

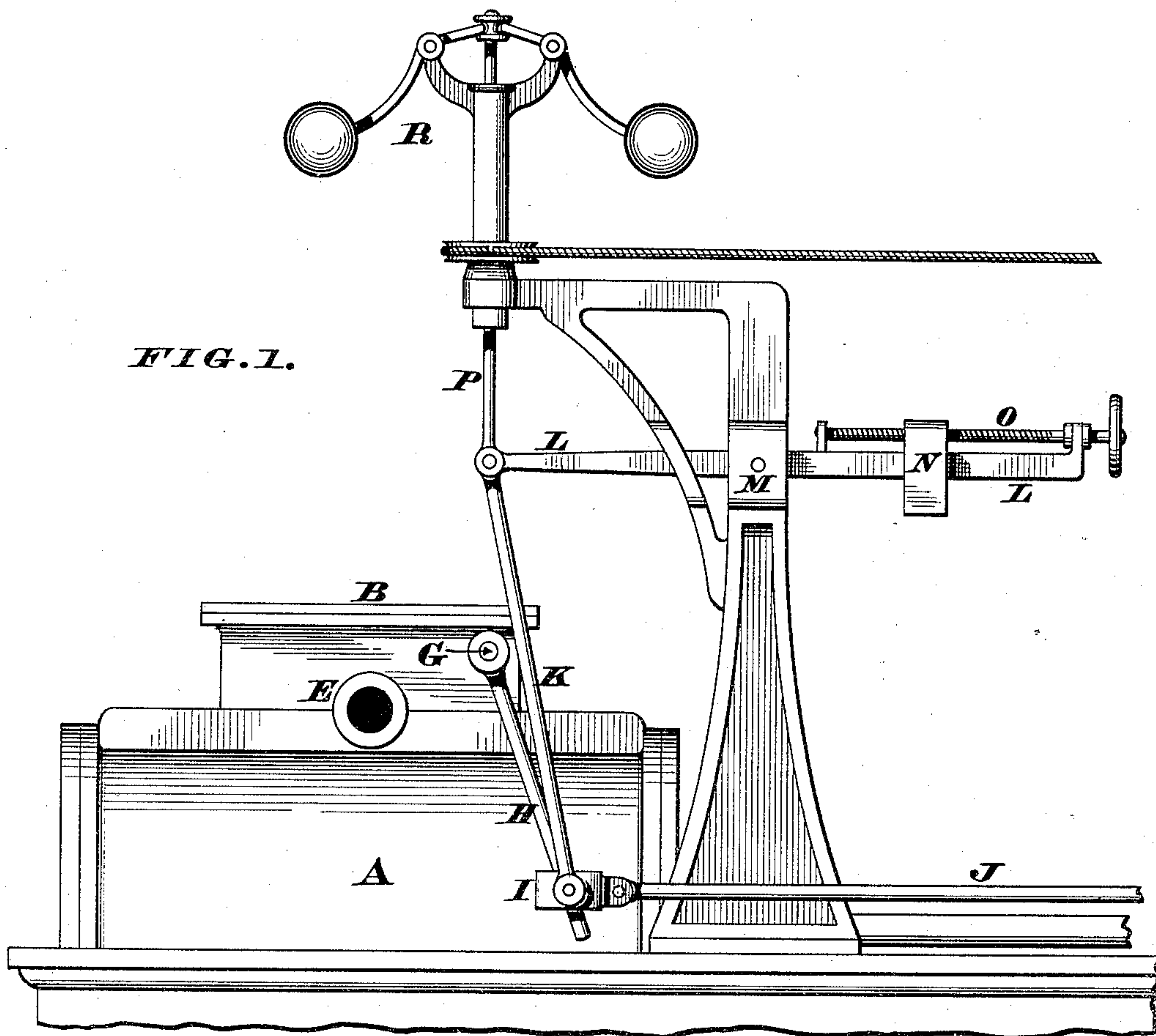
(No Model.)

