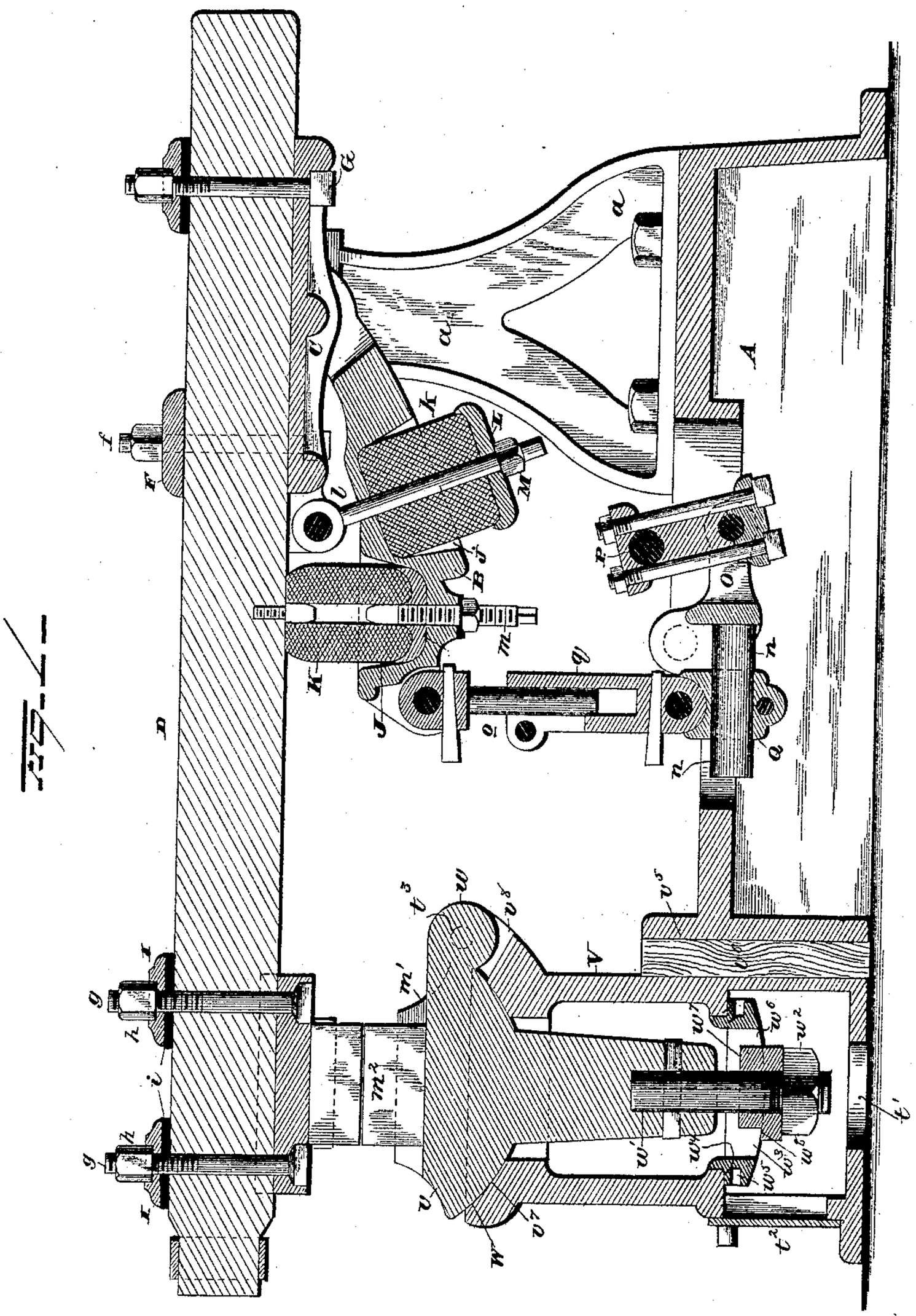
(No Model.) 3 Sheets—Sheet 1.

