No. 686,149. Patented Nov. 5, 1901.

E. L. SHARPNECK.

STEAM STAMP MILL.

(Application filed Apr. 1, 1901.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.

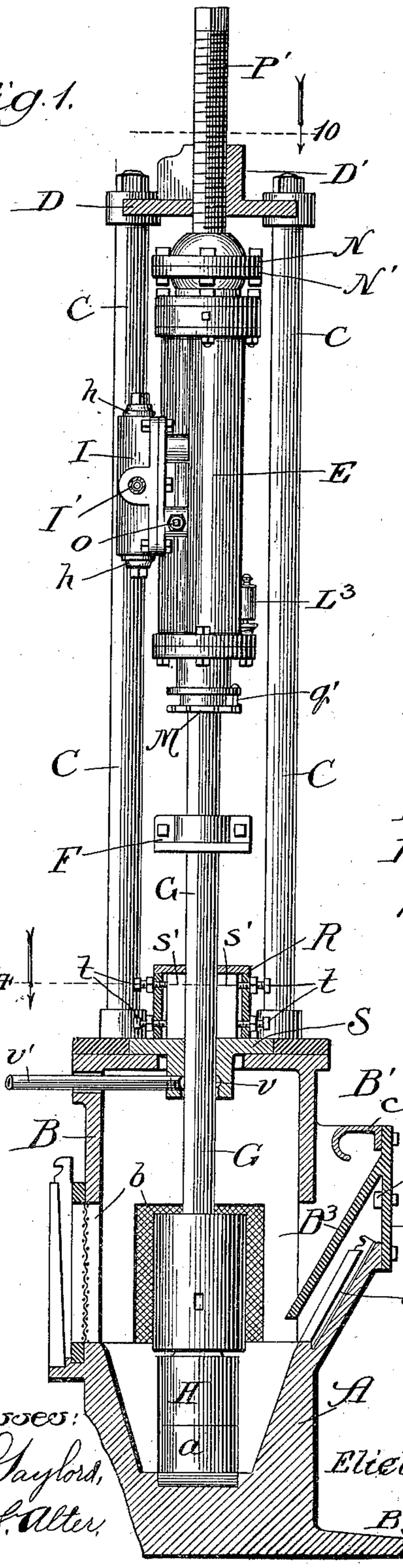
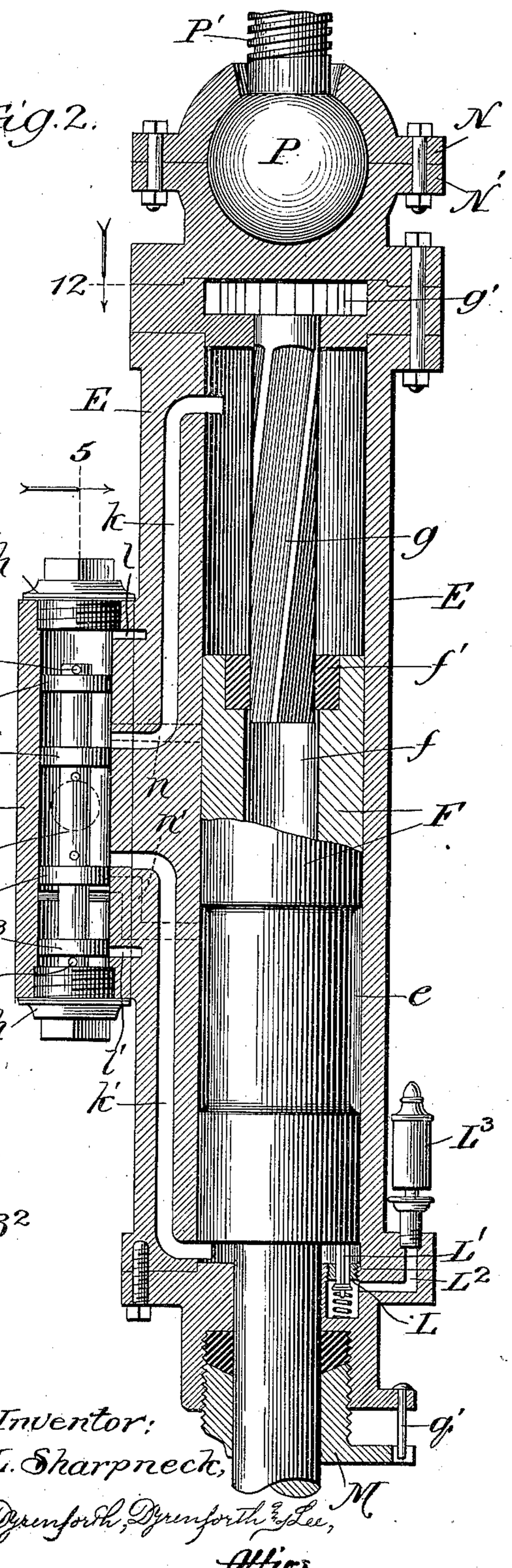


Fig. 2.



