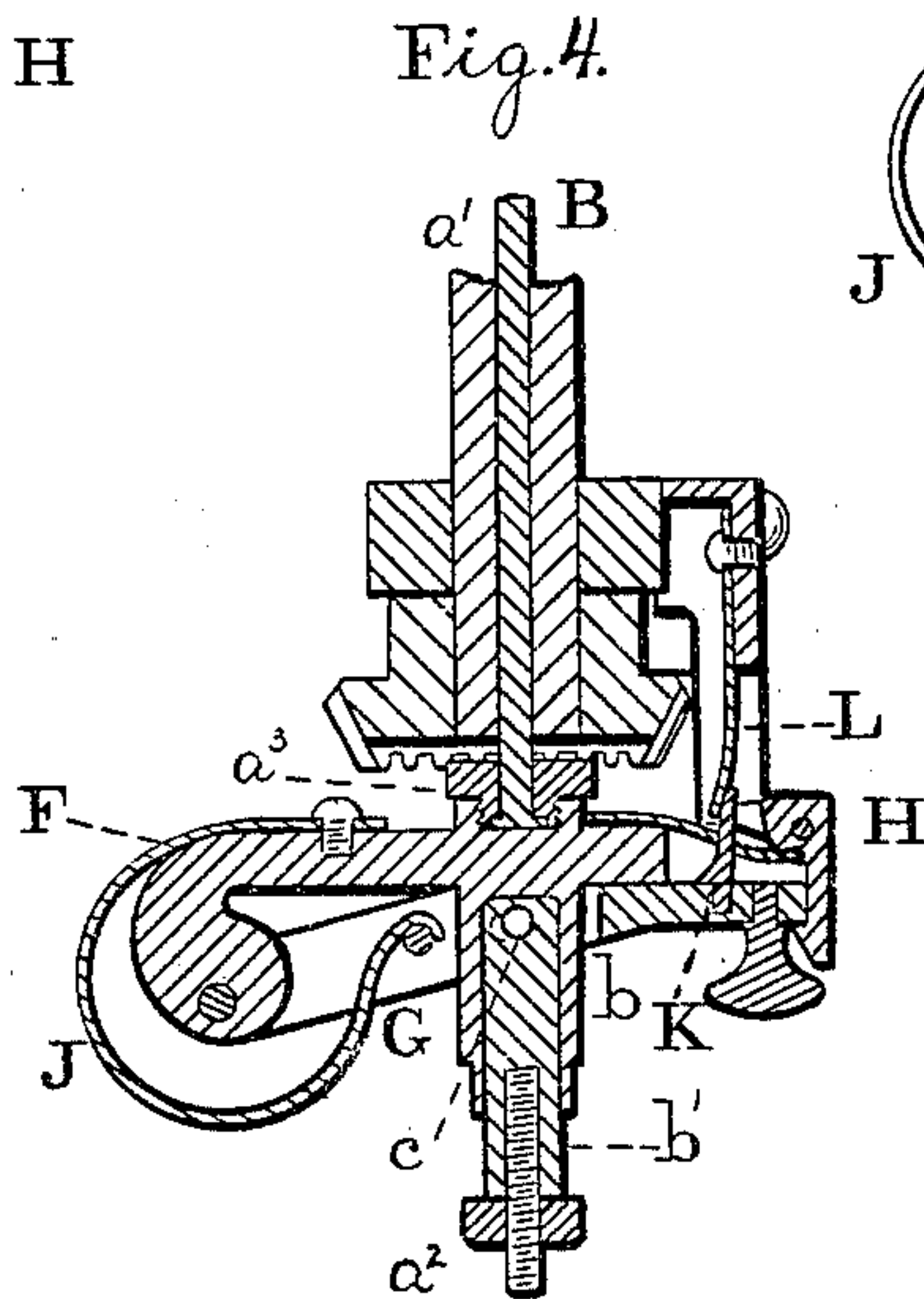