G. DANBY.

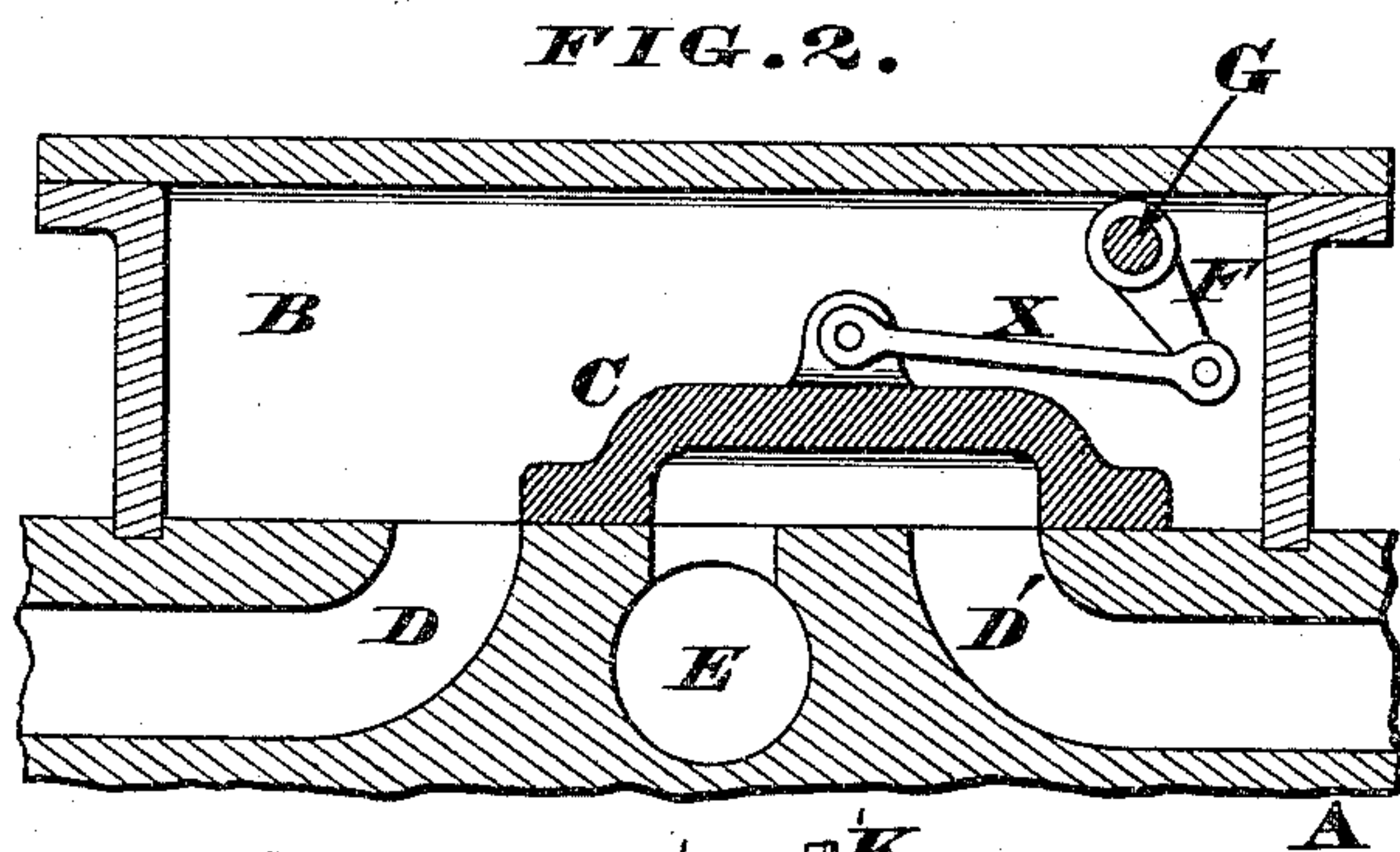
## AUTOMATIC CUT-OFF VALVE GEAR.

No. 317,979.

