

G. J. ROBERTS.
Steam-Pumps.

No. 138,695.

Patented May 6, 1873.

Fig. 1.

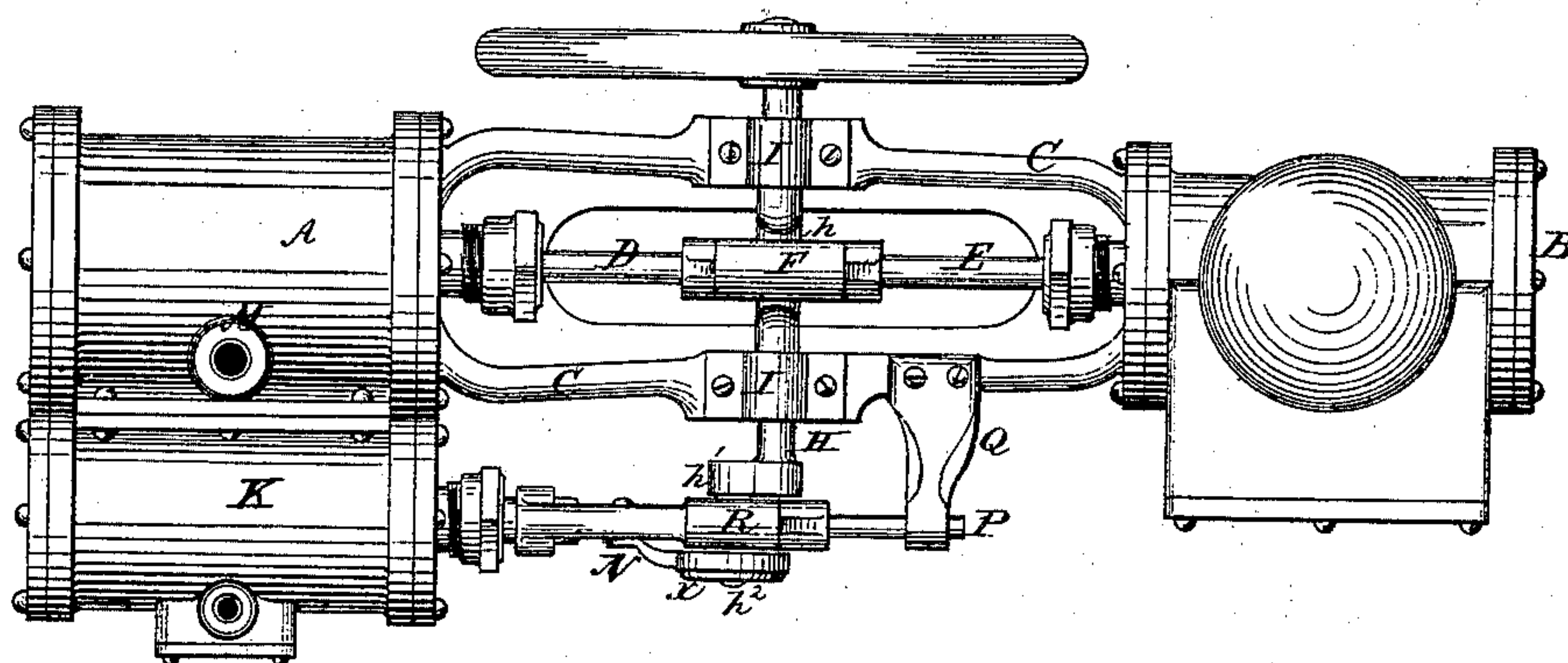
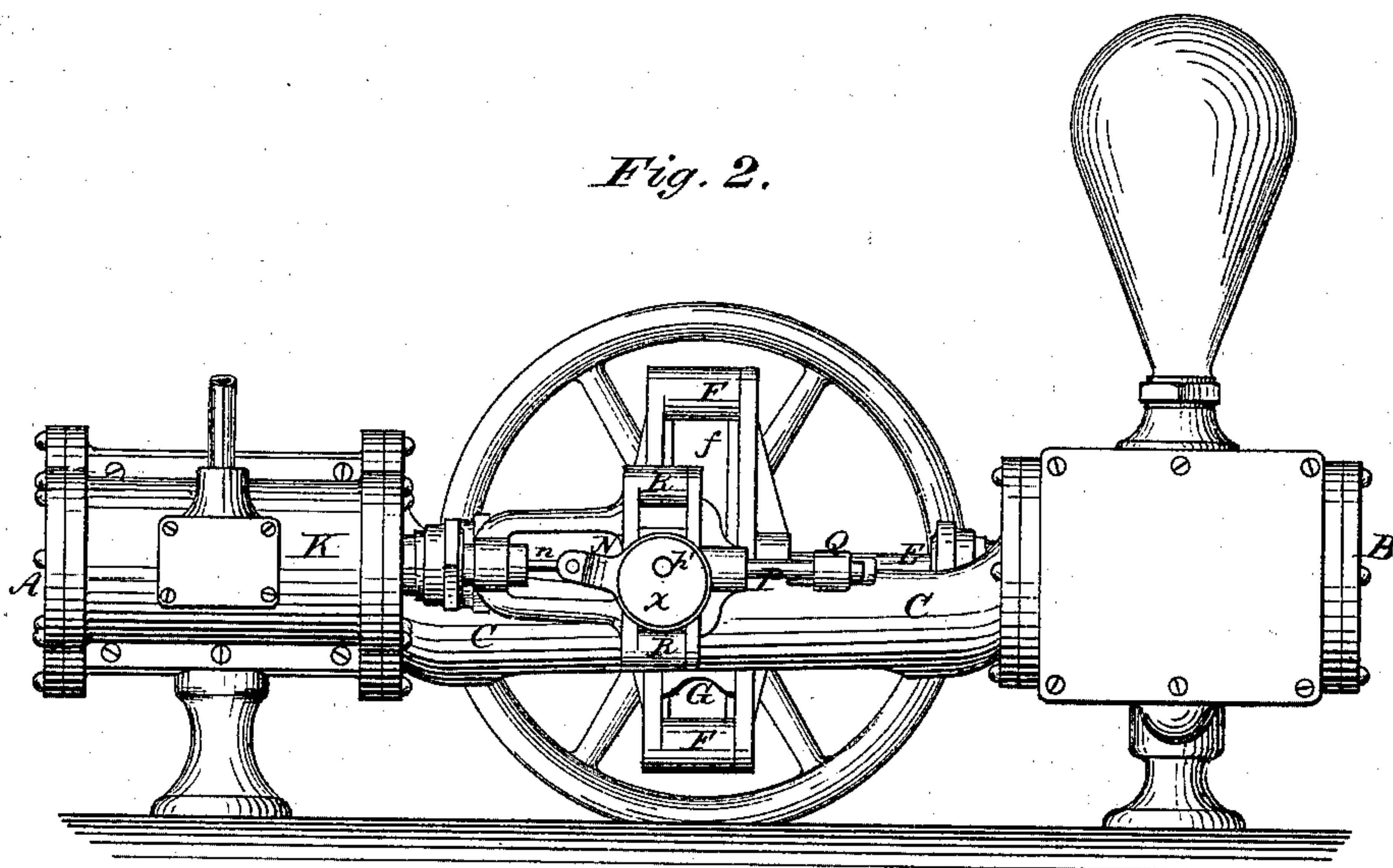