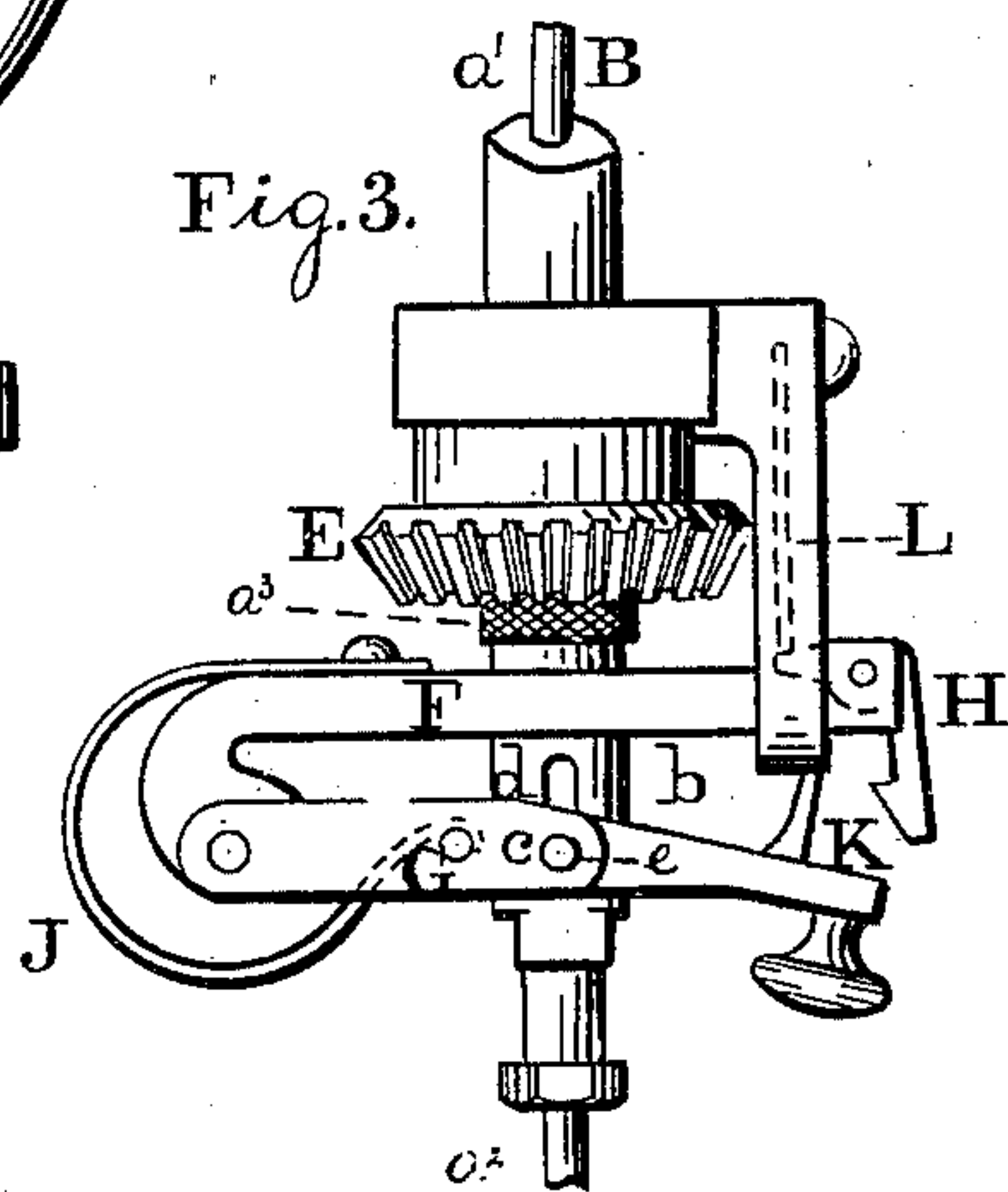