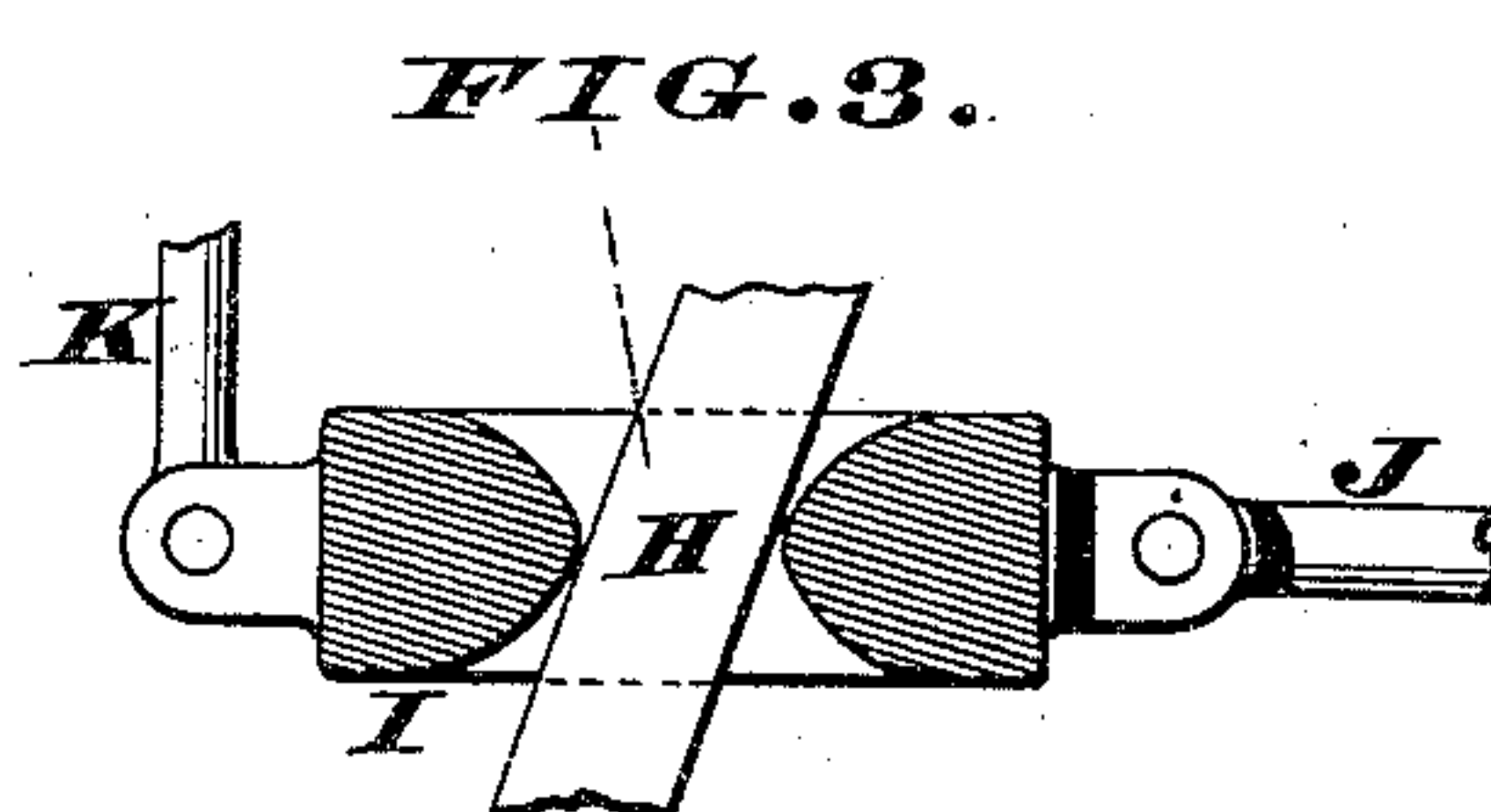
Patented May 19, 1885.



