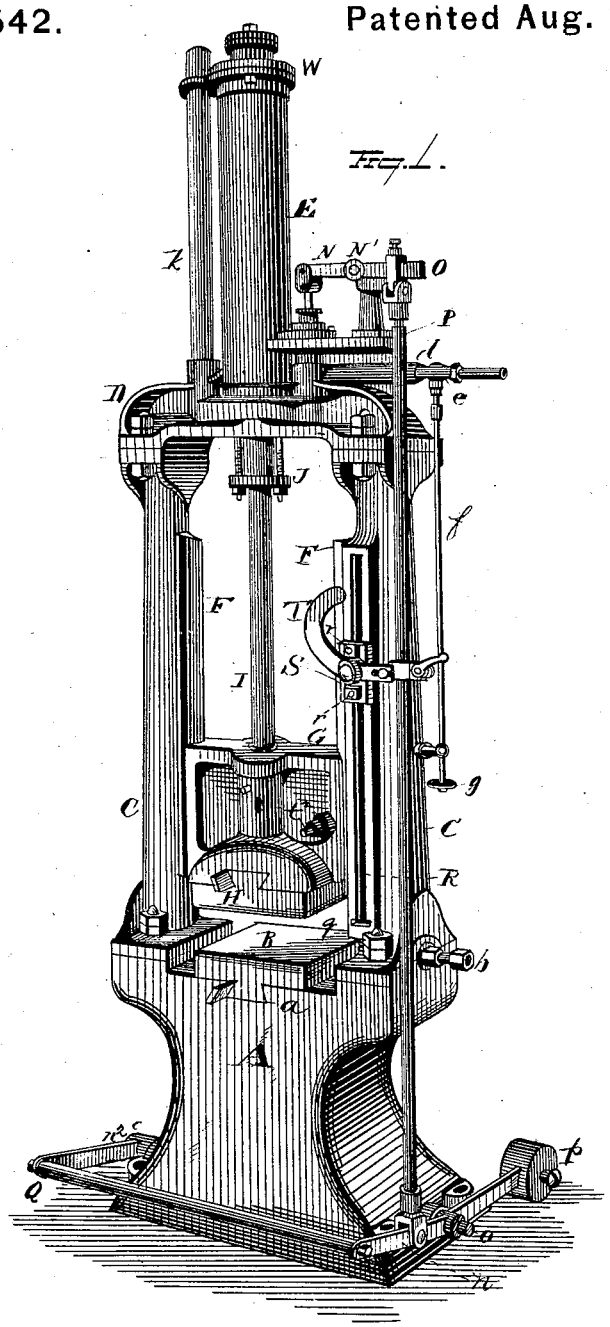
3 Sheets—Sheet 1.

T. R. MORGAN.

Steam-Hammers.

No. 207,542. Patented Aug. 27, 1878.

Fig. 1.



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3 Sheets—Sheet 2.

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Fig. 2.