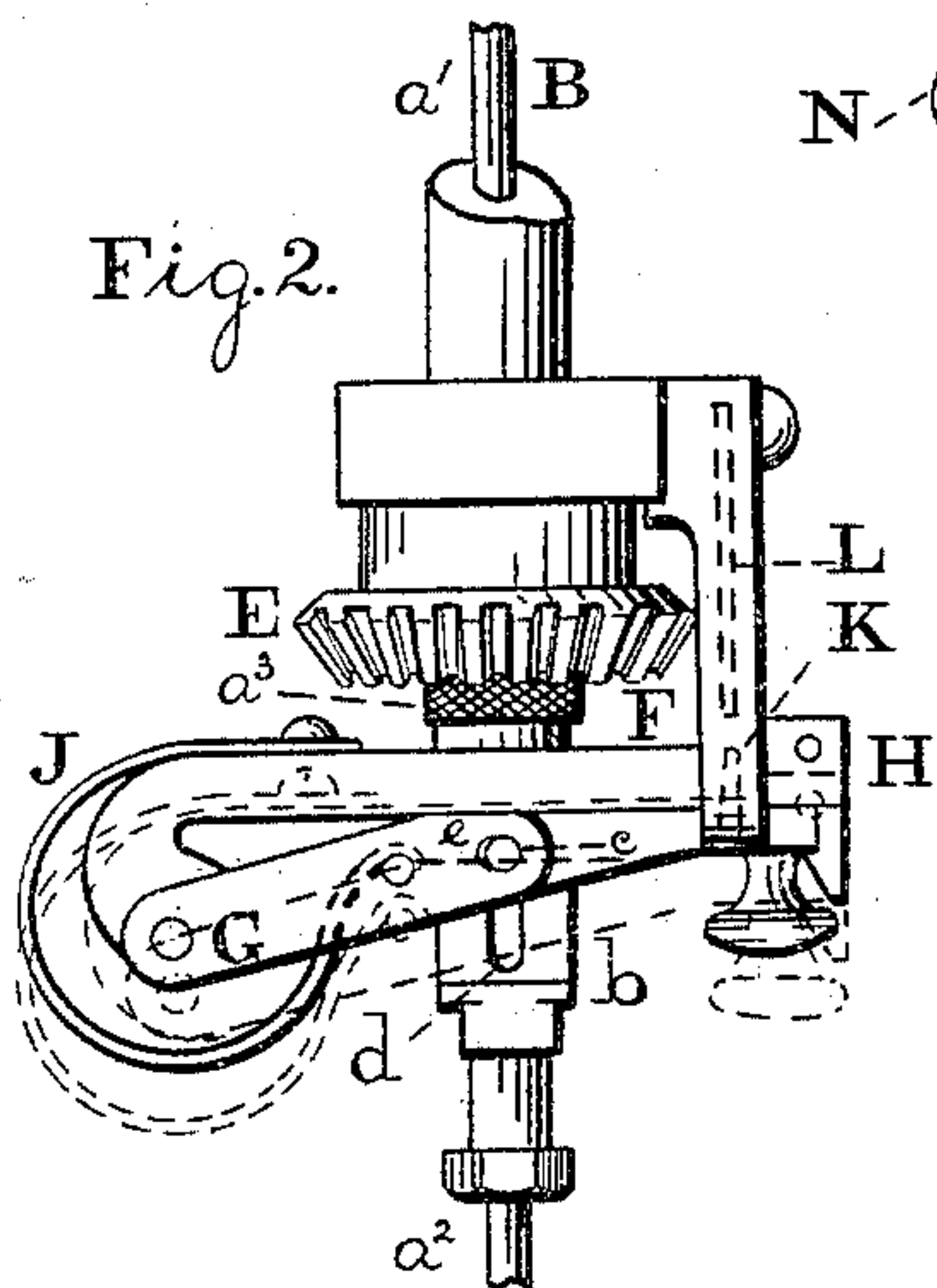