Fig. 2.



Witnesses:

Joh R Young
Herr von Hofstetter.

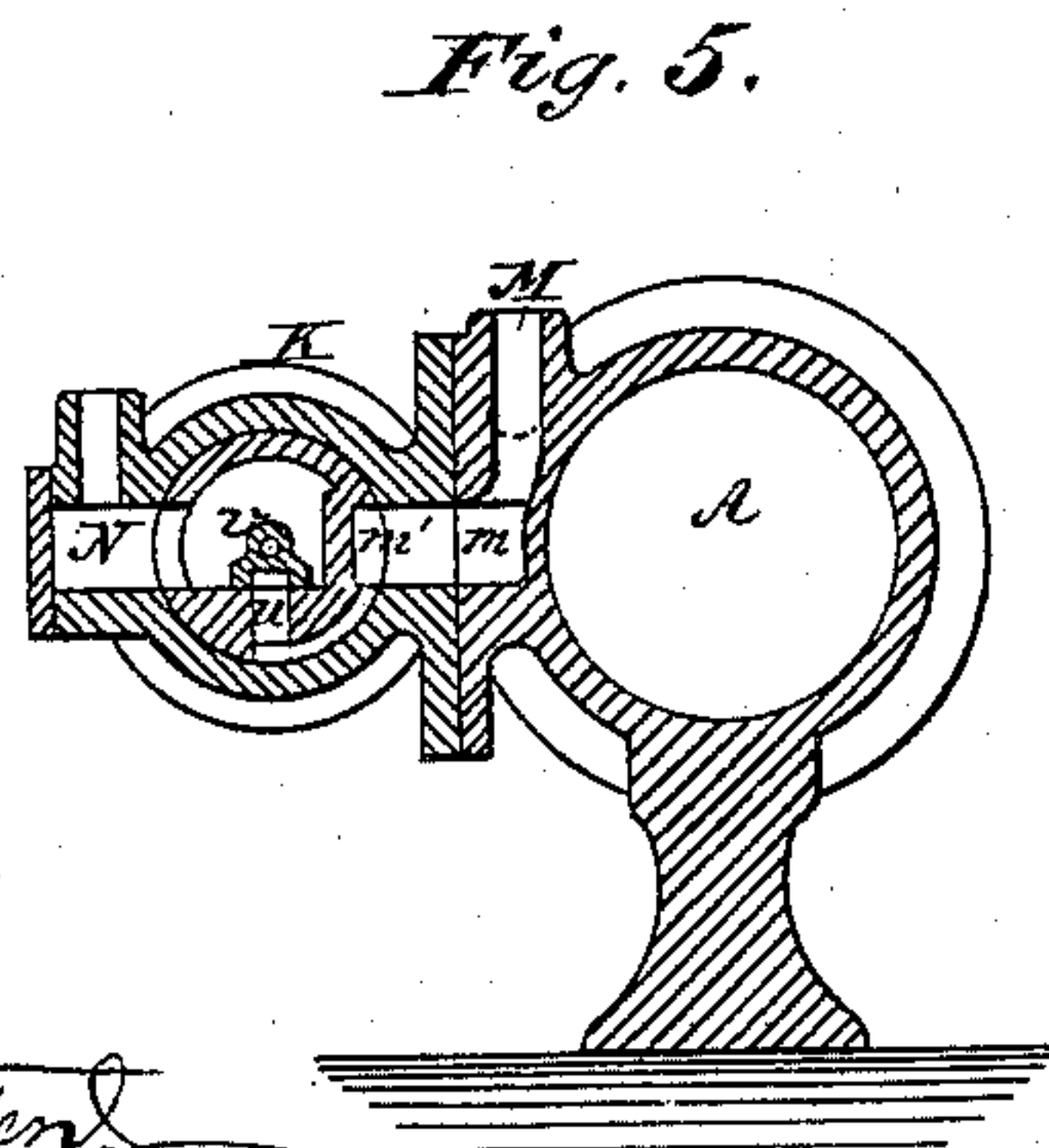