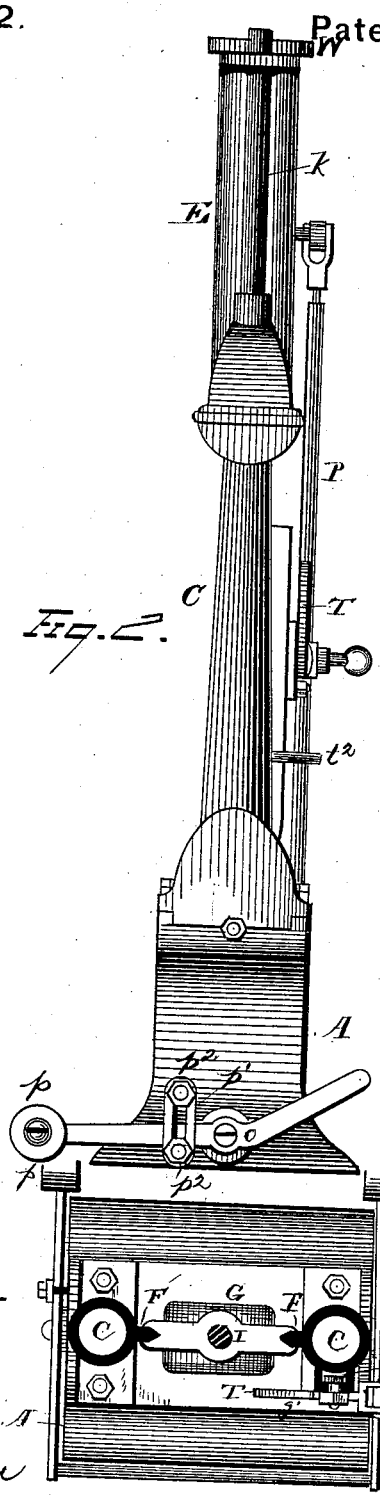

Fig. 4.

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3 Sheets—Sheet 3

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Fig. 3.

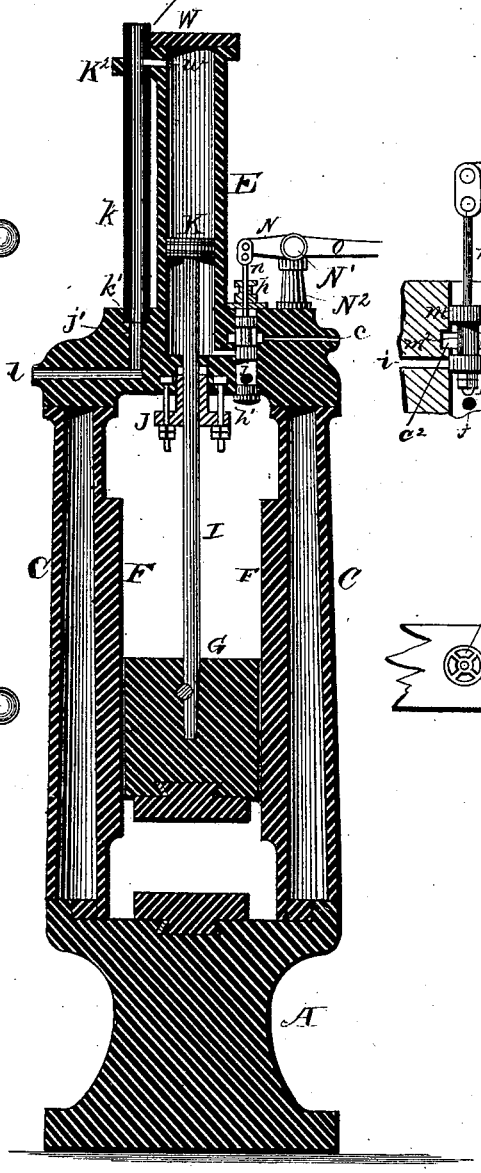


Fig. 5.

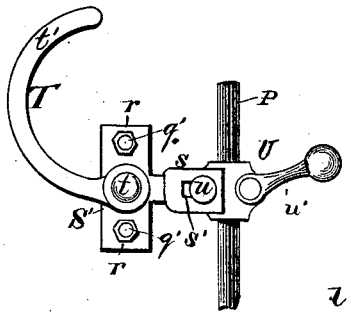


Fig. 8.

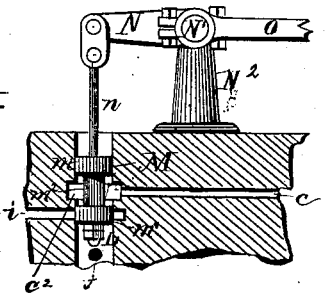
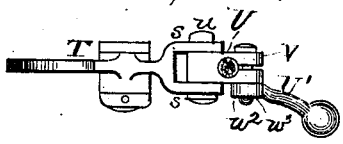


Fig. 6.



