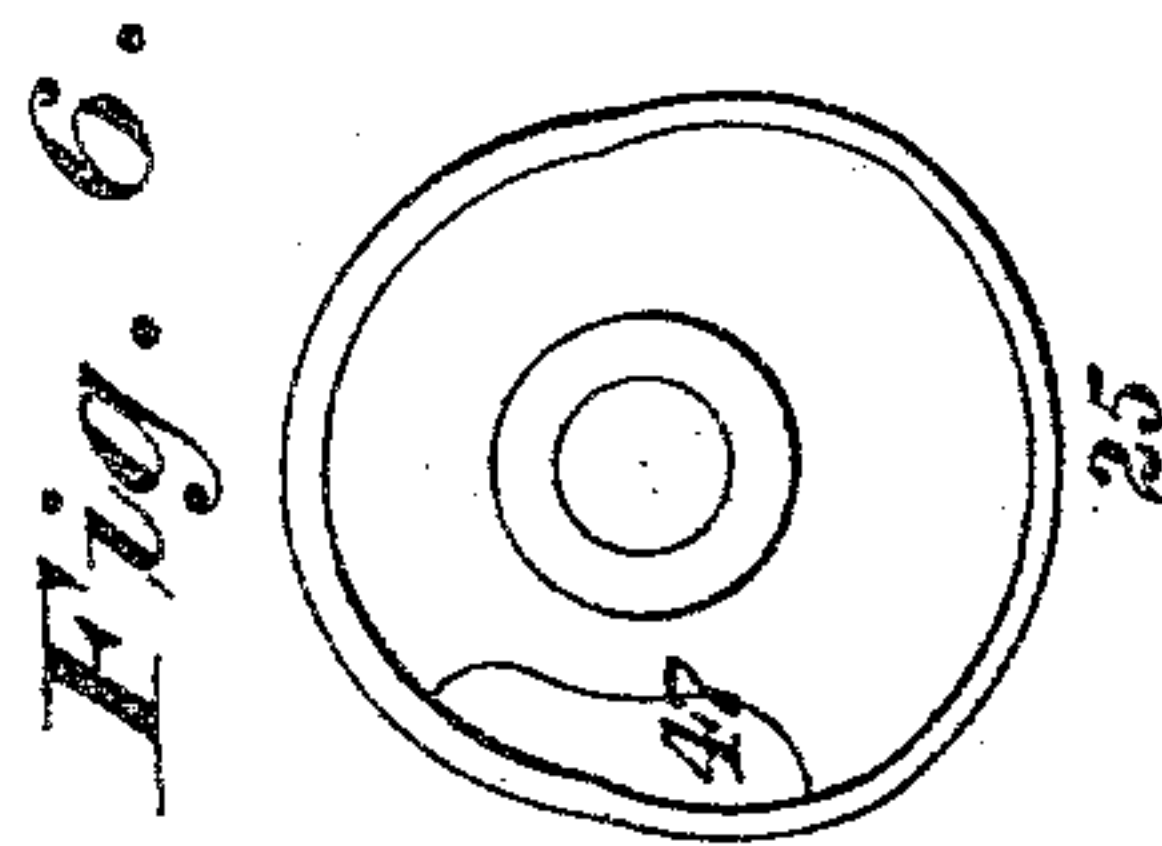
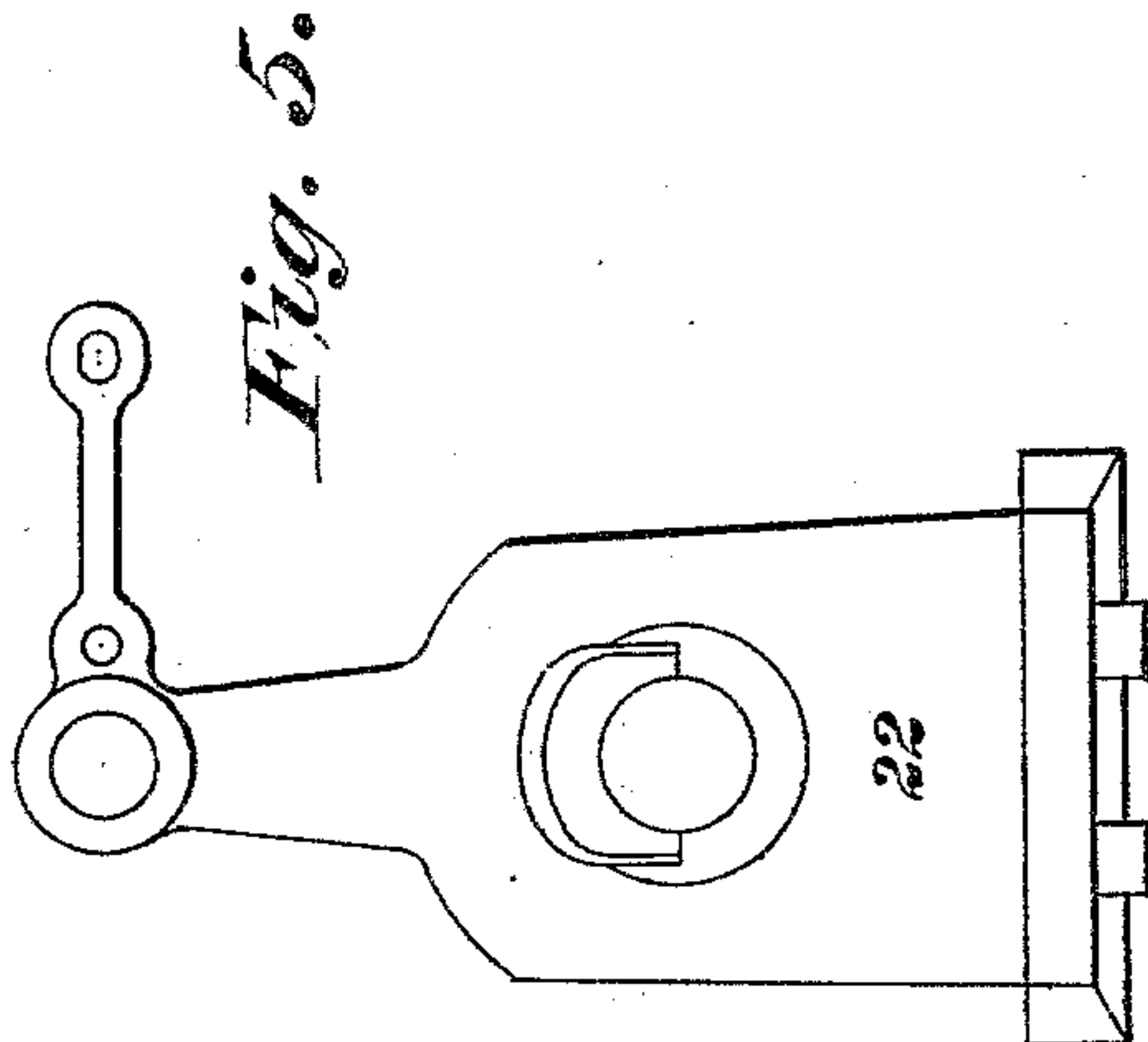