C. M. BROWN.

POWER HAMMER.

No. 327,999. Patented Oct. 13, 1885.



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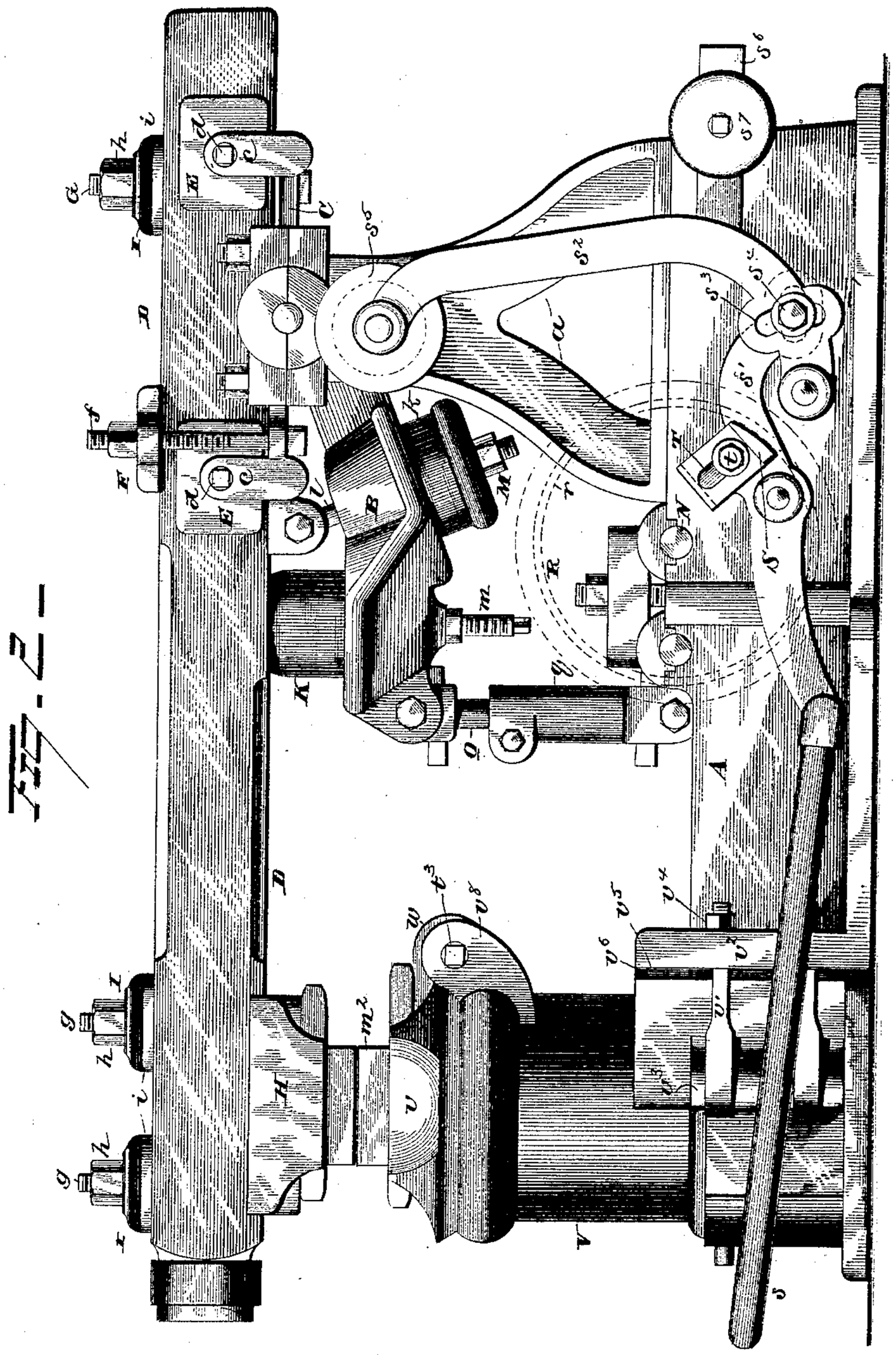

