No. 612,949. Patented Oct. 25, 1898.

W. H. LAW.

POWER HAMMER.

(Application filed Nov. 8, 1897.)

(No Model.) 2 Sheets—Sheet 1.

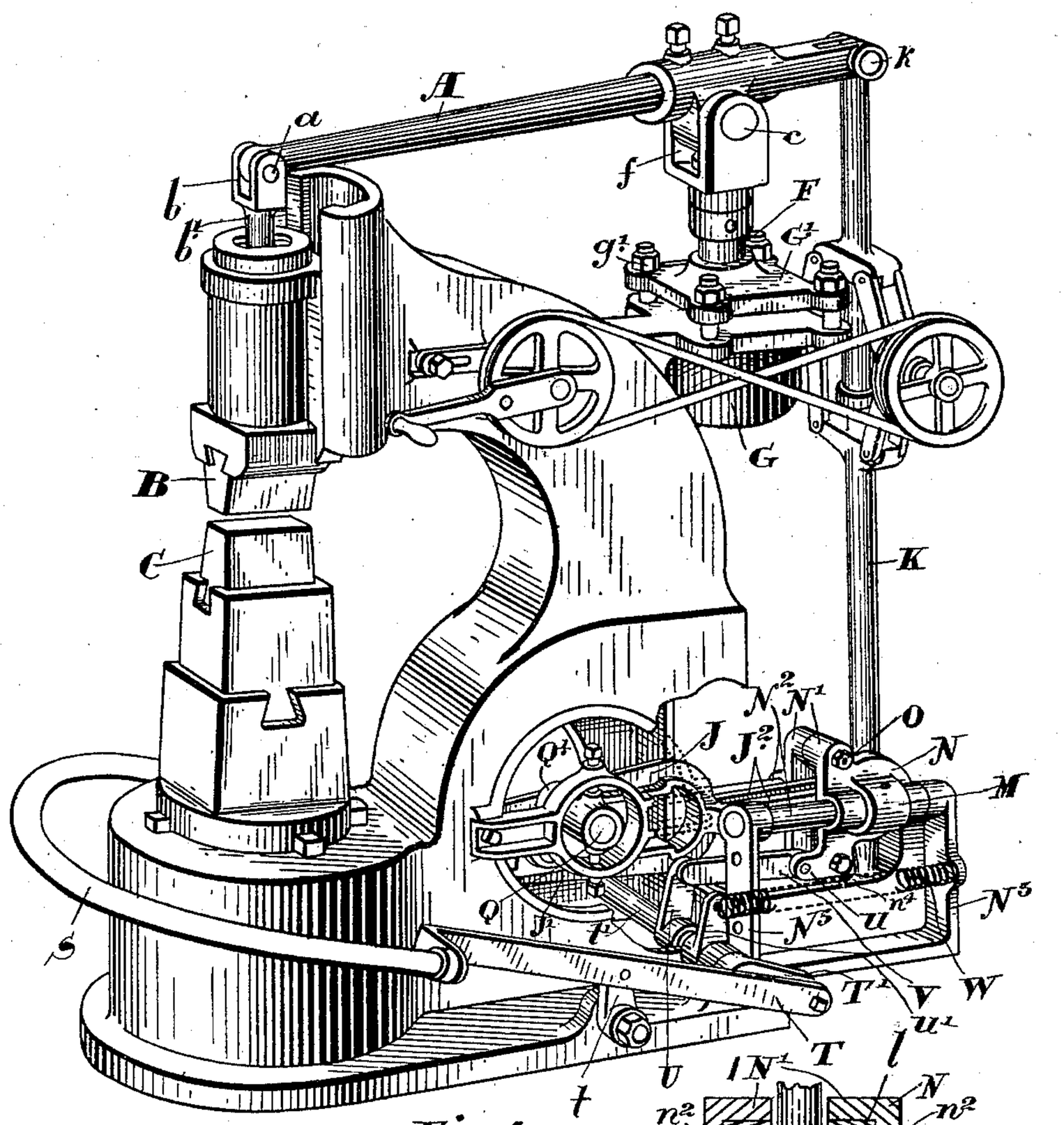

Fig. 1.

