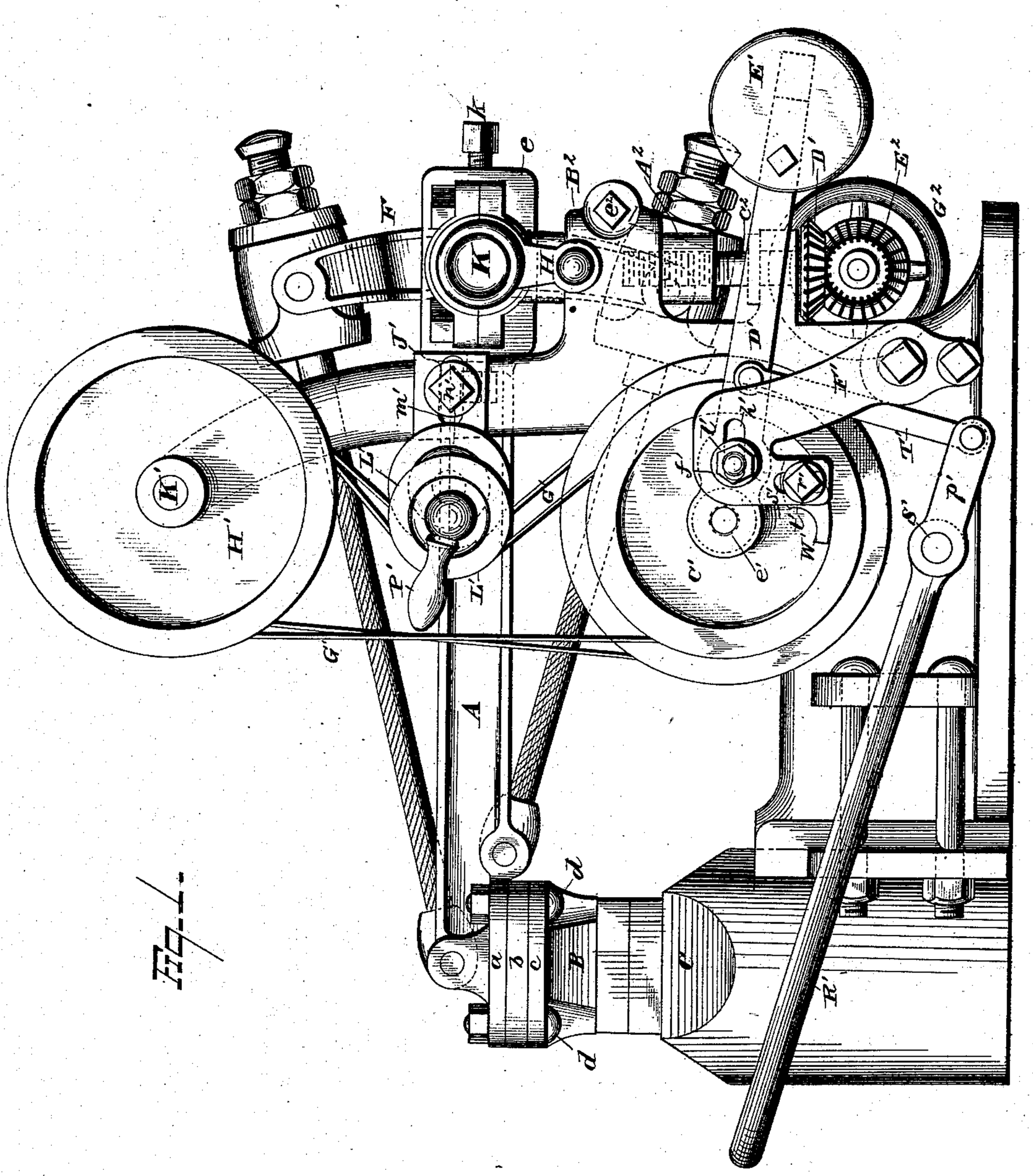
(Model.)

7 Sheets—Sheet 1.

C. M. BROWN.

Power Hammer.

No. 240,881. Patented May 3, 1881.



WITNESSES

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ATTORNEY

(Model.) 7 Sheets—Sheet 2.

C. M. BROWN.

Power Hammer.

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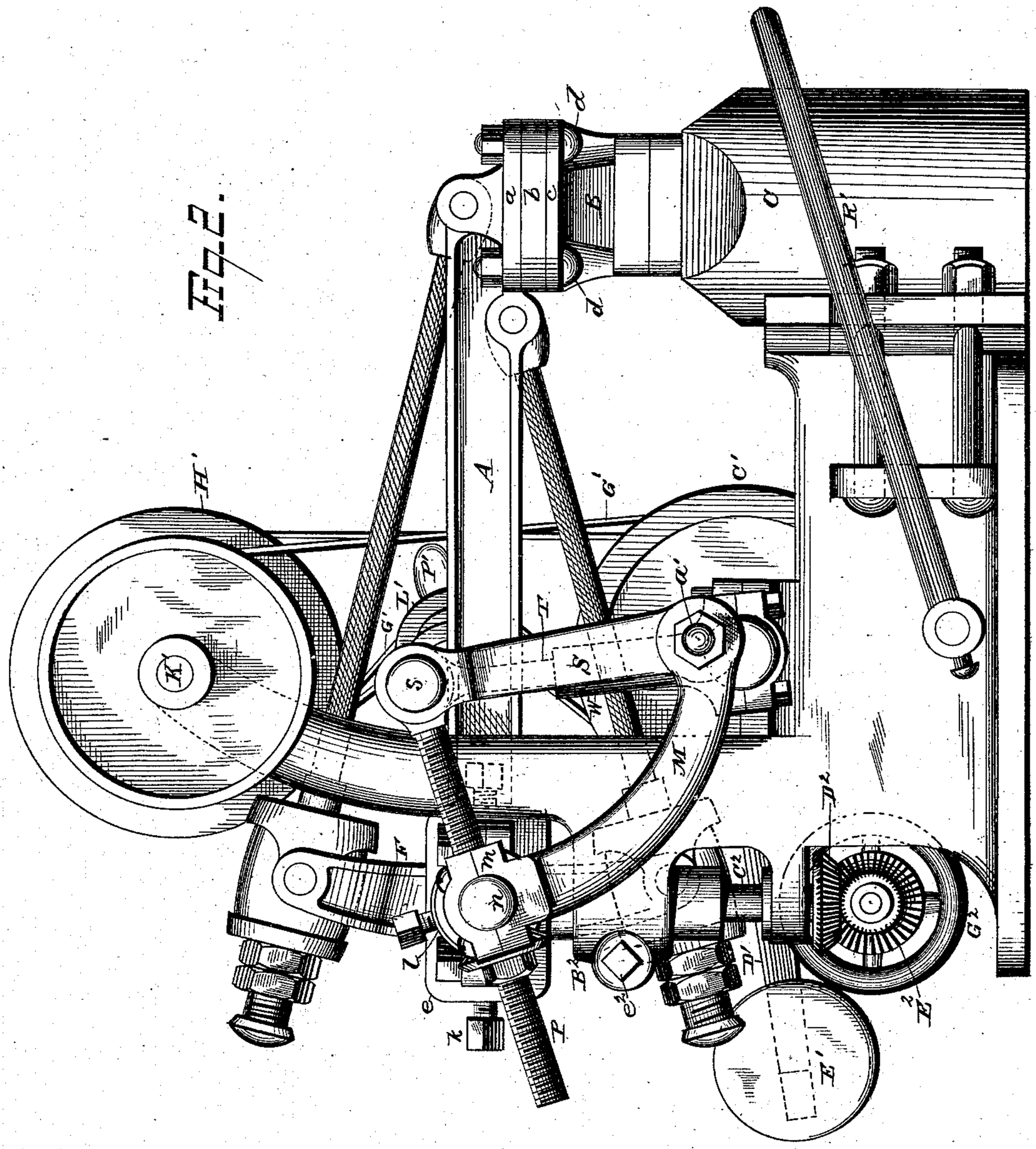
Fig. 2.



