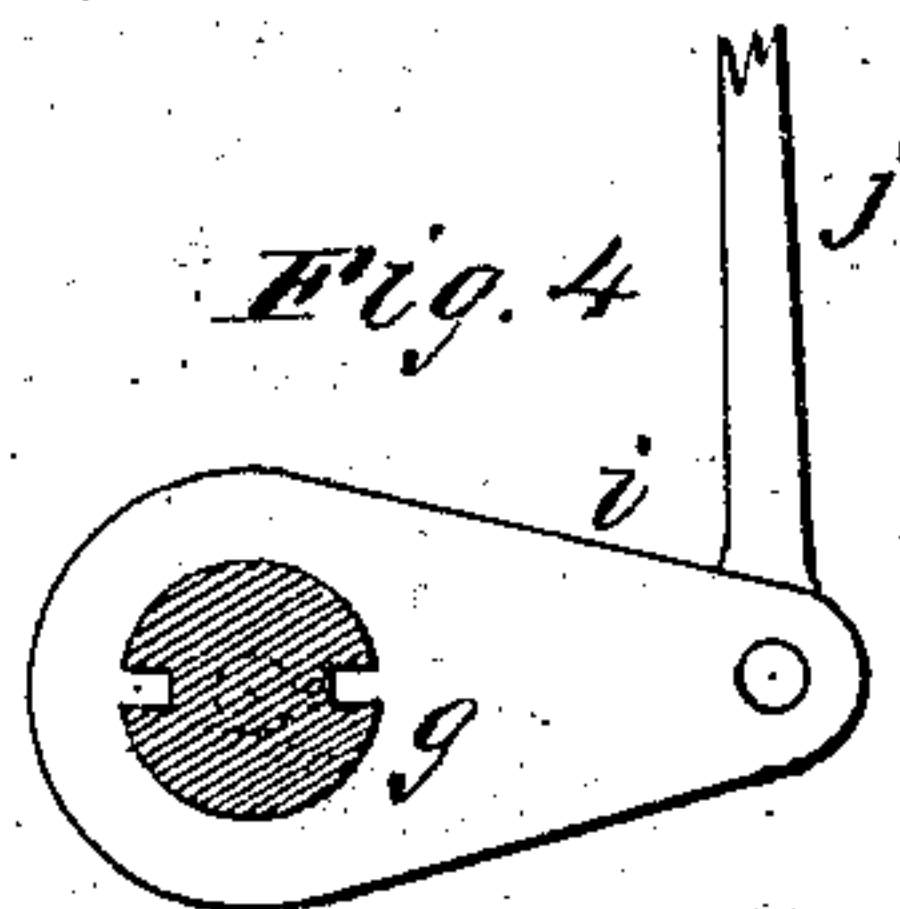
