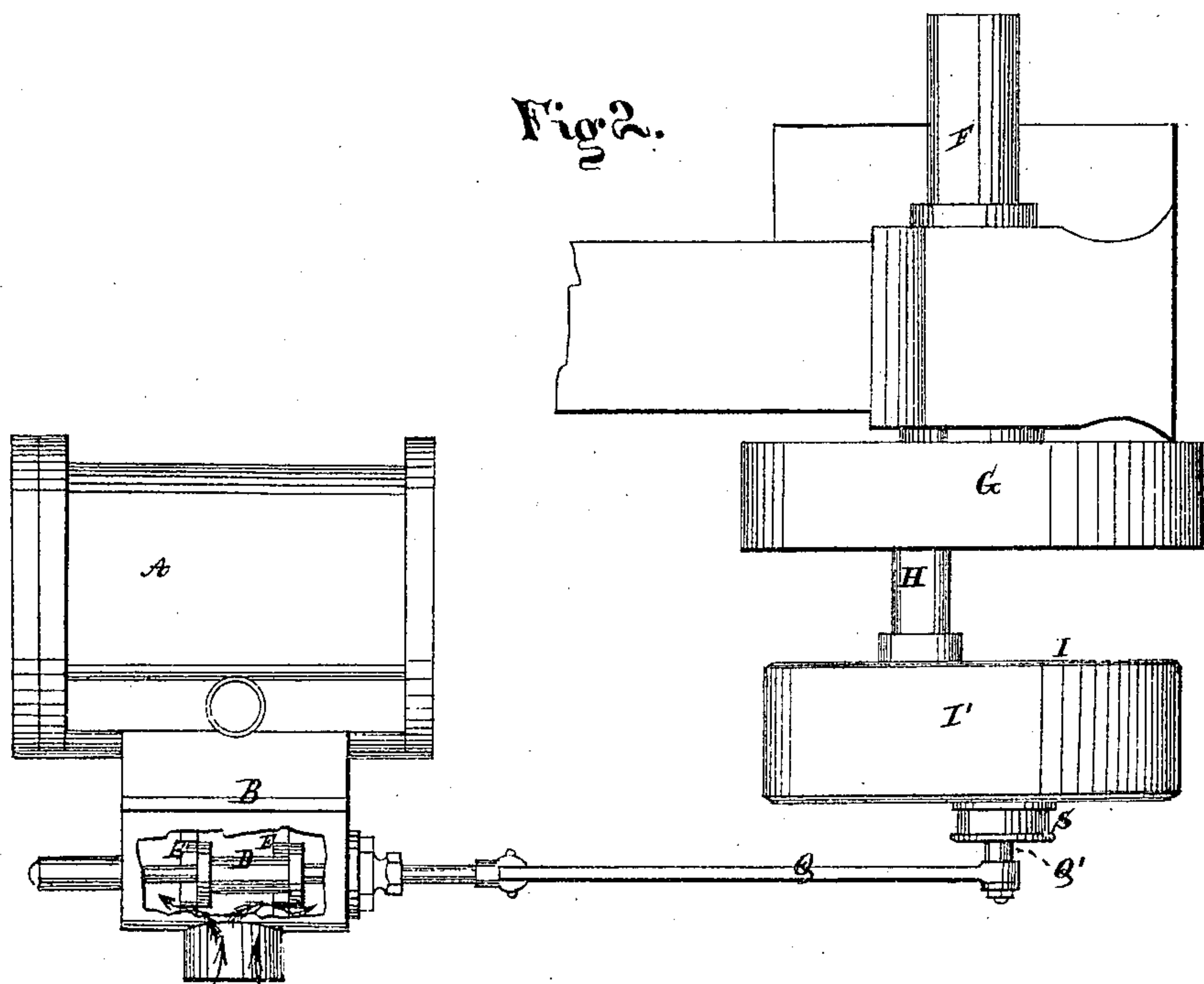