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(Model.)

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C. M. BROWN.

Power Hammer.

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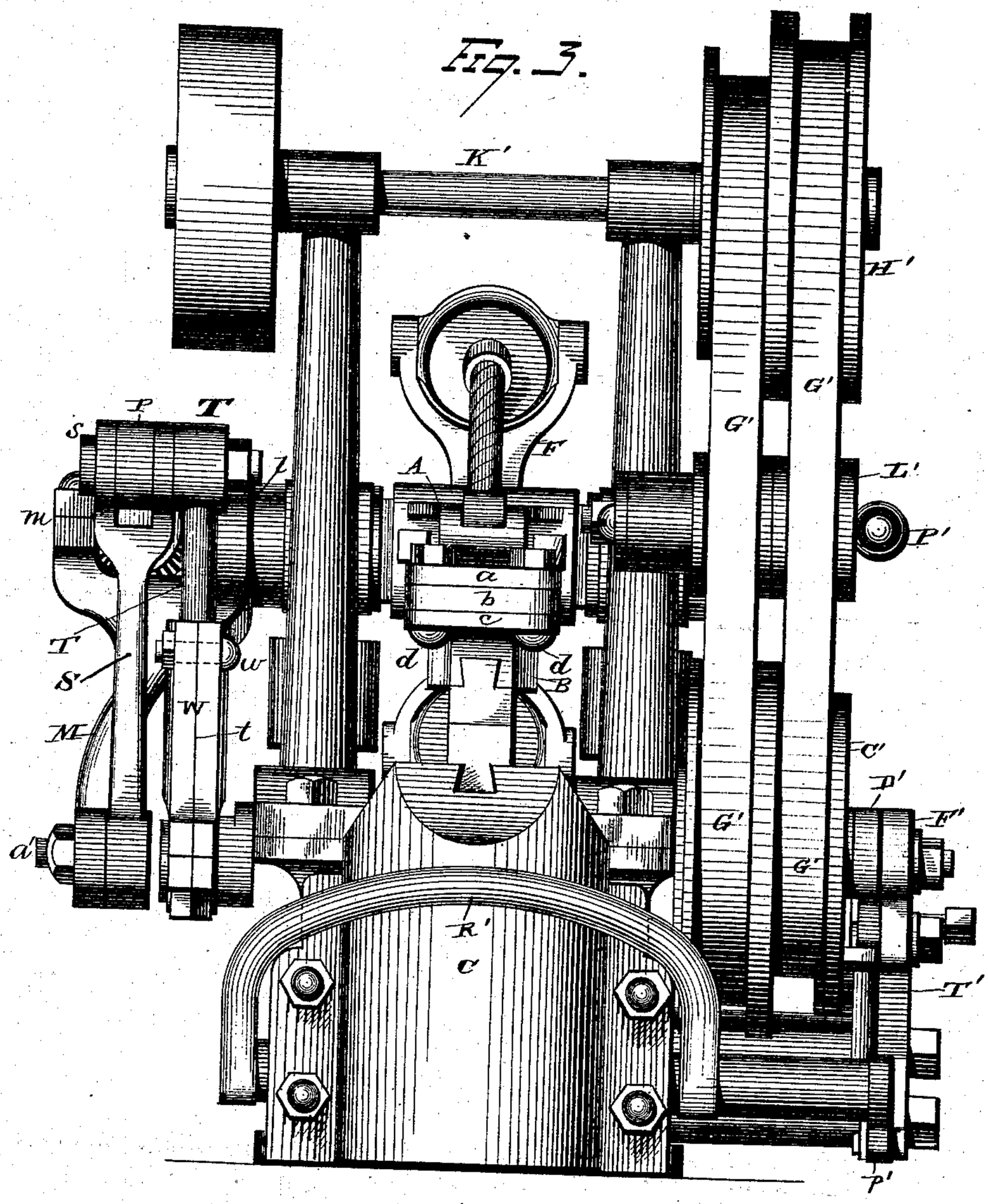
Fig. 3.



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(Model.)

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Power Hammer.