Witnesses:
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(No Model.) 3 Sheets—Sheet 2.

Fig. 3.

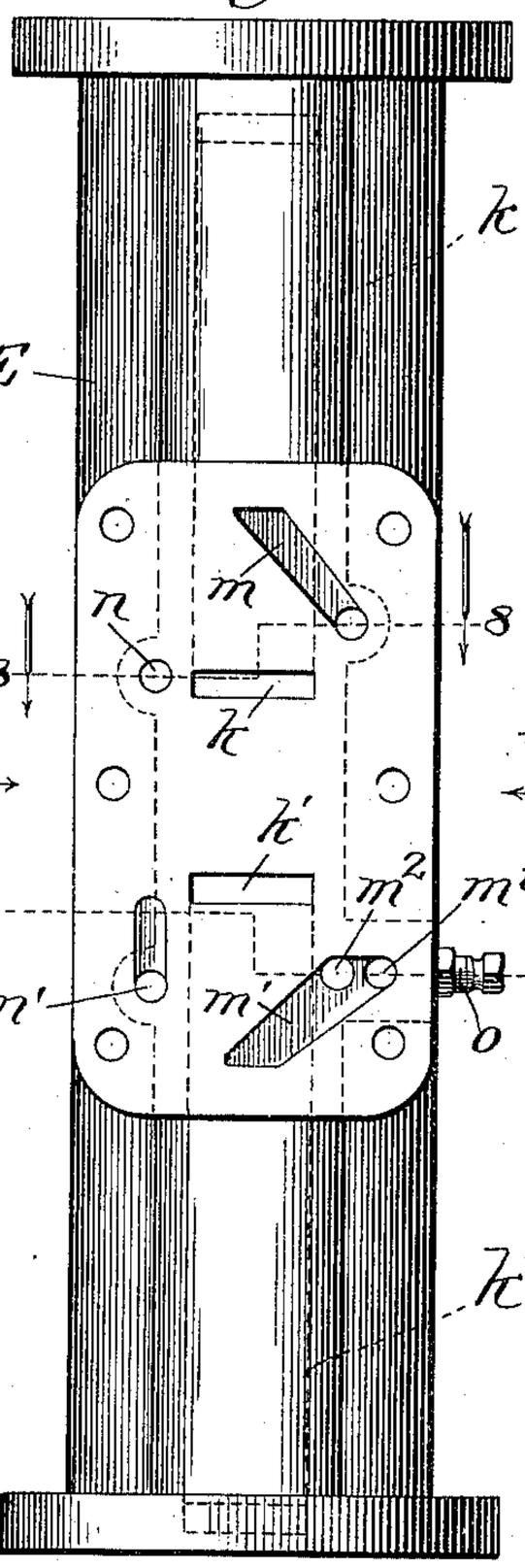


Fig. 4.