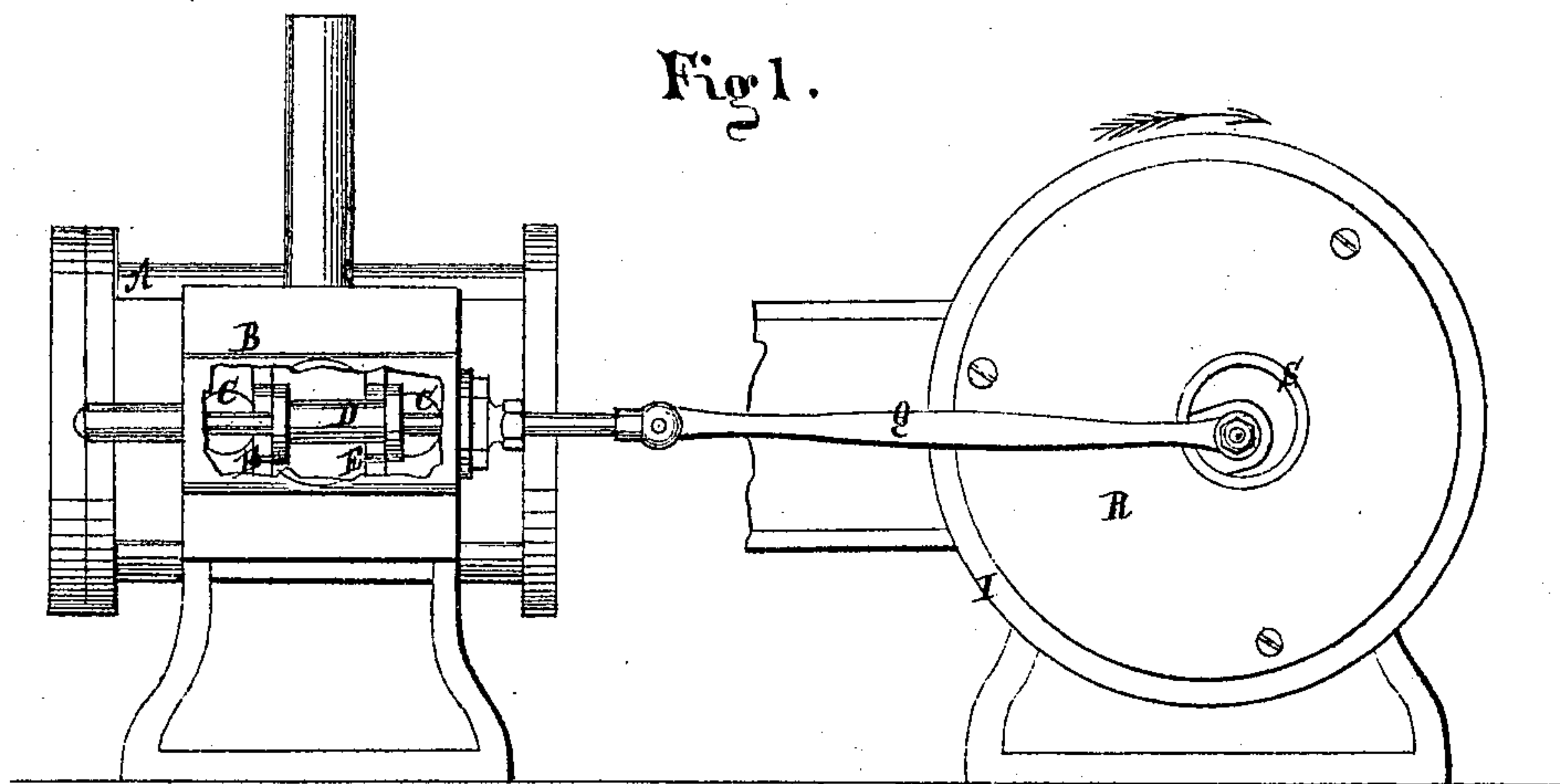