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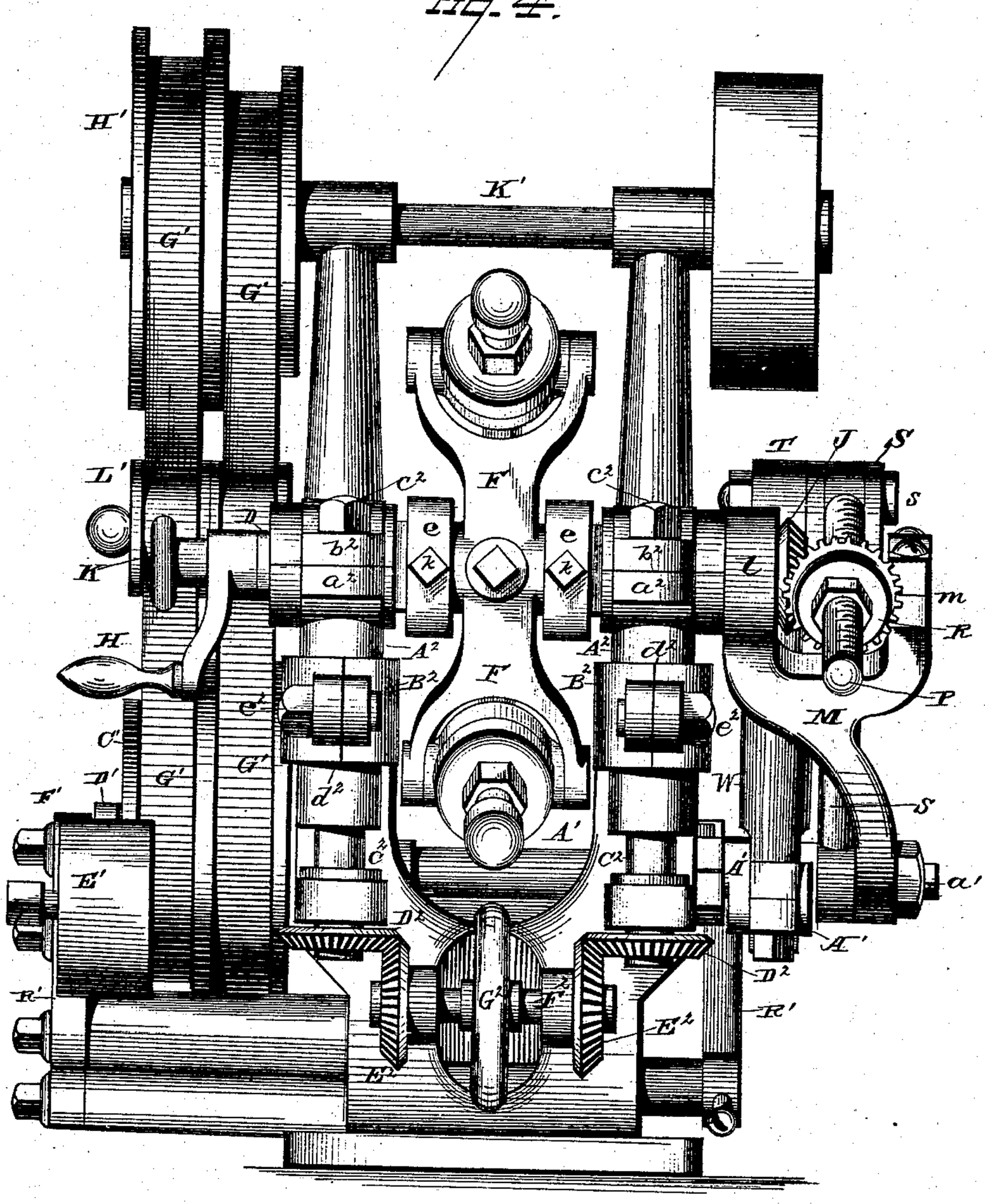
Fig. 4.



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Power Hammer.

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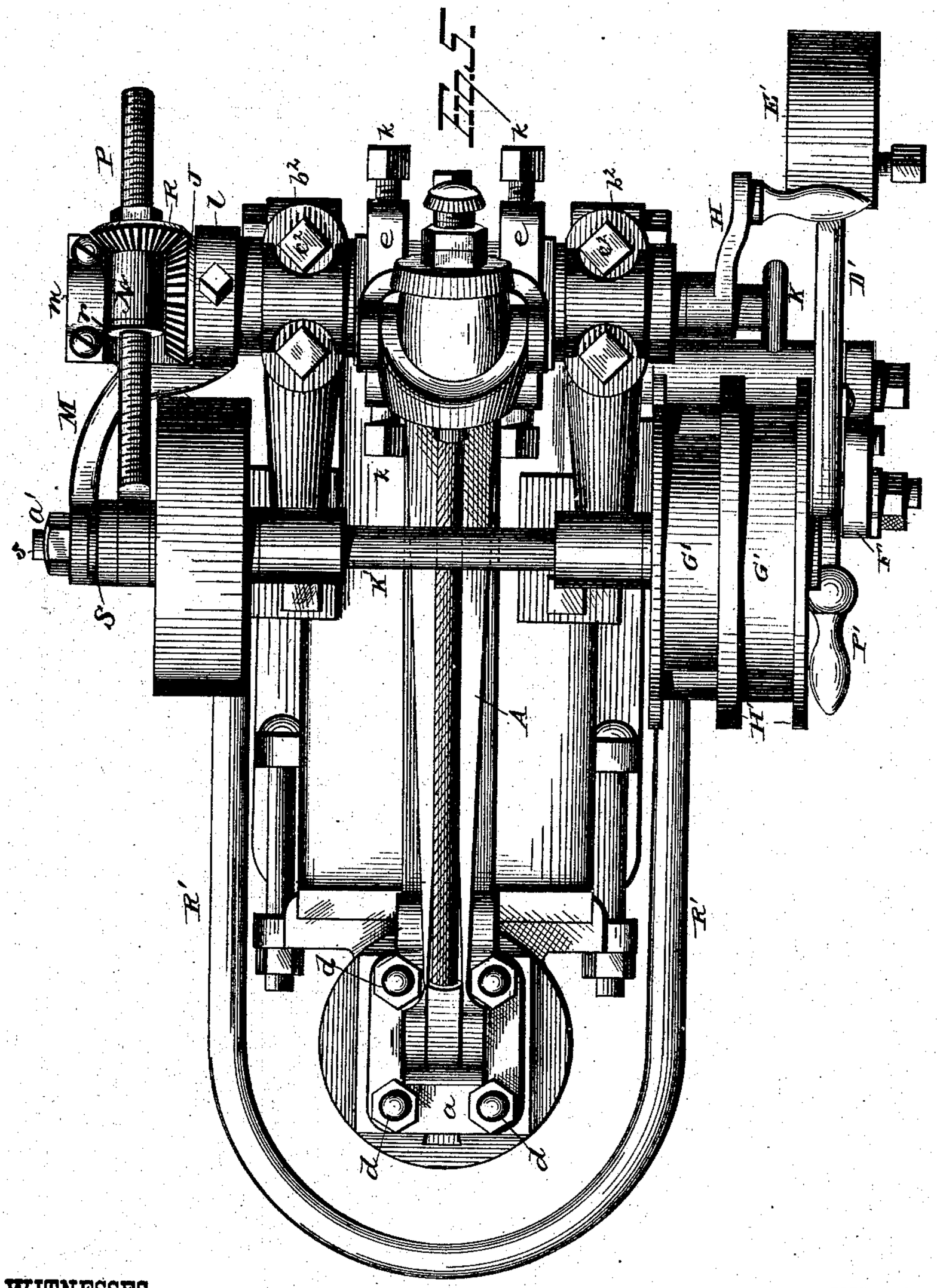
Fig. 5.



