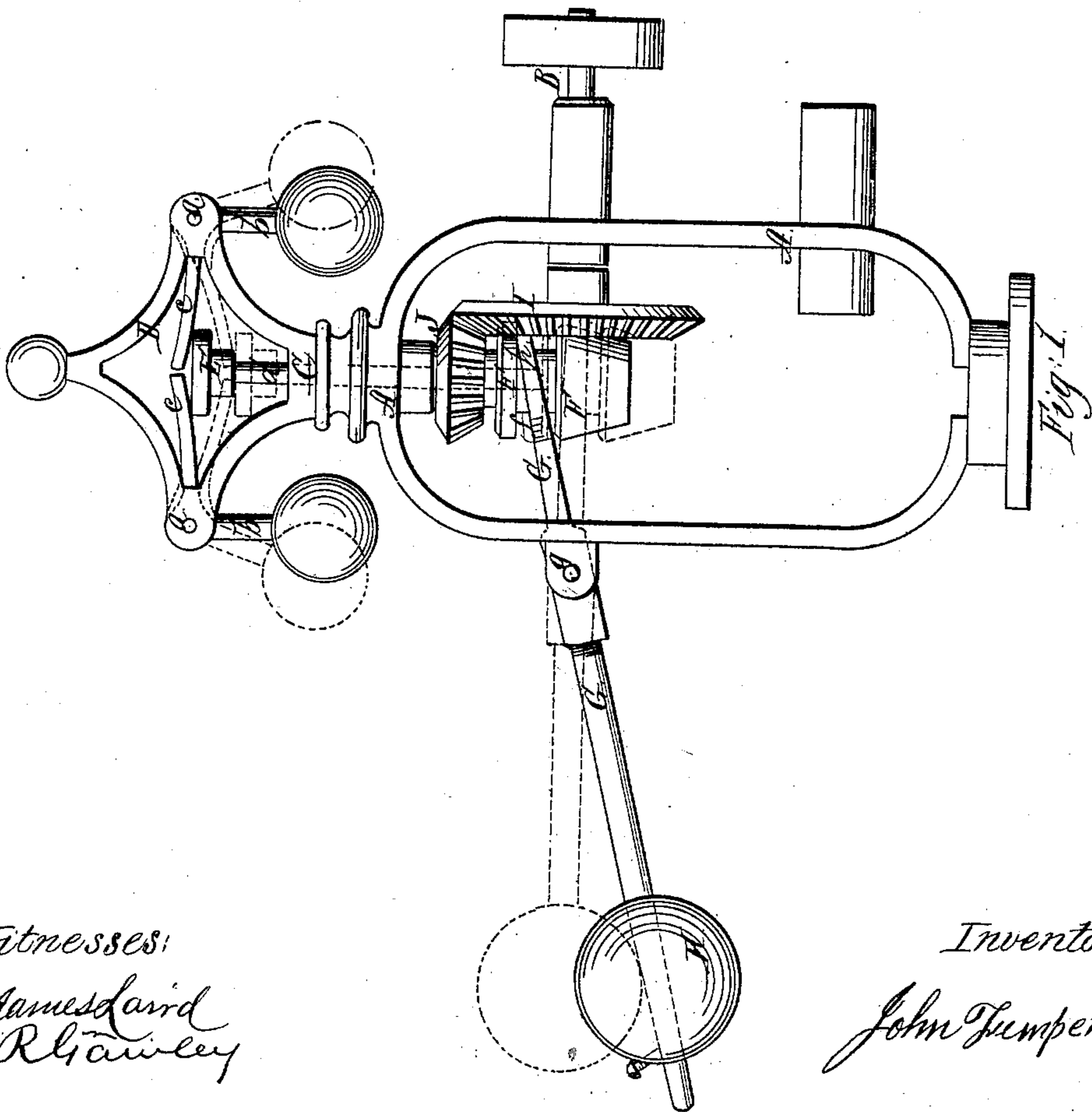
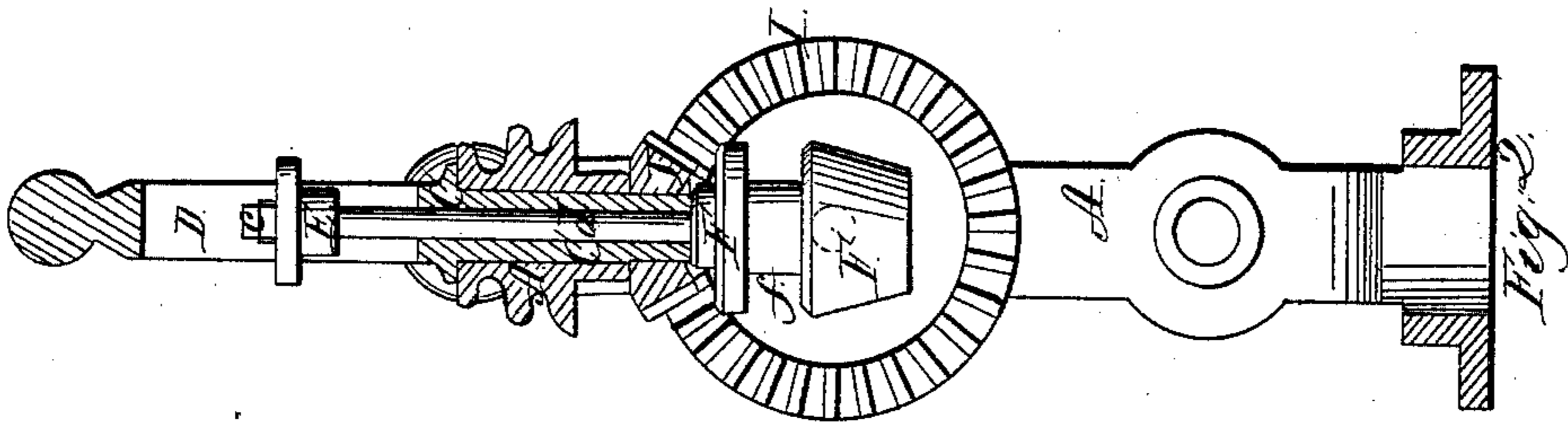