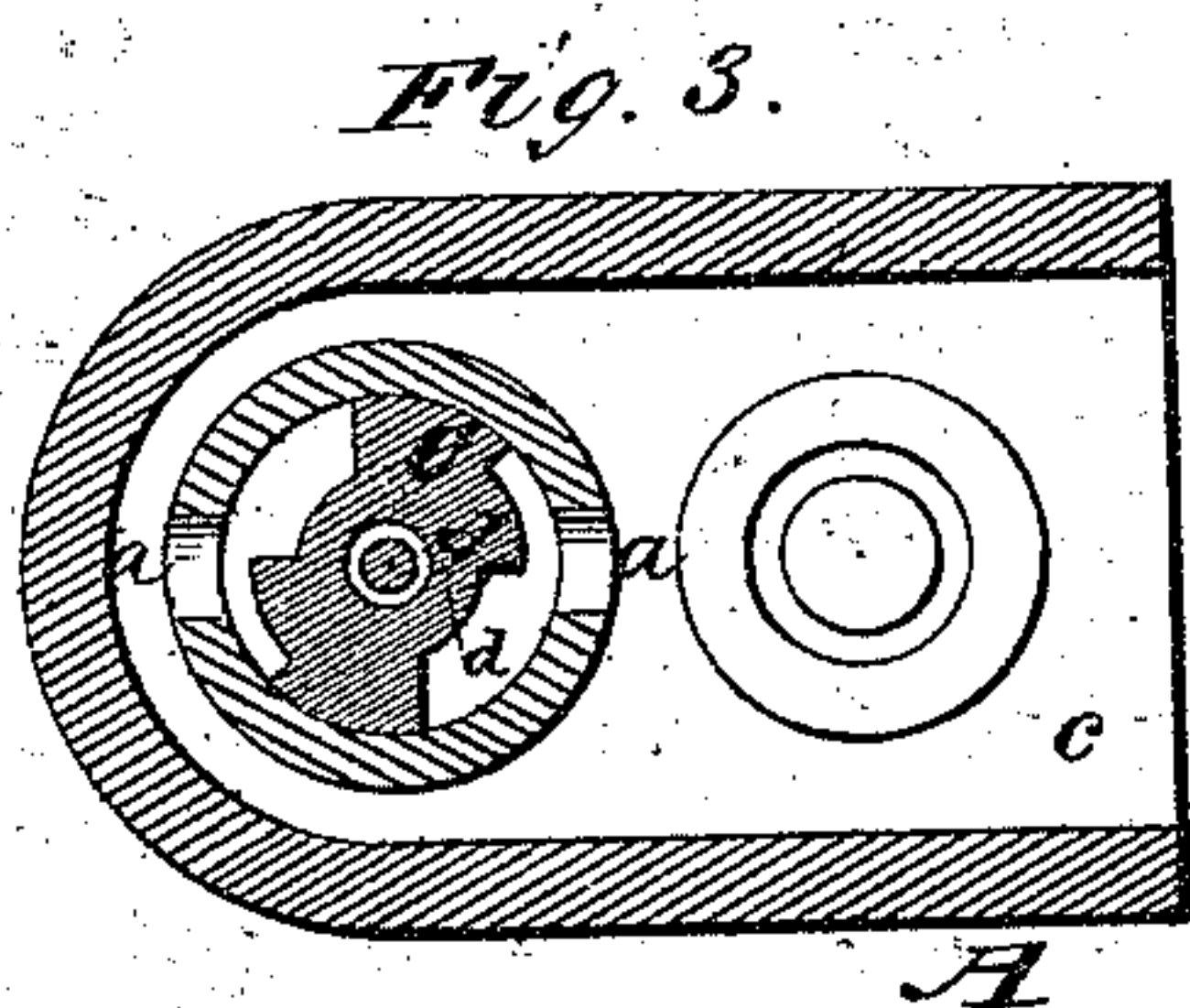
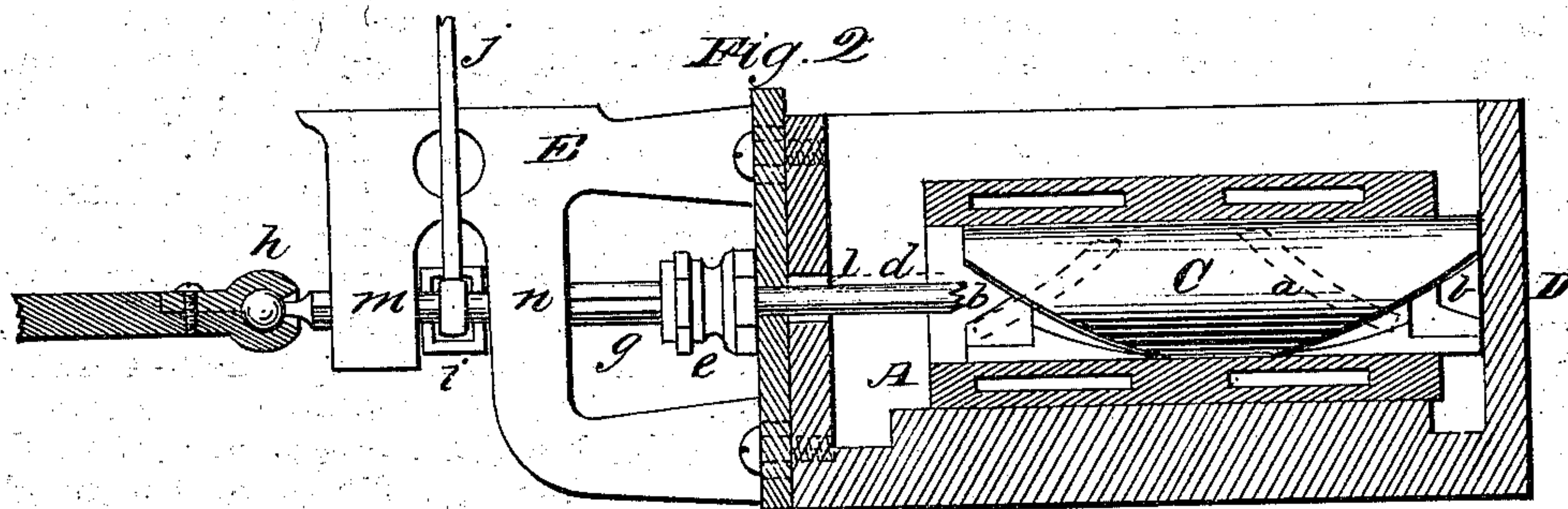