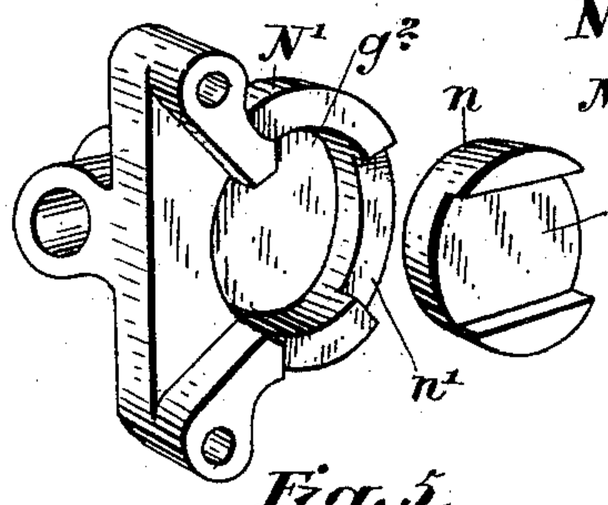

Fig. 5.

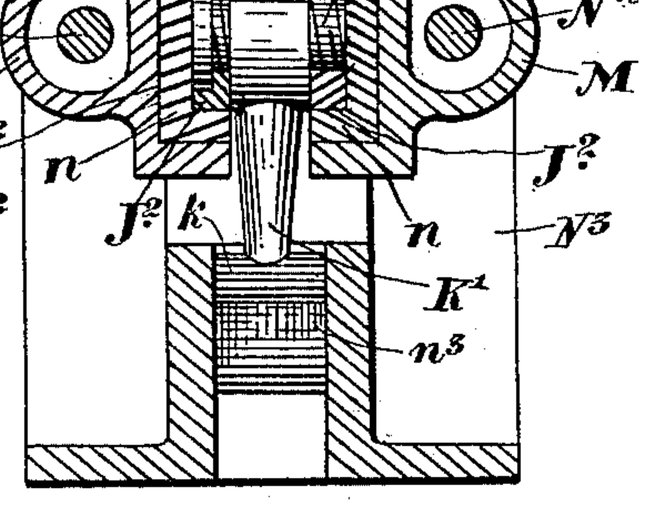

Fig. 4.

Witnesses
H. J. S. Lowry.
A. Dennison

Inventor
W. H. Law
by Fetherstonhaugh & Co
attys.

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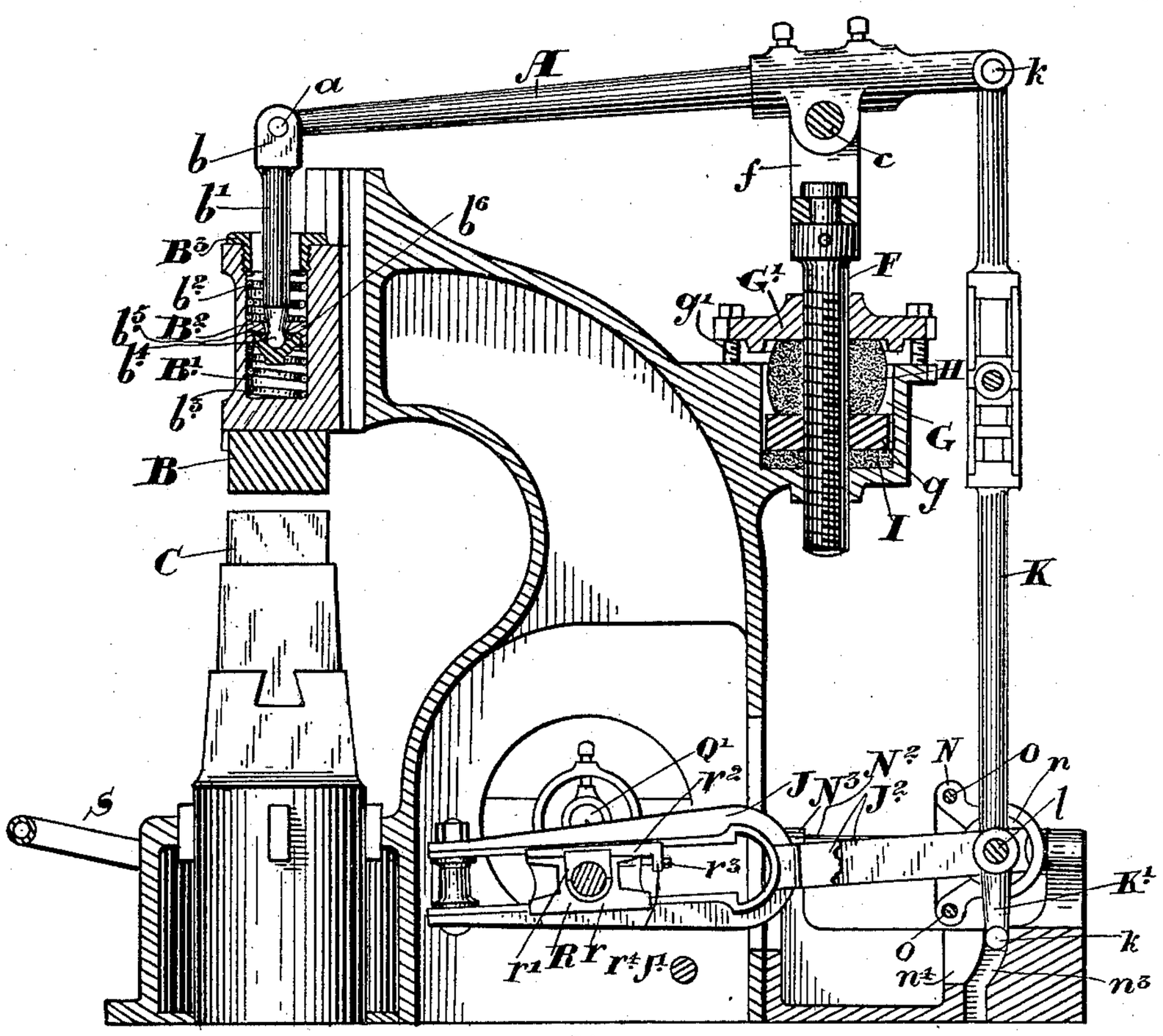