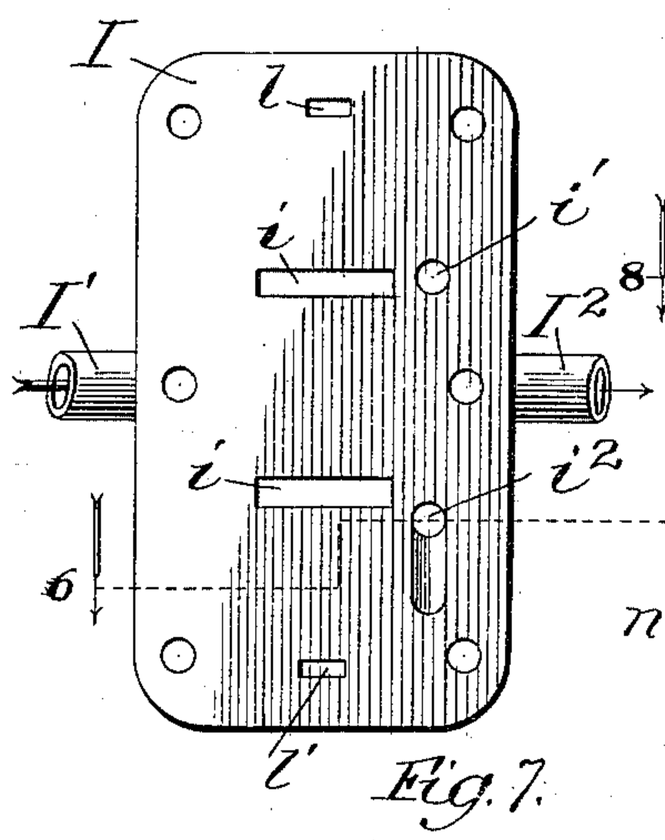


Fig. 7.

Fig. 5.

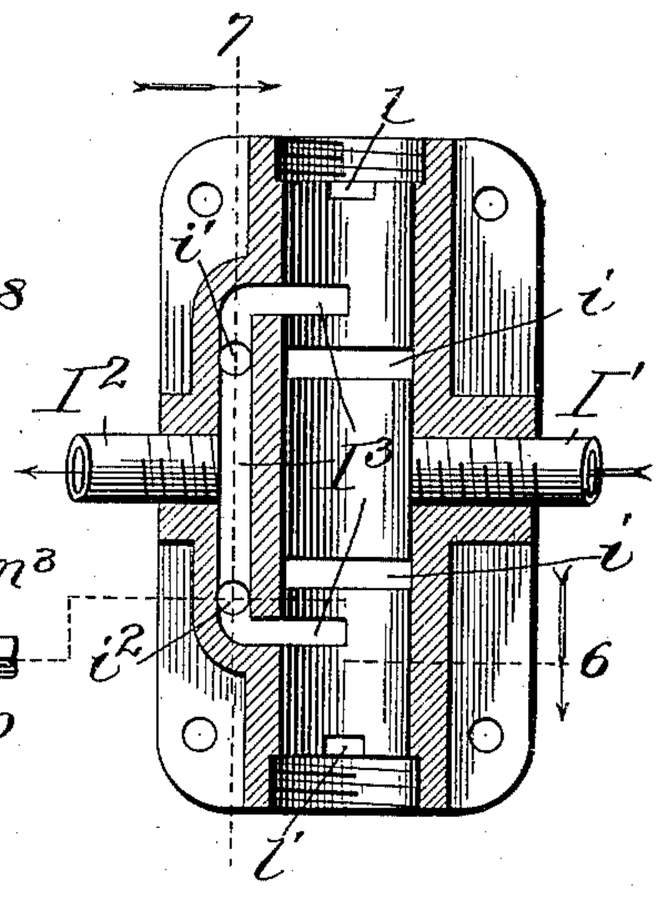
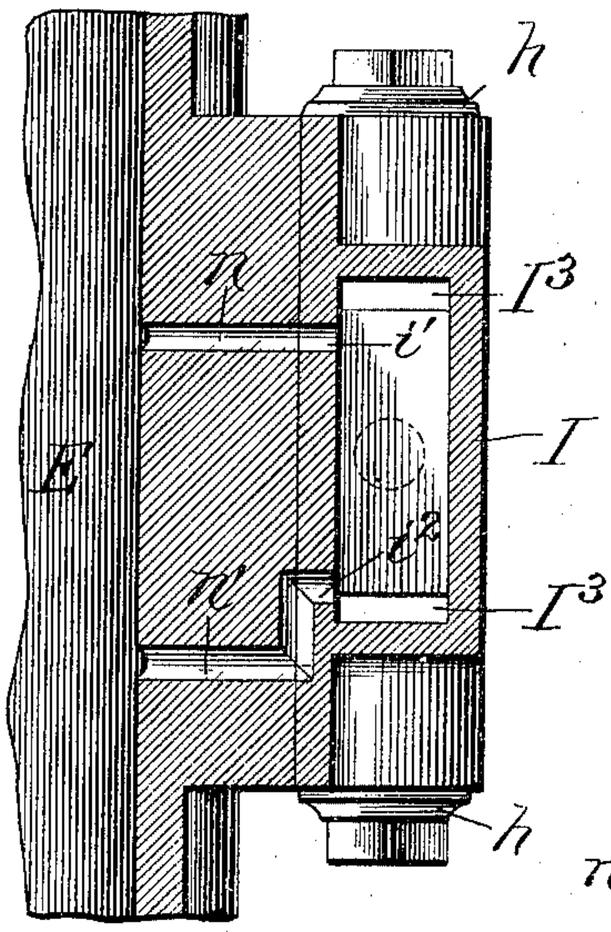


Fig. 8.

