

*J. L. Whetstone,
Rotary Steam Valve.*

N^o 22,321.

Patented Dec. 14, 1858.

Fig. 1

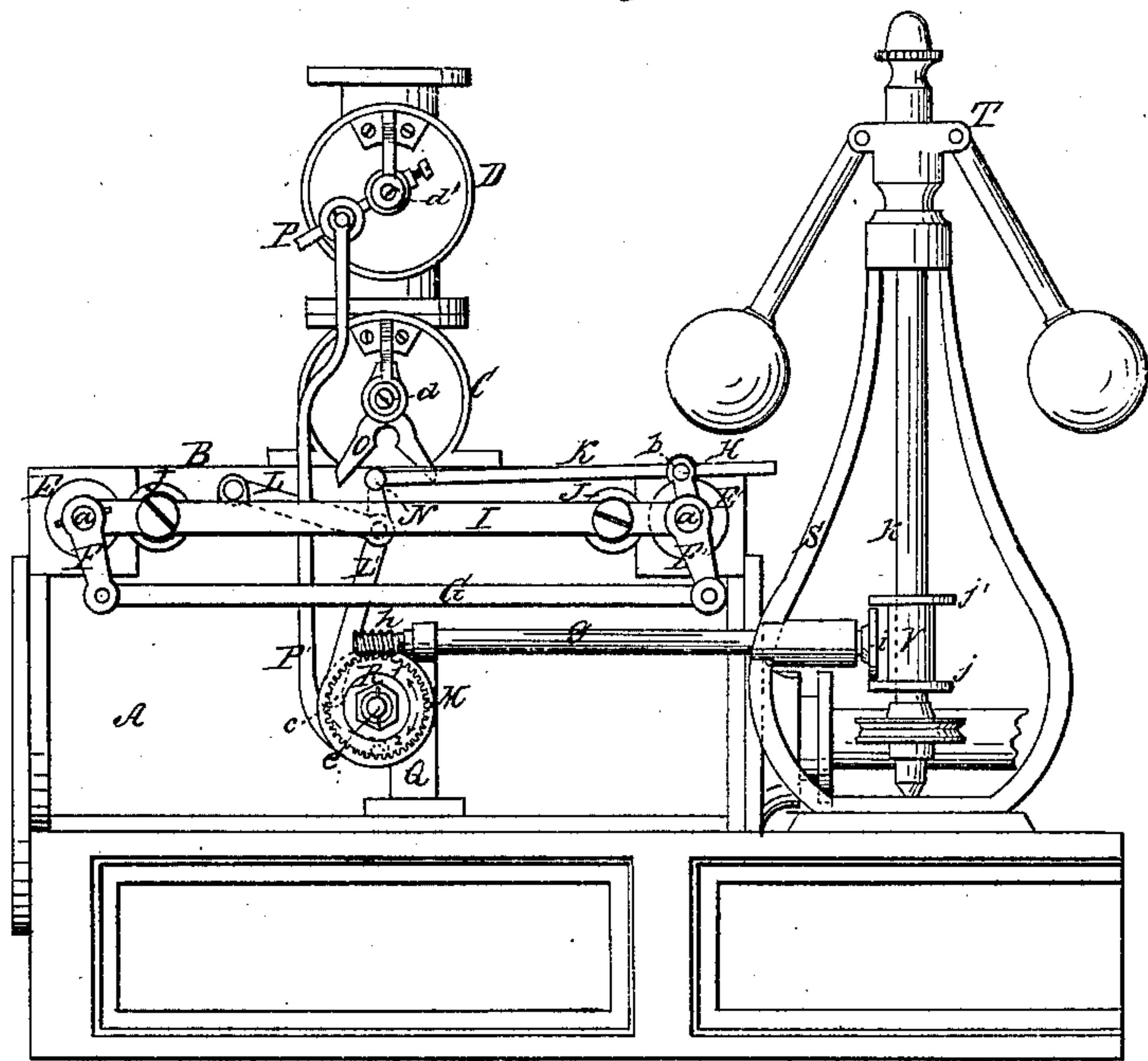