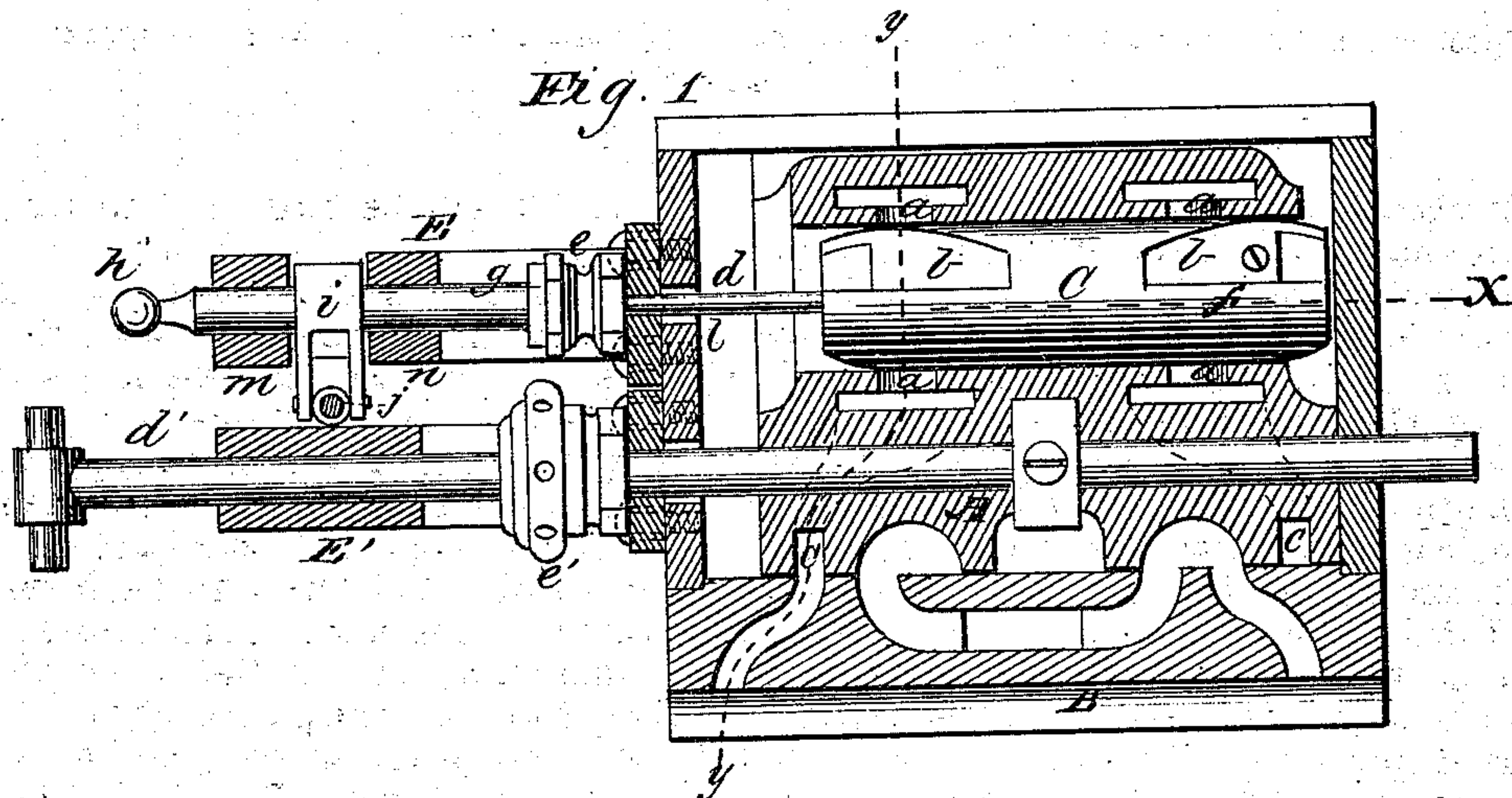