Fig. 6.



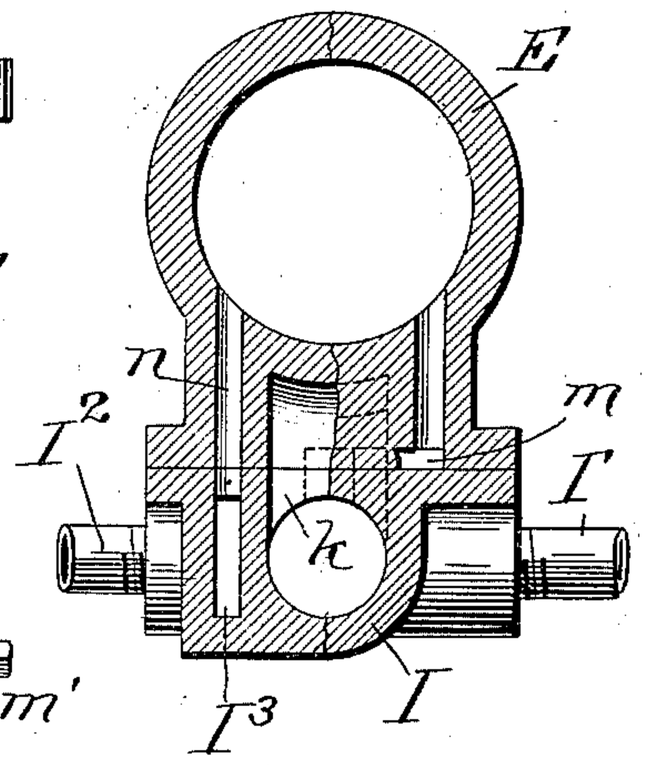


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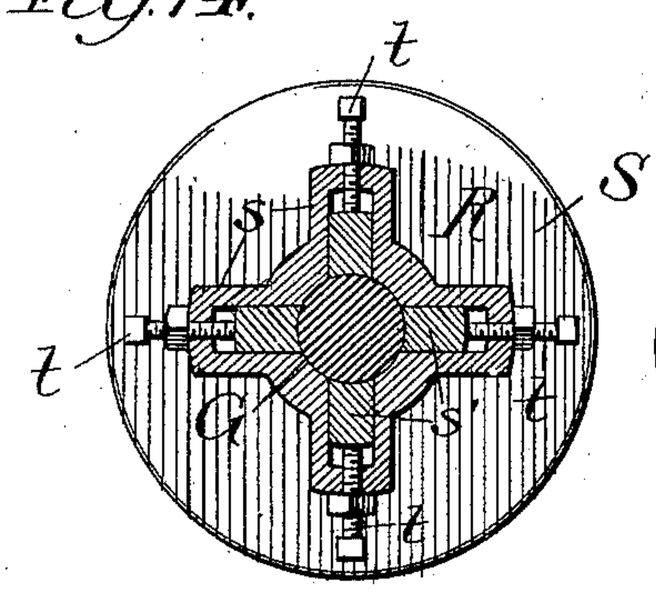
Fig. 14.