Fig. 2

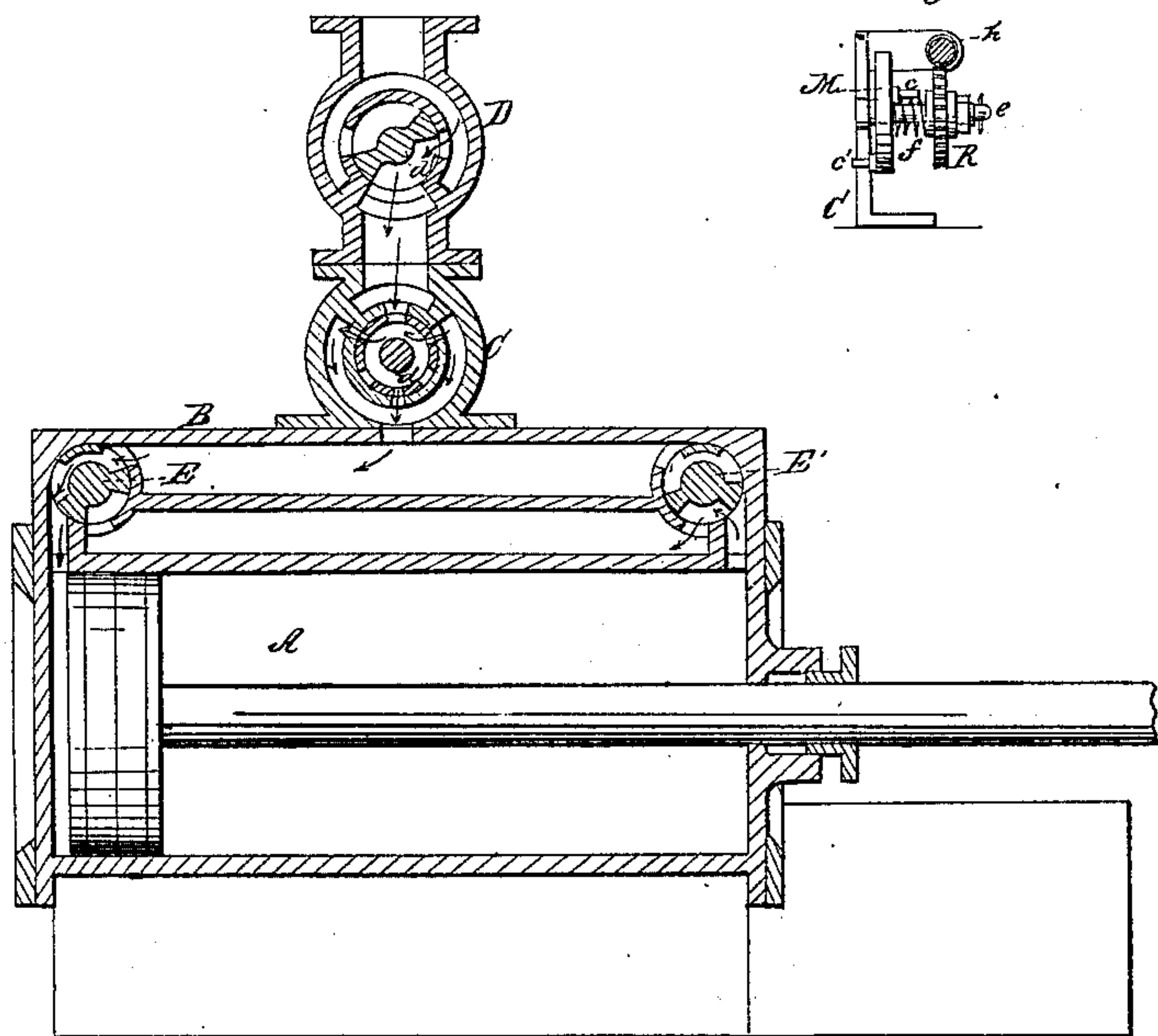
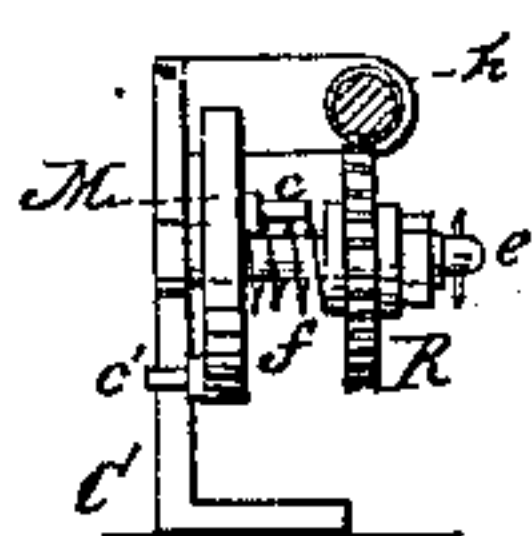


Fig. 3



UNITED STATES PATENT OFFICE.