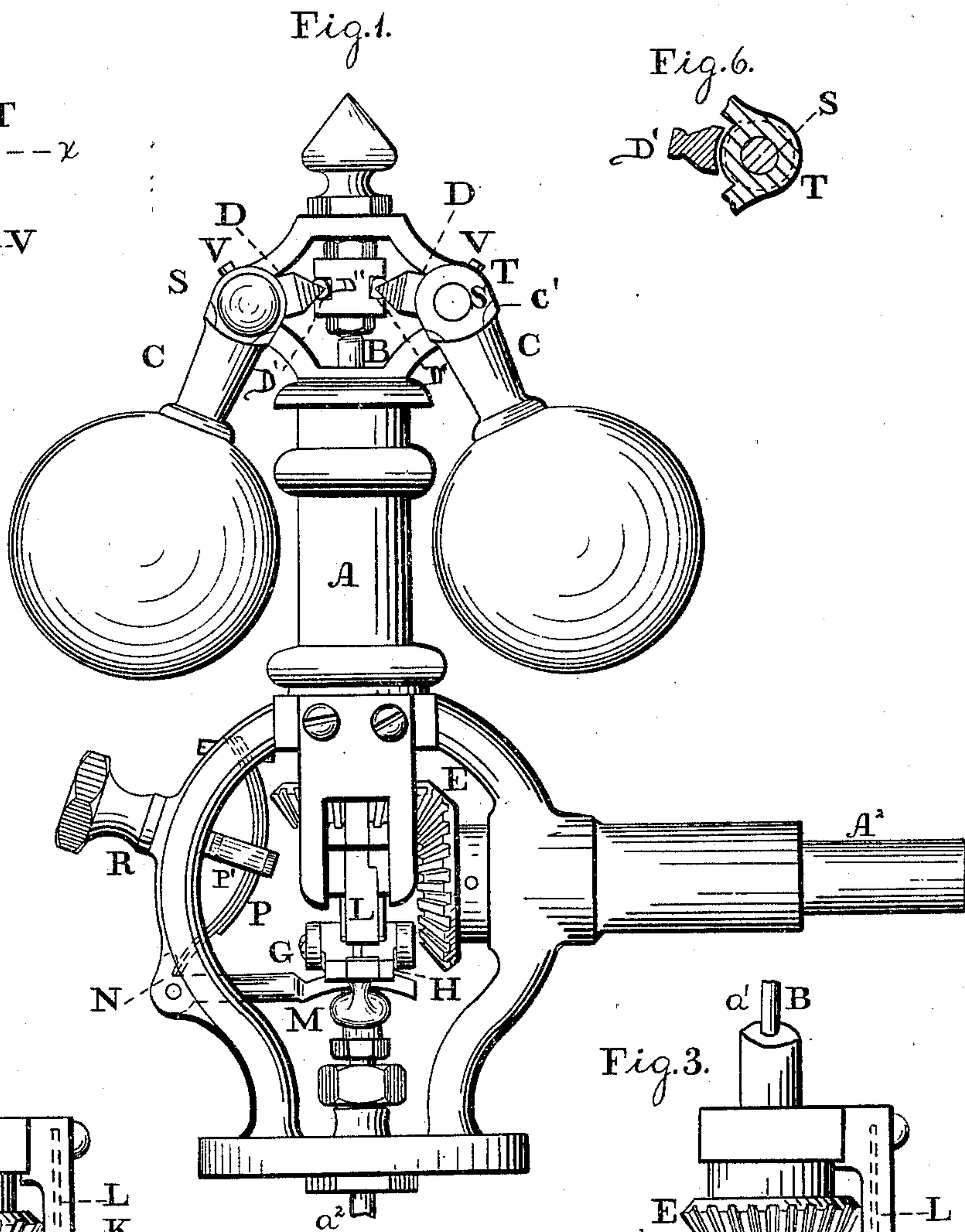
