2 Sheets—Sheet 1.

T. HILL.

STEAM-HAMMER.

No. 176,860. Patented May 2, 1876.

Fig. 1.

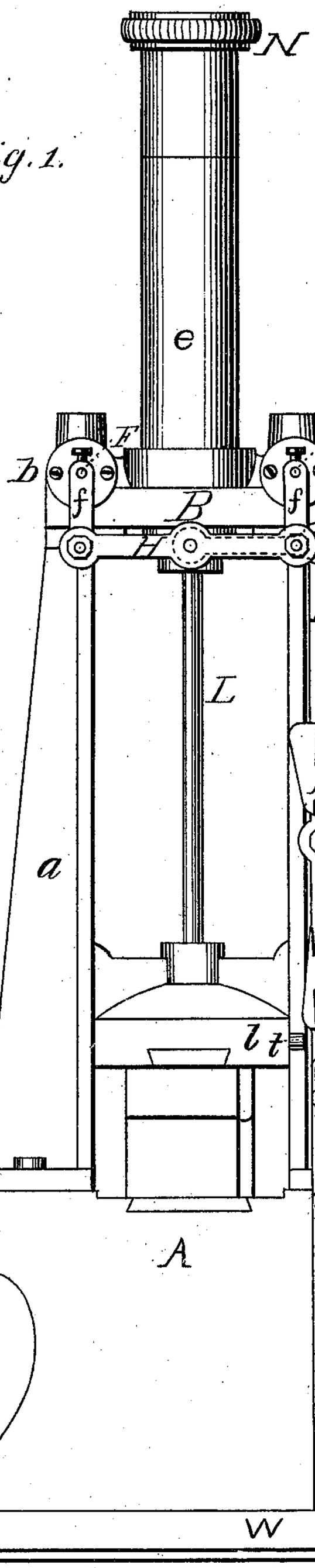


Fig. 2.

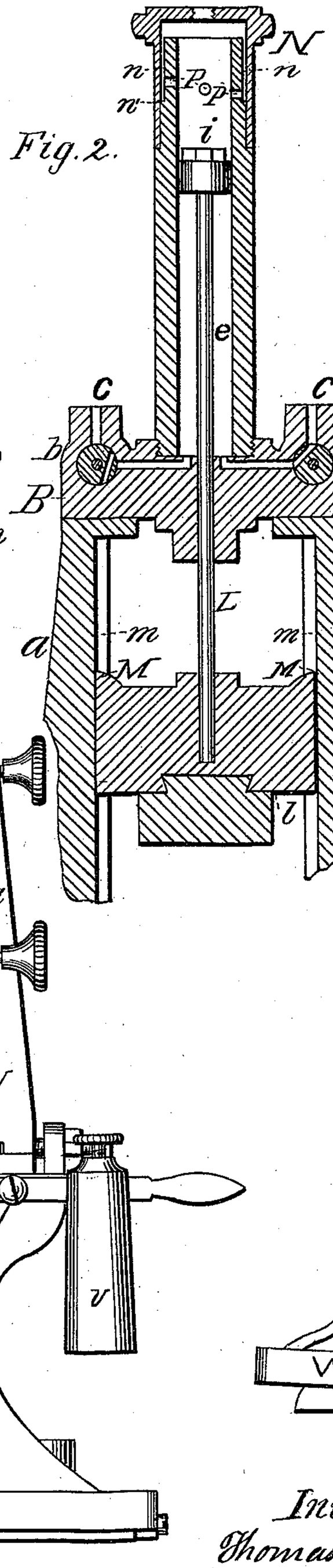
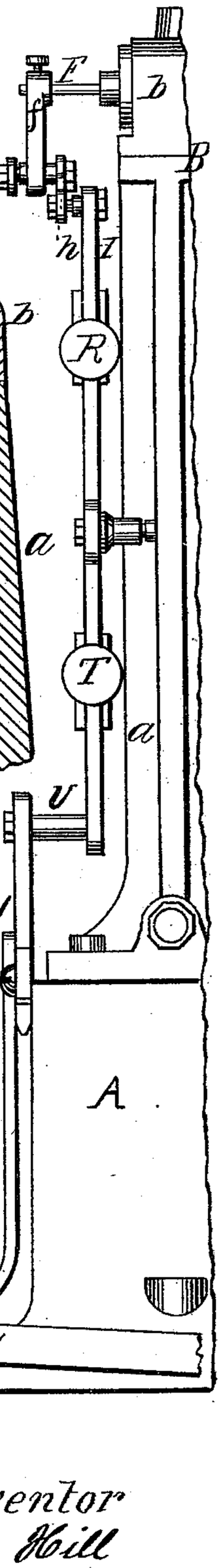


Fig. 3.



Witnesses
John A. Tauberschmidt
Chas. E. Gill

Inventor
Thomas Hill
by his attys.
Cox & Cox

2 Sheets—Sheet 2.

T. HILL.

STEAM-HAMMER.

No. 176,860 Patented May 2, 1876.