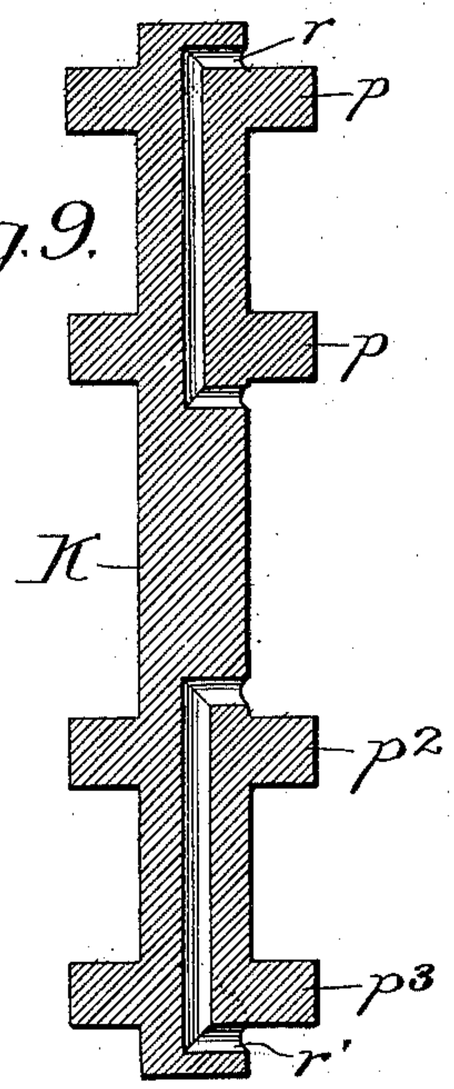
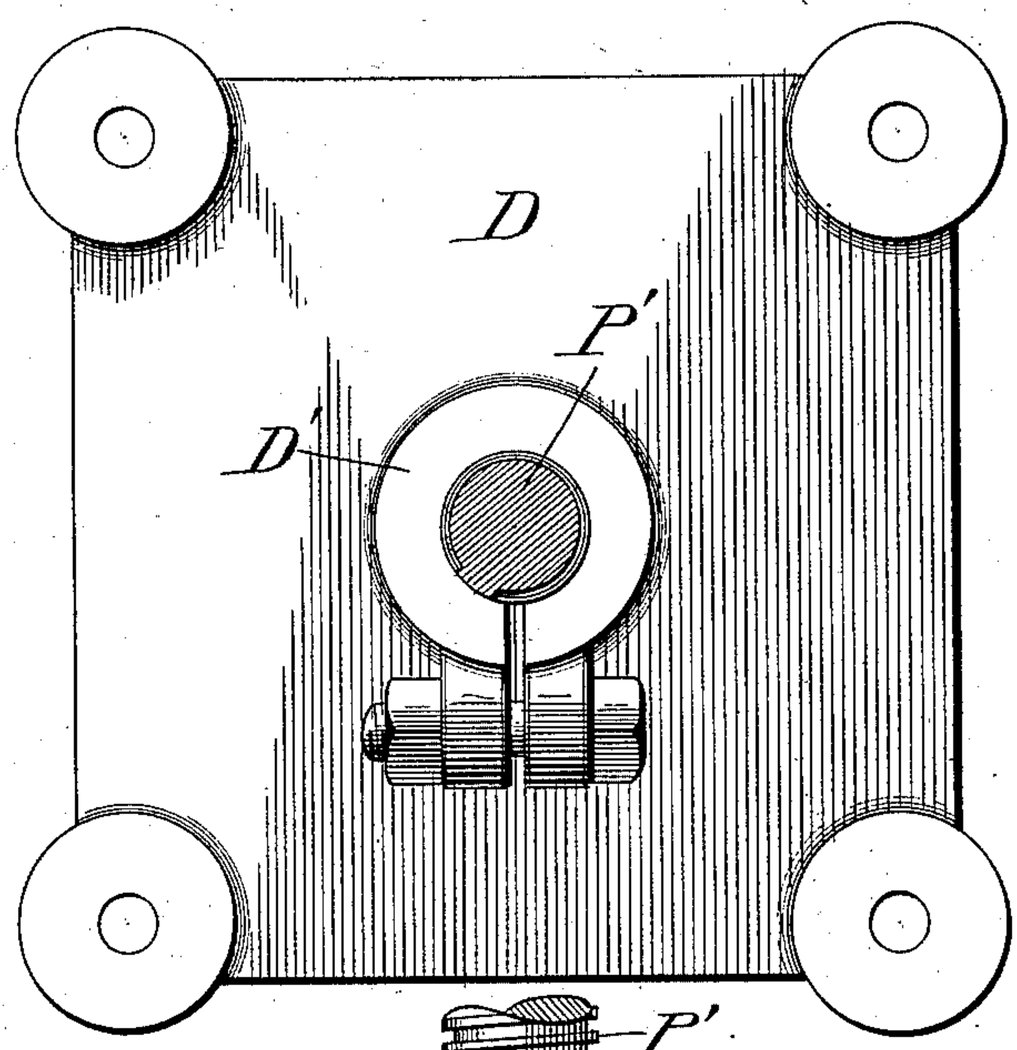


Fig. 9.

