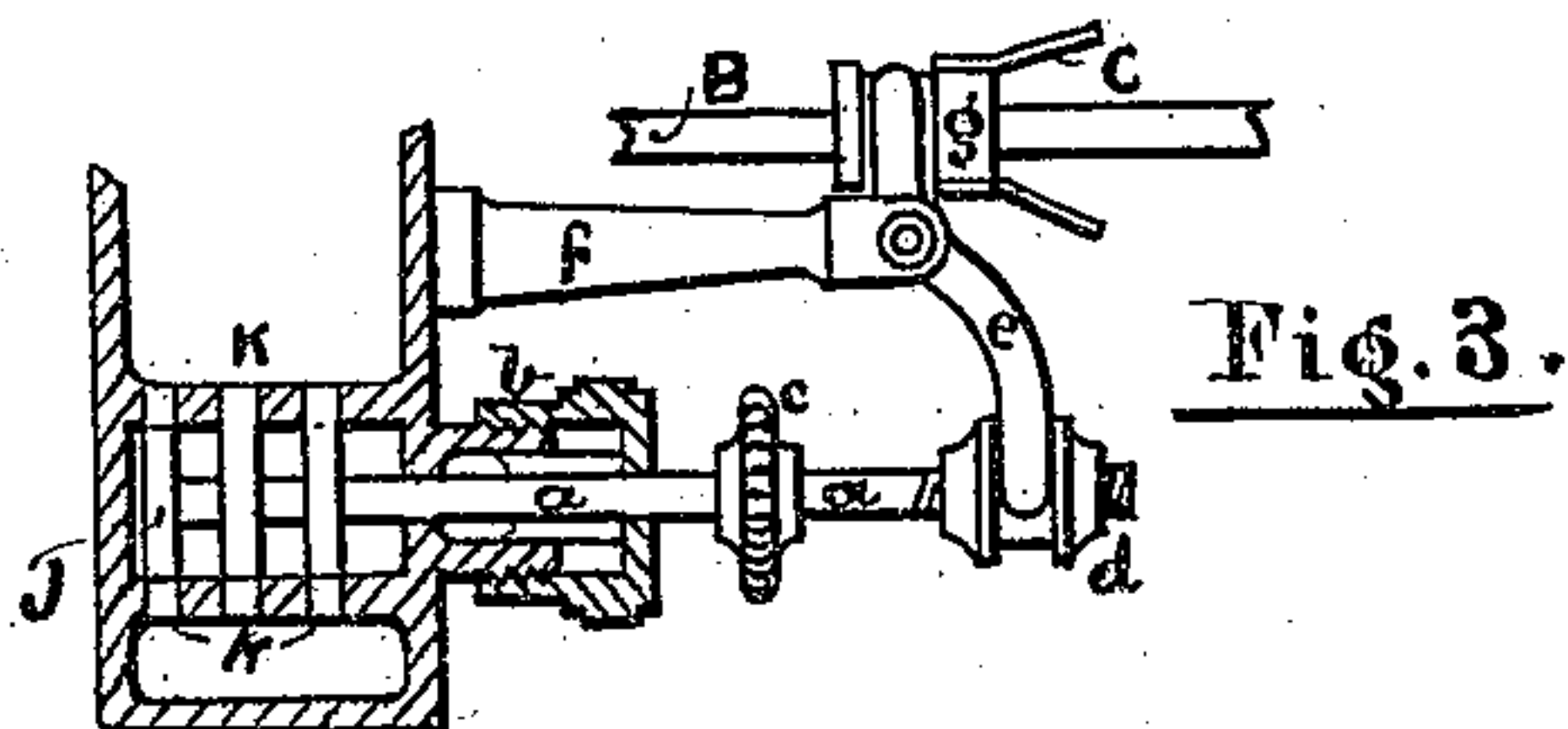
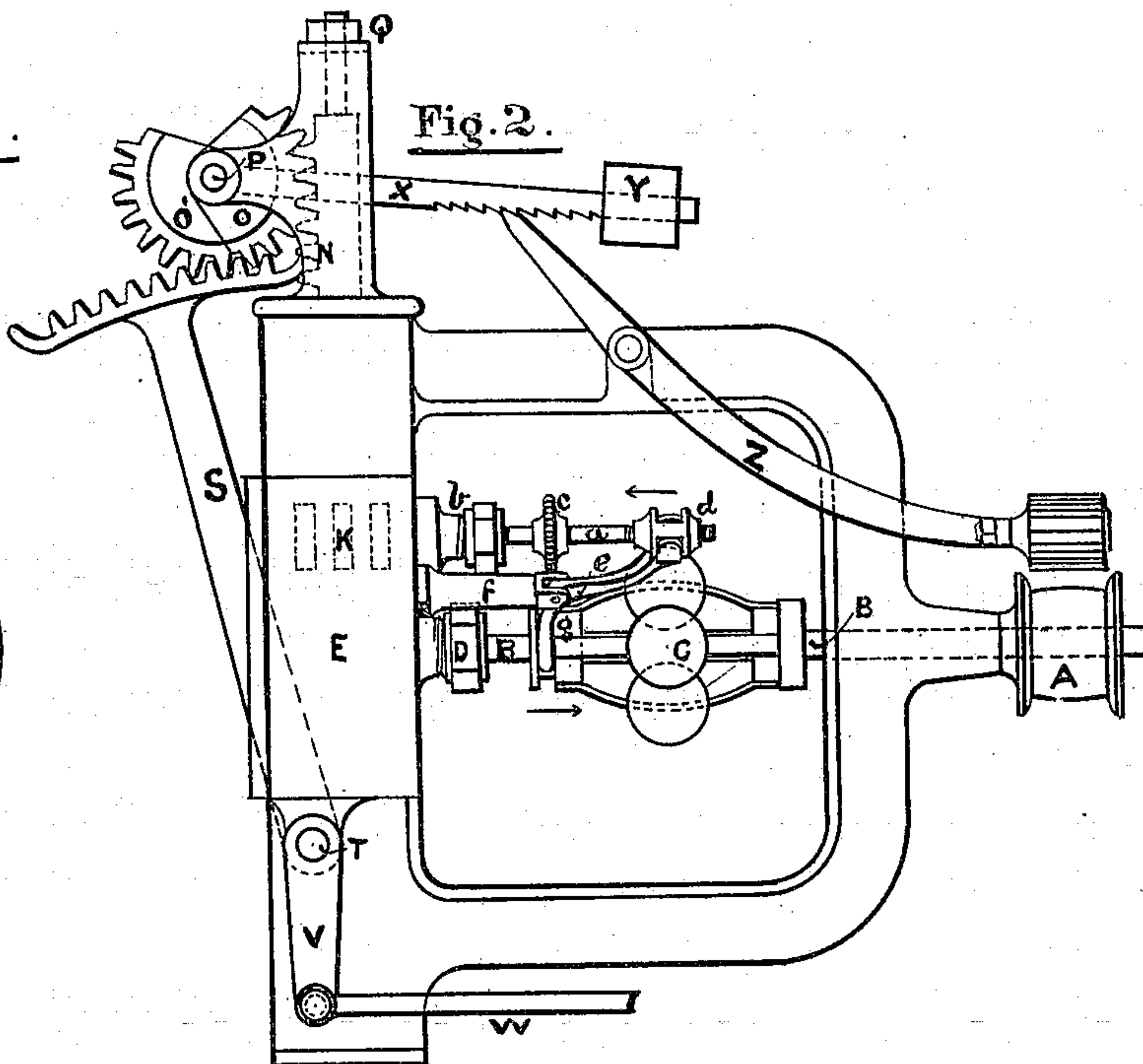
