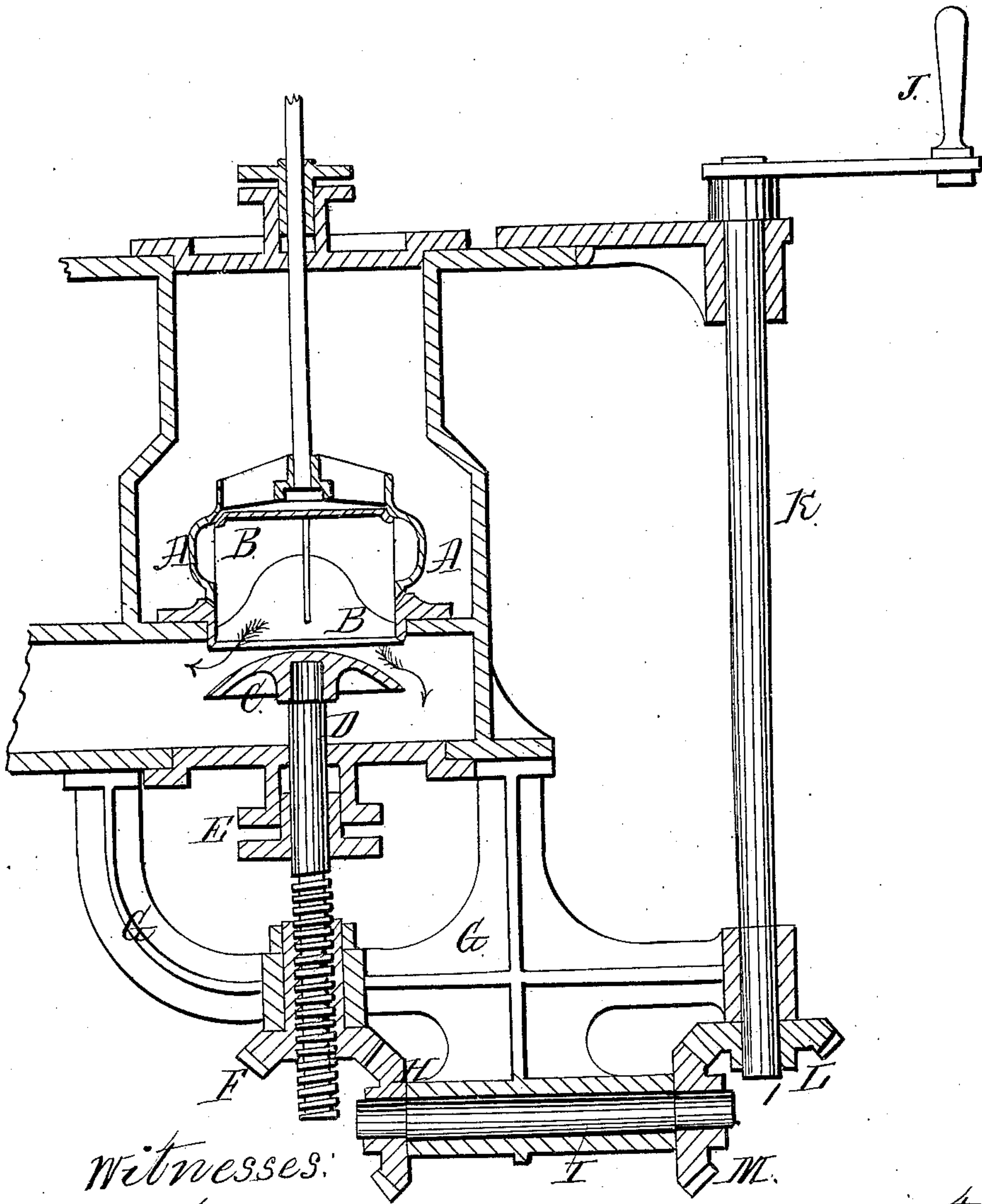


H. P. M. Birkinbine,

Governor.

No 10,224.

Patented Nov. 15, 1853.



Witnesses:

Henry Howson.
Jacob H. Yocum Jr

Inventor

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UNITED STATES PATENT OFFICE.

HENRY P. M. BIRKINBINE, OF PHILADELPHIA, PENNSYLVANIA.

SUPPLEMENTAL VALVE TO THE EQUILIBRIUM-PIPE OF THE CORNISH ENGINE.