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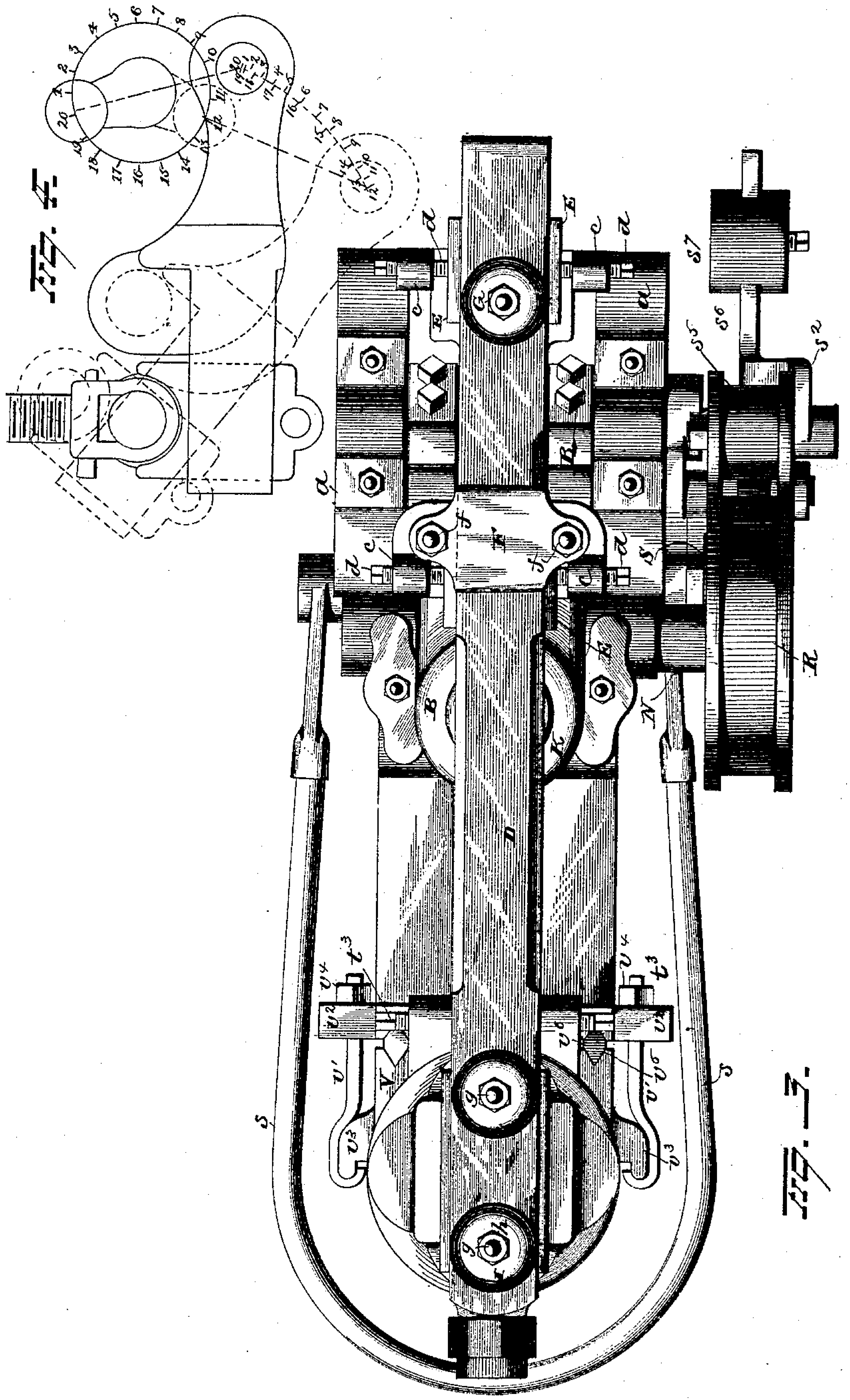

Fig. 4.