J. W. THOMPSON.

Improvement in Automatic Cut-Off Steam-Engine Governors.

No. 128,986.

Patented July 16, 1872.



Witnesses
J. H. Burridge.
R. C. Hobert.

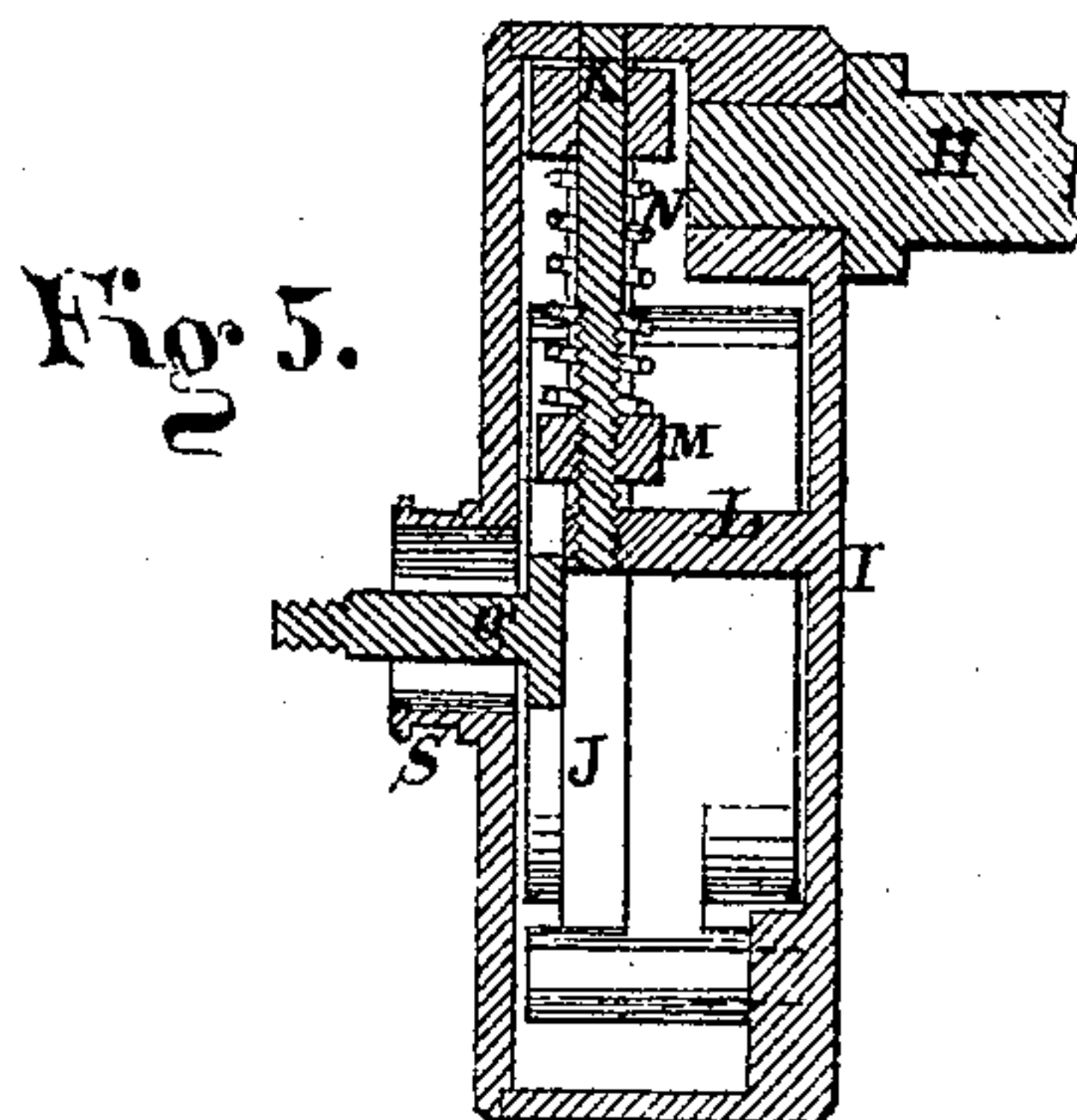
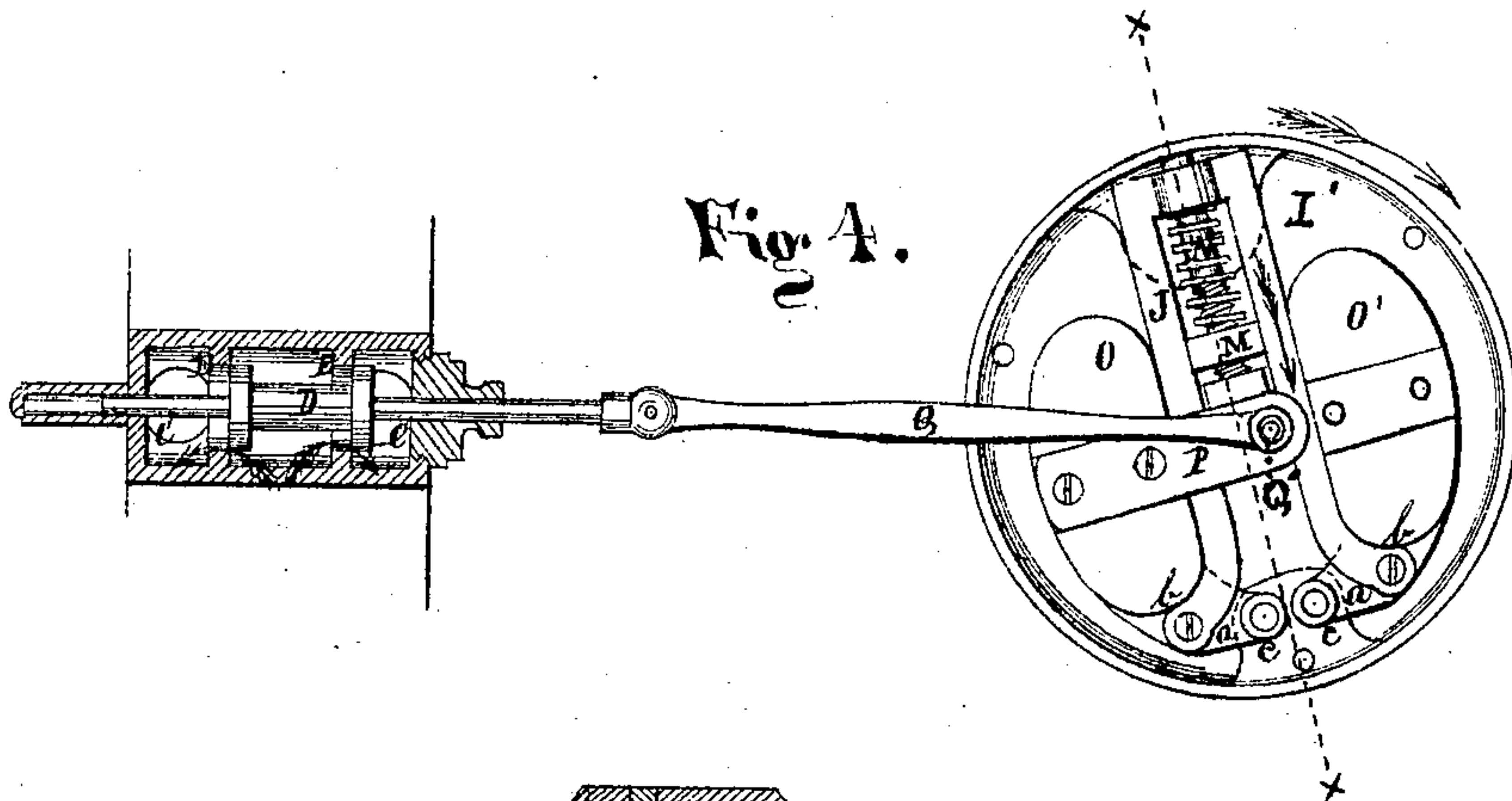