Fig. 2.

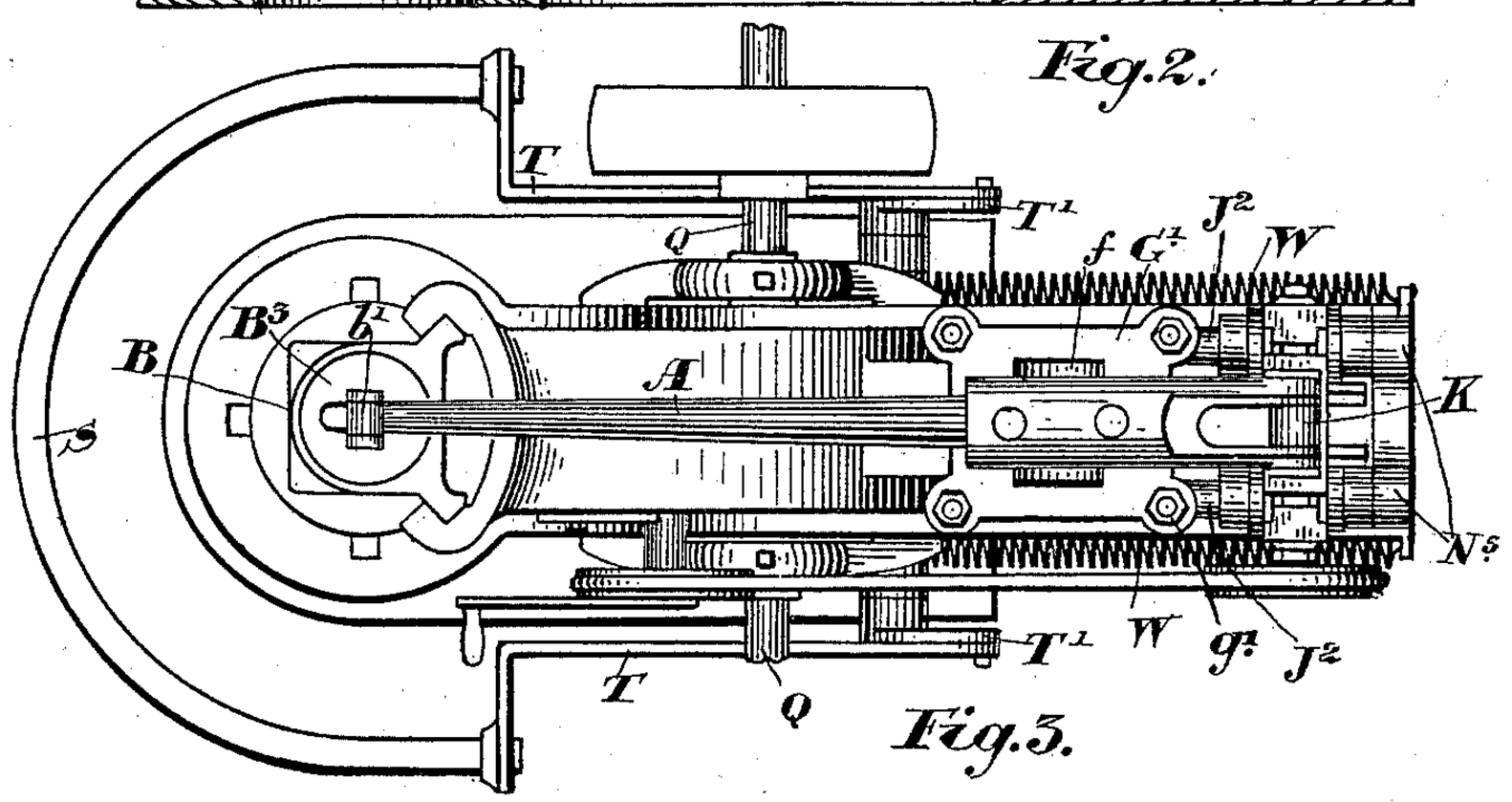

Fig. 3.

Witnesses.
H. S. Young.
A. Dennison.

Inventor:
W. H. Law.
by Fetherstonhaugh & Co.
attys

UNITED STATES PATENT OFFICE.

WILLIAM HARTILL LAW, OF PETERBOROUGH, CANADA.

POWER-HAMMER.

SPECIFICATION forming part of Letters Patent No. 612,949, dated October 25, 1898.

Application filed November 8, 1897. Serial No. 657,842. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM HARTILL LAW, of the town of Peterborough, in the county of Peterborough, in the Province of Ontario, Canada, have invented certain new and useful Improvements in Power-Hammers, of which the following is a specification.

My invention relates to improvements in power-hammers patented to me in the United States of America on June 21, 1892, under No. 477,559; and the object of the present invention is, first, to provide a more positive and effectual means of imparting to the ram a regular motion and a uniform blow, and as a result a quick responding of the hammer when changing it from heavy to light blows; secondly, to provide a ready means of adjustment for the cushion of the spindle upon which is fulcrumed the upper lever; thirdly, to improve the construction of the movable fulcrum in such a manner that it will be stronger and that there will be less wear and tear on the parts to such a degree that they will be almost indestructible and will work much more freely than in the former construction, and, fourthly, to improve the form of the lower lever and sliding block, whereby the wear and tear is