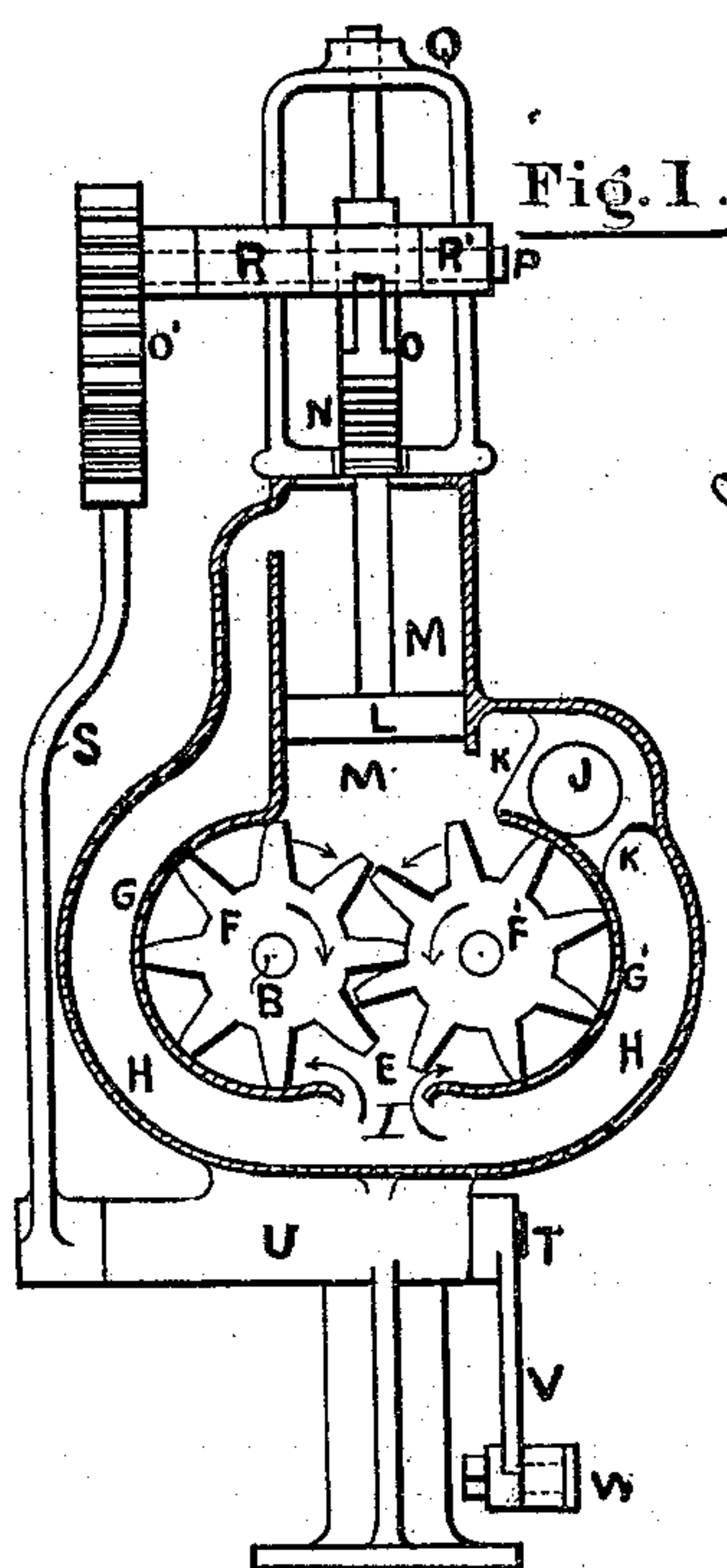