Fig. 10.



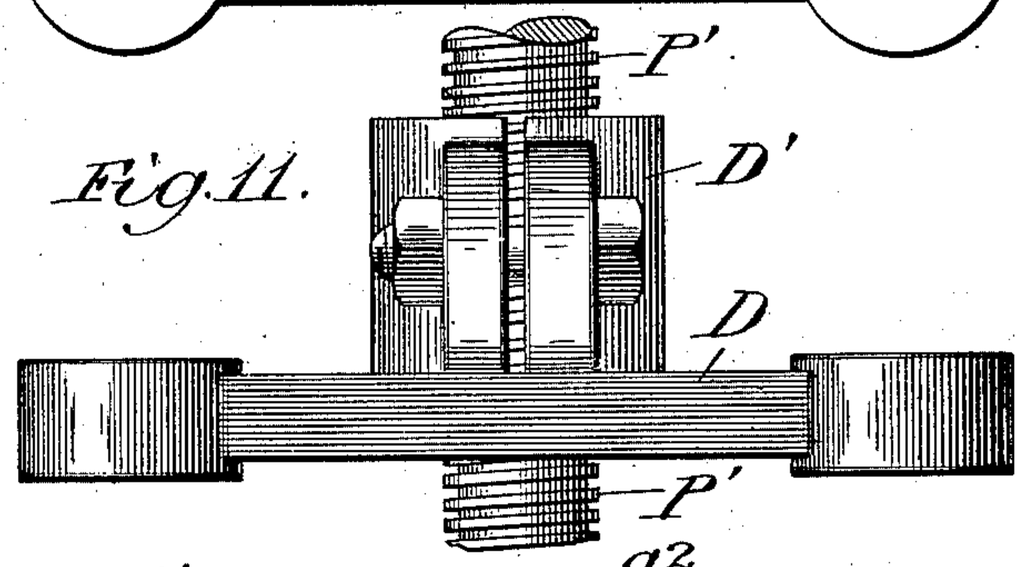


Fig. 11.

Fig. 13.

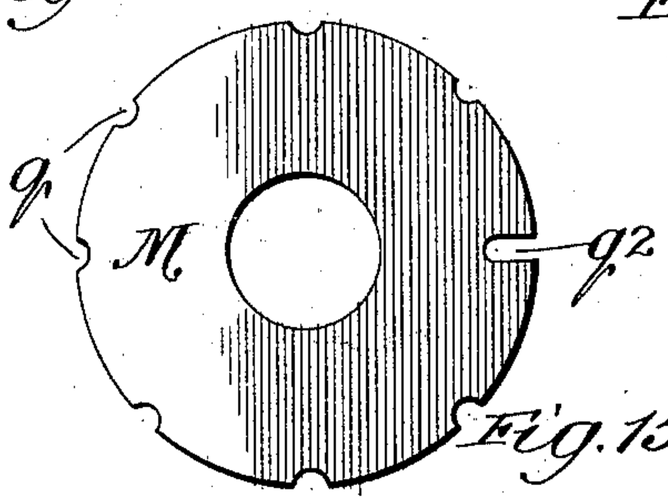


Fig. 12.

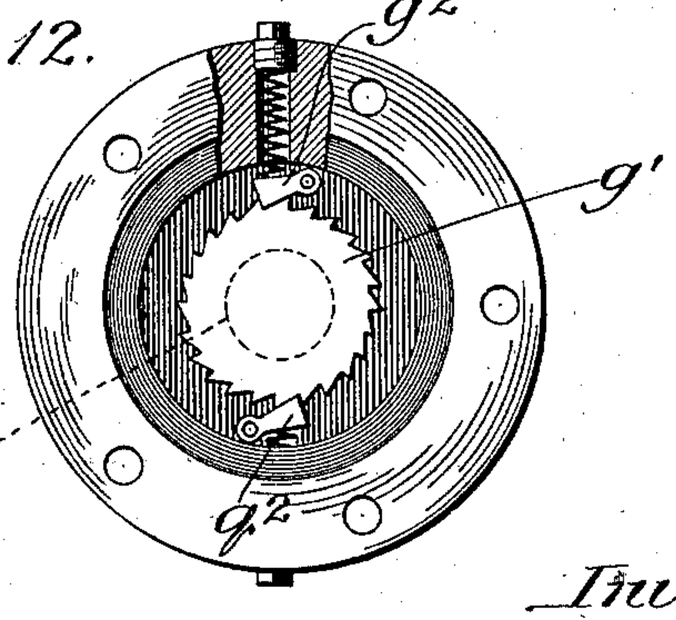
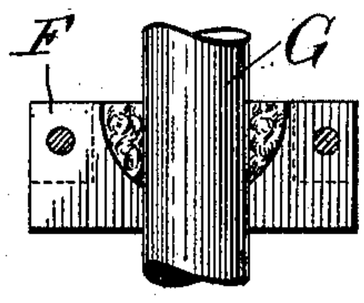