Fig. 4

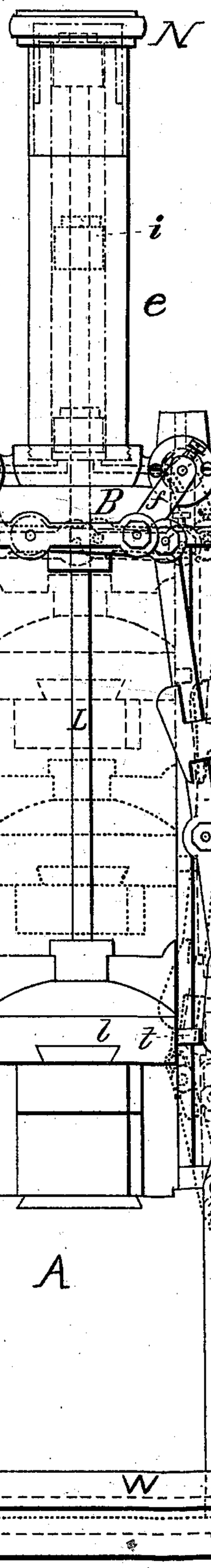


Fig. 5.

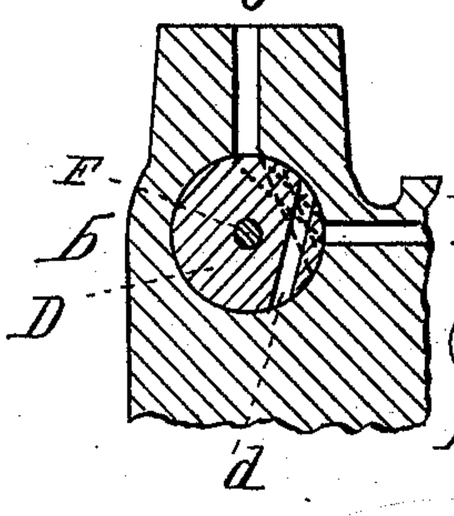
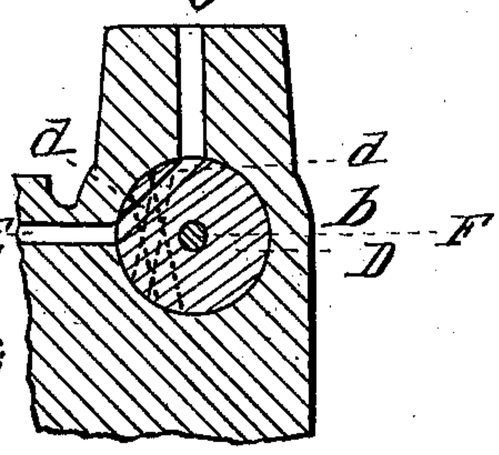


Fig. 6.



Witnesses
John A Tauberschmidt
Chas. C. Gill

Inventor
Thomas Hill
by his attys. Cox & Cox.

UNITED STATES PATENT OFFICE.

THOMAS HILL, OF QUINCY, ILLINOIS, ASSIGNOR OF ONE-HALF HIS RIGHT TO PLINY BLISS WILLIAMS, OF SAME PLACE.

IMPROVEMENT IN STEAM-HAMMERS.

Specification forming part of Letters Patent No. **176,860**, dated May 2, 1876; application filed February 15, 1876.

To all whom it may concern:

Be it known that I, THOMAS HILL, of Quincy, in the county of Adams and State of Illinois, have invented a new and useful Improvement in Direct-Acting Steam-Hammers, of which the following is a specification, reference being had to the accompanying drawings.

The invention relates to an improvement in direct-acting steam-hammers, as more specifically described hereinafter, the object of the invention being to provide a device for forging and analogous purposes, which is driven by the direct action of steam, and the stroke and velocity of which may be controlled as desired.

Figure 1 is a front elevation of a device embodying the elements of the invention. Fig. 2 is a central vertical section of same. Fig. 3 is a side elevation of same. Fig. 4 is a side elevation, showing the different positions of the devices operating the hammer, in dotted lines. Figs. 5 and 6 are central sections of the valves.

A in the accompanying drawings is an anvil, provided with the two vertical standards *a*, their tops connected by the brace B, in each end of which, and directly over the tops of the standards, are provided the valve-chambers *b*, having at their top the induction-ports C, and within them the valves D, having the channel *d*, the mouths of which connect with the induction-ports C, and also with the induction-port E leading into the steam-chambers *e*, situated midway between the valves. Thus in only one position does the channel *d* afford a passage for the steam. These valves are provided with rigidly-attached stems F, which project outward, and at the proper place are rigidly secured to the upper end of crank-levers *f*, the lower ends of which are pivoted to the ends of a cross-bar, H, which is connected at its center by an elongated pivot to the end of the draw-rod *h*, the other end of which is pivoted to the upper end of governing-lever I, hereinafter mentioned. These valves are so arranged in relation to each other that when one is in the receiving position the other is closed. Thus, when these respective positions of the valves are changed, the steam in the steam-chamber is retained therein.