W. H. CRAIG.
Governor for Steam-Engines.

No. 202,332.

Patented April 16, 1878.



Witnesses

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WARREN H. CRAIG, OF SAN FRANCISCO, CALIFORNIA.

IMPROVEMENT IN GOVERNORS FOR STEAM-ENGINES.

Specification forming part of Letters Patent No. 202,332, dated April 16, 1878; application filed July 3, 1877.

To all whom it may concern:

Be it known that I, WARREN H. CRAIG, of the city and county of San Francisco, State of California, have invented an Improved Governor for Steam-Engines, of which the following is a specification:

The object of my invention is to provide a regulator for steam-engines which shall be more powerful in its action than those commonly used, while excelling in that sensitiveness and quickness of operation necessary to perfect action, thus rendering my improved governor specially adapted to operating sliding and other cut-off valves, both balanced and unbalanced, as well as throttle or governor valves requiring much power to move them.

My invention is illustrated in the accompanying drawings, in which—

Figure 1 is a sectional elevation, Fig. 2 is a side view, and Fig. 3 is a detached detail, of the valve below described.

Like letters of reference refer to like parts in all figures.

Referring to the drawings, A is the pulley, which receives motion from the engine-shaft. It is secured on the shaft or spindle B. This spindle carries an ordinary spring-and-ball governor, C, of any of the numerous patterns suitable. The spindle B passes through the stuffing-box D into the chamber E, which is filled with oil and contains the toothed wheels F F'. One of these toothed wheels is secured on the end of the spindle B, while the other toothed wheel revolves upon a short spindle having its bearings within the chamber E. These toothed wheels engage with each other, and have closely-fitting curbs G G' a little over half-way around their circumference. Between these curbs and the outer shell of the chamber a passage-way, H, is formed, which passage-way communicates with an opening, I, below the toothed wheels, and leads through the valve-ports K to the space in the chamber above and between the wheels and the piston L. The passage-way H also communicates to the space above the piston in the vertical cylinder M.