greatly reduced, the lever works more freely, and the block may be adjusted much more readily and more securely held in position when adjusted; and it consists in the various details of construction hereinafter more particularly explained.

Figure 1 is a perspective view of my power-hammer, with the lower portion of the frame broken away, so as to show the means of operation. Fig. 2 is a longitudinal sectional elevation through the center of the machine. Fig. 3 is a plan view of the machine. Fig. 4 is a sectional elevation of the fulcrum-head, showing the connection of the lower portion of the pitman to same. Fig. 5 is a perspective detail of one side of the fulcrum-head and circular trunnion fitting therein.

In the drawings like letters of reference indicate corresponding parts in each figure.

A is the upper lever.

B is the ram, and C is the anvil-block.

The front end of the upper lever A is connected by the pin *a*, between the jaws *b*, at the upper end of the rod *b'* of the ram B, thereby supporting the ram. The ram B has a cylindrical hole B', in which is placed a piston B^2 and two spiral springs b^2 and b^3 at the upper and lower side of the piston. The bottom of the rod *b'* is provided with a ball-shaped end b^4, which works in a socket formed in the piston by the annular plate b^5 and screw-cap b^6 and hole in the piston. The spiral springs and piston are held in position in the cylindrical hole B' by the hollow screw-cap B^3, externally threaded and extending into the internal thread at the top of the ram.