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(Model.) 7 Sheets—Sheet 6.

C. M. BROWN.

Power Hammer.

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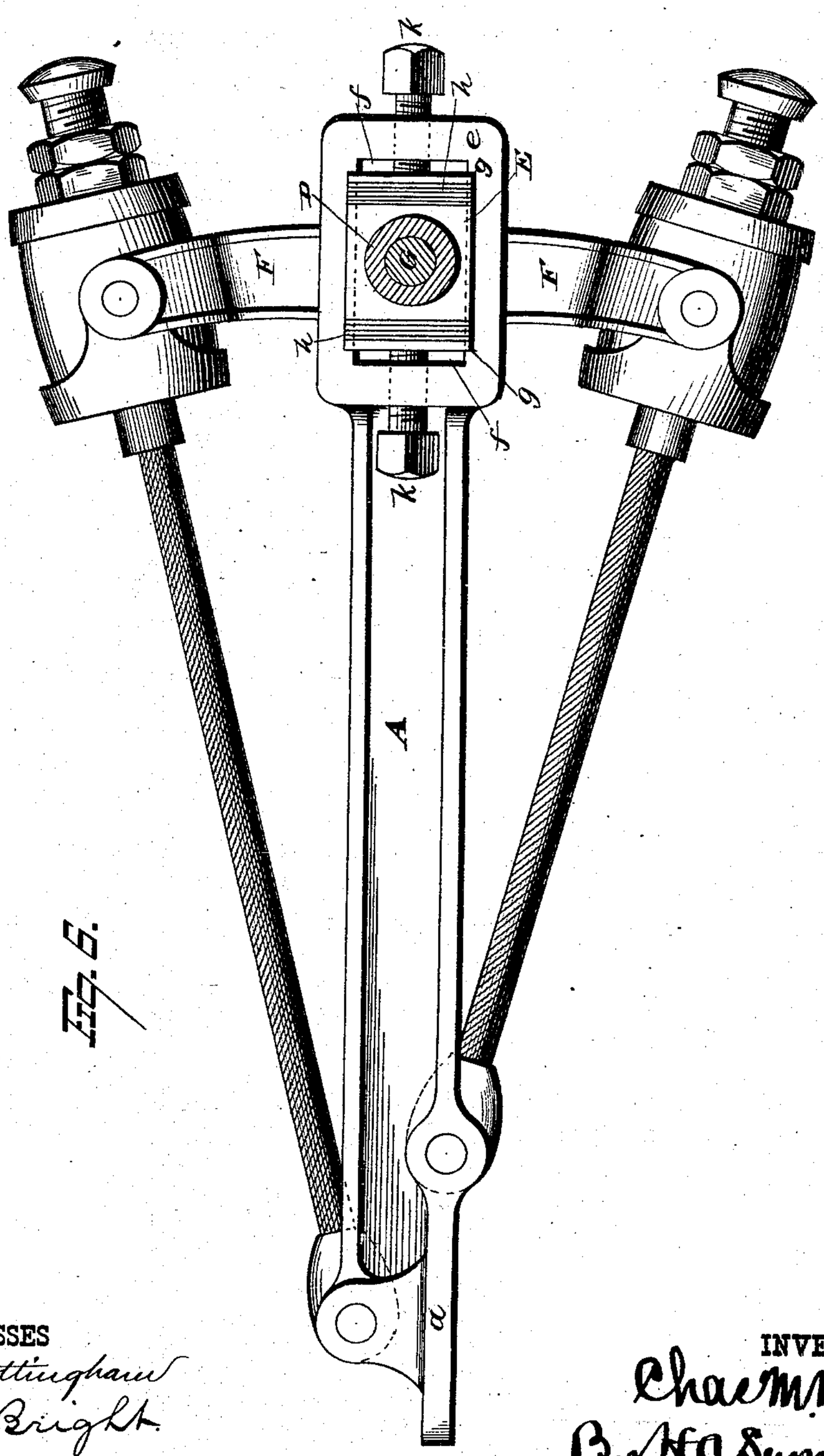

Fig. 6.

WITNESSES

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Power Hammer.

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Fig. 7.

