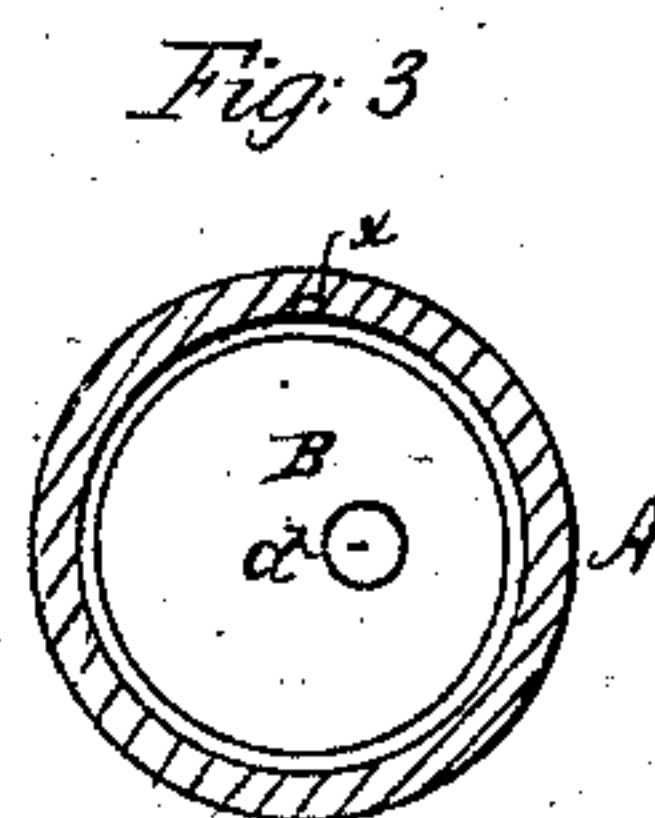
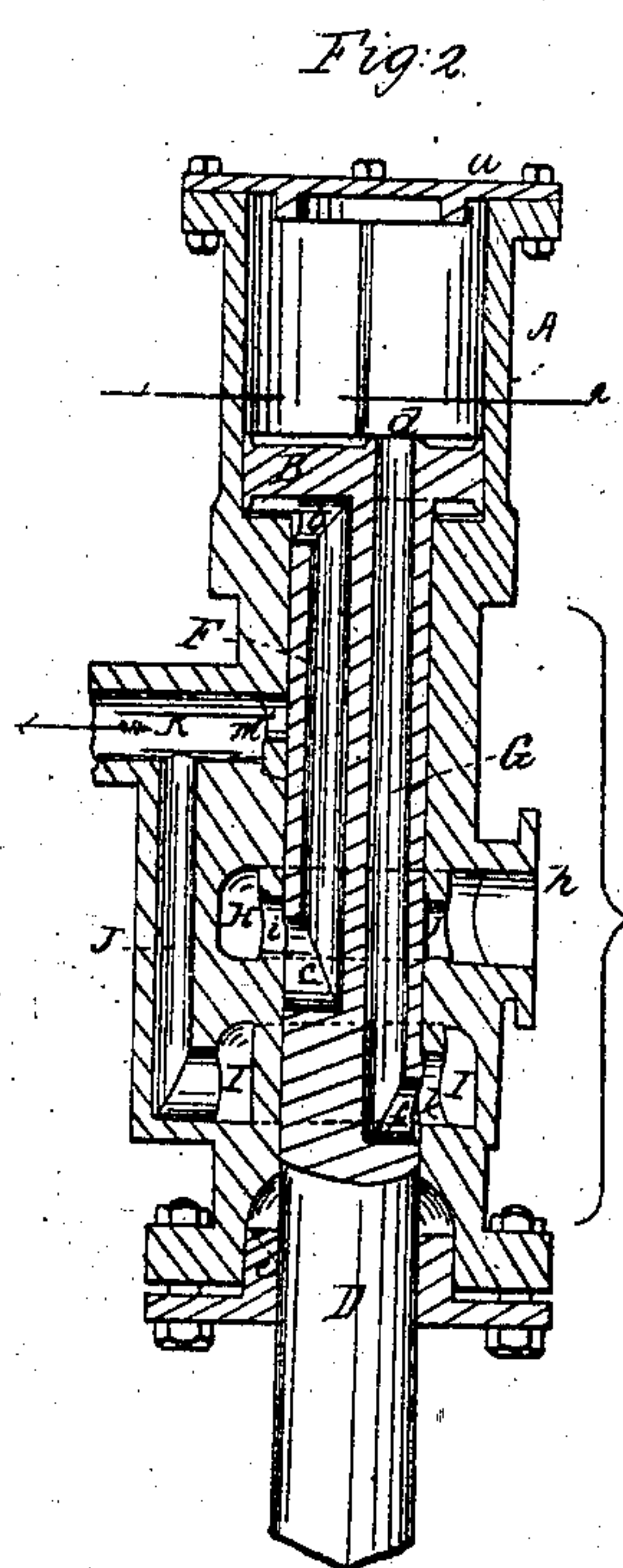