By supporting the ram in the manner described I find in practice that I am able to get more regular motion and uniform blows; also, in changing from heavy to light blows or the reverse my improved construction acts instantly. The ball b^4 allows motion in the connecting-rod to compensate for the circular motion of the end of the top lever. It also allows considerable movement in all directions and prevents shock and stress, which would otherwise be produced in the rod. I may also mention that the wear and tear is less.

The upper lever A is pivoted on the pin *c* in the jaw *f*, which is formed at the upper end of the screw-spindle F. It will be noticed that the screw-spindle F extends down through the cushion-chamber G, formed at the rear upper end of the machine.

H and I are cushions or cushion-springs situated, respectively, above and below the nut *g* and designed to relieve the machine from any shock or undue strain caused by the blow of the ram or otherwise. The cushion-chamber G is provided with a suitable cover G', held in position by the tightening-bolts *g'*. These bolts are used to compress the cushions H and I and secure the necessary elasticity. The spindle F is screwed into the nut *g* and passes through the bottom of the cushion-chamber G and the cover G'. The spindle F of course can be screwed up or down, as required, to regulate the height of the lever A without changing the elasticity of the cushion. I am thus enabled by this construction to not interfere with the degree of elasticity of the cushions, as I would be compelled to do in my former machine when raising and lowering the height of the upper lever by means of its spindle-fulcrum.

J is the lower lever, and K the pitman,

which is connected at the top by the pin *k* to the end of the lever A. The lower lever J is constructed in one piece having two arms J′, vertical to each other, at the forward end, and two arms J^2, horizontally arranged, at the rear end, the two arms in each set being parallel to each other and the one set at right angles to the other.

l is a screw-pin which extends through both the rear arms J^2 and the bottom end of the pitman K, being screwed through both of the arms J^2 of the lever, as shown in Fig. 4.

Between the arms J′ at the front end of the lever is fitted the sliding cross-head, in which is journaled the crank Q′ of the crank-shaft Q.

The sliding block R consists of three parts, r, r', and r^2. The inner sides of the arms J′ are parallel to each other, and the upper part r^2 of the sliding block is made tapered in order to compensate for wear and is adjusted by turning the collar-bolt r^3, which extends through the offset r^4 into the part r'. In the improved form of lower lever the crank, passing through the center of the lever, does away with the rocking tendency, which was a defect in my former machine, and at the same time giving a much smoother action, besides reducing the wear and tear.

N is the movable cross-head or fulcrum, which is made in two parts N′ N′. Each part has formed on its side a circular recess g^2, within which the circular trunnions *n* oscillate. The parts N′ are connected together by bolts O (see Figs. 1 and 2) and are supported on two horizontal round bars N^2 N^2, supported on top of the standards N^3 N^3, forming part of the base of the machine, on each side of the movable cross-head N. The rear end of each part or half N′ of the movable cross-head is slotted at n', so as to permit of the passage of the end bars of the lever. The circular trunnions *n* are provided with face recesses n^2, through which the arms J^2 extend.

K′ is the tailpiece of the pitman K, which extends below the trunnions and is provided with projecting lugs *k* on each side, which are designed to have movement within arc-shaped grooves n^3.

n^4 is a slot in the bed-plate in front of and to the center of the grooves n^3. This slot n^4 permits of the downward movement of the lower end K′ of the pitman K as such pitman changes its position, and the arc-shaped grooves n^3, being formed of a composite curve corresponding precisely to the exact path of travel of the lugs *k*, hold the pitman K steady and free from vibration during its movement, thus preventing any vibration on the part of the treadle.

M M are oil-chambers formed at each side of the cross-head N at the outer side of the parts N′. These cups are preferably packed with wool-waste and kept saturated with oil. By this means the bars upon which the movable cross-head moves are kept properly lubricated.

In my former patent the fulcrum-head slid on its base along the bed. I find in practice that the oscillating motion in the lever produces a similar motion in the fulcrum or cross head, which causes a tendency to bind on the ways. I attribute this rocking motion to the fact that the lever is working at a considerable height above the base. In order to obviate this difficulty, as before described, I make the fulcrum-block to slide upon two round bars, which constitute the ways and which are located in the center of the block, thus completely preventing the oscillation so detrimental in my former machine.

In my improved fulcrum cross-head hereinbefore described I dispense with the projecting pin utilized in my former patent and make the trunnion circular and make recesses in the two parts of the cross-head to suit the same, thus leaving a bearing all around the circumference, thereby making the block and trunnions almost indestructible. The wear and tear will be much less and it will work much more freely.