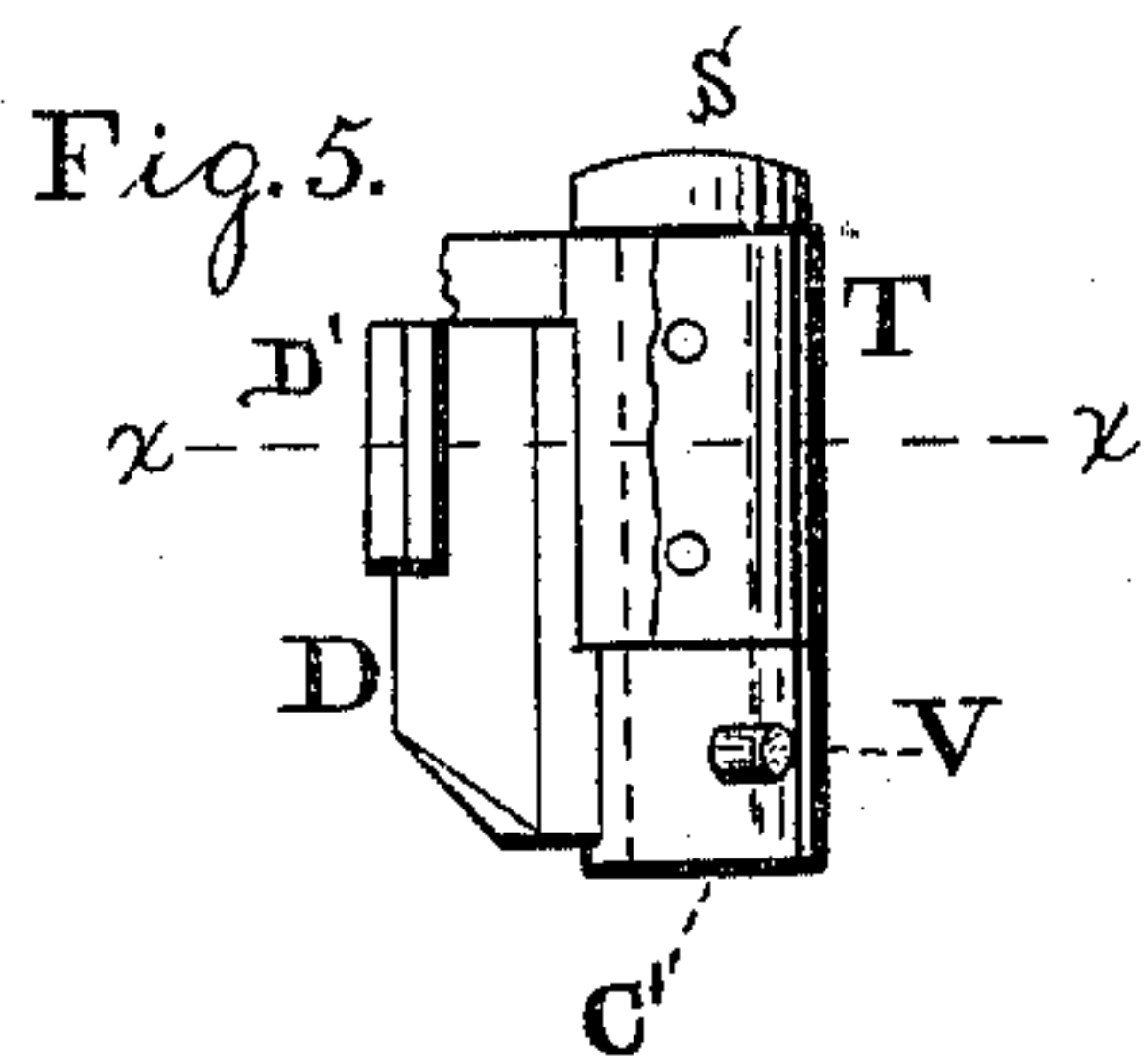