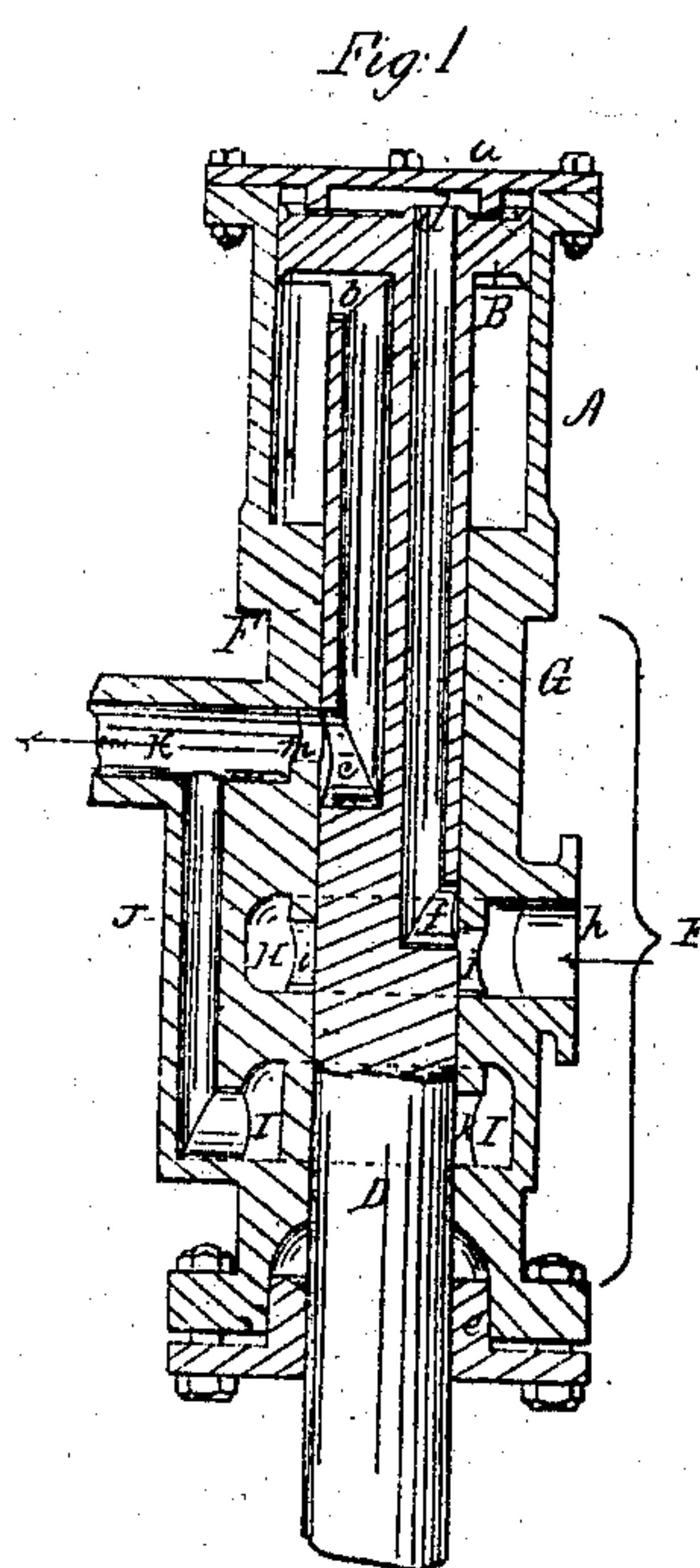