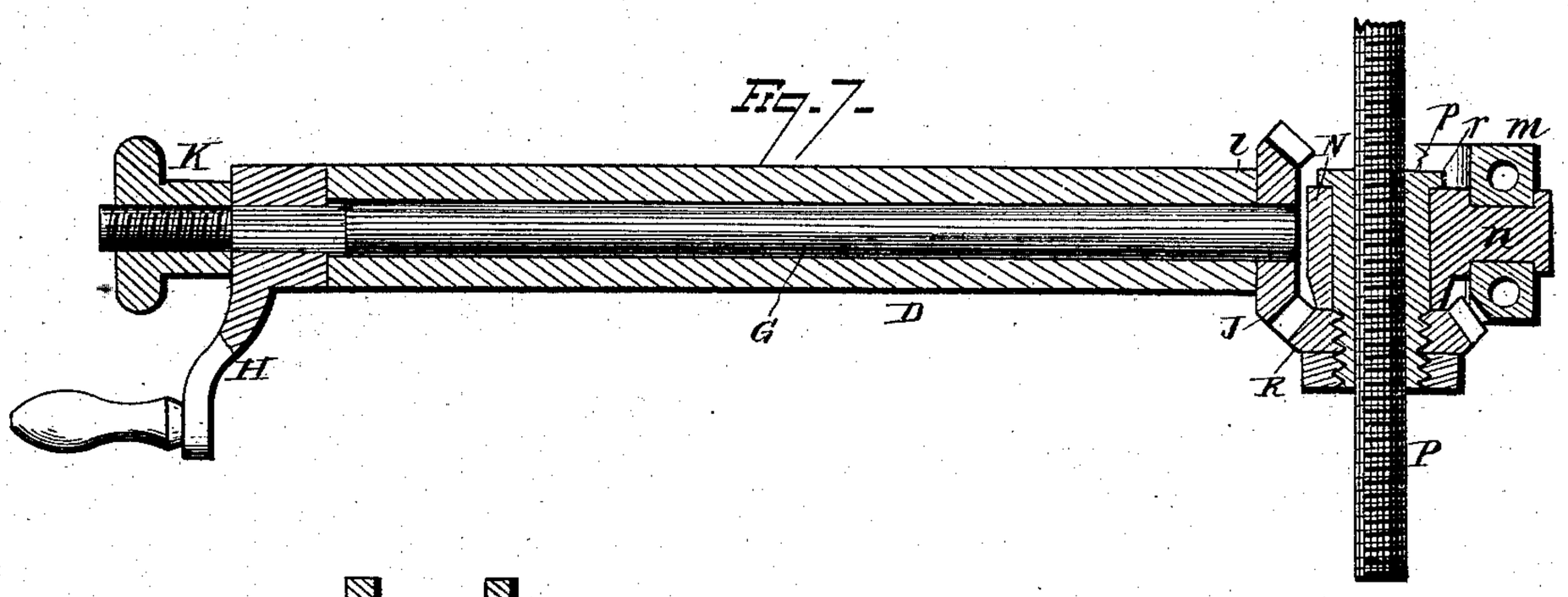


Fig. 9.

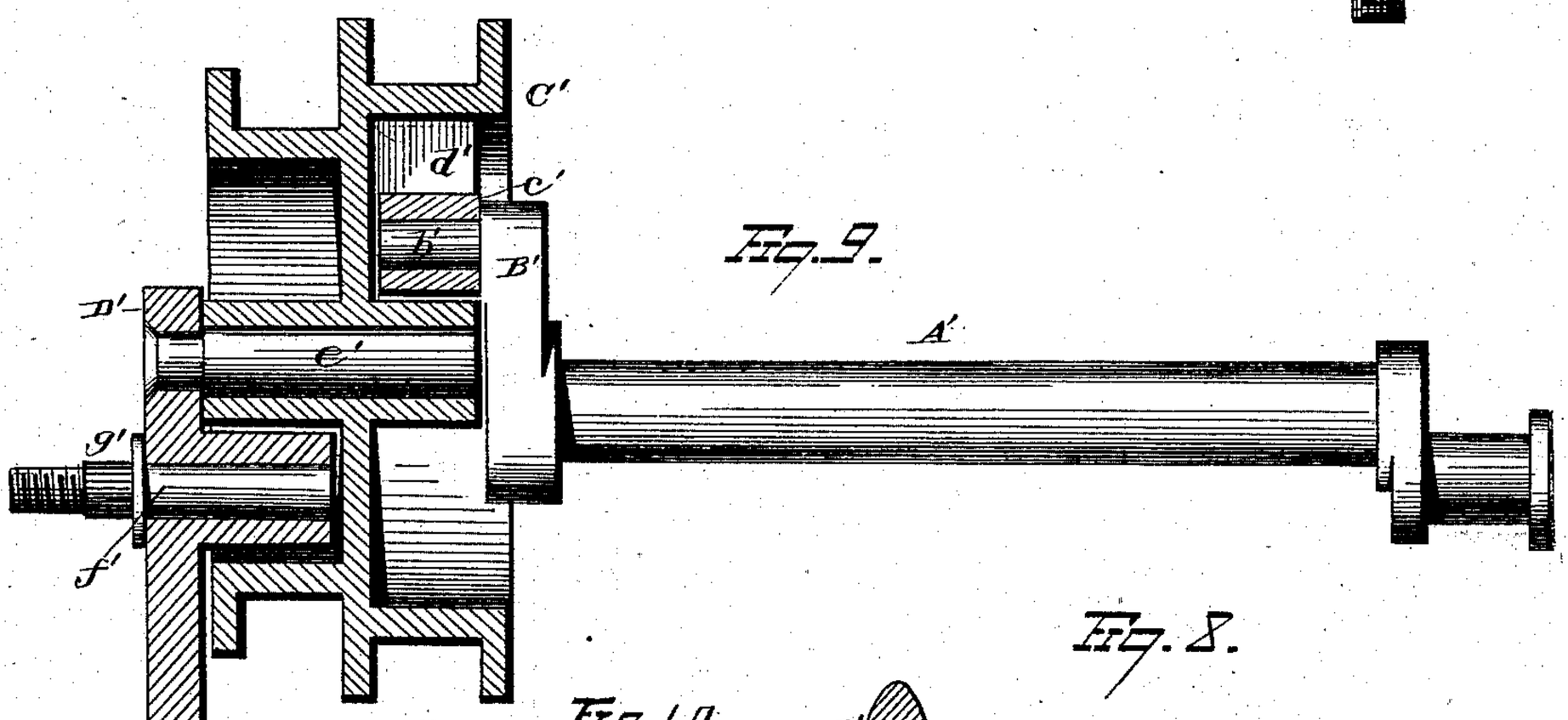


Fig. 10.