Specification forming part of Letters Patent No. **10,224**, dated November 15, 1853.

To all whom it may concern:

Be it known that I, HENRY P. M. BIRKINBINE, of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a new and Improved Mode of Regulating the Motion of Pumping-Engines; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawing, and to the letters of reference marked thereon.

My invention relates to that description of pumping machinery generally known among engineers as the "Cornish engine;" and it consists of intercepting the passage through the equilibrium-pipe by means of any convenient valve apparatus in connection with machinery for regulating the same.

In order to enable others to make and use my invention, I will proceed, first, to describe, in general terms, the operation of an ordinary Cornish engine, and, second, my invention as applied to the same.

In the Cornish engine the steam from the boilers is admitted to the cylinder, which, pressing against the piston, raises the plunger of the pump to the required height, thus completing the upward stroke. The communication with the boilers being now closed, the steam, which has filled the space in the cylinder on one side of the piston, is by the opening of the equilibrium-valve allowed to rush through a passage to the other side, so that the pressure on each side of the piston will now be equal. The plunger will consequently descend by its own or any additional superincumbent weight and the water be forced to the height required. The opening and closing of the separate valves are caused by tappets on a plug-rod in conjunction with weighted levers and the cataract apparatus, the form and action of which are too familiar to engineers to need description.

The equilibrium-passage above referred to is in ordinary Cornish engines uninterrupted—that is, when the equilibrium-valve is open the steam will rush with rapidity from one side of the piston to the other, causing an equally rapid descent of the plunger and its adjuncts. Now should there be but a moderate head of water to force against this great rapidity is liable to cause shocks dan-

gerous to the working parts of the engine. This would be especially felt in engines which raise water into a stand-pipe, the level in the latter being liable to a great and sudden fluctuation.

To obviate the difficulties arising from the above causes the removal from and addition of weight to the plunger is the plan most generally used, but one from which great inconvenience and delay arise.

I will now proceed to describe my invention and the manner in which it is applied to Cornish engines as a means of overcoming the objectionable shocks above mentioned.

The figure in the drawing represents a sectional view of that portion of the valve-nozzles which contains the equilibrium-valve with my improved regulating apparatus attached.

A is the equilibrium-valve of the common double-beat principle; B, the valve-seat, secured to the bottom of the chamber, with a flange projecting downward. This flange forms the seat for a supplementary valve C, which is of the common disk form. This valve, which is in the chamber below the equilibrium-valve, has a spindle D, which passes through a stuffing-box E at the bottom of the chamber. The end of the spindle screws into the hub of the miter-wheel F, which is allowed to work loosely in the center of the cross-bar G. Into the wheel F gears another wheel H on the shaft I, which is caused to revolve in either direction by the handle J on the vertical shaft K, in conjunction with a second pair of miter-wheels L and M.

It will be easily seen that on turning the handle J, which is conveniently situated for the attendant engineer, the supplementary valve C may be brought farther from or closer to the opening beneath the equilibrium-valve, and consequently the passage of the steam therefrom more or less obstructed at pleasure. Should the head of water to force against be low, the engineer raises the valve toward the opening, the steam in its attempts to escape to the opposite end of the piston will be partially arrested, and the plunger will descend with a gradual and easy motion. Should the head of water, on the contrary, be high, the engineer turning the handle J in a contrary direction, the supplementary valve will

be withdrawn from the opening and the steam allowed to have full play, the efficient head of water being in itself sufficient to arrest any sudden and dangerous descent of the plunger.

The supplementary valve has the additional advantage of giving the engineer power to arrest the engine fully at any portion of the downward stroke of the plunger in case of accident.

Having now described the nature of my invention and the manner in which the same may be carried into effect, I wish it to be understood that I do not confine myself to the particular form of supplementary valve herein described or to the particular method

shown of actuating the same. It will easily be seen that a slide-valve might answer the same purpose as the former, and that various mechanical devices might be substituted in place of the latter; but

What I claim is—

The use of the adjustable valve apparatus above described, or any equivalent to the same, for intercepting more or less the steam in the equilibrium-passage, so as to regulate the rapidity of descent of the plunger according as the head of water may require.

HENRY P. M. BIRKINBINE.

Witnesses:

HENRY HOWSON,
JACOB H. YOCUM, Jr.