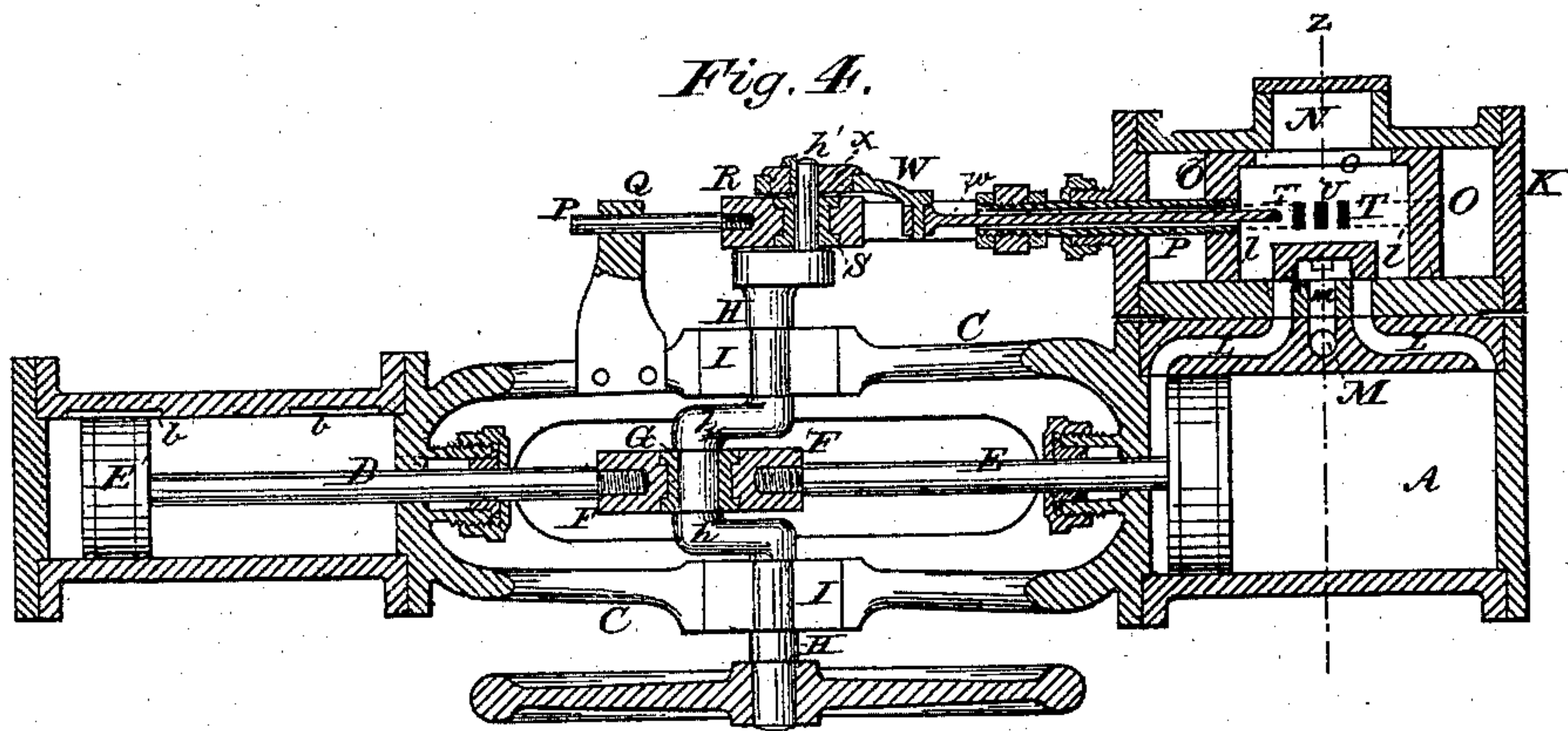
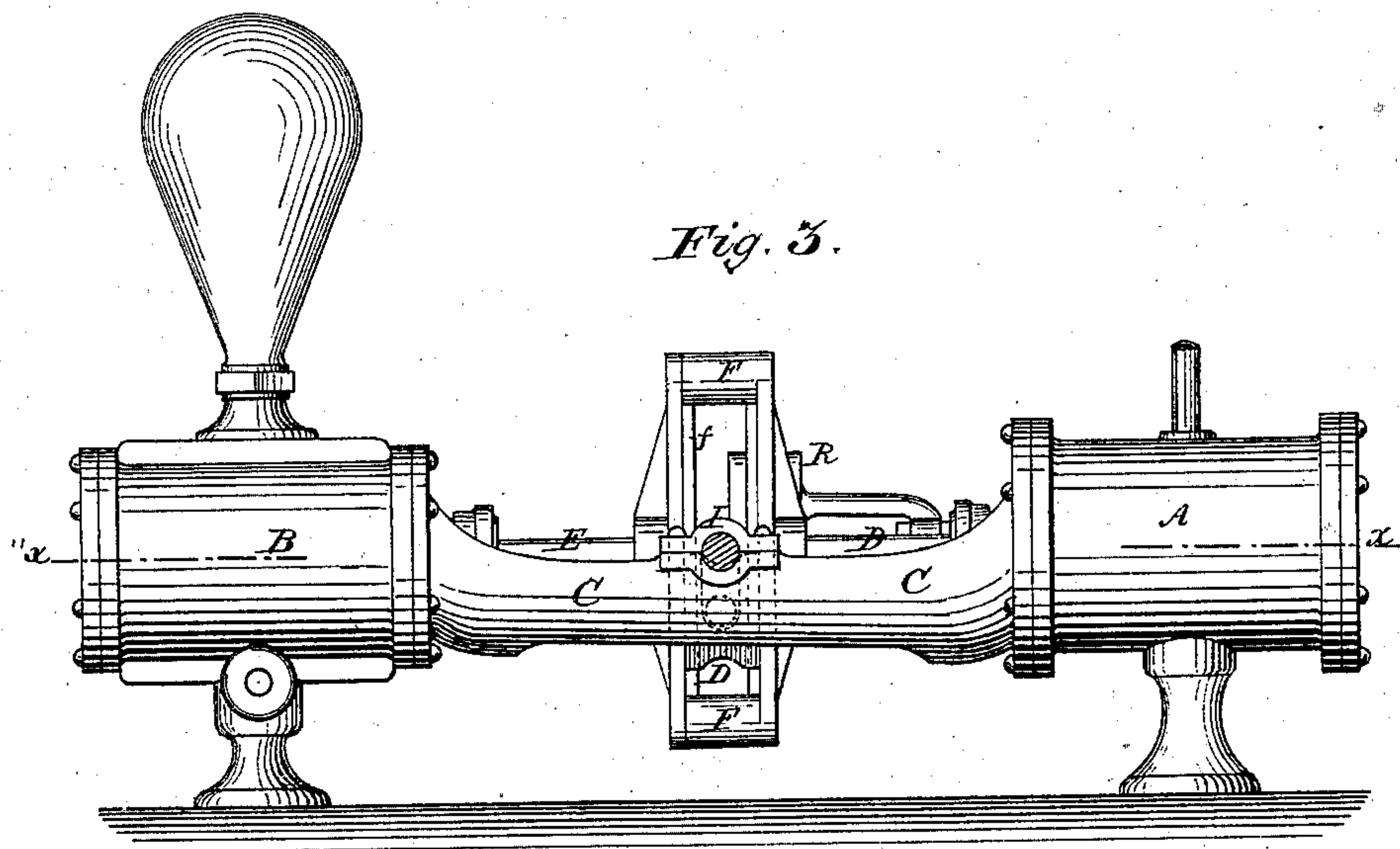
Inventor:

Geo. J. Roberts, by
Prindle and Co. his Attys

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John R. Young
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UNITED STATES PATENT OFFICE.

GEORGE J. ROBERTS, OF DAYTON, OHIO.

IMPROVEMENT IN STEAM-PUMPS.

Specification forming part of Letters Patent No. **138,695**, dated May 6, 1873; application filed February 5, 1873.

To all whom it may concern:

Be it known that I, GEORGE J. ROBERTS, of Dayton, in the county of Montgomery and in the State of Ohio, have invented certain new and useful Improvements in Steam-Pumps; and do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawing making a part of this specification, in which—

Figure 1 is a plan view of the upper side of my improved engine. Figs. 2 and 3 are elevations of opposite sides of the same. Fig. 4 is a longitudinal section of the same upon line *x x* of Fig. 3, and Fig. 5 is a vertical section of the steam-cylinder upon line *z z* of Fig. 4.

Letters of like name and kind refer to like parts in each of the figures.

The design of my invention is to increase the efficiency of direct-acting steam-pumping engines, and, by avoiding the usual "dead-centers," to enable the engine to be operated at a lower rate of speed than would otherwise be possible; to which end it consists, principally, in the employment of a piston-valve for moving the crank over the dead-center, substantially as and for the purpose hereinafter specified. It consists, further, in a supplemental valve arranged and operating within the main valve for the purpose of controlling the steam used for moving the latter, substantially as is hereinafter shown. It consists, further, in a solid valve-stem arranged within a hollow valve-stem, and both combined with suitable valves and operating mechanism, substantially as and for the purpose hereinafter set forth. It consists, further, in the construction of the main valve, and the arrangement therein of the main and supplemental ports, substantially as and for the purpose hereinafter shown and described. It consists, further, in the means employed for controlling the movements of the main and supplemental valves, substantially as and for the purpose hereinafter specified. It consists, further, in the means employed for relieving the pump-plunger from pressure near the end of each stroke, substantially as and for the purpose hereinafter shown.

In the annexed drawing, A represents the steam-cylinder, and B the water-cylinder, con-