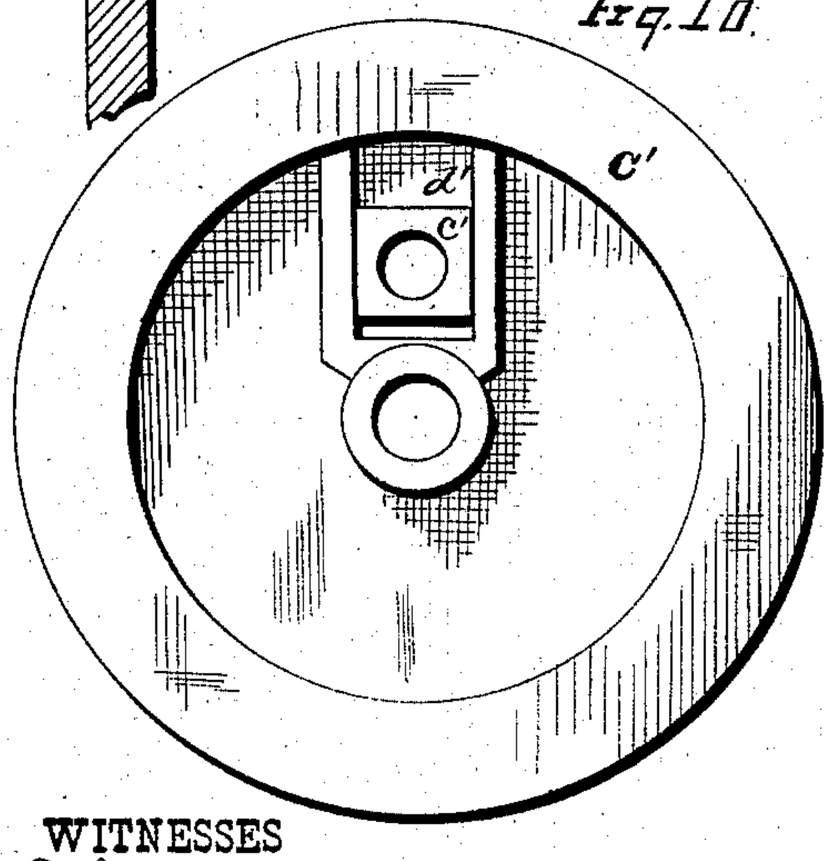
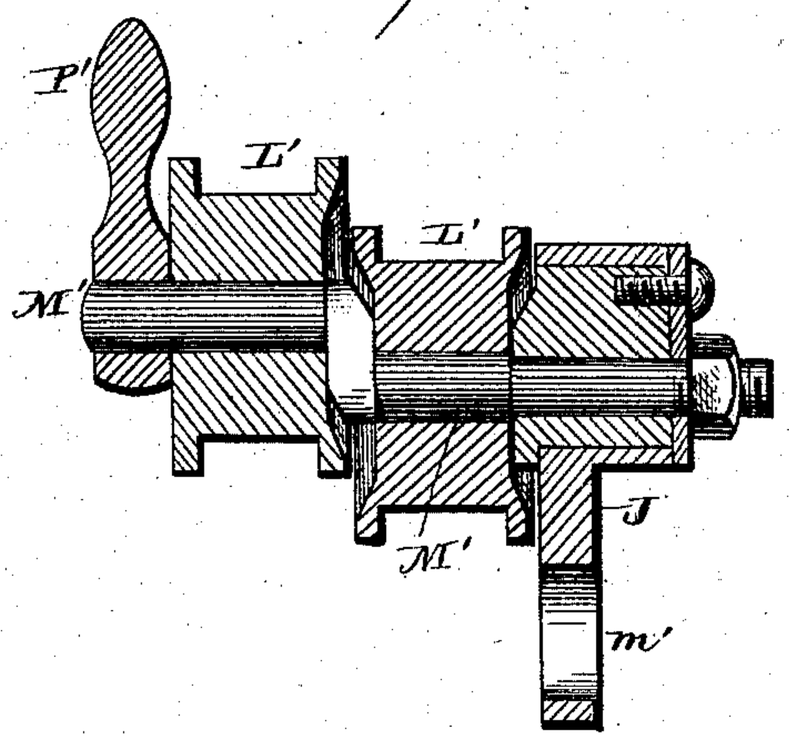


Fig. 8.



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UNITED STATES PATENT OFFICE.

CHARLES M. BROWN, OF CHICAGO, ILLINOIS.

POWER-HAMMER.

SPECIFICATION forming part of Letters Patent No. 240,881, dated May 3, 1881.

Application filed June 11, 1880. (Model.)

To all whom it may concern:

Be it known that I, CHARLES M. BROWN, of Chicago, in the county of Cook 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 pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification.

This invention provides certain improvements in power-hammers, having respectively the following ends in view: first, to render the hammer-beam adjustable in its action upon the work, and also to render it durable in use; second, to raise and lower the rear extremity of the hammer-beam and secure it in vertical adjustment; third, to vary the length of stroke of the hammer, and the force and rapidity of the blow given thereby; fourth, to vary to any desired degree the rapidity of the downstroke of the hammer comparatively with its upstroke; fifth, to start and stop the machine by a novel construction of brake-and-treadle mechanism.

In the drawings, Figure 1 is a view, in elevation, of one side of the machine. Fig. 2 is a similar view of the opposite side. Fig. 3 is a view in front elevation. Fig. 4 is a view in rear elevation. Fig. 5 is a plan view. Fig. 6 is a detail view, showing the hammer-beam mounted on its shaft. Fig. 7 is a detail view, in a horizontal section, through the shaft on which the hammer-beam is mounted. Fig. 8 is a detail sectional view of the tightening-pulleys on their shaft. Fig. 9 is a detail sectional view, representing the manner of adjustably connecting the drive-pulley with its crank-shaft. Fig. 10 is a detail view, representing the inner side of said pulley.

The hammer-beam A has its forward extremity provided with horizontal flanges *a*, extending forward and on both sides thereof, in the same plane with the lower surface of the beam. An enlarged bearing-surface is thereby formed, between which and a like bearing-surface of the hammer-head B is interposed an elastic substance, *b*. This bearing-surface of the hammer-head is formed by flanges *c*, formed in the same plane with its upper surface. Through said flanges *a* and *c*, and also through the interposed elastic substance, the fastening-bolts *d* pass.

The hammer-beam is provided with two rear arms, *e*, mounted upon the horizontal shaft D. Journal-boxes E are fitted in the transverse openings *f* in the beam-arms. Metallic plates *g* are fitted in said openings, one on each side of each journal-box. An elastic substance, *h*, is interposed between each journal-box and its respective plate. Set-screws *k* have their ends engaging with said plates and their bodies threaded in openings formed in the arms *e*. The elastic substance *h* permits the beam to yield slightly in the line of its length. The screws *k* adjust the beam in the same line, so as to cause the die in the hammer-head to correspond with the position of the die in the anvil.

Upon the horizontal shaft D are clamped the struts F, which are fitted between the two beam-arms. This horizontal shaft is tubular, and through it passes an internal shaft, G, with its extremities projecting therefrom. A portion of one extremity of the internal shaft is angular in cross-section, and on it is fitted a crank-handle, H. A nut, K, is threaded upon the outer portion of said shaft extremity, by turning which the handle may be clamped laterally against the end of the tubular shaft. A bevel-gear wheel, J, is rigidly secured on the opposite extremity of the internal shaft, G, and as the nut K clamps the handle against one end of the tubular shaft this gear-wheel is clamped against the opposite end of the tubular shaft.

