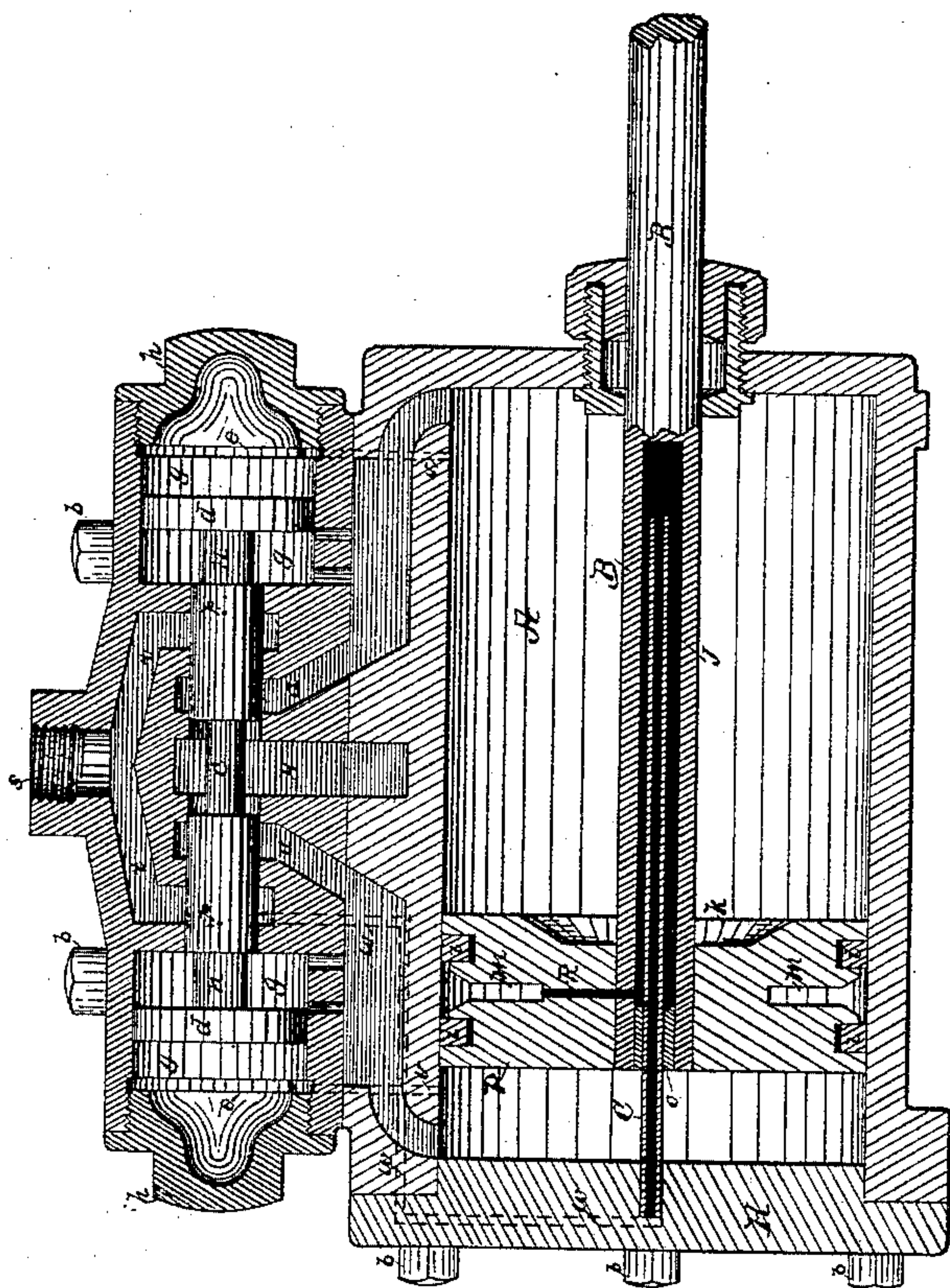


(No Model.)

F. M. METCALF.
STEAM ENGINE.

No. 442,905.

Patented Dec. 16, 1890.



WITNESSES.

Wm A. Crosby.

Nathan A. Briggs

INVENTOR.

Foster M. Metcalf.

B. Martin Metcalf.
Atty.

UNITED STATES PATENT OFFICE.

FOSTER M. METCALF, OF BATTLE CREEK, MICHIGAN, ASSIGNOR TO THE
BATTLE CREEK MACHINERY COMPANY, OF SAME PLACE.

STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 442,905, dated December 16, 1890.

Application filed July 9, 1890. Serial No. 358,185. (No model.)

To all whom it may concern:

Be it known that I, FOSTER M. METCALF, a citizen of the United States, residing at Battle Creek, in the county of Calhoun and State of Michigan, have invented certain new and useful Improvements in Steam-Actuated Valves, of which the following is a specification.

This improvement relates to that class of engines which carry live steam in a chamber of the piston-head for the purpose of actuating the valve automatically by means of trip steam-conduits and passages therefrom.

In the present instance my invention is applied to the steam-actuated valve shown in the patent to E. H. Marsh, dated December 18, 1888, No. 394,656, and therefore the steam-chest, valve, and its chambers need not be more particularly described here, since I do not confine myself to any particular form, inasmuch as my improvement is adapted for use in connection with a great variety of steam-actuated valves of this class, as will presently appear.