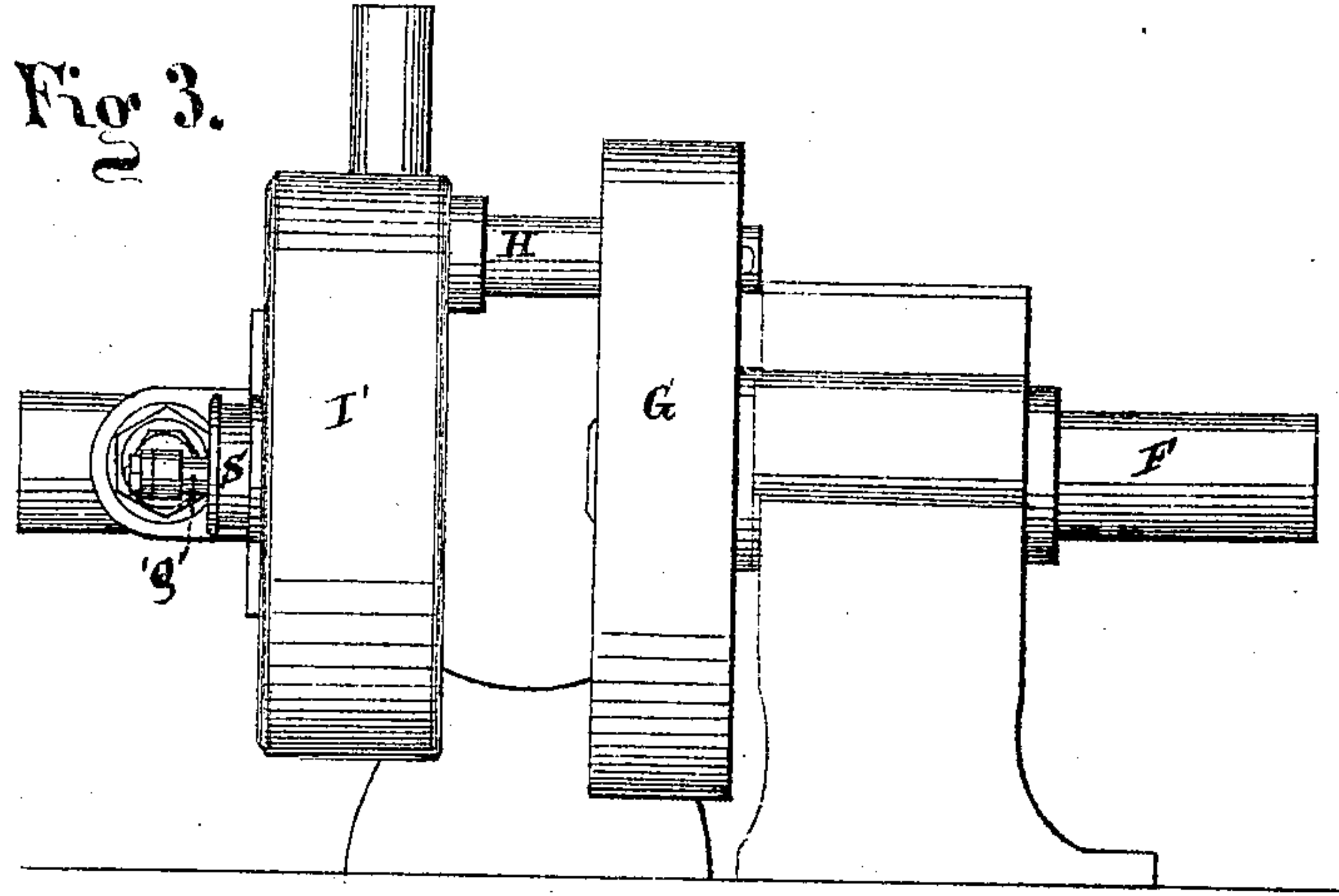
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UNITED STATES PATENT OFFICE.