D. A. WOODBURY.
Cut Offs for Steam-Engines.

No. 154,363.

Patented Aug. 25, 1874.



Witnesses:

James C. Booth
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Inventor:

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UNITED STATES PATENT OFFICE.

DANIEL A. WOODBURY, OF ROCHESTER, NEW YORK.

IMPROVEMENT IN CUT-OFFS FOR STEAM-ENGINES.

Specification forming part of Letters Patent No. **154,363**, dated August 25, 1874; application filed February 20, 1874.

To all whom it may concern:

Be it known that I, DANIEL A. WOODBURY, of Rochester, in the county of Monroe and State of New York, have invented certain Improvements in Automatic Cut-Offs for Steam-Engines, of which the following is a specification:

The object of my invention is to provide a simple, durable, and effective cut-off gear which can be controlled with ease by the governor; and it consists chiefly in the use of a balanced cylindrical cut-off valve sliding in a chamber in the back of the main valve, and arranged to admit steam into passages in the latter by means of spiral ports in the cut-off valve-seat, the point of cut-off being determined by rolling the valve in its seat; and it further consists in a method of compensating the wear of the valves and seats.

In the drawing, Figure 1 is a horizontal sectional view of my device applied to the steam-chest of a side engine. Fig. 2 is a vertical sectional view of the cut-off valve and connections, showing those parts above the dotted line *x*, Fig. 1. Fig. 3 is a transverse section of the valves at the dotted line *y*, Fig. 1.

A, Figs. 1 and 3, is the main or distributing valve, moving upon a face on the cylinder B in the usual manner, and having the ordinary exhaust-passages, and also steam-passages *c c*, communicating with chambers formed in the back of the valve. C is a cylindrical cut-off valve fitted closely into a seat provided in the main valve. This valve admits steam from the chest D at its ends, and ports *a a* are provided in its seat, which communicate, through the chambers before mentioned, with the steam-openings *c c* in the face of the main valve, as indicated by full and dotted lines in Figs. 1 and 3. The ports *a a* are cut spirally around the valve-seat, there being two or more openings near each end around the periphery of the seat, as shown in Figs. 1 and 3. The extremities of the valve C are also of spiral form, to correspond with the ports *a a*, and there are consequently two or more spiral admission-edges, *b*, at each end, one for each port *a*. The valve C is reciprocated in its seat by means of the stem *d* and the usual eccentric attachments, and it is plain that, if a rolling movement be imparted to it through the stem *d*, the point

of cut-off will be varied, since the length of the valve is thus virtually altered.

It will be seen that by this construction of valve and arrangement of ports the former is perfectly balanced, the steam pressing upon it equally in all directions, whether the ports be open or closed, and that thus the force necessary to work it is reduced to the minimum, and, at the same time, it is perfectly free to be rotated by the governor through suitable connections. The latter, particularly, is a great desideratum, since in the valves of this class heretofore used the pressure upon them, when a port was closed, was so great as to hinder, if not actually prevent, the action of the governor.