Fig. 3.

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UNITED STATES PATENT OFFICE.

CHARLES M. BROWN, OF ROCKFORD, ILLINOIS.

POWER-HAMMER.

SPECIFICATION forming part of Letters Patent No. 327,999, dated October 13, 1885.

Application filed June 18, 1885. Serial No. 169,099. (No model.)

To all whom it may concern:

Be it known that I, CHARLES M. BROWN, of Rockford, in the county of Winnebago and State of Illinois, have invented certain new and useful Improvements in Power-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 appertains to make and use the same.

My invention relates to an improvement in cushioned power helve-hammers.

Previous to August 3, 1880, the best cushioned helve-hammers in common use were actuated by a crank (or its equivalent, an eccentric) raising the hammer with the same speed that it was brought down, and, as the weight of helve and hammer were to be raised at each blow, it necessarily followed that nearly all the power was exerted in raising the hammer and little to delivering the blow.

On the above-named date Letters Patent No. 230,612 were granted to me for an improvement in power-hammers, in which mechanism was shown and described by which the speed of the hammer during its fall was increased above the speed during its rise.

In Letters Patent No. 240,881, granted me on May 3, 1881, mechanism of a somewhat different character was shown and described for accomplishing the slow-rising and rapid-falling movements of the hammer.

The object of my present invention is to further improve the mechanism for producing the slow-rising and quick-falling movement of the hammer, whereby the velocity of the hammer at the moment of delivering the stroke shall be materially increased.

A further object is to provide an anvil which may be rotated and tilted within certain predetermined limits, and to provide means for laterally adjusting the hammer to correspond with the adjustment of the anvil.

A further object is to connect the brake-shoe and band-tightener with the foot-lever in such a manner that they may be adjusted so as to determine the height of the foot-lever when the hammer is at rest and the pressure of the belt-tightener on the belt, respectively, and to connect the hammer to the helve and helve to the cushion-bar in such a manner as to prevent the loosening of the nuts by the jar.

With these ends in view my invention consists in certain features of construction and combinations of parts, as will be hereinafter described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a view of the hammer in vertical longitudinal adjustment. Fig. 2 is a view in side elevation. Fig. 3 is a top plan view, and Fig. 4 is a diagram of the mechanism for producing the slow-rising quick-falling movement of the hammer.

A represents the bed-plate on which the hammer and its operating mechanism are supported. A pair of upright brackets, *a*, are secured on the rear end of the bed A, on the upper ends of which the cushion-bar B is journaled. The rear end of the bar B is bifurcated, and an elongated helve-seat, C, is loosely mounted on the shaft *b*, which forms the journals of the cushion-bar B. The seat C is wider at its ends than the thickness of the hammer-helve D, and is provided with upwardly-extending ears *c* at the four corners.

Set-screws *d* extend through the ears *c* and impinge against bearing-plates E, secured to the sides of the helve. The object of the set-screws will hereinafter appear.

The helve D is secured to the seat C by means of a yoke, F, and draw-bolts *f*, extending through the seat and ends of the yoke, and by a draw-bolt, G, extending through the helve and seat C, near its rear end. The perforation in the seat C, through which the bolt G extends, is elongated laterally to allow the beam to swing a short distance to the right or left.

The hammer H is secured to the helve D by means of a pair of draw-bolts, *g*, which extend through the helve near its front end. The nuts *h* on the draw-bolts G *g* are recessed into the tops of the washers I, and cause the washers to turn therewith. Between the bases of the washer and the helve, washers *i*, made of leather or other tough flexible material, are interposed, affording the metallic washers a yielding seat, and preventing the jar from the hammer from working the nuts loose.