JOSEPH W. THOMPSON, OF SALEM, OHIO.

IMPROVEMENT IN AUTOMATIC-CUT-OFF STEAM-ENGINE GOVERNORS.

Specification forming part of Letters Patent No. 128,986, dated July 16, 1872.

To all whom it may concern:

Be it known that I, JOSEPH W. THOMPSON, of Salem, in the county of Columbiana and State of Ohio, have invented a certain new and useful Improvement in Automatic-Cut-Off Steam-Engine Governor; and I do hereby declare that the following is a full, clear, and complete description thereof, reference being had to the accompanying drawing making part of the same.

Figure 1 is a side elevation of the engine cut-off and governor. Fig. 2 is a plan view, partly in section. Fig. 3 is a front elevation. Fig. 4 is a detached section. Fig. 5 is a transverse section of the cut-off and governor in direction of the line $x x$, Fig. 4.

Like letters of reference refer to like parts in the several views.

SPECIFICATION.

The nature of this invention relates to a governor for operating cut-off steam-valves, and which is of that class that automatically adjusts the point of cut-off—i. e., the point in the stroke of the piston at which the induction steam is cut off to allow the steam already admitted to do duty by expansion before it is exhausted—to the earliest point in the stroke of the piston at which the desired amount of power can be obtained from the engine, and which automatically changes that point whenever the exigencies of the case require it, making it later when the load is increased or the pressure falls, and vice versa. The construction of the governor is such that it acts as a crank to impart a reciprocating motion of a variable length of throw to a cut-off valve; said valve being so constructed as to admit steam to the cylinder during a portion of each extreme of its throw, and to cut it off during a certain portion of the middle of its throw, the same as is done by an ordinary slide-valve, and to which the governor may be applied.

The following is a more full and complete description of the governor and its operation in connection with the valve.

In the drawing, Fig. 1, A represents the cylinder of a steam-engine; B, the steam-chest. C C' are the openings for admitting steam from the cut-off valve-chamber into the steam-

chest, from which chest steam is admitted into the cylinder in the ordinary way. D is the cut-off valve, and E the seats thereof. Fig. 2 is a plan, partly in section, of the engine with the main shaft F having thereon the crank G, of which H is the crank-pin or wrist. To said pin or wrist is secured in a firm and rigid manner the governor I referred to, and which consists of the following devices, inclosed in the shell or case I', said case being secured near its periphery to the wrist, as shown in Figs. 2, 3, and 5, and in such relation to the internal mechanism as to be in the diametrical line $x x$, Fig. 4. Said internal mechanism consists of a yoke, J, the union end of which is retained in position by an adjusting-screw or guide-rod, K, Fig. 5, passing through it, and on which said yoke slides. The outer end of the guide-rod is secured in the rim of the case, whereas the inner end is secured in a stay, L. Around the rod, between the end of the yoke and tension-nut M, is a spring, N, the purpose of which will presently be shown. The open ends of the yoke referred to are each pivoted to a neck, a , of the weights O O', Fig. 4, at the points o , and said necks are each pivoted to the case at the points c . Pivoting the weights to the case permits of their being moved outwardly, and in this outward movement the yoke at the same time is drawn in direction of the arrow by virtue of its pivotal attachment to the necks of the weights, but which is returned by the resiliency of the spring N. To the weight O is secured a plate, P, to the inner end of which is attached the valve-rod Q by a pin, Q'. It will be observed, on examination of Fig. 4, that the point of attachment of the rod Q to the plate is eccentric to the axial line of the case and main shaft; the amount of eccentricity being equal to the throw of the valve D and whereby the valve is operated. R, Fig. 1, is a disk covering the face of the case. To said disk is secured a large hollow wrist or crank pin, S, Fig. 2. Said wrist is also eccentric to the axial line of the case and shaft, and which is in fact the eccentric for operating the slide-valve. Through said hollow wrist passes the pin Q', above referred to, with room for lateral movement independent of the wrist, as shown in Fig. 5. It will be observed that the pin Q'

is eccentric in its relation to the hollow wrist, (though having an isochronous rotation therewith.)