The spindle *d* passes freely through the valve C to that extremity opposite the stuffing-box *e*, and is rigidly fastened to it by a set-screw, *f*, Fig. 1, or other suitable device. By this means the elasticity of the rod is made available to allow the valves to wear upon their seats within certain limits, and also to permit the main valve to retreat in case of water gathering in the cylinder. By thus making the distance between the stuffing-box and the point *f* considerable, the attachment of the valve to the rod is much simplified, for it is found necessary to make some provision for change in position of the valves, and this plan allows the change to occur as necessity requires, within small limits. The valve-stem *d* is secured at its outer extremity to the sleeve or enlarged rod *g*, Figs. 1, 2, and 4, which is supported in bearings in the bracket E. This bracket is bolted steam-tight to the face of the steam-chest D, and receives the stuffing-box *e*. The sleeve *g* has a ball-and-socket joint at its extremity, which forms the attachment to the eccentric-rod, and is provided with longitudinal grooves, (shown in Fig. 4,) into which splines in the arm *i* fit. This arm is located between the two bearings *m* and *n* of the bracket E, and consequently has no lateral movement, but permits that of the sleeve *g* through it. The rod *j* is pivoted to the outer end of the arm *i*, and proceeds to an ordinary centrifugal governor or other suitable regulating device. Thus it will be observed that the sleeve *g*, stem *d*, and valve are free to move longitudinally in obedience to the eccentric, while, at the same

time, a circumferential movement may be imparted to them through the splined arm, thus adjusting the point of cut-off. The opening *l* in the wall of the steam-chest, through which the stem *d* passes, is considerably larger than such stem, and the bracket *E* is made adjustable along the face of the steam-chest by means of slotted bolt-holes or otherwise. By this means, when the wear of the valve-seats becomes greater than the elasticity of the rod *d* is able to compensate, the stuffing-box and supporting-bearings of the valve-stem may be adjusted to correspond with such wear, and in the case of a side engine, with the settling of the valve upon its supporting-surface also. This adjustment of the bracket *E* is not a substitute for the compensation obtained by the elasticity of the rod *d*, but is intended as an adjunct thereto, that derived from the rod being automatic and within small limits, while the other is available for larger and fixed amounts of adjustment. The upper face of the bracket *E* also affords a convenient base for the support of the governing device, in case such location is desirable.

The cut-off valve may be a hollow cylinder, having suitable provision for attaching the stem *d*, and, instead of the admission-edges *b*, spiral openings may be formed in its shell, the operation being the same in either case.

The ball-joint *h* permits the rolling movement of the rod *g*, and also the vertical swing of the eccentric-rod; and it will be observed in this, as well as in regard to the frictional surfaces of the sleeve *g*, rod *d*, and valve *C*, there is a continuous positive movement imparted

by the eccentric, which greatly facilitates the adjustment of the parts by the governor.

If desirable, the stuffing-box *e* may be located some distance from the wall of the steam-chest, and the elasticity of the rod *d* increased; or in this case the rod may be attached at some other part of the valve *C*, and the flexibility of the valve-stem still retained.

I am aware that slide-valves having a rolling adjustment in their seats, in connection with spiral or diagonal ports and corresponding admission-edges on the valves, are in use, and I do not claim such construction of valve and arrangement of ports; but

What I claim as my invention is—

1. The cylindrical cut-off valve *C*, provided with ports or admission-edges *b*, and capable of a rolling adjustment in its seat in the main valve, in combination with the main valve *A*, having spiral ports *a* and passages *c*, substantially as and for the purpose set forth.

2. In combination with a valve, *C*, having a rolling movement in its seat, the stuffing-box *e*, made adjustable along the face of the steam-chest laterally to the valve-spindle, for the purpose of following up the wear of the valve and seat.

3. In combination with a valve, *C*, having a rolling movement in its seat, the bracket *E*, supporting the stuffing-box *e* and spindle-bearings *m* and *n*, and capable of adjustment along the face of the steam-chest, substantially as and for the purpose set forth.

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