The bar B is provided with an upwardly and downwardly opening socket or cushion

seat, J *j*, respectively, in which are secured the elastic cushions K *k*, the former resting with its upper end against the lower side of the helve, just in front of the helve-seat C, and the latter provided with a cap, L, on its lower end. A bolt, *l*, pivotally secured at its upper end to the front end of the seat C, extends downwardly through the cushion *k* and cap L, and is provided with a draw-nut, M, on its lower end, by means of which the cushion *k* is compressed or released and the bar B pressed toward the under side of the helve. A screw-bolt, *m*, extending through a threaded boss on the lower side of the beam B, opposite the seat *g*, extends upwardly to a movable cap located in the seat J, by means of which the cushion K is compressed and released and bar B forced away from the lower side of the helve. From the above it will be seen that the cushions reciprocally act upon each other, and by means of the separate adjustments the cushion-bar B is held in the proper adjustment relatively to the helve.

The hammer is operated through a main crank-shaft, N, suitably journaled in the bed-plate in front of the supporting-brackets *a*. A rock-arm, *n*, is journaled in suitable bearings in front of the shaft N, and is connected at one end with the main crank-shaft N by the pitman O, and at its other end with the front end of the cushion-bar B by the pitman *o*. The journals of the arm *n* are located between and above its ends, thereby admitting of a rocking motion of the entire arm forwardly and backwardly on its bearings.

The rear end of the arm *n* extends below and slightly to the rear of the axis of the main shaft N, and occupies such a position relatively to the wrist-pin P on the main shaft when the hammer is down and the arm *n* horizontal, that any motion of the wrist-pin P to the right or left will tend to depress it. Furthermore, the wrist P should occupy a position at a short distance to the left of its highest point when the arm *n* is in the position above stated. By referring to the diagram, Fig. 4, the full lines represent about the relative positions of the arm *n* and wrist P when the hammer is down. The path of the wrist P when the main shaft makes a revolution, is divided into twenty equal parts. The path which the wrist *p* (the point where the pitman O is attached to the arm *n*) describes during the revolution of the main shaft is provided with a series of marks on the right, numbered 1 to 12, inclusive, representing about the distances traveled by the wrist *p* while the wrist P was describing the corresponding distances in its path, and with a series of marks on the left, numbered 13 to 20, inclusive, denoting the distances traversed by the wrist *p* while the wrist P was describing the corresponding distances in its path. The dotted lines show the position of the arm *n* and wrist P when the hammer is at the limit of its rise ready to strike. From the above it will be plainly seen that twelve-twentieths, or three-fifths, of the revolution of the main shaft was devoted to raising the hammer, and only two-fifths to bring it down. Its downward stroke must therefore be performed with greater velocity than its upward stroke, and by further examining the distances traversed at different parts of its downstroke it will be observed that at or about the time when the hammer would ordinarily come in contact with the work it is traveling about twice as rapidly as during the corresponding part of its rise. This point of highest speed appears from the diagram to be at about the middle of its downward stroke, and the cushion-bar is moving at this time with its greatest velocity; but as a matter of fact the hammer, owing to its inertia and the elasticity of its connection with the cushion-bar, does not attain its highest speed until the crank-wrist has passed around to a position corresponding to the numbers 19 or 20, when the rear spring ceases to force it downwardly and the front spring resists its momentum.

In practice I find that the hammer gives its most powerful blow at about the lowest point of its stroke. By the above arrangement the driving-power is brought to bear in forcing the hammer downwardly as well as upwardly, the momentum is increased, and a hammer of lighter weight is made to do the work of a heavier hammer of the ordinary construction. The pitman *o* is secured on the forward end of the arm *n*, in a sliding adjustment on the arm, whereby the length of hammer-stroke is determined to the finest degree.

The pitman *o* is also made longitudinally adjustable, to determine the point at which the stroke shall be delivered.

My preferred means for accomplishing the above-described adjustments consist in providing a clamping-sleeve, Q, adapted to slide on the forward end of the arm *n*, and pivotally securing to the sleeve Q the lower section, *q*, of the pitman *o*. The upper portion of the section *q* is also a clamping-sleeve, in which the upper section of the pitman *o* is adapted to fit and slide.