Having described the construction and arrangement of the governor, the practical operation of the same is as follows: The position of the hollow wrist S, as shown in Fig. 1 in its relation to the slide-valve which it operates, is such as to lead and work the valve at the proper time to admit steam into the cylinder at the regular stroke of the piston during its ordinary movement, and the position of the pin Q', to which the cut-off valve D is attached by the rod Q, as shown in the drawing, is such in its relation to the cut-off valve as to allow a free admission of steam when the motion of the engine is not great enough to actuate the mechanism of the governor, at which slow movement of the engine the cut-off and governor are at rest so far as it affects the induction of steam. An increased movement of the engine produces a corresponding speed in the revolution of the case or governor I. This accelerated speed of the case or governor I impels the weights O O' toward the periphery of the case by virtue of its acquired centrifugal force. This movement of the weights actuates the yoke, as above described, and by the action of which, at the same time, changes the position of the pin Q' in its eccentric relation to the axial line of rotation, bringing the pin Q' more or less near said line, as the speed of the engine or the centrifugal force may be. This change effected in the position of the pin Q' shortens the throw of the valve D, which will prevent or cut off a corresponding amount of steam from passing through the valve, as indicated by the arrows, Figs. 1 and 2. This expansion of the weights shortens the throw of the valve and their contraction lengthens it; at the same time the angular advance of the wrist Q' is so changed as to preserve a uniform point of induction at whatever point the cut-off is effected. By this means the admission of steam into the steam-chest through the valve D is automatically regulated by the centrifugal force of the governor and the resiliency of the spring N, which is highly sensitive to every change of resistance or of steam pressure, and having great steadiness of motion and freedom from the vibratory irregularity so common to the ordinary governors, owing to causes inherent in their construction and not from any change of load or pressure of steam. In the drawing, a circular form of cut-off valve is shown. This perhaps is the best form of valve for this purpose; however this form is not a necessary one, as any valve having a reciprocating, oscillating, or an equivalent movement may be made to admit and

cut off steam, as above described, and which will fulfill all the conditions required by the governor.

By means of the tension-nut M referred to, and which is actuated by turning the adjusting-screw from the outside, the power of the spring N can be increased or lessened, and thereby cause the inertia of the weights O O' to be more or less sensitive to the centrifugal force of the governor, and by such means regulate the initial movement of the cut-off valve; thus the speed or motion of the engine is regulated.

When the parts are adjusted as shown the engine will run in the direction indicated by the arrows in Figs. 1 and 4. When it is desired to run the engine in a reverse direction, the plate P is attached to the weight O' instead of O, while a corresponding change in the position of the hollow wrist S is effected by turning the disk R around until the proper position is reached, when it is firmly secured.

Claims.

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

1. The yoke J and spring N in combination with the weights O O', reversible plate P, and pin Q', substantially in the manner as and for the purpose set forth.

2. The yoke J, spring N, weights O O', plate P, and pin Q', as arranged in relation to and in combination with the valve D, in the manner as and for the purpose specified.

3. The weights O O', plate P, pin Q', yoke J, spring N, case I, and hollow wrist S in combination with the crank G, as and for the purpose set forth.

4. Hollow wrist S and pin Q', as arranged in relation to each other, in the manner substantially as described, and for the purpose specified.

5. The spring N, adjusting-screw or guide-rod R, and tension-nut M in combination with the yoke J, in the manner as and for the purpose set forth.

6. The pivoted weights O O' in connection with the pin Q', when arranged in such co-relation to each other as to operate conjointly, substantially as and for the purpose set forth.

7. The governor revolving isochronously with the engine-crank, and so arranged that it will impart a variable reciprocating movement to a cut-off valve by means of the pin Q', weights O O', and yokes, substantially as and for the purpose set forth.

JOSEPH W. THOMPSON.

Witnesses:

W. H. BURRIDGE,
J. H. BURRIDGE.