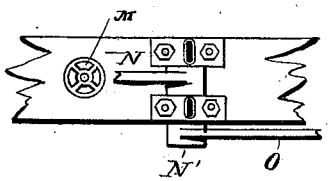
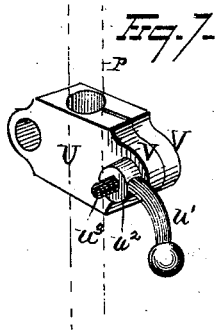


Fig. 7.



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UNITED STATES PATENT OFFICE.

THOMAS R. MORGAN, OF ALLIANCE, OHIO.

IMPROVEMENT IN STEAM-HAMMERS.

Specification forming part of Letters Patent No. **207,542**, dated August 27, 1878; application filed August 13, 1878.

To all whom it may concern:

Be it known that I, THOMAS R. MORGAN, of Alliance, in the county of Stark and State of Ohio, have invented certain new and useful Improvements in Steam-Hammers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification.

My invention relates to an improvement in steam-hammers, the object being to provide a steam-hammer of such construction that, while it may be employed for any of the purposes of ordinary steam-hammers, it shall be especially adapted for forging and stamping of metals into molds, as in the power drop-hammers, which latter are operated by belts, pulleys, gearing, and catches, and often seriously damage expensive molds, besides being dangerous to the operator using the same; and to that end my invention consists, first, in a hollow column for a steam-hammer, having an elongated undercut groove formed therein in casting, for allowing of the vertical adjustment of the rocker which actuates the steam-valve.

My invention further consists in the combination, with a counterbalanced treadle, pivoted to the base of the hammer, and a connecting-rod secured at its lower end to the treadle, and at its upper to a valve-lever, of a rocker adapted to be vertically adjustably secured to one of the columns of the hammer.

My invention further consists in the combination, with a counterbalanced treadle, pivoted to the base of a steam-hammer, and a connecting-rod, having its opposite ends respectively secured to the treadle and a steam-valve lever, of a rocker pivoted to a slide, adapted to be vertically adjusted within an elongated undercut slot in one of the columns of the hammer-frame.

My invention further consists in the combination, with a connecting-rod attached to the treadle and valve-lever, of a rocker pivoted to a vertically-adjustable slide and provided with a friction-clamp, whereby the outer end of the rocker may be adjustably secured to the connecting-rod.

My invention further consists in the combination, with a connecting-rod attached to the treadle and valve-lever, of a rocker pivoted to a vertically-adjustable slide, the outer end of said rocker being bifurcated and provided with oblong slots, through which extends a pin for attaching a friction-clamp to the rocker.

My invention further consists, in a single-acting steam-hammer, in the combination, with the steam-cylinder, having a port leading to the lower end thereof, of a valve-chamber the upper end of which is closed, and having an exhaust-port leading from its lower end, and located below the steam-port, to the cylinder, and an induction-port entering the valve-chamber at a point above the cylinder steam-port, and a hollow double piston-valve constructed with a recessed central portion, said valve being connected to a treadle by a connecting-rod which has an adjustable rocker secured thereto.

My invention further consists in certain details of construction and combinations of parts, as will hereinafter more fully appear from the following description and claims.

In the accompanying drawings, Figure 1 is a view, in perspective, of my improved steam-hammer. Fig. 2 is a side elevation, and Fig. 3 is a vertical section, of the same. Fig. 4 is a transverse section through the columns. Fig. 5 is a side elevation of adjustable rocker for operating the valve mechanism, and Fig. 6 is a plan view of the same. Fig. 7 is an enlarged view of the friction-clamp. Fig. 8 is a detached view of the valve-chamber with its ports and the double piston-valve located therein, and Fig. 9 is a plan view of the same.