J. Tremper,
Governor.

No 37,064.

Patented Dec. 2, 1862.



Witnesses:

James Laird
Rawley

Inventor:

John Tremper

UNITED STATES PATENT OFFICE.

JOHN TREMPER, OF BUFFALO, NEW YORK.

IMPROVEMENT IN CENTRIFUGAL GOVERNORS.

Specification forming part of Letters Patent No. 37,064, dated December 2, 1862.

To all whom it may concern:

Be it known that I, JOHN TREMPER, of Buffalo, in the county of Erie and State of New York, have invented a new and useful Improvement in Centrifugal Governors; 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 is an elevation of a governor constructed according to my invention. Fig. 2 is a vertical section of the same at right angles to Fig. 1.

Similar letters of reference indicate corresponding parts in both figures.

The object of this invention is to so construct a centrifugal governor that it may be driven at any speed and increase or obtain power, according to the speed, in such ratio as to overcome friction; also, to enable the balls to be made small and effect the necessary movement of the valve by a very little motion toward and from the axis of revolution; also, to cause the governor to run at the same speed, whatever the position of the balls relative to the axis; and to these ends the invention consists in a certain novel mode of applying the balls, in combination with the spindle or axis of the governor, and with a weight or spring employed to act in opposition to the centrifugal force of the balls.

It further consists in a mode of combining the ball-arms with the rod or its equivalent, through which their action is made effective on the regulating-valve, that the said valve may be used as a stop-valve to stop the engine at any speed, and a separate stop-valve may be dispensed with.

To enable others to make and use my invention, I will proceed to describe its construction and operation.

A is the stationary frame which supports the several working parts of the governor, and contains the bearing for its driving-shaft B. C D is the spindle of the governor, having its upper part, D, extended in an open or closed form, to make it constitute a frame, at opposite ends of which are inserted the pins *a a*, by which the ball-arms *b c b c* are attached. This spindle is driven by bevel-gearing I J from the shaft B. The pins *a a* are arranged at

equal distances from the axis of the spindle C D, but being much farther from it than in any centrifugal governor I have previously known, so that when the governor is at rest the balls may hang vertically below the said pins, as shown in Fig. 1 in black outline, and yet be at a considerable distance from the spindle. By thus arranging the pins *a a* and allowing the balls to hang vertically below them the angle formed by the pendulous portions of the arms with the spindle is never great, and consequently no considerable portion of the centrifugal force of the balls is ever wasted on the pins *a a*, but all exerted effectually upon the valve. The ball-arms are made with a rectangular bend, and the suspending-pin *a* of each one inserted at the bend. The lower portions, *b b*, of the arms to which the balls are attached are made so much shorter than the corresponding portions of the arms of other governors, and the pins *a a* are set so far from the axis of revolution of the governor, that the upper portions of the arms, which are long enough nearly to reach the axis of the governor, are longer than the lower portions, taking the measurement of the latter to the centers of the balls. The balls are made much lighter than in an ordinary ball-governor, as their weight is not required to be sufficient to counterbalance the centrifugal force, a separate weight or spring being used for that purpose, as will be presently described.