The steam-chamber *e* is secured, as aforesaid, in a vertical position midway between the valves, and operates as a cylinder to receive the head *i* of the hammer-shaft L, which depends downward through a packed aperture in the base of the cylinder, and has secured at its lower end the hammer *l*, provided on each side with the guides M, working in the guide-slots *m*, in the inner and opposite faces of the standards *a*.

The upper end of the cylinder is provided with a movable head, N, in the top of which may be provided a cock or other suitable means of affording a vent for the air when too much is compressed above the piston-head, retaining sufficient, however, to form a cushion.

The base of this head N fits over an annular shoulder, *n'*, near the top of the cylinder, in a steam-tight manner. Above this shoulder is provided an annular recess, *n*, having the ports P. The top of the cylinder does not quite touch the inside lower face of the cap N.

It is, therefore, obvious that when the steam is admitted to the chamber *e* the piston-head will ascend, but should it, by the force of the expansion of the steam, or otherwise, pass one of the ports P, the steam will escape into the annular recess over the upper edge of the cylinder, and afford a cushion to resist the ascending stroke of the piston-head.

The governing-lever I is secured by an elongated pivot near its center to one of the vertical standards *a*. Above this pivot is secured movably upon the lever I the dog R, arranged to slide vertically upon the lever, provided with a set-screw, and having its inner face so conformed as to permit the ascent of anything coming in contact with it, substantially as shown. This dog should be of such length that after the stud *t* has come in contact with it as the hammer ascends, the impact will continue until the hammer is dropped by means of the treadle.

Below the elongated pivot of the governing-lever another dog, T, is secured in a manner

analogous to the one above mentioned, but having its face reversed, so as to offer no obstacle to the descent of any object. This dog should be of such length that after the stud *t* has touched it, as the hammer descends, the impact will continue until the stud leaves it as the hammer ascends.

The dogs are placed in such position in relation to the stud *t*, projecting from one side of the hammer, as to operate thereon in the manner hereinafter described.

To the lower end of the lever I is provided the projecting standard U, the end of which is confined in the slot in the upper end of the shorter arm of the bell-crank lever V, which is pivoted to the anvil through its horizontal arm, which is formed into a lever projecting on one side of the anvil, and furnished with the adjustable counterpoise *v*. To the angle of the bell-crank lever is pivoted a bar, which depends vertically, its lower end being secured to the treadle W.

Operation: The hammer being in its depressed position, the lower dog T is forced outward. This operates through the bell-crank and its attachments to elevate the treadle, at the same time causes the valve mechanism to assume such position that while one valve is receiving steam the other valve is closed. The steam being now in the cylinder, below the piston-head on the hammer-shaft, the hammer rises, its ascent continuing until the stud *t* comes in contact with the upper dog. This throws the lever outward, and it, operating upon the intermediate mechanism, closes both valves, thus retaining the steam in the cylinder below the piston-head *i*, suspending the hammer. The treadle now being depressed, the valves are thrown into such position that the one which received the steam is closed and that exhausting steam opened. Thus the steam is permitted to escape from below the piston-head, allowing the hammer to drop, its descent being accelerated by any steam which may have escaped through the ports P in the upper part of the cylinder, and compressed therein. The hammer having reached the end of its stroke, the stud *t* comes in contact with the lower dog, causing a repetition of the operation first above described and an instantaneous elevation of the hammer.

It is obvious that by an adjustment of the upper dog R the power of the hammer may be perfectly regulated, while an adjustment of the lower dog up or down serves correspondingly to accelerate or diminish the rapidity of the hammer stroke.

It is also obvious that the operator can drop the hammer at any point he chooses by simply depressing the treadle, or arrest its ascent by removing his foot from the treadle. It is also obvious that one valve can be employed instead of two, though the latter is the preferred means. It is likewise true that the lower dog can be dispensed with, as after the blow is struck it is only necessary to take the foot from the treadle, when the hammer will ascend.

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

1. A steam-hammer provided with a projecting stud, which, as the hammer descends, strikes against a dog, thereby opening the receiving and closing the exhaust valves, and when the hammer ascends strikes a dog, closing both valves, holding the hammer suspended.

2. The combination of the exhaust and receiving valves, arranged in relation to each other, as specified, in combination with the levers *f*, cross-bar H, draw-rod *h*, and lever I, substantially as specified.

3. The steam-chamber provided with a movable head, N, annular shoulder *n'*, recess *n*, and ports P, substantially as set forth.

4. The dog R, in combination with the lever I, draw-rod *h*, cross-bar H, and levers *f*, for operating the valves, substantially as specified.

5. The dog T, in combination with the lever I, draw-rod *h*, cross-bar H, and levers *f*, for operating the valves, substantially as described.

In testimony that I claim the foregoing improvement in direct-acting steam-hammers, as above described, I have hereunto set my hand this 31st day of January, 1876.

THOMAS HILL.

Witnesses:

FRANK W. JONES,
U. H. KEATH.