

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

No. 226,160

Patented April 6, 1880.

Fig. 3.

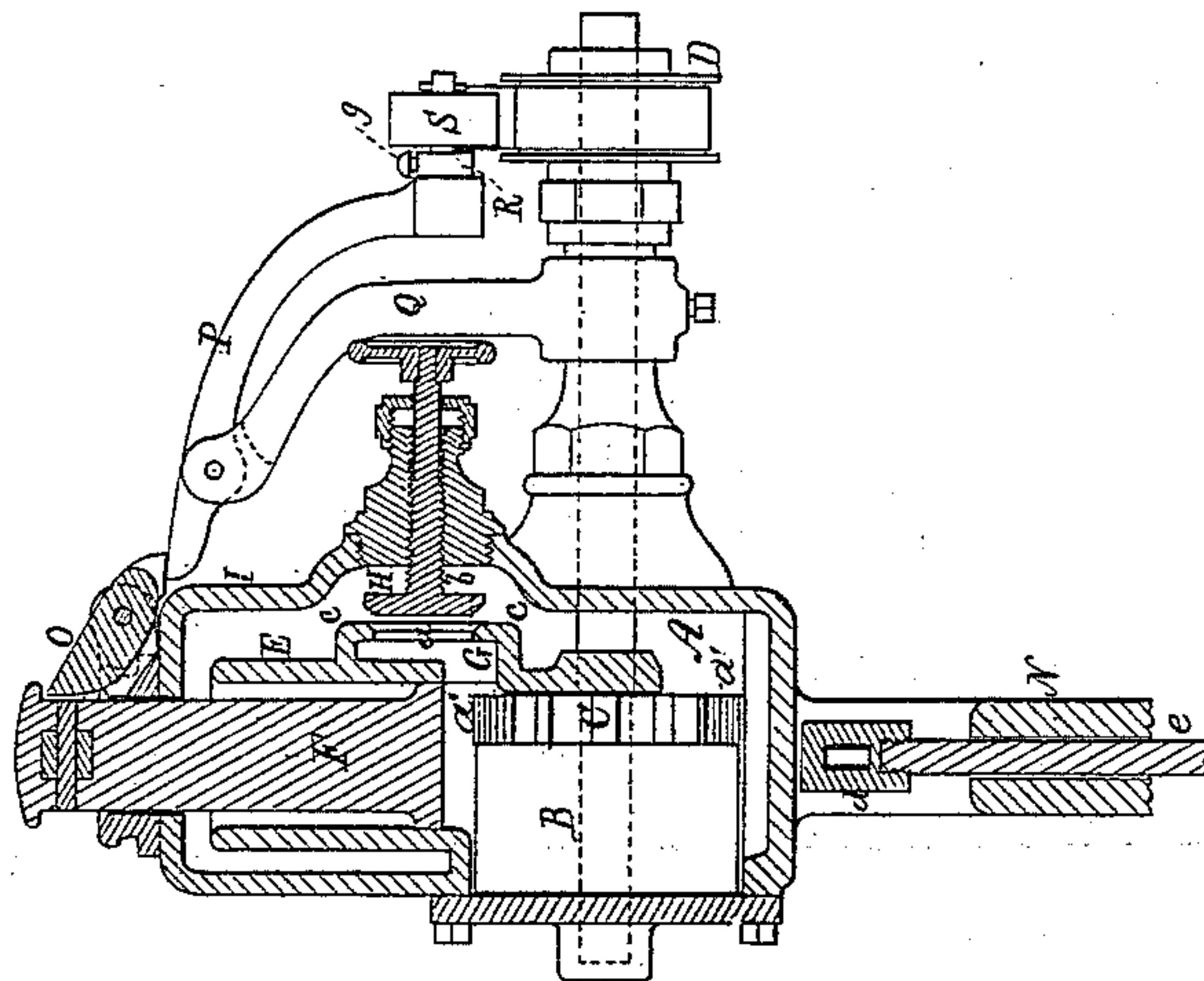


Fig. 2.