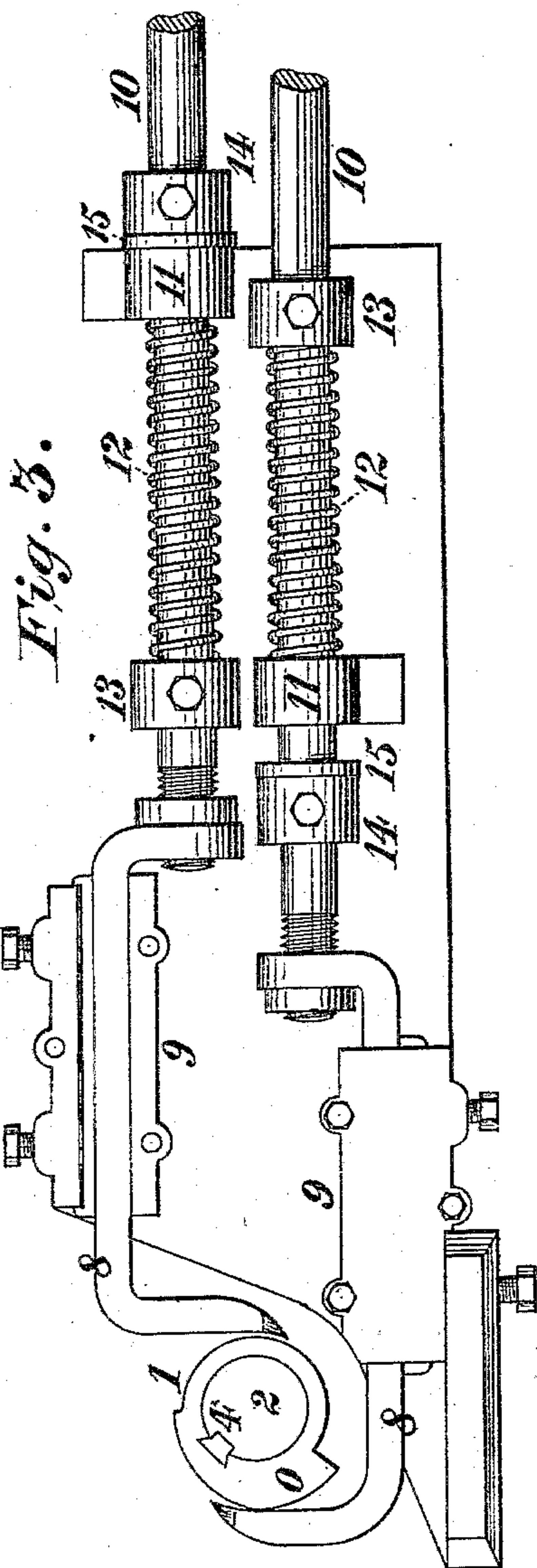
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N. F. BURNHAM.