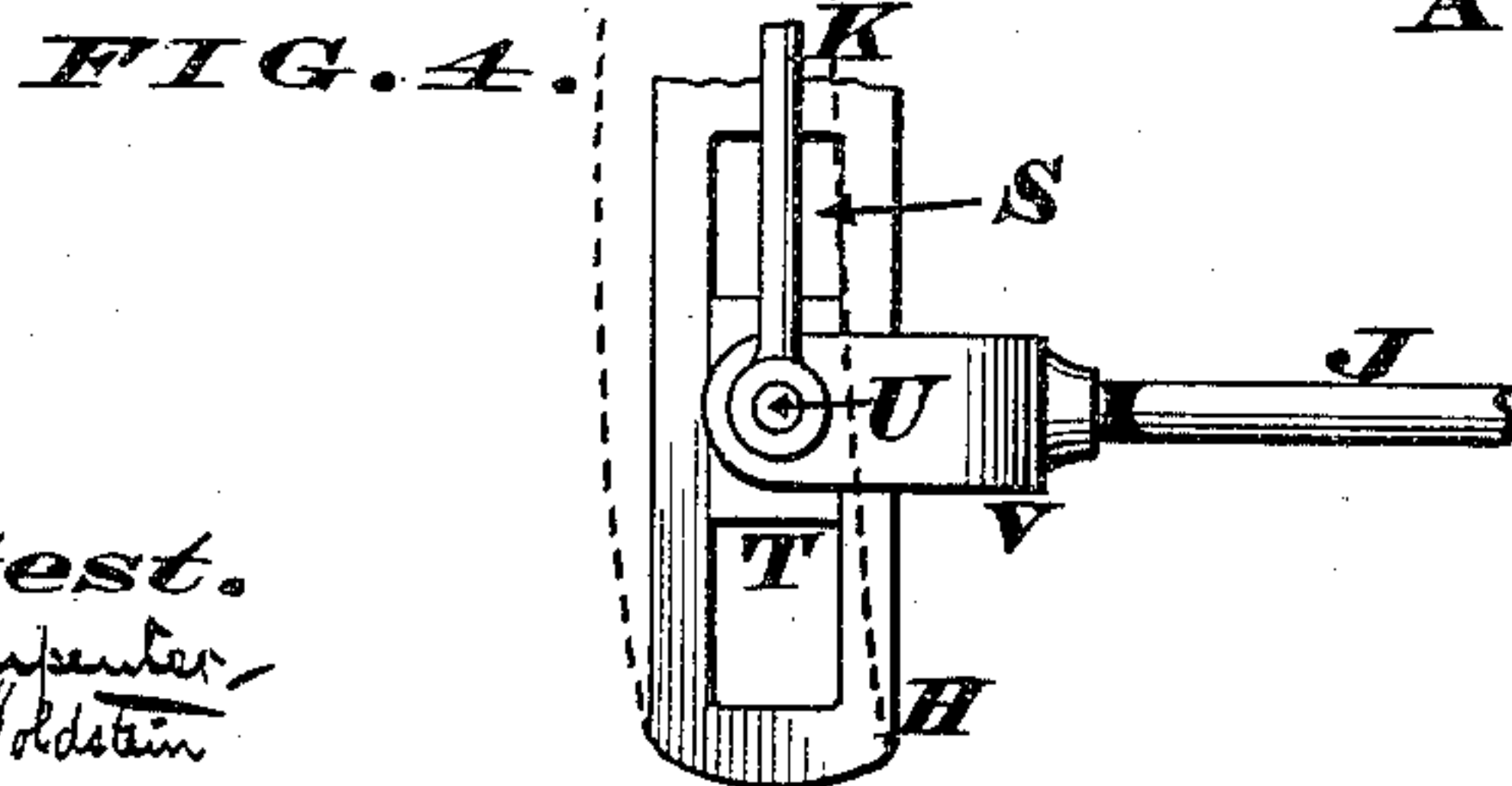
**FIG. 1.**



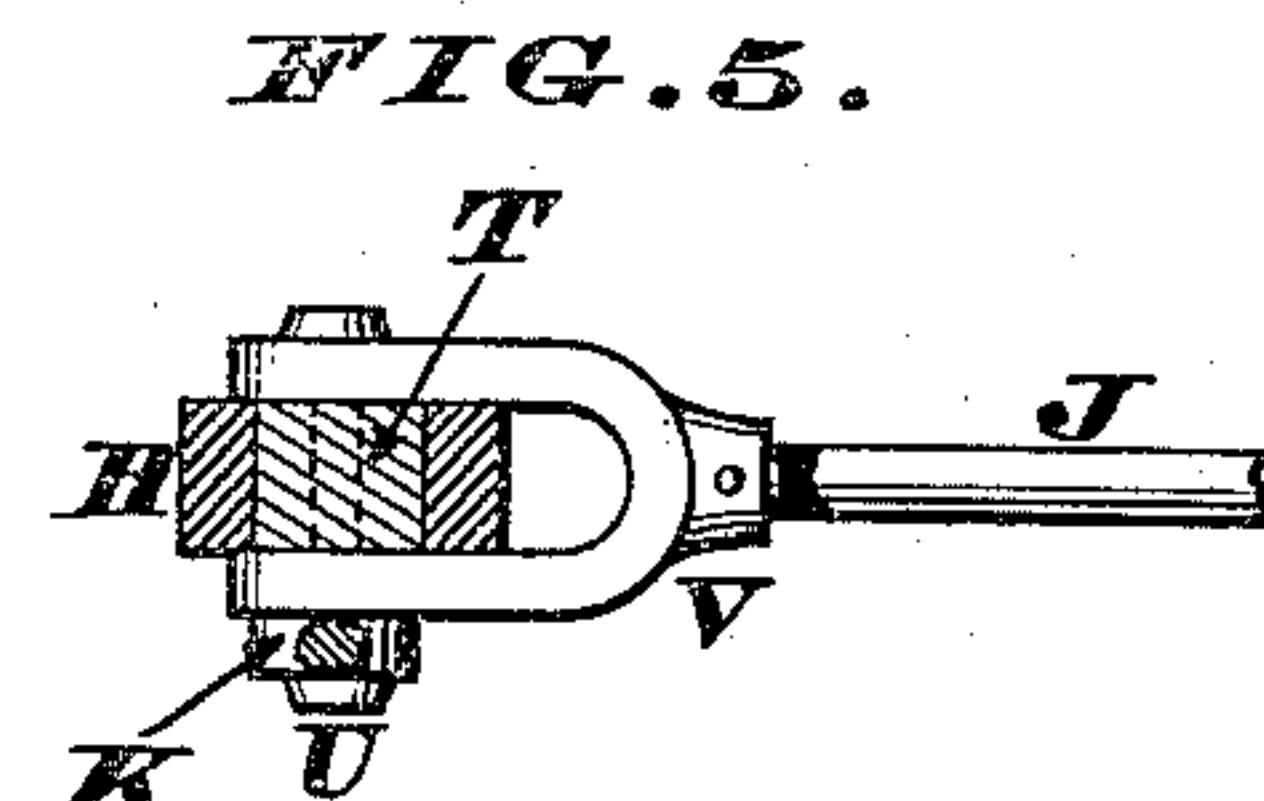
**FIG. 2.**



**FIG. 3.**



**FIG. 4.**



**FIG. 5.**

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# UNITED STATES PATENT OFFICE.

GEORGE DANBY, OF MOUNT HOLLY, OHIO.

## AUTOMATIC CUT-OFF-VALVE GEAR.

SPECIFICATION forming part of Letters Patent No. 317,979, dated May 19, 1885.

Application filed December 24, 1884. (No model.)

*To all whom it may concern:*

Be it known that I, GEORGE DANBY, a citizen of the United States, residing at Mount Holly, in the county of Clermont and State of Ohio, have invented certain new and useful Improvements in Automatic Cut-Offs, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention includes a novel combination of devices, wherewith the main valve of an engine can be automatically controlled for the purpose of admitting a greater or less volume of steam into the cylinder, and thereby regulating the speed of the piston to suit any special duty. The main valve may be of the ordinary slide pattern, or it may be adapted to have a reciprocating rotary motion within the steam-chest, and is preferably operated by a rock-shaft whose outer end carries an arm that vibrates or swings alongside the steam-cylinder, this motion of said arm being effected by a rod that is driven either by a cam or eccentric secured to the engine-shaft in the usual manner.

The method of coupling the eccentric-rod to the rock-shaft arm is immaterial; but said coupling must be of such a character as to be capable of being either raised or lowered for the purpose of regulating the swing of said arm, and thereby controlling the stroke of the main valve. The elevation and depression of this coupled end of the eccentric-rod is accomplished by any approved form of governor, which latter is driven from the engine-shaft, either by a belt or gearing, or otherwise. When the engine runs too fast, the governor automatically depresses the coupled end of the eccentric-rod, thereby limiting the swing of the rock-shaft arm and restricting the travel of the main valve, which act reduces the volume of steam that enters the cylinder and diminishes the piston-speed; but if the engine should run too slow the opposite action takes place—that is to say, the governor now automatically elevates the coupled end of the eccentric-rod, thereby compelling the rock-shaft arm to swing a greater distance and effect a corresponding increase in the travel of the main valve. Consequently a greater volume of steam will be admitted into the cylinder and the piston-speed increased accordingly, as hereinafter more fully described.