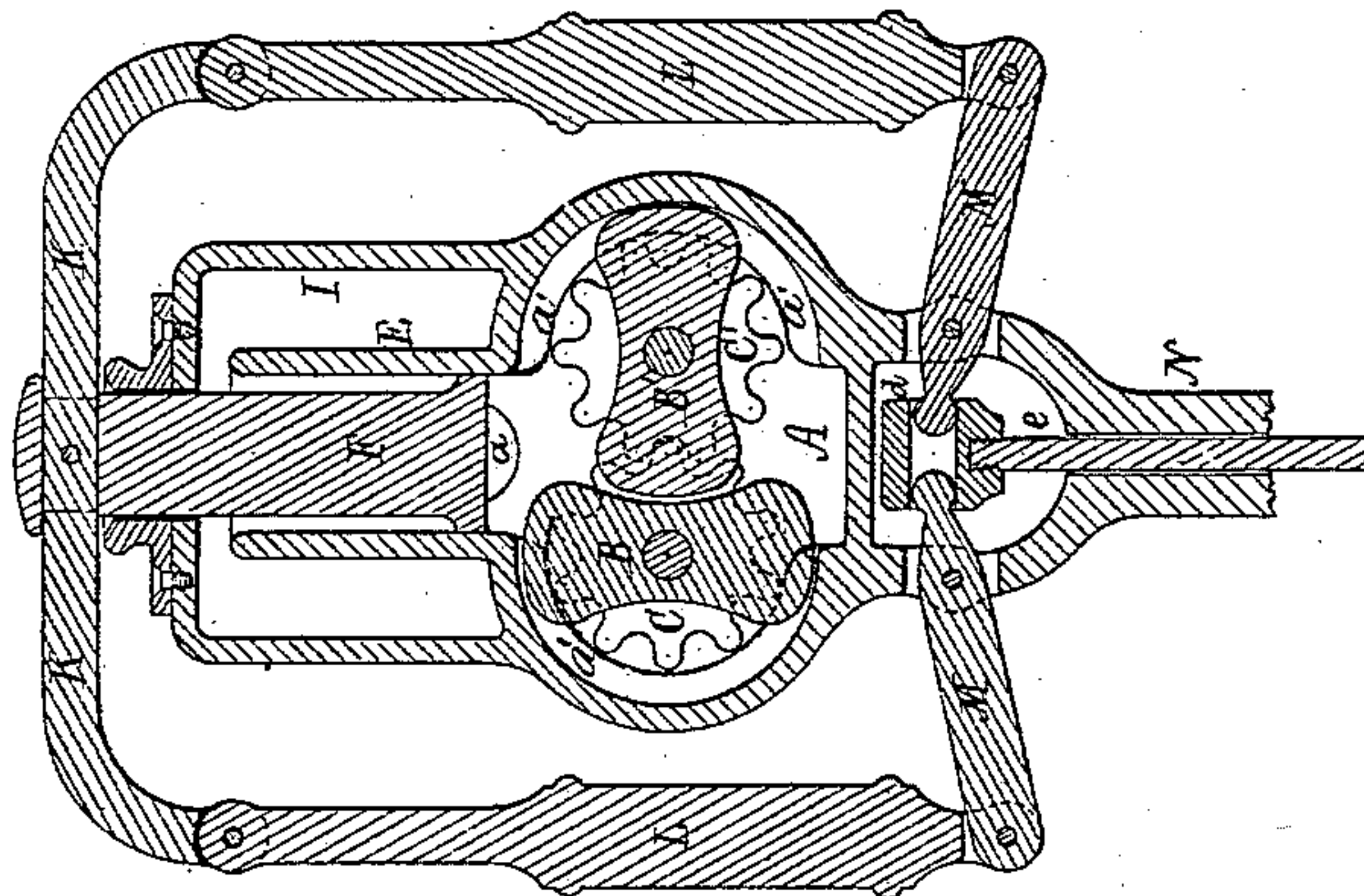
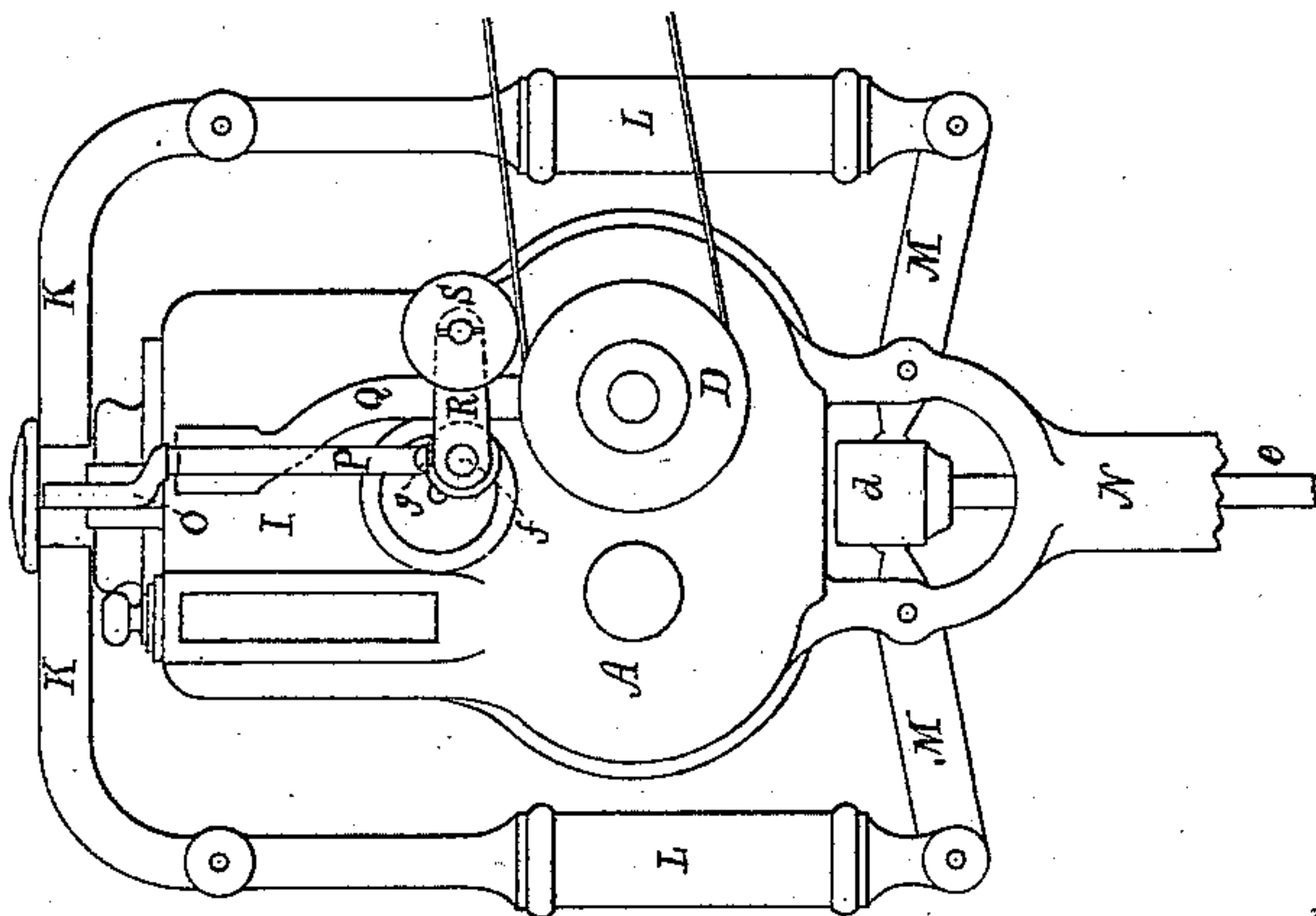