GOVERNORS FOR STEAM-ENGINES.

Patented April 18, 1876.



Witnesses:

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# UNITED STATES PATENT OFFICE.

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## IMPROVEMENT IN GOVERNORS FOR STEAM-ENGINES.

Specification forming part of Letters Patent No. **176,205**, dated April 18, 1876; application filed  
April 13, 1875.

*To all whom it may concern :*

Be it known that I, DAVID SHIVE, of the city and county of Philadelphia and State of Pennsylvania, have invented a new and useful Improvement in Governors; and I do hereby declare the following to be a clear and exact description of the nature thereof, sufficient to enable others skilled in the art to which my invention appertains to fully understand, make, and use the same, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 is a side elevation of the device embodying my invention. Figs. 2 and 3 are side views, enlarged, of a detached portion in different positions. Fig. 4 is a central longitudinal vertical section of the parts of Fig. 2. Fig. 5 is a plan view of the arms of the pendulum which act on the spindle. Fig. 6 is a transverse vertical section thereof in line *x x*.

Similar letters of reference indicate corresponding parts in the several figures.

My invention consists in a safety-check, whereby the valve automatically closes when the governor stops, or is disconnected by the displacement or breaking of the driving-belt, gear-wheels, or other parts. The stem of the valve is formed in two parts, and to the upper part there is connected a fixed arm, which carries a latch, with which engages an oscillating arm, which is connected to the lower part of the stem and jointed to the fixed arm. Attached to the standard of the governor is a downwardly-projecting finger, which serves to operate the latch, so as to release the oscillating arm. A guard is provided for preventing the finger acting inopportunely on the latch.

The invention also consists in a regulating device, whereby the governor may be adjusted to allow the engine to run at any desired speed. A lever is pivoted to the standard and bears against the valve-stem. A spring is connected to the standard, and, bearing against the lever, is regulated by a screw.

The invention also consists in the construction of the pendulum-arms, and the arms which act on the spindle, whereby said arms are greatly strengthened, and loose connec-

tions are prevented, each pendulum or pendulum-arm being arranged at an angle of forty-five degrees from the radial.

Referring to the drawings, A represents the frame or standard of the governor; B, the spindle or stem; C, the pendulums; D, the arms through which the pendulums act on the spindle, and E the gearing by means of which, and the shaft  $A^2$ , the governor is connected to the engine. The spindle or stem B is formed into two parts, of which one part,  $a^1$ , is connected to the pendulums C, and the other part,  $a^2$ , to the governor-valve. F represents an arm, which, by means of a nut or other fastening,  $a^3$ , is fixed to the lower end of the upper part  $a^1$  of the stem, and to said arm is jointed an oscillating arm, G, which is forked to pass around a socket, *b*, depending from the arm F. In the socket *b* is fitted a sliding piece,  $b'$ , to which the upper end of the lower part  $a^2$  of the stem is secured. A pin, *c*, is fixed to the sliding piece  $b'$ , and, projecting through vertical slots *d*, formed in the socket *b*, passes through slots *e*, in the oscillating arm G on said piece  $b'$ , is thus connected to the arm G, and slides freely in the socket, due to the motions of said arm G. The free end of the arm F has attached to it a spring-latch, H, which is angular or L-shaped, and its lower limb is adapted to engage with the free end of the arm G, and hold the latter elevated. A spring, J, is suitably arranged and connected to force down the said arm G when released from the catch or latch H. It is obvious that according as the arms F G are opened or closed, the valve-stem is lengthened or shortened. From the arm G there projects upwardly an inclined or tapering piece or guard, K, which is so located that when the arm G is elevated toward the arm F said guard will pass through a slot in the arm F and come in proximity to the upper limb of the latch H. L represents a spring-finger, which is attached to the standard over the latch H, and adapted to come behind the guard K, or against the top of the upper limb of the latch H, as will be stated.

In a governor, as ordinarily constructed, the pendulum and valve are so connected that the



distance between the points of connection cannot be varied. Hence, it follows that the valve must be open when the balls are down, and closed as the balls fly up. This action of the governor is perfectly satisfactory so long as there is no derangement of the governor, or the driving mechanism or devices. If, however, the driving-belt or gear-wheels should be broken or displaced, or from any cause the governor should be disconnected from the engine, the valve is opened to its full extent, and the engine immediately "runs away," and in some cases serious accidents occur. This is, however, prevented by my safety-check, which automatically closes the valve in the event that the governor is disconnected during the working of the engine.