S is the U-shaped treadle, which is preferably made semicircular in form at the front and is connected by the bars T, pivoted on the arms *t*, to the arms T′ on the end of the cross-spindle *t′*.

U is an arm extending upwardly from the inner end of the spindle *t′*. The arm U is connected to the lugs *u* on the forward end of the cross-head N by the link V.

W are spiral springs extending at each side of the fulcrum and connected to arms *u′* on the spindle *t′* at one end and to the rearmost standard N^3 at the opposite end. The springs W force the fulcrum-block back to its normal position under the pitman K.

In my former machine the spring W was attached to the frame vertically above the front end of the lever T, and acted vertically with increased tension as the operator pressed on the treadle. In this machine, however, as the operator presses down the treadle the arm to which one end of the spring is attached, being vertical, is pulled forward, so that the pull gradually approaches more nearly the center and thus decreases the leverage, so that there is no greater power exerted when the treadle is pressed down to its full extent than when the operator starts to press it down. It will thus be seen that when a man is forging no extra pressure is required than the normal pressure at first exerted.

What I claim as my invention is—

1. In a power-hammer, the combination with the anvil-block, the upper lever and the ram having an opening therein, of the rod pivoted to the end of said lever having a bulbous lower end, a socketed piston fitting said bulbous end, a plate screwed on said piston for retaining said end therein, a spring located above and below the piston, a cap having a depending flange screwed in the opening in said ram and bearing on said upper spring, substantially as described.

2. In a machine of the class described, the combination with the upper lever and ram and pitman all operated as described, of the screw-spindle pivotally supporting the lever, the cushion-chamber on the back of the frame of the machine, the nut located therein, the cushion-springs located one on each side of the nut and a suitable cover for the cushion-chamber as and for the purpose specified.

3. The combination with the pitman, lever, anvil-block and ram, of the movable cross-head suitably supported and comprising the parts N and N′ having inner circular recesses, circular trunnions oscillating in the same, and the lever J connected at the forward end to the crank-shaft and having the arms at the rear end extending through recesses n^2 in the circular trunnions and the pin connecting the arms to the lower end of the pitman as and for the purpose specified.

4. The combination with the pitman, lever, anvil-block and ram, of the movable cross-head suitably supported and comprising the parts N and N′ having inner circular recesses, circular trunnions oscillating in the same, and the lever J connected at the forward end to the crank-shaft and having the arms at the rear end extending through recesses n^2 in the circular trunnions and the pin connecting the arms to the lower end of the pitman, a tail K′ forming part of the lower end of the pitman and having lateral lugs k formed on it, the curvulate grooves in the bed-plate within which the lugs work and the slot in the bed-plate in front of the center of the same as and for the purpose specified.

5. The combination with the pitman, lever, anvil-block and ram, of the movable cross-head suitably supported and comprising the parts N and N′ having inner circular recesses, circular trunnions oscillating in the same, and the lever J connected at the forward end to the crank-shaft and having the arms at the rear end extending through recesses n^2 in the circular trunnions and the pin connecting the arms to the lower end of the pitman, the oil-chambers formed at the outer sides of the parts N′ and the round horizontal rods extending through such oil-cups and sliding bearings formed on the parts N′ and suitable standards for supporting such rods on a line with the pin-center of the cross-head as and for the purpose specified.

6. The combination with the movable cross-head, pitman, lever, anvil-block and ram, of the quadruple-armed lever having the rear pair of arms extending vertically into and slidably connected to the movable cross-head and the forward pair of arms open horizontally and the crank-shaft and bearing-blocks suitably held between the arms, so that the center of the crank is in the center line between the arms as and for the purpose specified.

7. The combination with the movable cross-head and lower lever suitably supported and connected together, the pitman-lever, of the semicircular U-shaped treadle S, extension-bars T pivoted on the arms T′, the arm U, the cross-spindle t', the arm on the cross-spindle and link connecting it to the cross-head, the arm u' and the spiral spring connected at one end to the arm u' on the cross-spindle and at the opposite end to the rear portion of the frame as and for the purpose specified.

WILLIAM HARTILL LAW.

Witnesses:
B. BOYD,
H. DENNISON.