My improvement consists in a peculiar construction and novel arrangement of the piston-head and connecting live-steam conduits and passages, whereby the stroke capacity of the cylinder-bore is utilized to its fullest extent at the same time that the whole is greatly simplified, rendered compact and effective to a degree not hitherto attained.

The accompanying drawing represents my invention in longitudinal vertical section.

A represents the engine-cylinder; B, the piston-rod; P, the piston-head; C, the live-steam supply-tube, and H is the head of the cylinder, of which the supply-tube C is a fixture. The piston-rod B is provided with a longitudinal channel or chamber J, reaching a suitable portion of its length from its fixed end in the piston-head, where the contiguous bushing or stuffing-box *o* serves the purpose of a closure of the said longitudinal chamber, and in which the tube C has sliding engagement, as seen. Adjacent to the inner end of the bushing *o* a steam-conduit R rises parallel with the face of the piston-head and connects the longitudinal chamber of the rod with the live-steam annular chamber M, situ-

ated between the packing-rings *i i* of the piston-head P.

Firmly fixed centrally of the head H of the engine-cylinder is situated the supply-steam tube C, whose free opposite end reaches sufficiently near the end of the cylinder to secure telescopic engagement with the channel J of the piston-rod throughout the reciprocations of the engine-piston, as clearly seen in the drawing.

From the fixed end of the tube C opens the steam passage-way W, leading from the live-steam chest or other source of supply, and near each end of the engine-cylinder valve-tripping steam-passages *v v* alternately connect the piston-chamber or steam-reservoir M with the end chambers of the valve at each reciprocation of the piston, whose pulsations are thereby actuated and controlled in manner following, to wit: Steam is conveyed from the chest through the passage-way W (dotted lines) to the tube C of the cylinder-head H and delivered by means of the telescopically-sliding chambered piston-rod B and connected conduit R into the annular chamber or steam-reservoir M of the piston-head, whence it alternately passes through the valve-tripping passages *v v* to the respective end chambers thereof, whereby the valve is moved to reverse the action of the engine-piston.

I have shown a bushing *o* as a sliding closure of the piston-rod chamber J instead of the well-known stuffing-box, because a perfectly-tight joint is not a necessity, inasmuch as a slight escape of steam at this point will force the piston into proper position to move the valve should it stop exactly on the center—a positive advantage, as is evident, although I do not confine myself to the form shown.

Having thus fully illustrated and described my invention and pointed out some of its advantages with its mode of operation, what I claim, and desire to secure by Letters Patent of the United States, is—

1. In a steam-engine, the chest provided with suitable ports, chambers, and passages, a steam-actuated valve, and the engine-cylinder provided with a longitudinally-chambered piston-rod carrying a chambered piston-head

sliding telescopically on a live-steam supply-tube fixed to the head of the cylinder and connected by suitable port with live-steam source, substantially as and for the purposes set forth.

2. In a steam-engine, the chest provided with a steam-actuated valve, suitable ports, passages, and chambers, a longitudinally-chambered piston-rod sliding telescopically on the steam-supply tube, one end of which is free within said chamber of the piston-rod and the opposite end fixed in a suitable support and in communication with live-steam pressure, a piston-head provided with a live-steam reservoir in direct communication by suitable conduit, as R, with the longitudinally-chambered and telescopically-sliding piston-rod, and valve-tripping passages connecting the cylinder with the end chambers of the valve at each pulsation of the engine-piston, substantially as shown, illustrated, and described.

3. In a steam-engine, the chest, suitable ports, passages, and chambers, the steam-actuated valve, the engine-cylinder, the cylinder-head provided with a steam-supply tube, the piston-rod provided with longitudinal chamber sliding telescopically thereon and carrying the chambered piston-head, and suitable ports and passages connecting the same and adapted to secure the full stroke of the piston or equal to the bore of the cylinder, substantially as shown and described.

4. In a steam-engine, the chest, the steam-actuated valve, suitable ports, passages, and chambers, the cylinder-head or other support provided with a steam-supply tube, one end of which is fixed to said support and in direct communication with live-steam source, as W, and the opposite end of said supply-tube opening into the longitudinally-chambered piston-rod and telescopically sliding on said

supply-tube by means of the bushing or stuffing-box *o*, forming a closure of said longitudinal chamber, the piston-head provided with steam-reservoir M and conduit R, connecting said reservoir and piston-rod chamber, and steam-passages *v v*, connecting the cylinder with the chest or chamber of the valve, substantially as and for the purposes described.

5. The steam-supply tube, one end thereof securely fixed and in communication through suitable passages with live-steam pressure, inserted into and in combination with a hollow or longitudinally-chambered piston-rod carrying a piston-head, with an annular central depression or groove sliding telescopically upon the same, substantially as shown and described, and for the purposes set forth.

6. The steam-supply tube C, in connection with the hollow or chambered piston-rod B, with its bushing or stuffing-box *o*, substantially as and for the purpose set forth.

7. The steam-supply tube C, in connection with the cylinder-head H, its steam-port W, and operative connections, substantially as shown, combined, arranged, and operating as set forth.

8. The longitudinally-chambered piston-rod B, with its steam-conduit R, in connection with piston-head P, carrying steam-reservoir M, packing-rings *i i*, bushing *o*, and operative connections, substantially as shown, illustrated, and described, and for the purposes set forth.

In testimony that I claim the foregoing I have hereunto affixed my hand and signature, this 30th day of June, A. D. 1890, in the presence of two witnesses.

FOSTER M. METCALF.

Attest:

MARTIN METCALF,
NATHAN H. BRIGGS.