Fig. 15.



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UNITED STATES PATENT OFFICE.

ELIEL L. SHARPNECK, OF CHICAGO, ILLINOIS.

STEAM STAMP-MILL.

SPECIFICATION forming part of Letters Patent No. 686,149, dated November 5, 1901.

Application filed April 1, 1901. Serial No. 53,881. (No model.)

To all whom it may concern:

Be it known that I, ELIEL L. SHARPNECK, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Steam Stamp-Mills, of which the following is a specification.

My invention relates to improvements in the construction of steam stamp-mills of the kind which employ a vertically-reciprocating plunger for triturating the ore or the like; and the purpose of my invention, besides the general feature of improving the structure and operation of a device of this character and to insure a substantial uniformity in the degree of trituration performed thereby, is, first, to cause the operation of the stamp or plunger to be effected, as to the raising and lowering thereof, by live steam or equivalent motive fluid.

A further object is to provide means for preventing entirely the access of dust or fine particles from the mortar to the plunger-stem and its bearings.

A further object is to cause the operation of the stamp to be substantially automatic by causing the opening alternately of the proper steam-valves to be accomplished by the position of the plunger.

A further object is to provide for the automatic alinement of the plunger-stem in its cylinder in case of such wear in the bearings or other cause as would give to the stem a tendency to bind.

A further object is to improve the general structure of the apparatus in the particulars hereinafter pointed out, whereby it becomes more economic in use and more effective for its various functions.

In the drawings, Figure 1 is a view in sectional elevation of a steam stamp-mill constructed in accordance with my invention; Fig. 2, a vertical sectional view of the steam-cylinder and its valve mechanism; Fig. 3, a view in side elevation of the cylinder with the steam-chest removed and showing the location and form of the steam induction and eduction ports; Fig. 4, a face view of the steam-chest removed from the cylinder; Fig. 5, a vertical central sectional view through the steam-chest taken on line 5 of Fig. 2; Fig. 6, a section taken on irregular lines 6 6 through Figs. 3, 4, and 5; Fig. 7, a broken section on line 7 in Figs. 5 and 6; Fig. 8, a horizontal section on irregular line 8 in Fig. 3; Fig. 9, a sectional view detached of the slide-valve in the steam-chest or valve-chamber; Fig. 10, an enlarged sectional plan view of the top of the stamp-mill, the section being taken on line 10 in Fig. 1; Fig. 11, a broken view showing the top plate of the mill in side elevation; Fig. 12, a horizontal section taken on line 12 of Fig. 2; Fig. 13, a view of a gland, detached, which holds the packing at the lower end of the cylinder; Fig. 14, an enlarged horizontal section on line 14 of Fig. 1, and Fig. 15 a broken sectional view of a tappet and oil-catcher.

A is the mortar of the stamp-mill, which carries the chamber or casing B. Secured to and rising from the top of the casing B is a frame formed with four pillars C. The pillars are connected together at the top by a cap-plate D. In the mortar A is the anvil-block *a*, and at three sides of the chamber B are the usual screened openings *b*. The ore is fed into the chamber B through the chute B′, which is formed in an extension of the casing. Across this extension extend plates *c c′*. A closing-plate B^2 is bolted to the casing extension and to the cross-pieces *c c′*. The lower part of the casing extension is inclined and arranged to receive a copper amalgamating-plate *d*. The upper plate *c* projects inward and curls downward, the space between it and the side of the casing proper being the feed-opening for the ore. On the closing-plate B^2 is a downward-inclined plate B^3 above and parallel with the amalgamating-plate *d*, the plate B^3 operating as the chute for directing the ore as it enters to the anvil *a*.