No. 80,550.

D. Joy,
Steam Hammer,

2 Sheets-Sheet 1.
Patented Aug. 4, 1868.



Witnesses
Wm. A. Steel
John Parker

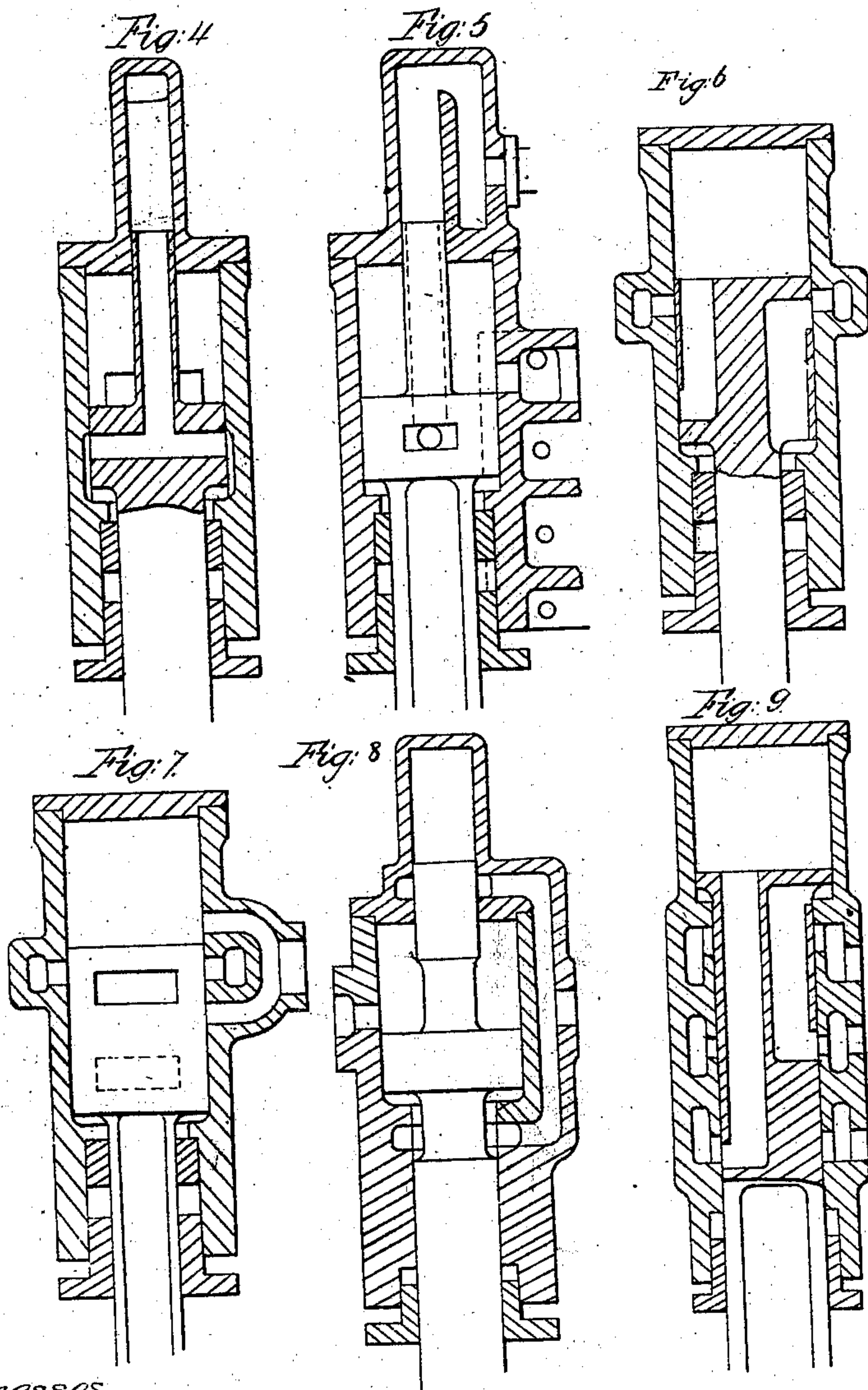
Inventor
David Joy
By H. H. Houston

2 Sheets-Sheet 2.

D. Joy,
Steam Hammer.

No. 80,550.

Patented Aug. 4, 1868.



Witnesses
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DAVID JOY, OF MIDDLESBORO, GREAT BRITAIN, ASSIGNOR TO GUSTAVE BRINKMAN,
ASSIGNOR TO J. VAUGHAN MERRICK, W. H. MERRICK, AND JOHN E. COPE.

Letters Patent No. 80,550, dated August 4, 1868.

IMPROVEMENT IN STEAM-HAMMERS.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL WHOM IT MAY CONCERN:

Be it known that I, DAVID JOY, of Middlesboro, in the county of York, Kingdom of Great Britain and Ireland, have invented certain Improvements in Steam-Hammers; and I do hereby declare the following to be a full, clear, and exact description of the same.

My invention consists in the employment of the piston or hammer-bar of a steam-hammer or hammers, driven by elastic fluid as the valve for the hammer, the ports being formed in the piston, hammer-bar, or cylinder, or among them conjointly, all substantially as described hereafter.