JOHN L. WHETSTONE, OF CINCINNATI, OHIO.

VALVE-GEAR OF STEAM-ENGINES.

Specification of Letters Patent No. 22,321, dated December 14, 1858.

To all whom it may concern:

Be it known that I, JOHN L. WHETSTONE, of Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in the Valve-Gear of Steam-Engines; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1, represents an elevation of the valve gear constructed according to my invention. Fig. 2, is a vertical central section of a steam cylinder with the valves, representing the same in a position corresponding to the position of the valve gear represented in Fig. 1. Fig. 3, is a side elevation of the disk which adjusts the cut off and the throttle-valve.

Similar letters of reference in the three figures refer to corresponding parts of this arrangement.

This invention consists in operating the cut-off valve of a steam engine by a forked lever which is actuated by means of an adjustable radius bar connected to the rock-shaft or other device from which the main valves are operated, said radius bar being so connected by suitable devices to the governor that the upward motion of the governor balls due to an increase of its speed shall cause the radius bar to be moved toward the crotch or narrowest part of the forked lever, in which case the cut off valve is moved quicker, and cuts off the steam at an earlier stage of the stroke; or so that the downward motion of the governor balls due to a decrease of its speed shall cause the radius bar to be moved toward the widest opening of the forked lever, and in that case, the cut off will be effected at a later period in the stroke, or not at all; and this invention further consists in so connecting the cut-off gear and the throttle valve to the same vibrating disk or bell crank by pins nearly or quite at right angles to each other that a change in the position of the cut-off gear is effected quickly when the change in the position of the throttle valve is slow, and vice versa.

To enable others skilled in the art to use and construct my invention I will proceed to describe the same.

A, represents a steam cylinder and B is the valve-chest. On the top of the valve chest and in its center are the chambers C and D, containing the cut-off valve and the

throttle valve. The several valves are represented as vibrating once but the invention is equally applicable to slide valves or piston valves, and to other constructions of throttle valves besides the one represented in the drawings. The main valves E, E', are operated in the usual manner by cranks F, F', which are connected by a rod G, and are actuated from the eccentric. A bar I which is rigidly attached to the valve chest by standards J, J, forms the guide for the spindles *a*, *a'* of the main valves.

A short arm H, is attached to the spindle *a*, of the valve E' in an opposite direction to the crank F' from which a pin *b*, projects over which the bar K fits so that it can easily be lifted off and brought out of gear with the same. The bar K (which I denominate a radius bar) is connected to a link, N, which is pivoted or hinged at its other end to the arm L and likewise to the rod L', this rod being connected to the vibrating disk M by a pin *c*.

A forked lever or arm O is attached to the spindle of the cut off valve and a projecting boss on the link N plays within the crotch or fork of O, giving an intermittent vibrating motion to it when in the narrow part of the fork, but giving no motion to it when in the widest part, except to place the fork central to the throw of the radius bar longitudinally.

The arm P which is attached to the spindle *d'* of the throttle valve is connected to the vibrating disk M by means of a rod P' which is attached to the pin *c'* on the under face of the disk. The pins *c* and *c'* are nearly or quite at right angles to each other, and attached to the disk one at the under and the other at the upper face of the same so that the rods P' and L' may not interfere with each other.

The disk M, rotates on a pin *e* which extends from a standard Q and a worm-wheel R, is arranged on the same shaft so as to communicate its motion to the disk M by the friction produced between the faces of the worm wheel, and washers or collars on the disk, by means of a spiral spring *f*. The motion of the disk is limited by the pin *c'* striking against the standard Q in order that it shall not move farther either way than is required. The worm wheel R, derives its motion from a shaft *g*, which has a worm screw *h*, on one end gearing in the wheel R. The shaft *g''* has one of its bearings in the standard Q and the other in the frame S of

the governor T, and to its other end a disk *i*, is attached which is situated between the two flanges *j*, *j'*, of a sleeve V, which fits loosely over the spindle *k*, of the governor.