A represents the anvil, which is provided with a dovetail slot, *a*, for securing the lower die, B, in position. To the opposite sides of anvil A are secured the lower ends of two hollow and tapered columns, C, upon the upper ends of which rest the base D of the steam-cylinder E. Columns C are made of sufficient size to insure the desired strength, and when made hollow the weight of the upper part of the hammer-frame is reduced, and thus the tendency of the hammer to tip or sag is obviated. Each one of the columns C has a guide, F, preferably V-shaped in transverse section, cast thereon, said guides being afterward planed smooth, and serve to guide the ram G. The columns C are made adjustable by means

of set-bolts *b*, or any equivalent devices. The lower face of ram G is constructed with a dovetail slot, within which is adjustably secured the upper die, H. To the upper end of the ram is secured the lower end of the piston-rod I, the upper end of which passes through a stuffing-box, J, attached to the lower head of the steam-cylinder E, and is secured to piston K. *c* is a steam-inlet passage formed in the steam-cylinder base D, and connected with a steam-pipe, *d*, that leads to a steam-boiler. A throttle-valve, *e*, is placed in pipe *d* near the base D, and is provided with a valve-rod, *f*, which extends down within easy reach of the operator, the lower end being furnished with a hand-wheel, *g*. Steam-inlet passage *c* leads into a cylindrical valve-chamber, L, and surrounds the same, forming an annular steam-chamber, c^2.

The upper end of valve-chamber L is closed by a stuffing-box, *h*, and its lower end by a plug, *h'*. Steam-passage *i* conveys steam from valve-chamber L into the lower end of the steam-cylinder. *j* is an exhaust-passage leading from the lower end of valve-chamber L around the steam-cylinder, where it connects with an upright passage, *j'*, extending through the base of the steam-cylinder.

An exhaust-steam pipe, K, is attached to any suitable coupling, K^1, and extends upwardly to the top of the steam-cylinder, and is attached or held by a bracket, K^2, connected to the cylinder. A small waste-water passage, *l*, extends from the juncture of the exhaust-passages *j j'*, and in the outer end thereof is secured a water-pipe, which extends down by the side of one of the hollow columns, and into a well or any suitable waste-water receptacle.

M is a hollow piston-valve, the opposite ends having pistons *m* m^1 attached thereto or formed solid with the body of the valve. An annular recess, m^2, is formed in the body of the valve between the pistons *m* m^1. A valve-stem is attached to the upper end of the valve, and extends through the stuffing-box *h*, and is fastened to the outer end of the arm N, the opposite end of which is rigidly secured to a rock-shaft, N^1, journaled in a bracket, N^2. Motion is imparted to the rock-shaft N^1 by means of an arm, O, attached thereto, and to the end of which is pivoted the upper end of a connecting-rod, P, while the lower end of same is pivoted to the arm *n* of treadle Q. The arms *n* n^2 of the treadle are pivoted at *o* to the anvil of the hammer. The outer ends are provided with adjustable weights *p*, the position of which relative to the pivotal points *o* is regulated in accordance with the desired time to be consumed in operating or shifting the steam-valve M. To the anvil is secured a slotted upright, p^1, which is provided with adjustable stops p^2, for regulating the vertical movement of the treadle. One of the hollow columns C has an elongated undercut slot, R, formed on its front side in the process of casting and in line with the piston-rod. The lower or upper end of the slot is enlarged, as at *q*, for the reception of the heads of adjusting-bolts *q'*, which extend through the plate or slide S, whereby the latter is adapted to be adjustably secured on the column C by loosening the nuts *r* on the outer ends of bolts *q'*, and then the slide or plate may be freely moved to the desired position, when the nuts *r* are turned down snugly against the face of the slide, and operate to secure the same in any desired position.

T is a rocker, which is pivoted at *t* to the adjustable slide S, and is provided with an inwardly-projecting arm, t^1, of any desired curve or inclination, which is moved upward and outward by a pin, t^2, attached to the ram G.