Applied to the engine is a fulcrumed lever, one end of said lever having the governor-rod coupled thereto, while its opposite end carries a weight capable of being shifted by hand and retained at any specific adjustment, the object of this weight being to counterbalance the connected portion of the eccentric-rod and its accessories, and also to increase or diminish the sensitiveness of the governor. By retracting this counter-balance toward the fulcrum of the lever the governor will have less duty to perform, and will act quite promptly, while the advancement of said weight will increase the load imposed on the governor and cause it to operate more slowly, as hereinafter more fully described.

In the annexed drawings, Figure 1 is a side elevation of a steam-engine provided with my automatic cut-off. Fig. 2 is a vertical section of the steam-chest. Fig. 3 is an enlarged vertical section of the coupling that actuates the rock-shaft arm. Figs. 4 and 5 are respectively a side elevation and horizontal section of a modification of said coupling.

A represents a steam-cylinder whose chest B incloses an ordinary slide-valve, C, which latter is adapted to communicate with the inlet-ports D D' and exhaust-port E in the usual manner. Valve C is coupled by a link, X, to an internal crank or cam, F, of a rock-shaft, G, said shaft being disposed transversely of the chest B, and having a swinging or vibrating arm, H, depending from its outer end. The lower or free end of this arm traverses a slot in the block I, as seen in Fig. 3, to which block is attached one end of the eccentric-rod J, previously alluded to. Furthermore, this block I has connected to it the lower end of a rod, K, the upper end thereof being suspended from a lever, L, that is fulcrumed at M to a standard or other support projecting rigidly from the main frame of the engine. One end of this lever carries a counter-balance, N, capable of being adjusted by a set-screw, O, that engages therewith, the opposite end of said lever having attached to it the rod P of any suitable form of governor, R, the latter being driven by the engine in the customary manner.

The operation of my automatic cut-off is as follows: The weight N is first adjusted so as to exactly counterbalance the rods J K when



the balls of the governor R are in their normal or closed condition, and said weight is then shifted farther away from the fulcrum M, in case it is desired to prevent any action of  
 5 said governor until a heavy duty is imposed on the engine. The engine being then started, the eccentric-rod J imparts motion to the arm H, thereby vibrating or swinging the latter and causing the slide-valve C to reciprocate  
 10 within the steam-chest in the usual manner; but if the engine should run so fast as to cause the centrifugal force of the governor-balls to overcome the weight of counter-balance N the rod P would be forced down, thereby swing-  
 15 ing the lever L on its fulcrum M and depressing the rod K and coupling-block I. It is evident the motion of eccentric-rod J will now impart a comparatively limited swing to the arm H, because the block I is located near the  
 20 free end of said arm. Hence the stroke of the valve C is restricted and less steam is admitted to the cylinder; but if the engine should run too slow the governor-balls will drop, thereby elevating the rods P K, which act  
 25 pulls the coupling-block I toward the rock-shaft G and imparts a longer stroke to the main valve C. This increased stroke uncovers more fully the inlet-ports D D' and allows a greater volume of steam to enter the cylinder  
 30 and drive the piston at a higher speed. The cause of this increased stroke of the valve will be apparent when it is considered that the motion of the eccentric-rod is at all times the

same. Therefore it is evident that the elevation of the free end of said rod must cause an  
 35 increased swing of the arm H and its attached rock-shaft G.

In the modification of my invention seen in Figs. 4 and 5 the swinging arm H is slot-  
 40 ted longitudinally at S to receive a sliding block, T, which block carries a short stud, U. This stud couples the rod K and the forked end V of the eccentric-rod J to said block T. Furthermore, it is preferred to curve the arm  
 45 H, as indicated by the dotted lines in Fig. 4, and if this is done it is evident the slot S must have a corresponding shape imparted to it. Finally, the rod K may be attached to the mid-length of block I, as seen in Fig. 1, or to  
 50 the end of said block, as represented in Fig. 3.

I claim as my invention—

The combination, in a steam-engine, of a rock-shaft, G, actuating the main valve, an eccentric-rod, J, connected by a coupling-  
 55 block, I, to the arm H, and a governor-rod, P, communicating with said eccentric-rod and also with the fulcrumed lever L, which latter carries a shiftable counter-balance, N, that is capable of being retained at any specific ad-  
 60 justment, for the purpose herein described.

In testimony whereof I affix my signature in presence of two witnesses.

GEORGE DANBY.

Witnesses:

JAMES H. LAYMAN,  
 WM. DANBY.