An arm, M, has its rear extremity bifurcated, one branch, *l*, thereof being clamped on the tubular shaft D, and the other branch, *m*, providing bearing for the journal *n* of a pivoted sleeve, N. Within this sleeve is fitted an internal sleeve, *p*, having screw-thread engagement with a screw-rod, P. An annular flange, *r*, formed on the forward end of the internal sleeve, *p*, fits against one end of the external sleeve, N. The other end of the internal sleeve is provided with a bevel-gear wheel, R, which meshes with gear J. The two bevel-gear-wheels, the internal sleeve, and the pivoted sleeve are all fitted between the two branches of the arm M. The latter extends downwardly in forward curve from its bifur-

cated portion, and its forward extremity is pivoted to the lower extremity of link S. The upper extremity of said link is bifurcated, and the forward extremity of screw-rod P is pivoted therein by pivot *s*. This pivot also pivots the upper extremity of pitman T to the inner side of link S. This pitman is fitted in a longitudinal socket formed in arm W, said socket having a longitudinal slit, *t*, in one side, and screws *w* adjust the walls of this slitted portion to or from each other. The pitman can be clamped within this socket, so that it may have a greater or less portion of its length projecting therefrom. The socket-arm has its lower extremity connected to a crank or eccentric of shaft A′.

By turning crank-handle H, shaft G, and gears J R the sleeve *p* is turned, and, as the latter is prevented by pivoted sleeve N from moving upon screw-rod P, the latter is longitudinally moved. This lengthwise movement of screw-rod P adjusts the upper extremities of link S and pitman T correspondingly to or from the line of the axis of shaft D. This adjustment increases or diminishes the length of stroke of the hammer. If, when the hammer-head rests upon the work at the lowest point of its stroke, the joint *a′* of arm M and link S centers with shaft A′, any adjustment of the link S relative to the axial line of shaft D will affect only the upstroke of the hammer-beam, and the blow is delivered at the same point, whether the stroke is long or short.

On the extremity of the shaft A′, opposite to that which is connected with the foregoing parts, is crank B′, having crank-pin *b′*, working in the slide *c′*, which fits in a radial groove, *d′*, formed in the inner face of pulley C′. This pulley is mounted on a journal, *e′*, formed on the forward extremity of lever D′, the opposite extremity of said lever being provided with a weight, E′, adapted to be secured at different points thereon. This lever is fulcrumed upon a pivot, *f′*, having a portion, *g′*, formed angular in cross-section, and adapted to be moved forward or backward in a horizontal slot, *h′*, of a bracket, F′. The extremity of this pivot, which projects outwardly from the bracket, is screw-threaded, and provided with a nut, *l′*, which secures the pivot at any desired point in the slot. The pulley being connected by slide and groove with shaft A′, and being mounted on a journal formed rigid with the weighted lever, is carried by the latter forward or backward with the adjustment of the pivot *f′* in the bracket-slot. This adjustment of the pulley causes its axis of rotation to be correspondingly moved toward or from crank-pin *b′*, thereby connecting the pulley to crank B′, so as to increase or decrease the rapidity of shaft A′ during different parts of its revolution. By increasing the distance between the axis of the pulley and its connection with the crank the movement of the crank-shaft is accelerated during one portion of its revolution and retarded during the remaining portion of its revolution. The cranks on the opposite ends of this shaft A′ are located in relative positions thereon, as shown in the drawings, so that the slow movement in one portion of its revolution serves to raise the hammer slowly and easily, and the rapid movement in one portion of the shaft revolution forces the hammer down with swiftness and power.

The shaft A′ and pulley C′ being journaled eccentrically to each other, the crank B′ necessarily describes a different circle from that which is described by said pulley. The eccentricity causes the crank-pin *b′* to approach the axis *e′* during one part of the revolution of shaft A′, and to recede from it during the remaining portion of said revolution. The degree of this eccentricity causes the degree of variation in the speed of the shaft during different portions of its revolution.

The compound pulley C′ may be a double pulley, as shown in the drawings, or it may be composed of more than two pulleys.

The several sub-pulleys are of different diameters, and are driven by separate belts G′, the latter respectively passing over corresponding sub-pulleys on a compound pulley, H′, secured on one extremity of driving-shaft K′.

A series of tightening-pulleys, L′, are mounted upon a shaft, M′, located horizontally between the two compound pulleys. Each one of the tightening-pulleys is mounted upon said shaft, with a different degree of eccentricity thereto, and rotates loosely thereon. The number of tightening-pulleys correspond to the number of belts G′, and respectively bear against them. Shaft M′ is mounted on a bracket, J′, having a horizontal slot, *m′*, through which passes screw *n′*. This screw secures the bracket to the machine-frame, so that by adjusting said bracket the series of tightening-pulleys can be moved to or from the belts. The object of this adjustment of the bracket is to move the series of tightening-pulleys, as may be necessary by reason of any variation in the length of the belts, which may occur from time to time. By turning the handle P′ the shaft M′ may be rotated so as to throw any desired tightening-pulley against its respective belt, and simultaneously throw the other tightening-pulleys away from their belts. Different rates of speed can thus be obtained in actuating shaft A′ without varying the speed of the driving-shaft or stopping the operation of the machine. Thus when the hammer is working at a long stroke more time may be given it than when short but light and rapid blows are desired.

A treadle, R′, is secured to a rock-shaft, S′, the latter having an arm, *p′*, pivoted to the lower extremity of link T′. The upper extremity of this link is pivoted to lever D′ at a point between the fulcrum and the weight E′ of said lever. By depressing the treadle the rear portion of said lever is thrown up, and its portion which is forward of its fulcrum is thrown down. The pulley C′ is thereby lowered, thus tightening thereon the belt,

which is adapted by the adjustment of the shaft M′ to drive said pulley. This lowering of said pulley also serves to free it from contact with the brake-shoe W′, the latter being adapted to have frictional engagement with the inner side of the rim of the sub-pulley, which is adjacent thereto. A screw-bolt, *r′*, passes through a vertical slot, *s′*, in bracket F′, and is threaded in a socket, *t′*, formed on the brake-shoe. By adjusting the shoe it may be moved to or from the rim of the pulley. The depression of the treadle releases pulley C′ from its brake, and simultaneously throws said pulley into action by the tightening of the belt about it.