Fig. 1.



Witnesses

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# UNITED STATES PATENT OFFICE.

WARREN H. CRAIG, OF LAWRENCE, MASSACHUSETTS.

## GOVERNOR FOR STEAM-ENGINES.

SPECIFICATION forming part of Letters Patent No. 226,160, dated April 6, 1880.

Application filed November 17, 1879.

*To all whom it may concern:*

Be it known that I, WARREN H. CRAIG, of Lawrence, of the county of Essex and State of Massachusetts, have invented a new and useful Improvement in Governors for Steam-Engines; and I do hereby declare the same to be described in the following specification, and represented in the accompanying drawings, of which—

Figure 1 is a side elevation, Fig. 2 a longitudinal section, and Fig. 3 a transverse section, of a governor of my improved kind.

In several respects the said governor is like that described in Letters Patent No. 202,332, dated April 16, 1878, and granted to me. It also, in some particulars, is like one or more others of the kind heretofore invented and used.

The essential features of difference between my said governor and those referred to constitute the subjects of my present invention. They may be briefly stated as follows—that is to say:

First. The reservoir I arrange above the pump and around the piston-cylinder, and provide such reservoir with an educt or passage leading from it into the lower part of the pump-chamber.

Second. The reservoir is also made to encompass or extend around the valve-seat and valve of the cylinder.

Third. The pump has two rotary pistons and a set of gears for revolving them, and both pistons and gears are arranged within the pump-chamber, so as to revolve in the oil or fluid thereof.

Fourth. The piston is provided with arms and weighted connection-rods, and also with levers to connect it with the stem of the valve of the engine supply-pipe.

Fifth. The stop motion is composed of a lever-clamp and an operative lever and wheel therefor, instead of a rack and catch lever, as represented in my said patent.

In the drawings, the pump barrel or chamber is shown at A as provided with two rotary pistons, B B', formed and arranged as shown, neither of which operates to revolve the other. They are furnished with operative gears C C', which, arranged on the shafts of the pistons, engage with each other, and, with

the pistons, are disposed within segmental recesses *a' a'*, opening into and communicating with the pump-chamber. The shaft of one of the said pistons is provided with a driving-pulley, D. The gears C C' rest against the pistons B B'.

Over and opening into the pump-chamber is the cylinder E, having within it the piston F. The said cylinder is open at both ends, and at its lower part it opens into a chambered projection, G, having an eduction-opening, *a*, to co-operate with a valve, H, which, by means of a screw, *b*, to its stem, is adjustable relatively to the opening—that is, so as to be moved either nearer to or farther from the opening, as occasion may require.