nected together by means of a semi-cylindrical frame, C, the ends of which have a suitable shape, and form heads for the corresponding ends of said cylinders. The piston and pump rods D and E, respectively, are connected at their inner ends to or with a head, F, within which is a vertical parallel groove, *f*, that receives and contains a sliding-box, G. A shaft, H, journaled within suitable bearings I that are formed upon the upper edges of the frame C, is provided with a crank, *h*, which is journaled within the box G, and, by means of the reciprocating motion of the head, is caused to revolve, the vertical movement of said box being just equal to the stroke of the piston. Upon one side of the steam-cylinder A is a steam-chest, K, which has the form of a cylinder, corresponding in length to the length of said cylinder A, but having about one-half its diameter of interior. From the interior of the valve-chest K, upon the side next to the steam-cylinder, two steam-ports, L, and an exhaust-port, *m*, of usual form are provided, and furnish communication between said steam-chest, the steam-cylinder, and the exhaust-pipe M. Steam is admitted to the steam-chest through an opening, N, in its outer side. Within the steam-chest K is fitted a piston-valve, O, which closely fills the space transversely, while longitudinally it has a length equal to about two-thirds the length of said steam-chest. Said valve is constructed hollow, and upon its outer side is provided with an inlet-port, *o*, which corresponds to and receives steam from the opening N, while upon the opposite side are provided two other ports, *l*, that are suitably arranged so as to admit steam to the cylinder-ports L. Between the ports *l* the wall of the valve is extended inward so as to form an exhaust-port, *m'*, which, in connection with said ports *l*, operates in the same manner as the ordinary slide-valve. The valve thus constructed is provided with a rod or stem, P, which extends outward through the end of the steam-chest, and into a guide or bearing, Q, attached to and extending horizontally outward from the frame C. Between the bearing Q and the steam-chest is provided a slotted head, R, similar in form to the head F, and within said head is fitted a sliding box, S, that is journaled upon a crank, *h'*, formed upon the end

of the shaft H, the throw of said crank being just equal to the necessary travel of said valve. The relative radial positions of the cranks h and h' being adjusted the motion of the piston will cause the valve to be moved within its chest, so as to properly control the admission to and emission from the cylinder of the steam. In order that the main crank may be assisted over the "dead-points" a valve-seat is formed upon the lower side of the interior of the valve O, and from said seat two steam-ports, T, and one exhaust-port, U, open downward, the former extending longitudinally outward to the ends of said valve, as seen by the dotted lines in Fig. 4, while the exhaust-port curves inward and upward and opens into the main exhaust-port m' , shown in Fig. 5. Upon the valve-seat thus constructed is placed an ordinary slide-valve, V, which is operated by means of a rod, w , that extends outward through the rod P, made hollow for this purpose, and by means of a suitable strap, W, is connected with an eccentric, X, which is secured to or upon the end of the crank h' .

The adjustment of the eccentric being such as to cause the supplemental valve V to move in advance of the main valve, steam is alternately admitted into and exhausted from the ends of the valve-cylinder, so as to cause said main valve to be driven in the same manner as is the piston; and, as said valve exerts the greatest force upon its crank at the instant that the main crank is passing its dead-centers, it will be seen that the power of the piston is supplemented by that of said valve, and the motion of the engine made continuous and regular. It is found that by this arrangement the engine can be run with ease at a speed so low as to be practically impossible to any ordinary engine. The pump has the usual construction of parts except that within the interior of its cylinder. Upon one side and near each end is provided a longitudinal groove, b , which has a length somewhat greater than the length of the piston or plunger E' , so that when the latter comes opposite said groove a portion of the water at its front will be permitted to escape into the space at its rear, and

thus relieve the pressure, against which said piston is being forced. The object of this relief-port is to lessen the resistance to the motion of the piston at or near the end of each stroke, so as to cause its momentum to assist the crank in passing its dead-centers.

Having thus fully set forth the nature and merits of my invention, what I claim as new is—

1. In a steam-engine provided with a piston-valve, which is positively driven by steam-pressure, the combination of said valve with the driving-shaft and suitable mechanism in such a manner as to cause the motion of the former to assist the main crank over its dead-centers, substantially as specified.

2. In combination with the hollow piston-valve Q, provided with an interior valve-seat and with the ports T and U, the slide-valve N, constructed to operate substantially as and for the purpose shown.

3. The hollow and solid valve-stems P and w , respectively, when arranged as shown and combined with suitable valves and mechanism to reciprocate the same, substantially as and for the purpose set forth.

4. The main valve O, constructed as shown, and provided with the inlet-port o , main ports l l and m' , and the supplemental ports T T and U, when said ports are arranged substantially as and for the purpose described.

5. In combination with the valves O and V and with their rods P and w , respectively, the shaft H provided with the crank h' , the slotted head R, the box S, the strap W, and the eccentric X, substantially as and for the purpose specified.

6. In a pump-cylinder, a relief port or groove, b , placed near each end and operating in connection with the plunger E' , substantially as and for the purpose shown.

In testimony that I claim the foregoing I have hereunto set my hand this 31st day of January, 1873.

GEORGE J. ROBERTS.

Witnesses:

JAS. C. YOUNG,
JACOB SNYDER.