To adjust the hammer-beam so that the hammer may operate fairly upon thick and thin work, the shaft upon which the hammer-beam is mounted is vertically adjusted as follows: The extremities of shaft D have bearing in journal-boxes connected to standards A^2. The lower journal-boxes, a^2, are formed solid with the upper ends of the standards. The upper journal-boxes, b^2, are formed independent of the standards, and are secured to the lower journal-boxes by screw-bolts c^2. The standards are fitted in sleeves B^2, formed rigid with the machine-frame. Said sleeves are formed with longitudinal slits d^2 on their rear side. Screw-bolts e^2 secure together the walls of the slitted portions of said sleeves, thereby tightening or loosening the sleeves about the standards. The latter can thus be secured at any desired point of vertical adjustment. Rods C^2 have their upper extremities threaded in longitudinal openings formed in the standards. Their lower extremities are secured against vertical movement and provided with bevel-gear wheels D^2. The latter mesh with bevel-gear wheels E^2, respectively secured to opposite extremities of a transverse shaft, F^2, provided with hand-wheel G^2, secured to its central portion. By turning this hand-wheel the screw-rods C^2 raise or lower the standards, thereby vertically adjusting the shaft D and bringing the hammer-beam in position to have the hammer-head strike fairly the work which is to be forged.

The foregoing description sets forth the best manner now known to me for carrying out the principle of my invention. Changes, substitutions, and omissions of parts may, however, be made as regards the parts described, provided the essential features of invention set forth in the following claims are employed.

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 hammer-beam A, provided with an elongated opening at its rear end, of an adjustable shaft-bearing, located within said opening, yielding plates *h* and metal plates *g*, located on opposite ends of the bearing, and set-screws *k k*, for imparting adjustment to the bearing, substantially as set forth.

2. In a power-hammer, the combination, with a hammer-beam, a horizontal shaft on which it is mounted, standards in which the shaft is journaled, and brackets projecting from the rear end of the machine-frame, of vertical rods screw-threaded in the standards, gear-wheels mounted on the lower extremities of the rods, and a transverse shaft having its extremities provided with gear-wheels which engage with said gear-wheels on the rods, substantially as set forth.

3. In a power-hammer, the combination, with a rotary shaft having a crank-pin, a slide in which the latter is journaled, and a pulley having a radial groove in which the slide fits, of a lever provided with an axle on which the pulley is mounted, and an adjusting device adapted to maintain said lever, with the pulley-axle more or less eccentric to the axis of the rotary shaft, substantially as set forth.

4. In a power-hammer, the combination, with a tubular shaft on which the hammer-beam is mounted, an arm secured to the tubular shaft, and a rotary shaft fitted in the tubular shaft, of a link connected to the arm, a screw-rod connected to the link, a sleeve threaded on the screw-rod and having gear-connection with the rotary shaft, and a pivoted sleeve inclosing said threaded sleeve, substantially as set forth.

5. In a power-hammer, the combination, with a tubular shaft, an internal rotary shaft, a bifurcated arm secured by one branch to the tubular shaft, and a sleeve pivoted to the other branch, of a link connected to said arm, a screw-rod connected to the link and threaded in said sleeve, and gearing which connects the latter with said internal shaft, substantially as set forth.

6. In a power-hammer, the combination, with a tubular shaft on which the hammer-beam is journaled, an arm adapted to be secured in rotary adjustment upon the tubular shaft, and a link pivoted to said arm, of a screw-rod pivoted to the link, a pivotal sleeve threaded upon the screw-rod, and gearing connecting the pivotal sleeve with a rotary shaft fitted in the tubular shaft, substantially as set forth.

7. In a power-hammer, the combination, with arm M, secured to tubular shaft D, on which the hammer-beam is mounted, vertical link S, pivoted to the arm, and screw-rod P, provided with pivotal sleeve *p*, gearing with internal rotary shaft G, of shaft A′, provided with arm W, pitman T, pivoted to the upper extremity of link S, and mechanism for securing said pitman to arm W in longitudinal adjustment, substantially as set forth.

8. In a power-hammer, the combination, with rotary shaft A′, arm W, having a socket formed with a longitudinal slit, and an adjusting device which secures the walls of the slit together at a greater or less relative distance, of pitman T, fitted in said socket, link S, arm M, and screw-rod P, having gear-connection with rotary shaft G, substantially as set forth.

9. In a power-hammer, the combination, with tubular shaft D, on which the hammer-beam

is journaled, arm M, having its upper extremity secured to the tubular shaft, and link S, pivoted to the arm, of screw-rod P, pivoted to the upper extremity of the link and threaded in pivotal sleeve *p*, wheel J, formed on one extremity of rotary shaft G and engaging with a wheel secured to the sleeve, and nut K, adapted to clamp crank H and wheel J respectively against the ends of the tubular shaft, substantially as set forth.

10. In a power-hammer, the combination, with a treadle, a horizontal pivoted lever, and a link connecting the two, of a pulley mounted on an axle with which the lever is provided, and a brake-shoe secured to a bracket formed independent of the lever, the lowering of said pulley operating to tighten its belt and also free its inner rim from the brake, substantially as set forth.

11. In a power-hammer, the combination, with a treadle, a horizontal pivoted lever, and a link connecting the two, of a counter-balance secured to one arm of the lever, a pulley mounted on an axle secured to the other arm of the lever, and a brake-shoe which bears against the inner rim of the pulley, said brake-shoe being supported by a bracket and adapted by an adjusting device to be maintained at different vertical points in a slot formed in said bracket, substantially as set forth.

12. In a power-hammer, the combination, with a pulley, a lever provided with an axle on which the pulley is mounted, and a brake-shoe, of a bracket provided with a horizontal slot and a vertical slot, fulcrum *f'*, and screw-bolt *r'*, substantially as set forth.

13. In a power-hammer, the combination, with two compound pulleys, belts which gear them together, and a rotary shaft, of tightening-pulleys journaled on the latter eccentrically thereto and also to each other, and an adjusting device adapted to maintain said shaft at different distances relative to the belts, substantially as set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 28th day of May, 1880.

CHARLES M. BROWN.

Witnesses:
L. D. POLLARD,
F. HAGUE.