J, Fig. 3, is the valve which opens and closes the passage H. It is simply a series of collars attached to the stem *a*, the collars being a little wider than the ports they cover. The

stem *a* passes through the stuffing-box *b*, and has an adjusting-nut, *c*, by which it may be turned around and screwed in or out of the collar *d*, which takes the forked end of the lever *e*. Thus the valve is adjusted in relation to the ports. The lever *e* vibrates on a fulcrum-pin supported between the jaws of the fulcrum-post *f*, transmitting motion from the sliding collar *g* of the ball-governor to the valve J, so that when the sliding collar *g* moves in the direction of the arrow-points, as shown in Fig. 2, the valve is moved in the opposite direction.

At about the middle of the piston-rod is a toothed rack, N, which engages with the segment of a gear-wheel, O, on the horizontal cross-shaft P. The upper end of the piston-rod passes through the guide Q. The horizontal cross-shaft is supported in bearings R R', and there is a segment-gear, O', fitted on its end, this segment-gear engaging with the segment-gear formed on the end of the lever S. The lever S is secured on one end of the horizontal shaft T, which rests in the bearing U. On the opposite end of this shaft is the lever V, which, in vibrating, moves the valve regulating the supply of steam to the engine, the rod W making the connection thereto.

X is a lever, having a weight, Y, sliding upon it, secured to and radiating from the axis of the shaft P. This is used as a means of adjusting the degree of resistance the piston shall offer to the pressure below it; also, it insures the return of the piston when the pressure is withdrawn.

Z is a lever, having a pulley, which rests on the driving-belt, secured on one end. The other end engages in the notches of the lever X, so that when the driving-belt of the governor breaks the pulley on the lever Z, losing its support, will fall. The opposite end of the lever will then fly upward, carrying the lever X with it, and thus effect a shutting off of the steam. It may, however, be so arranged, by the adjustment of the weight Y, that the lever X will be the heavier, and, instead of the lever X being thrown up and the steam shut off, it will simply be checked from falling, and the steam will be held at just the point of supply it had at the moment the belt broke.

The operation is as follows: Motion being

given to the spindle B, the ball-governor revolves, as also do the toothed wheels F F'. When the engine moves at its proper speed the ball-governor holds the valve J open just sufficiently to allow a free passage back to the oil raised by the toothed wheels from below. Thus an unobstructed circulation of oil occurs, and the engine moves at even speed.

Now, if the engine moves faster, the ball-governor flies out, and the valve J is partly closed, the passage H is obstructed, and the oil pumped up from below will accumulate between the piston L and the toothed wheels F F'. A pressure will immediately occur, and the piston will rise in its cylinder, and, through the intermediate connections, close the valve supplying steam or correspondingly affect the cut-off valve, as the case may be.

Should the engine move slower than the regular speed, a contrary action takes place, and more steam is given.

I am aware of governors operating to control the engine by pumping fluid into a chamber containing a piston, which, in rising and falling, by the increased or decreased pressure below it, due to the speed of the pump's action, affects the throttle-valve or cut-off valve, as the case may be. Still I know of none having the combined parts as herein described.

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

1. In combination with a rotary pump governor, as herein described, consisting of the gears F F', with their spindles, chambers, and passages, chamber M and piston L, valve J and ports K, the governor C, secured upon the main spindle B, connecting with and operating the valve J to effect a contraction or enlargement of the passage-way through which the fluid is forced by the pump, as and for the purpose described.

2. In combination with the rotary pump governor herein described, consisting of the gears F F', with their spindles, chambers, and passages, chamber M and piston L, valve J and ports K, the toothed rack N, segment-gears O O', cross-shaft P, with its bearings R R', lever S, with its segment-gear, horizontal shaft T, bearing U, and lever V, as and for the purpose described.

3. In combination with the notched lever X and weight Y, secured on the shaft P, the swinging lever Z, with its attached pulley, resting on the driving-belt, arranged and operating as and for the purpose described.

WARREN H. CRAIG.

Witnesses:

J. K. FIRTH,
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