The adjustment or setting of the check is performed prior to the starting of the engine, the engineer raising the arm G, so that it is locked to the arm F by means of the latch H. In this raising movement the guard K reaches the lower portion of the finger L, and forces it behind said guard, so that the latch H is clear of said finger, as in Fig. 4. When the engine is started and the pendulum-balls have been thrown out to their ordinary working position, or nearly so, then the guard descends with the arms F G, due to the lowering of the spindle, and is disengaged from the finger L, the latter then assuming a position over the latch H, but not in contact therewith. The valve will now act similarly to the valve of an ordinary governor, and be opened and closed, due to the motions of the balls. If, however, the balls drop to their lowest position due to disarrangement or disengagement, as has been stated, the ascent of the spindle raises the arms F G, and brings the upper limb of the latch H against the finger L, thus throwing out or tripping the latch H, which immediately releases the arm G and disengages it from the arm F. The descent of the arm lowers the part  $a^2$  of the spindle, and frees the valve from control of the governor, and thus also closes the valve, whereby steam is shut off and the engine stopped. M represents a lever, one end of which is jointed to the standard A, and the other end bears against a shoulder on the valve-stem. A shoulder, N, is formed on the lever near its fulcrum end, and bearing against the same is a spring, P, whose tension and consequent action on the lever M is regulated by a screw, R, which is fitted to the standard. The spring P has one end connected to the standard A, and its other end bears against the shoulder N of the lever M. A yoke, P', is connected to the screw R and attached to the spring P, so that the latter may be made to bear stronger or lighter on the lever M, whereby, by the increase or diminution of the resistance of the spring to the closing of the valve, the speed permitted to the engine will be correspondingly increased or diminished.

D represents the arms of the pendulum which act on the spindle. Said arms are cast solid with the pendulum-arms, and project laterally therefrom at the upper ends thereof. From the inner portions of the laterally-projecting arm C there project inwardly, or at right angles thereto, connections D', which reach centrally and operate the nut D'' of the spindle or stem. Bolts S S pass through bosses or bearings T at the upper portion of the standard or frame-work A of the governor, and the eyes C' of the pendulum-arms are attached by pins V to the ends of said bolts outside of the bearings T, so that the pendulums will be arranged at an angle of forty-five degrees from the radial.

It will be seen that there are no joints between the pendulum-arms and the arms which act on the spindle, whereby looseness of parts does not exist, and the connection of the pendulum-arms and the arms which act on the spindle is rendered exceedingly strong and durable.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The downwardly-projecting finger L, attached to the standard of the governor, in combination with L-shaped catch H, fixed arm F, and oscillating arm G, substantially as and for the purpose set forth.

2. The fixed arm F, connected to the upper stem  $a'$ , and carrying the latch H, and the oscillating arm G, connected to the lower stem  $a''$ , and jointed to the fixed arm F, in combination with the downwardly-projecting finger L, attached to the standard of the governor, and operating substantially as and for the purpose set forth.

3. The guard K and oscillating arm G, in combination with the finger L, latch H, fixed arm E, and the two-part spindle, substantially as and for the purpose set forth.

4. The lever M, jointed to the standard A, formed with the shoulder N near its axis, and bearing against the valve-stem, in combination with the spring P, connected at one end to the standard A, and the screw R, passing through the standard and connected to the spring P, substantially as and for the purpose set forth.

5. The pendulum-arms C, formed solid with eyes C', laterally-projecting arms D, and inwardly-projecting connections D', in combination with the bolts S, projecting through the bearings T, and having the pendulum-arms fitted on the projecting ends of said bolts, and secured by pins V passing through the eyes C' and said projecting ends, substantially as and for the purpose set forth.

DAVID SHIVE.

Witnesses:

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