d is the rod through which the governor operates upon the valve, running through the center of the lower part, C, of the spindle, which is bored to admit of its passage, and having its upper end, which enters the frame D, fitted with a broad headed cap, E, with the top of which the upper portions, *c c*, of the ball-arms are kept in contact by the balls. On the lower part of the said rod *d* there is secured a circumferentially-grooved collar, F, whose groove *f* receives within it the forked end of a lever, G, which is arranged to work on a fixed fulcrum, *g*, secured in one side of the frame A, and to the opposite end of the said lever there is attached a weight, H, which acts to raise the rod *d*, and thereby produce a greater or longer opening of the regulating valve or valves in opposition to the action of the centrifugal force of the balls, which makes

the arms *b c b c* act as levers to press down the said rod, and thereby produce a less or shorter opening of the said valve or valves. The portions *c c* of the arms being as long as or longer than the portions *b b*, the movement of the valve-operating or valve-controlling rod *d* is as great or greater than the movement of the balls toward and from the axis of revolution, and hence the governor effects its regulation very quickly. The under surfaces of the upper portions, *c c*, of the ball-arms are curved in such manner near their ends that as the balls fly outward with increasing centrifugal force the said surfaces bear at points nearer their ends upon the cap *E*, as will be understood by a comparison of the two positions of the governor illustrated in black and red outline in Fig. 1, and hence reduce the leverage of the balls upon the said rod, and the upper surface of the fork *h* of the lever *G* is so curved that as the rod *d* is depressed by the increasing centrifugal force of the balls the upper side of the groove *f* in the collar *F* is caused to come in contact with the said fork nearer to the fulcrum *g* of the lever *G*, and so reduce the effective length of the forked arm of the said lever. By thus forming the surfaces of the aforesaid portions of the ball-arms and of the upper side of the fork *h* the effect of the weight *H* is increased and diminished as the centrifugal force of the balls increases and diminishes, and, though the weight rises and falls with the increased or diminished centrifugal force, it may, by properly forming the aforesaid surfaces, be made to balance the centrifugal force in all positions of the balls, and hence the governor is equally sensitive to either an increased or diminished velocity, which is seldom or never the case with the ordinary ball-governor or any other by me known. A spring may be applied to the lever *G*, to serve the same purpose as the weight *H*.

By not connecting the arms with the valve-operating or valve-controlling rod, but applying them to merely press against the end of the said rod, the regulating-valve is enabled to be used as a stop-valve, all that is necessary

to make it shut off the steam being to raise the weighted end of the lever *G*, and thereby depress the said rod. This may be done by a person at any distant part of the building in which the engine is situated by arranging a cord connected with the lever *G* to run over a suitable series of pulleys.

I am aware that a weight has been applied in combination with the balls of a governor as a counterpoise to their centrifugal force, and that in the patent of C. T. Porter, No. 20,894, there is described a counterpoise applied to a lever in such manner that its effective load is lessened as the balls fly outward, which is precisely the reverse of the action of the weight in my governor. I therefore do not claim the application of a counterpoise attached to a lever; but

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

1. A steam-governor having vertical or nearly vertical ball-arms *b b*, and arms *c c*, horizontal or otherwise, acting upon the valve-controlling or valve actuating rod *d*, the arms *c c* being as long as or longer than the arms *b b*, and the whole so constructed and arranged as to avail the full centrifugal force of the balls when hanging in vertical or nearly vertical positions and impart to the rod *d* a motion at least equal in extent to that of the balls.

2. The rectangular or nearly rectangular ball-arms *b c b c*, and the loaded lever *G*, applied in combination with each other and in relation with the governor-spindle and valve-operating or valve-controlling rod *d*, substantially as herein specified.

3. So constructing the connections or surfaces of contact of the ball-arms, the valve-operating or valve-controlling rod, and the loaded lever that the effective load on the lever acting in opposition to the centrifugal force of the balls increases or diminishes, as the centrifugal force of the balls increases or diminishes, substantially as herein described.

JOHN TREMPER.

Witnesses:

JAMES LAIRD,
R. GAWLEY.