OUT-OFF MECHANISM FOR STEAM ENGINES.

No. 274,559.

Patented Mar. 27, 1883.



WITNESSES:

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UNITED STATES PATENT OFFICE.

NATHAN F. BURNHAM, OF YORK, PENNSYLVANIA.

CUT-OFF MECHANISM FOR STEAM-ENGINES.

SPECIFICATION forming part of Letters Patent No. 274,559, dated March 27, 1883.

Application filed January 25, 1883. (No model.)

To all whom it may concern:

Be it known that I, NATHAN F. BURNHAM, of the city and county of York, in the State of Pennsylvania, have invented certain new and useful Improvements in Cut-Off Mechanism for Steam-Engines, of which improvements the following is a specification.

The object of my invention is to provide improved means for operating the cut-off valves of steam-engines in such manner that the same may be moved to and maintained at their full opening, either for the whole or any desired portion of the stroke of the piston, with the capacity of adjustability, either by hand or by connection with a governor, to any desired degree of expansion, during the operation of the engine.

To this end my improvements consist in certain novel devices and combinations, including a cam which is fitted to rotate with and move longitudinally upon the crank-shaft or a supplemental valve-shaft of an engine, a screw adapted to impart longitudinal movement in either direction to said cam, a pawl-lever and pawls operated by a connection with a governor or regulator, and serving to intermittently rotate a pawl-wheel, and a friction-clutch by which the movements of said pawl-wheel are communicated to the operating-screw of the cam, all as hereinafter more fully set forth.

In the accompanying drawings, Figure 1 is a plan or top view of a cut-off mechanism embodying my invention; Fig. 2, a side view, and Fig. 3 an end view, of the same; Fig. 4, an end view, showing the pawl-wheel and its operating devices; Fig. 5, a similar view of one of the standards which support the operating-screw, and Fig. 6 a view in elevation of the friction stop-motion wheel.