The drive-wheel R is secured on one end of the main crank-shaft N. It is provided on its inner edge with an interior circular face, *r*, adapted to form a bearing for the brake-shoe S. The latter is secured to one branch of the forked foot-lever *s*, near its rear end, and has a sliding adjustment toward and away from its bearing *r*, by means of an oblong slot, T, through which it is secured to the lever by a set-screw, *t*.

The foot-lever *s* is pivoted to the bed-plate, and the branch to which the brake-shoe is attached extends rearwardly in bent form, as shown at *s'*.

s^2 is the belt-tightener supporting-arm. It is pivotally secured to the bed-plate at its lower end, and is provided near its lower end with a transverse oblong slot, s^3, through which it is secured to the rear end of the lever-extension s^2, in different adjustments toward and away from the driving-belt, by means of a bolt and clamp-nut, s^4. A loose pulley, s^5, is mounted on a

stud at the upper end of the arm s^2, and adapted to press against the belt and tighten the same, thereby setting the hammer in motion. A rearwardly-extending arm, s^6, is attached to the arm s^2, near its lower end, and provided with a counter-weight, s^7, which has a sliding adjustment thereon.

When the front portion of the foot-lever s is depressed, the brake-shoe is disengaged from the drive-wheel and the belt-tightener brought into engagement with the belt. When the foot is released from the lever, the counter-weight s^7 immediately puts on the brake and releases the tightener from the belt.

By means of the adjustable brake-shoe and the adjustable tightener-arm the engagement of the shoe and tightener with the drive-wheel and belt, respectively, may be varied to suit the operator.

V is the anvil-block and v the anvil. The anvil-block is secured to the bed-plate by means of hook-bolts v', which extend through lateral flanges v^2 on the front end of the bed-plate, and hook over lugs v^3, formed on the sides of the block V. The heads of the bolts v' are threaded and provided with nuts v^4, by means of which the anvil-block is locked to the end of the bed-plate. Vertical sets of corresponding notches, v^5, are formed on the front end of the bed-plate and rear of the anvil-block, in which a series of wooden blocks, v^6, are inserted. They serve to relieve the bed-plate from the jar of the anvil, and at the same time, together with the fastening-bolts v', admit of the block V settling more or less without disturbing the bed-plate.

The block V is hollow, and is provided with a concave or globular-shaped anvil-seat, v^7, at its upper end, and with a pair of rearwardly-extending upwardly-inclined ears, v^8, between which the concave seat v^7 is partially cut away. An opening, t', is provided in the bottom of the block, and a door, t^2, at its lower front portion.

The head of the anvil v is provided with a convex or globular-shaped under surface, W, adapted to fit and have a rotary motion on the seat v^7. The head is further provided with a rearwardly-extending projection, w, adapted to rest and have more or less play between the ears v^8. Set-screws t^3, working in the ears v^8, impinge against the sides of the projection w, and serve to lock the anvil in the desired rotary adjustment in its seat. The shank of the anvil extends downwardly within the anvil-block, as shown, and is provided with a bolt or shaft, w', firmly set in its lower end in the line of its axis. The lower end of the shaft w' is threaded and provided with a nut, w^2. Between the shank of the anvil and the nut w^2 a plate, w^3, is interposed, having a bearing against a shoulder, w^4, on the inner surface of the anvil-block, and a series of radial sockets, w^5, in its edge for inserting a lever and rotating the plate.

The said plate w^3 is further provided with an oblong slot, w^6, through which the shaft w' extends. A washer, w^7, is loosely secured on the shaft w', and has an upper portion adapted to fit and slide within the slot w^6, and a lower portion, which slips under the plate along the edges of the slot. The bearing w^8, which the washer w^7 has on the under side of the plate w^3, is the arc of a circle concentric with the circle whose arc is an element of surface of the seat v^7. Across the top of the anvil is a dovetailed slot, m', in which the lower die, m^2, is secured.