The opposite end of the rocker T is bifurcated, the arms *s* having elongated slots *s'* formed therein, through which slots extends a pivotal pin, *u*, for attaching the friction-clamp U to the outer end of the rocker. The elongated slots in the outer end of the rocker allow the distance between the friction-clamp and slide to be increased or diminished at pleasure, whereby the adjustment of the slide may be varied without changing the position of the clamp, or the position of the clamp changed without moving the slide. Again, the elongated slots increase the travel of the rocker.

Friction-clamp U is adapted to be adjustably secured to the connecting-rod by means of a hand-lever, u^1, provided with a nut, u^2, which fits on a screw-threaded bolt, u^3, extending through the clamping-jaws V of the clamp. By loosening the nut u^2 the jaws are released from the connecting-rod, and the clamp may be moved to any desired position on the connecting-rod, and secured thereto by simply tightening the nut u^2.

The upper end of the steam-cylinder is provided with a head, W, suitably bolted thereto. A small passage, *w*, extends from the upper end of the steam-cylinder to the exhaust-pipe, to allow of the escape of any steam that may have escaped upwardly past the piston.

Having described the construction and arrangement of the several parts of my improved steam-hammer, I will now describe its operation.

Before steam is admitted the upper die will rest upon the lower die, and the piston will be located in the lower end of the steam-cylinder, sufficient space being provided below the piston for the admission of steam to raise the same, when desired. The foot-bar of the treadle will be raised by the treadle-weights, the latter being depressed to the lowest point of travel allowed by the adjustable stops. By opening the throttle-valve steam is admitted through the inlet-passage, and flows through the annular chamber between the pistons on the valve M, and from thence through the steam-passage into the steam-cylinder below the piston. If a small quantity of steam is admitted, the piston and ram will be slowly raised, while a quick motion may be imparted thereto by admitting a full supply of steam.

As the ram is raised, the pin secured thereto will strike the rocker which projects inwardly past the line of travel of the pin, and move the same upwardly through an arc of a circle, and correspondingly depress the opposite end of the rocker-lever, which operates to force the connecting-rod downwardly, and carry with it the forward part of the treadle. The downward movement of the connecting-rod also operates to raise the steam piston-valve M until the lower piston, m^1, has traveled above the steam-passage *i*, which has the effect of cutting off the supply of steam to the cylinder. When the valve is in the position above described, the exhaust-steam passage *j* is in direct communication with the steam-cylinder, and thus the steam which has operated to raise the piston and ram has a free passage to the atmosphere through exhaust-passages *j j* and pipe *k*, allowing the ram to fall freely. The weights on the treadle will then raise the connecting-rod and force the piston-valve through its downstroke, and cause it to assume its original position, when steam is again admitted to the cylinder, and the piston raised as before described.

The hammer can be operated in an automatic manner, as above described, and adjusted to deliver blows either light and quick or slow and heavy. This variable action of the hammer when working automatically is effected by varying the adjustment of the rocker-arm. For heavy blows, the rocker is moved upwardly and secured near the upper end of the column, and hence the ram must travel upwardly until it strikes the rocker and shifts the valve before it can fall. The velocity of the travel of the ram can be varied and regulated by the amount of steam admitted to the steam-cylinder. The steam is wire-drawn by the throttle, and if only a fine line of steam is admitted beneath the piston the ram will be carried up slowly and allow of the proper adjustment of intricate or difficult work between the successive blows of the hammer. If quick and heavy blows are desired, the throttle is turned wide open, and thus the piston is carried up quickly by a full head of steam. If short and quick blows are desired, the rocker is moved down and secured near the lower end of the slot, so that the valve will be shifted when the ram has been raised but a slight distance from the anvil.

When the hammer is being operated in an automatic manner, the weights on the treadle may be adjusted so as to keep time and work in harmony with the ram, so that during the time the ram is falling the weights will have reversed the position of the treadle and shifted the valve to admit steam below the piston the instant or just before the ram has struck the work operated upon, whereby the ram is instantly raised for striking another successive blow.