In order to enable others skilled in the art to make and use my invention, I will now proceed to describe its construction and operation, reference being had to the accompanying drawings, which form a part of this specification, and in which—

Figures 1 and 2, Drawing No. 1, are sectional views of the cylinder, piston, and rod of my improved steam-hammer, showing the moving parts in different positions.

Figure 3, a sectional plan on the line 1-2, fig. 2.

Figures 4 and 5, Drawing No. 2, represent a modification of my invention.

Figures 6 and 7, another modification,

Figure 8 a third modification, and

Figure 9 a fourth modification.

On reference to Drawing No. 1, A represents the steam-cylinder, having a suitable cover, *a*, and a piston, B, forming a part of the piston-rod D, which passes through the chambered continuation, E, of the cylinder, the latter terminating below in a suitable stuffing-box, *e*. In the piston-rod D are formed two passages, F and G, the former communicating with the interior of the cylinder, below the piston, at *b*, and having its outlet at *c*.

The passage G communicates with the interior of the cylinder, above the piston, at *d*, and has its inlet at *f*.

The continuation, E, of the cylinder has an annular steam-chamber, H, communicating with the steam-pipe at *h*, and having two outlets, *i* and *j*. There is also in this continuation of or projection from the steam-cylinder, an annular exhaust-chamber, I, having its inlet at *k*, and its outlet through the vertical passage J, which communicates with the general exhaust-pipe K, which also communicates with another outlet, *m*, for the exhaust steam.

The lower end of the piston-rod is provided with a suitable ram, and the cylinder and its continuation secured to any appropriate framework.

Supposing steam to be cut off from the chamber H, and the piston and its rod to be at the limit of their downward movement, as seen in fig. 2, and it be desired to start the hammer, steam is admitted to the chamber, when the following movements of the piston and rod will take place:

The moment steam is admitted to the chamber H, it will pass through *c* into the passage F, and thence through *b* to the interior of the cylinder, below the piston, which it will at once elevate.

As the piston rises, further communication between the steam-chamber H and the passage F is cut off, and immediately after this the steam will begin to pass through *j* and *f* and passage G, into the cylinder, above the piston, and this before the steam which raised the piston can escape through *c* and *m* to the exhaust; but the momentum acquired by the rising piston is such that even after steam begins to gain access to the cylinder above the same, it will continue to rise until the passage F communicates, through *c* and *m*, with the exhaust, when the steam acting on the top of the piston will force the same down.

On the descent of the piston, the exhaust at *c* and *m* is, in the first place, closed, while the inlet through *j* and *f*, for the passage of steam to the cylinder above the piston, remains open, but as the piston continues to descend, this inlet is closed immediately before steam is admitted to the cylinder below the piston, through *i* and *e* and passage F, so that at this point there is steam both above and below the piston, that above being cut off from the boiler, and acting with expansion only against that below, which is live steam from the boiler.

It should be borne in mind, however, that owing to the large diameter of the piston-rod, the area of the top

of the piston is much in excess of that below, and that the piston and rod, in their descent, have acquired a momentum, hence although the steam above the piston is acting through expansion only, the piston continues to descend until the passage G is open, through *f* and *h*, to the exhaust-chamber I, when the steam which served the purpose of impelling the piston and ram downwards, is at once disposed of, and the piston again commences its upward movement.

It will be observed that there is always a cushion of steam above the piston, as it approaches the limit of its upward movement, and below the piston, as it approaches the limit of its downward movement, and that the movement is limited, the extent of this movement depending upon the stationary openings *m*, *i*, *j*, and *h*, in respect to each other, and to the moving openings *e* and *f* of the piston.

It will be seen, without further description, that owing to these openings and the above-described passages, blows are imparted by the ram in rapid succession, without the aid of any valve, other than that required to regulate the flow of steam through the steam-pipe, the rapidity and force of the blows depending upon the quantity of steam admitted, and upon its pressure.

In order to prevent the piston and its rod from turning, and to insure the coincidence of the moving with the stationary openings, a pin, *x*, (fig. 3,) on the piston, fits and slides freely in a vertical groove in the cylinder.

Figs. 4 and 5, Drawing No. 2, illustrate a modification of my invention; figs. 6 and 7, a second modification; fig. 8, a third modification, and fig. 9 a fourth modification.

The construction and operation of these modified plans of carrying out my invention will be understood from the foregoing description, without further explanation.

I claim as my invention, and desire to secure by Letters Patent—

The employment of the piston or hammer-bar of a steam-hammer or hammers, driven by elastic fluid, as the valve for the hammer, the ports being formed in the piston, hammer-bar, or cylinder, or among them conjointly, substantially as set forth.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses.

DAVID JOY.

Witnesses:

WM. FOWKS,

JAMES SMALLWOOD.