Surrounding the cylinder E and the chambered projection G, and extending above the pump-barrel and the cylinder, in manner as represented, is the oil or fluid reservoir I, through whose head or upper end the piston extends and works freely. From the reservoir there is an educt or passage, *c*, leading into the pump-barrel or piston-chamber thereof.

Projecting in opposite directions, as shown, from the pistons are two arms, K K, from which are suspended weighted connection-rods L L, which at their lower ends are jointed to two levers, M, fulcrumed in a standard, N, and pivoted at their inner ends to the head *d* of the stem *e*, which is to be supposed to be the operative rod of the valve of the steam-supply pipe of the steam-engine. The weighted arms serve not only to aid in connecting the piston and valve rod, but to create the proper downward movement of the piston, as the force by which it may be driven upward may slacken.

Resting against the upper part of the piston, in manner as shown, is a lever or friction-clamp, O, which, pivoted to the reservoir, projects over the shorter arm of a lever, P. The said lever P is pivoted to a stationary standard, Q, the longer arm of the lever having a wrist or journal, *f*, extended from it, as shown. On this journal an arm, R, carrying a wheel, S, turns, such arm being provided with a clamp-screw, *g*, for fixing it to the journal. The wheel S rests, or is to rest, on the driving-belt of the pulley D. While such belt may remain whole it keeps the lever P, by the gravitating power of its longer arm, from fore-



ing the friction-clamp against the piston; but should the belt become broken the clamp will be pressed against the piston, so as to prevent it from dropping, and thereby causing the valve of the steam-supply pipe of the engine to be suddenly moved in a manner to cause the supply of steam to the engine to be greatly increased, and thereby correspondingly increase the power and velocity of the engine. Thus the clamp and its operative lever, and the means of supporting it by the driving-belt, become what is termed a "stop motion" for the piston.

In the operation of the governor the pump-barrel, the reservoir, and cylinder are to be supposed to be charged or supplied with a fluid, as a proper oil, for instance. As the pump-pistons may be revolved they will force the oil upward into the cylinder and against the piston thereof. From the cylinder the oil will be driven into the hollow projection, and thence through its educt and against the valve, and thence back into the pump barrel or chamber, the cylinder-piston rising in accordance with the increase of pressure, and falling as the pressure may decrease with respect to it.

By having the reservoir arranged with the cylinder and the pump in manner as represented, I am enabled to save the necessity of having a separate passage leading from the upper part of the cylinder down outside of the cylinder and into the reservoir, and besides gain further advantage.

By having the reservoir arranged above the pump, and extending around and above the cylinder, and provided with an educt leading from it (the said reservoir) into the pump, as set forth, I gain the following advantages—that is to say: I am enabled to provide a space for holding a large surplus of oil to supply the space made by the rising of the piston in the cylinder, which piston I make large in diameter. This surplus of oil compensates for the continual leakage around the driving-shaft of the pump. By the reservoir continuing entirely around the valve-seat and across it and opening into the pump, I am enabled to dispense with a separate passage from the valve to the pump, the force of the oil when it is passing the valve being spent in the fluid of the reservoir, and when the oil reaches the

pump it does so in mass, the air or gas escaping to the top of the reservoir, a steadier motion to the piston resulting therefrom.

By having the revolving pistons B B' and their operative gears C C' arranged within the pump-chamber the said gears not only operate the pistons but assist them in pumping the oil or forcing it upward against the piston F of the cylinder, and thus, by means of the gears arranged in the oil-chamber, a larger upward flow of oil and a consequent greater sensitiveness of the governor result.

What I claim as my invention in the described steam-engine governor is as follows, viz:

1. The cylinder provided with the chambered valve-seat projection and extended above the pump, in combination with the reservoir extending above the pump and cylinder and around such cylinder and valve-seat projection, and provided with an opening leading into the pump-chamber and across the valve-seat, all being substantially as set forth.

2. The combination of the piston-rod arms and the weighted connection-rods and the valve-stem levers, all being substantially as shown.

3. The stop motion applied to the piston and driving-belt, as described, and consisting of the friction-clamp and its operative lever, and the wheel thereof, whereby the breaking of the belt will cause the friction-clamp to press against the piston, all being adapted and to operate substantially as set forth.

4. The reservoir arranged above the pump and extending entirely around and above the cylinder, and provided with an educt leading from it (the said reservoir) into the pump, as set forth.

5. The pump-pistons arranged in the pump-chamber, and having their operative gears in contact with them, and extended into segmental recesses opening into said chamber, as represented, whereby the gears are enabled to aid in forcing the fluid up against the piston F.

WARREN H. CRAIG.

Witnesses:

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