5 The governor is constructed in the usual manner; the spindle is hollow and a rod extends in its inside from the inner ends of the arms which support the balls and is pinned to the sleeve V so that the latter is depressed 10 when the balls rise, and is raised when the balls fall.

The operation is as follows:—When the governor is running below its proper speed the weight of the balls presses the lower 15 flange *j* of the sleeve V against the edge of the disk *i*, and rotates the same in one direction so that the worm wheel R is operated in the direction of arrow 1, and the link N is withdrawn from the crotch of the forked 20 lever O, and consequently the cut off is deferred till a longer period of the piston stroke or is not operated at all, as the case may be. At the same time the throttle valve is thrown wide open, or is moved consider- 25 ably more than open, so as that steam enough may be admitted to the cylinder to enable the engine to gather up its speed. If the speed of the governor be greater than is proper, the balls will cause the upper flange 30 *j'* to press against the face of the disk *i*, so that the worm wheel R, is moved in the direction of arrow 2, and the link N, is gradually brought toward the crotch of the forked lever O and the cut off is then 35 effected at a very early period of the piston stroke; and at the same time the throttle valve is closing, and will be entirely closed if necessary to check the speed of the engine. When the governor is running at its proper 40 speed the sleeve V is in such position as to run clear of the disk *i*, and consequently the cut off gear and throttle valve maintain their positions, and operate uniformly.

It will be seen that the motion given to 45 the throttle valve is very small when the vibrating disk M is situated as represented in Fig. 1, while at the same time the radius bar K is moved up rapidly toward the crotch of the forked lever, and the period of cut off 50 is shortened rapidly without closing the throttle valve to any considerable extent; while on the other hand when the disk is brought in such position that the pin *c* is near its highest position, the continued mo- 55 tion of the disk has but little effect on the movements of the cut off but at the same time the throttle valve is rapidly closed.

The circulation of the steam will be easily understood from Fig. 2, and it will be ob- 60 served that the openings of the cut-off valve are very narrow so as to secure quick opening and closing, and in order to admit steam enough three openings are used.

Having thus described my invention as 65 shown in the drawings I do not wish to be

understood as limiting myself to the precise arrangement or combination of parts as herein described but will vary them as cir- cumstances may require; while at the same time I accomplish the same ends by means 70 substantially the same; as for instance, a sliding plate valve or a piston valve may be used instead of the rotating valve herewith shown; and in that case if preferred a forked 75 arm may be attached to the rod which operates the cut off valve and the adjustable radius bar may be operated in the forked opening so as to give the cut off valve a simi- 80 lar varying intermittent motion as that herein described. Or the arrangement of the parts may be reversed; as for instance, plac- 85 ing the forked lever or arm on the rod or rock-shaft which operates the main valve of the engine, and communicating motion to the cut off valve therefrom through an ad- 90 justable radius bar similar to that herein described. And, if desired, the governor may be made to operate the cut-off and throttle adjustments by a direct attachment of rods and levers to the rotating disk or an 90 equivalent device, without the worm wheel arrangement.

What I claim as new and desire to secure by Letters Patent is:

1. Operating the cut off valve by means 95 of a forked arm or lever O which is actuated by means of an adjustable radius bar K, which derives its motion from the rock-shaft or from the eccentric which operates the main valves of the engine, the whole being 100 arranged substantially as described.

2. Adjusting the radius bar K by the vari- 105 ations of the speed of the governor by means of a rotating disk operated by a worm-wheel R said worm-wheel being in such relation to the governor that when the governor is run- 110 ning at its right speed no motion is communicated to the same; but when the governor runs either too fast or too slow, the worm wheel is turned in one direction or the 115 other, and the radius bar K is raised or lowered so that the cut off is effected sooner or later—the whole being arranged and con- 120 structed substantially as described.

3. Operating the throttle and cut-off valve 115 adjustments in combination in such manner that the throttle valve is moved slowly and is not closed to any considerable extent while at the same time the cut-off adjustment is 120 moved rapidly; and on the other hand when the cut off adjustment is in position for the shortest periods of admission of steam the movements of the throttle valve are the most rapid; the whole being accomplished in the manner substantially as described.

JOHN L. WHETSTONE.

Witnesses:

CHARLES F. WITACH,
H. H. SMITH.