The cam 1, by which the cut-off valve or valves are operated, is bored out to fit easily upon a shaft, 2, which may be either the main or crank shaft of the engine, or, as in the present instance, a supplemental shaft carrying a spur-gear, 3, which meshes with a similar gear upon the main shaft. The cam 1 is adapted to move longitudinally upon its shaft 2, while partaking at all points in its traverse of the rotation thereof, by means of an internal key or feather, 4, which fits in a corresponding groove or spline, 5, in the shaft. The face 6 of the cam is turned to such diameter as will

be necessary to impart to the cut-off valve its full traverse to completely open its port, and said face is beveled or inclined on its outer edge from the point, 6, farthest from the eccentric portion of the cam to the point, 7, at which said edge intersects said eccentric portion.

The cam-yokes 8 are fitted to slide in guides or bearings 9, perpendicular to the axial line of the shaft 2, as shown in Fig. 3, in which the cap of the upper guide is removed, and are bent and curved at their ends adjacent to the cam, to fit against the periphery thereof, toward which they are pressed by springs, the faces of their ends being beveled or inclined in correspondence with the inclination of the edge of the largest portion of the cam. Each of the yokes is coupled, preferably by a screw-and-nut connection, to a rod, 10, fitting in a guide or bearing, 11, upon the frame, and connected at its opposite end by the usual swivel or right and left hand screws and nuts to a valve-stem, so as to enable any necessary adjustments of the cut-off valves to be made. A helical spring, 12, surrounds each of the rods 10, said springs bearing at one end against the fixed guides 11 of said rods, and at the other against collars 13, secured adjustably upon the rods by set-screws, so that the tension of the springs may be regulated as required. Stop-rings 14, each having a rubber face, 15, are secured upon the rods 10 on the sides of the guides 11 opposite to the springs, in such position that when the beveled portion of the cam 1 passes the yokes the tension of the springs forces the yokes up to and maintains them in contact with the periphery of the cam.

A traveling frame or guide, 16, is fitted to move longitudinally upon the shaft 2 by means of a pair of sleeves or sockets, 17, which are bored out to fit easily upon the shaft, their adjacent faces abutting against the ends of the cam 1, and a nut or internally-threaded socket, 18, (one or more,) with which a screw, 19, engages, is formed upon the upper portion of the frame 16, from which there projects a lateral arm, 20. The screw 19 is mounted in bearings 21 on the upper ends of a pair of standards, 22, longitudinal movement in either direction being prevented by a collar, 23, and a hand-wheel, 24, secured upon the screw on opposite sides of one of its bearings.

A friction stop-motion wheel, 25, having a long hub on one side, is fitted so as to rotate freely upon the screw 19, adjacent to one of the bearings thereof, and a double-armed lever, 26, is pivoted to the frame in such position that a pair of pins, 27, upon one of its ends, may engage a circumferential groove, 28, on the hub of the friction-wheel, the opposite end of said lever being coupled to a rod, 29, which passes freely through a bearing, 30, on the frame, and through the arm 20 of the traveling guide 16, and has a nut, 31, or collar secured upon it exterior to said arm. A helical spring, 32, upon the rod 29 tends to force the adjacent end of the lever 26 outwardly, and thereby to draw the opposite end of the lever, and with it the friction-wheel 25, in the direction of the cam 1. A rod, 46, which fits in a guide on the frame on the opposite side of the center of the lever 26, acts, when pressed upon by the arm 20, in the traverse of the guide 16 toward the friction-wheel, to move the latter in the direction of such traverse.

A pawl-wheel, 33, having a hub which extends on one side to the adjacent face of the friction-wheel, and on the other for a sufficient distance to form a bearing for a pawl-lever, is keyed upon the screw 19 exterior to and adjoining the friction-wheel, said pawl-wheel having a series of peripheral teeth, with which one or the other of a pair of pawls, 34 35, pivoted to a pawl-lever, 36, are adapted to engage, and to impart rotation to the pawl-wheel in one or the other direction, respectively. The pawl-lever 36, which is journaled upon the outer hub of the friction-wheel 25, is maintained in position longitudinally thereon by a nut, 37, engaging a thread on the end of the screw 19, and is vibrated by a crank-pin, 38, on the gear 3 of the shaft 1, which works in a longitudinal slot, 39, in the pawl-lever. The pawls 34 and 35 are pivoted to the pawl-lever 36 on opposite sides of the center of the pawl-wheel, and each is provided with a lateral projection, 40, which extends over the periphery of said wheel. A tripping-bar, 41, having a pin or stud, 42, on its outside, adapted to be connected by a rod or link with a governor or regulator, is fitted to slide longitudinally in guides on the face of the pawl-lever, arms 43 on the tripping-bar bearing against one or the other of the pawls, according as the tripping-bar is raised or lowered by the governor, and thereby disengaging said pawl from the pawl-wheel. A spring, 44, connected to pins 45 on the pawls, acts to engage one pawl with the pawl-lever after the other pawl has been disengaged and the tripping-bar moved a sufficient distance.