By means of the rotary plate w^3, with its oblong slot, the clamp-nut w^2, and the washer w^7, the anvil v may be tilted in any desired direction and securely locked in position. Thus the surfaces of the hammer-dies may be brought parallel to each other when they are at any desired distance apart, and inclined to each other to suit any wedge-shaped work to which the hammer may be applied. By rotating the anvil about its vertical axis, the dies may also be brought into alignment with each other.

The set-screws d, hereinbefore explained, serve to adjust the hammer to the right and left, to suit the different adjustments of the anvil.

It is evident that many slight changes might be introduced in the form and arrangement of the several parts described without departing from the spirit and scope of my invention; hence I do not wish to limit myself strictly to the construction herein set forth; but,

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

1. In a power-hammer, the combination, with the main crank-shaft and the hammer-helve, of the rock-arm, a pitman connecting the rock-arm and crank-shaft, and a pitman connecting the rock-arm and hammer-helve at a point in front of the pivotal bearing of the hammer-helve, the above parts being constructed and combined, substantially as described, whereby the crank on the main shaft travels more than one-half revolution in elevating the hammer, and less than one-half in lowering the hammer, substantially as set forth.

2. The combination, with the rock-arm, a main crank-shaft, and a pitman connecting one end of the rock-arm and crank-shaft, of an extensible pitman connected to the opposite end of said rock-arm, a hammer-helve and devices located between and connecting the extensible pitman and the hammer-helve, substantially as set forth.

3. The combination, with the rock-arm, a main crank-shaft and a pitman connecting one end of said rock-arm to the main crank-shaft, of an extensible pitman secured in sliding adjustment to the opposite end of said rock-arm, a hammer-helve, and intermediate devices connecting the hammer-helve and extensible pitman.

4. The combination, with a brake-lever and a brake-shoe adjustably secured thereto, of a

belt-tightener arm pivotally secured to the machine-frame and adjustably secured to the brake-lever, substantially as set forth.

5. The combination, with the hammer-helve and the bolts for securing the helve to its seat and the hammer to the helve, of metallic washers having recessed faces adapted to receive and fit the draw-nuts, and elastic washers interposed between the metallic washers and the helve, substantially as set forth.

6. The combination, with the bed-plate, an anvil-block having corresponding vertical grooves or recesses on their adjacent faces, and a series of wooden blocks located within said grooves or recess and separating the bed and block, of bolts for removably securing the anvil-block to the bed, substantially as set forth.

7. The combination, with a hollow anvil-block, and an anvil seated in its upper end, of a rotary slotted plate adapted to receive the shank of the anvil, and locking devices in engagement with the shank and rotary plate for locking the anvil in the desired tilted adjustment, substantially as set forth.

8. The combination, with a hollow anvil-block, and an anvil seated in the upper end of the block, of a rotary plate located in the lower portion of the anvil-block, and provided with an oblong slot adapted to receive a prolongation of the anvil-shank, and devices for locking the said prolongation to the plate, whereby the anvil may be tilted in any plane passing through its vertical axis, substantially as set forth.

9. The combination, with an anvil-block and an anvil seated in the block in rotary adjustment, and provided with a lateral extension, of a pair of set-screws secured to the anvil-block and bearing against the lateral projection of the anvil.

10. The combination, with an anvil-block having a concave seat in its upper end and a pair of ears or lugs extending upwardly and laterally therefrom, of an anvil seated in the said concave seat, and provided with a projection extending between the said ears or lugs, and set-screws extending through the ears or lugs and impinging against the projection on the anvil for locking the anvil in the desired rotary adjustment, substantially as set forth.

11. The combination, with the anvil-block, the anvil having a recess in its upper end for receiving the lower die, and the threaded bolt forming a prolongation of the anvil-shank, of the slotted rotary plate, the shouldered washer, and the clamp-nut, substantially as set forth.

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

CHARLES M. BROWN.

Witnesses:
DAVID N. STARR,
W. L. RUTLEDGE.