The rocker can also be adjusted in such a manner that the ram will be raised to the desired point, and held in its raised position until released, by slightly depressing the foot-bar of the treadle. In such case the rocker is adjusted so that the ram will move the same just sufficient to raise the piston-valve to a position when the lower piston will close the steam-port to the cylinder. As the piston and ram will then be upheld by the confined steam beneath the piston, the ram cannot fall until the operator slightly depresses the treadle, which raises the valve above the steam-port leading to the cylinder and opens a communication with the exhaust-port, and thus allows the ram to fall by gravity. This latter method of operating the hammer enables the operator to manipulate the work at his convenience, and places the hammer under thorough control.

The operator may stop the hammer at any point in its upward or downward stroke by slightly depressing the foot-bar of the treadle, which operates to raise the valve a sufficient distance to close the steam-port leading from the valve-chamber to the steam-cylinder, and thus holds the piston by the confined steam beneath the same.

Dead blows can be secured by simply holding the foot on the treadle and preventing the weights from shifting the valve, and admitting steam below the piston, or by adjusting the position of the weights on the treadle. The ram can be prevented from rebounding, and sent upward the instant it strikes the work, by adjusting the weights so that the valve will be shifted to admit steam below the piston an instant before the ram strikes the work.

From the foregoing it will be observed that my improved single-acting steam-hammer is capable of producing any desired stroke for forging or stamping metals. The blows can be varied at will, and caused to be regular or irregular, of varying intensity, and can be regulated at the will of the operator to suit the requirements of the work being stamped or forged.

Having fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a steam-hammer, a cast-metal column provided with an elongated undercut groove, substantially as set forth.

2. In a steam-hammer, the combination, with a treadle, a valve for governing the passage of steam to and from the steam-cylinder, and a rod connecting the treadle and valve-lever, of a rocker adapted to be adjustably secured to one of the columns of the hammer, substantially as set forth.

3. In a steam-hammer, the combination, with a treadle, a valve for governing the passage of steam to and from the steam-cylinder, and a rod connecting the treadle and valve-lever, of a rocker pivoted to a bearing adapted to be adjustably secured within an elongated slot formed in one of the columns of the hammer-frame, substantially as set forth.

4. In a steam-hammer, the combination,

with a rod connecting the treadle and valve-lever, of a rocker pivoted to a vertically-adjustable slide, and provided with a friction-clamp constructed to be adjustably secured to the connecting-rod, substantially as set forth.

5. In a steam-hammer, the combination, with a rod connecting the valve-lever and treadle, of a rocker pivoted to a vertically-adjustable slide, the outer end of said rocker having oblong slots formed therein, through which extends a pivot that secures the friction-clamp to the rocker, substantially as set forth.

6. In a single-acting steam-hammer, the combination, with a valve-chamber closed at its upper end and a piston-valve having a central annular recess formed therein, of a steam-inlet passage leading to the valve-chamber, a steam-passage leading from the valve-chamber to the steam-cylinder, said passage being located below the inlet-passage, and an exhaust-passage leading from the lower end of the valve-chamber to an exhaust-pipe, said piston-valve being connected with the treadle of the hammer by a connecting-rod to which a rocker is adjustably secured, substantially as set forth.

7. The combination, with the weighted treadle, piston-valve, and connecting-rod, of a rock-shaft journaled in a bracket attached to the steam-cylinder base, and arms rigidly secured to the rock-shaft and connected with the valve-stem and connecting-rod, whereby the weighted treadle serves to open the steam-port to the cylinder, and pressure on the treadle closes said port, substantially as set forth.

8. The valve-chamber having an exhaust-passage leading from its lower end around the cylinder and connecting with an upright exhaust-pipe, and a waste-water passage leading from the exhaust-steam passage to convey the water of condensation from the steam-cylinder, substantially as set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 8th day of August, 1878.

THOMAS R. MORGAN.

Witnesses:
THOS. B. HALL,
E. I. NOTTINGHAM.