The friction-wheel 25 is of irregular form, the distance from its center to its periphery, for a portion of its circumference, being less than that from the center of the pawl-wheel to the bottom of the teeth thereof, and for the remainder being greater than the distance from the center of the pawl-wheel to the top of its

teeth. A balance-weight, 47, on one side of the friction-wheel maintains the portion thereof which is of smaller diameter adjacent to the pawls until by the movement of the lever 26, which is effected by the traverse of the guide 16 in either direction, the wheel 25 is brought into frictional contact with the pawl-wheel, when by the rotation of the wheel thereby effected the portion which is of large diameter disengages the pawl from the pawl-wheel, and consequently stops the rotation thereof, and of the screw which moves the cam 1, such disengaging action being exerted upon either of the pawls that may at the time be in gear with the pawl-wheel.

In operation it will be obvious that the degree of expansion effected will be in correspondence with the longitudinal position of the cam upon its shaft relatively to the cam-yokes, and that such position may be varied by the movement of the screw and traveling guide in one or the other direction, either by the hand-wheel or by the pawl and pawl-wheel, as induced by the governor. At the termination of the traverse of the cam in one direction the rotation of the pawl-wheel is arrested by the movement of the lever 28 and friction-wheel 25, produced by the pressure of the arm 20 against the rod 46, and at the termination of said traverse in the other direction by a similar movement produced by the draft of the arm 20 upon the rod 29. The adjustment of the cam in any intermediate position is effected by the cessation of the rotation which ensues when either pawl is withdrawn from the pawl-wheel by the tripping-bar as actuated by the governor.

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

1. The combination, substantially as set forth, of a cam which is fitted to move longitudinally upon its shaft, an operating-screw adapted to impart movement to said cam, a pawl-wheel secured upon said screw, and a pawl adapted to be engaged with and disengaged from said pawl-wheel by a connection with a governor or regulator.

2. The combination, substantially as set forth, of a longitudinally-moving cam, an operating-screw, a traveling frame or guide, a pawl and pawl-wheel acting to rotate said operating-screw, and a friction-wheel actuated by the traveling frame, and serving to disengage the pawl from the pawl-wheel at the extremities of the traverse of the cam.

3. The combination, substantially as set forth, of a longitudinally-moving cam, an operating-screw, a pawl-wheel secured thereto, a traveling frame or guide, a vibrating pawl-lever, a pawl pivoted thereto, and a tripping-bar actuated by a connection with a governor, and serving to engage said pawl with and disengage it from the pawl-wheel.

4. The combination, substantially as set forth, of an operating-screw and a pawl-wheel, a pawl-lever journaled on said screw, pawls

pivoted to said lever, and a tripping-bar adapted to slide upon said lever, and having a pin or stud for connection with a governor or regulator.

5 5. The combination, substantially as set forth, of an operating-screw and a pawl-wheel, a vibrating pawl-lever and a pawl pivoted thereto, and a friction-wheel which is movable longitudinally on said screw, said friction-
10 wheel having a portion of its periphery adapted to disengage the pawl from the pawl-wheel when moved into frictional contact with the latter.

6. The combination, substantially as set forth, of an operating-screw, a pawl-wheel fast 15 thereon, a friction-wheel loose thereon, a traveling frame or guide moving longitudinally on the operating-screw, and a pivoted lever which is vibrated by the traveling frame and serves to institute and arrest frictional contact be- 20 tween the friction-wheel and the pawl-wheel.

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Witnesses:

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WM. BEITZEL.