E is the steam-cylinder, within which moves a piston F. The piston is formed externally with an annular depression *e* and has a central bore *f*, provided at its top with a nut *f′*, presenting a square opening. Into the opening of the nut *f′* enters a square spirally-formed rod *g*, carrying at its upper end a ratchet-wheel *g′*. The ratchet-wheel is on the outside of the cylinder and is engaged by opposite spring-controlled dogs g^2, which are adapted to prevent return rotation of the ratchet and rod *g*, while permitting forward rotation thereof. The effect of this construc-

tion is that the piston in its upward movement rotates by reason of the engagement of the nut f' with the rod g, while the latter is prevented from moving by the dog and ratchet mentioned, whereas in the downward stroke the tendency of the piston to rotate is counteracted by the free motion of the ratchet. In this manner the piston F is partially rotated in every upstroke. Fastened to the lower side of the piston is the plunger-stem G, carrying the stamp or shoe H. The partial rotation of the piston in each upstroke gives similar motion to the stamp, and thus equalizes wear thereof.

Bolted to one side of the cylinder E is a steam-chest or valve-chamber I, which is closed at its opposite ends by heads h and is preferably circular in cross-section. At central points on opposite sides are pipes I' I^2, respectively for live and exhaust steam or equivalent motive fluid. The pipe I' communicates directly with the bore of the valve-shell at the middle thereof, as shown in Fig. 5, while the exhaust-steam pipe I^2 communicates with a cored passage I^3, which leads into the bore of the shell at points toward the opposite ends of the valve-chamber. Through the bore of the shell lead ports i, which communicate with the steam-passages k k', formed in the wall of the cylinder E and leading, respectively, to opposite ends thereof. Through the wall of the valve-shell I, at opposite ends thereof, are formed ports l l', which communicate with passages m m', formed in the wall of the cylinder E and leading to the interior thereof. Also through the wall of the cylinder E are cut the ports n n', which coincide with and lead into ports i' and i^2, formed through the wall of the shell I and communicating with the exhaust-passage I^3. The passage m' leads to two cord-passages m^2 and m^3, formed through the wall of the cylinder E, the former of which, m^2, is always open, while the other, m^3, is adapted to be closed or reduced in area by an adjustable screw-plug o, entering the wall of the cylinder.

In the valve-chamber I is introduced the slide-valve K, which is provided with the four heads p p' p^2 p^3. The slide-valve K is shorter in length than the valve-chamber and is provided with two longitudinal passages r r', the former extending from a point above the head p to a point below the head p', while the port r', which is of greater dimensions than the port r, extends from a point above the head p^2 to a point below the head p^3. The ports r r' serve to admit live steam entering from the steam-pipe I' to the opposite ends, respectively, of the valve-shell for the purpose of moving the slide-valve from one end of the cylinder to the other.

At the lower end of the bore of the cylinder E a spring-controlled check-valve L passes into the cylinder, the stem L' of the valve being adapted to be engaged by the piston F as the latter nears the end on its full downstroke. The check-valve L controls communication between the interior of the cylinder and a port L^2, leading to a whistle L^3.

The plunger-rod or stem G passes through the gland M, having a flange provided with spanner-notches q. The gland has external screw-threads to engage internal screw-threads formed in the lower head of the cylinder E, as shown in Fig. 2. Between the gland and the cylinder-head is stuffing material, and the gland may be tightened against the material by turning with a spanner-wrench. A pin q' passing through a flange on the lower cylinder-head engages a notch q^2 in the gland and serves to prevent loosening of the gland.

The cylinder E and all the parts carried thereby may be raised and lowered. For this purpose I provide at the top of the cylinder a two-part socket N N', receiving the ball terminal P of an adjusting-screw P'. The screw P' passes through a clamp-nut D', forming an integral part of the top plate D. When it is desired on account of wear or otherwise to raise or lower the cylinder with relation to the anvil, this may be done by loosening the clamp-nut D' and turning the screw P'. Although such adjustment is rarely required it will be at once apparent that when it becomes necessary its performance may be quickly accomplished.

The operation of the piston and valve mechanism is as follows: The piston being in the position indicated in Fig. 2, live steam passes from the pipe I' into the valve-shell between the heads p' p^2 and then through the cored passages r r' to the opposite ends of the valve. Live steam also passes through the cored passage k' to the lower end of the cylinder, causing the piston F to rise. The exhaust-steam from the cylinder above the piston passes through the passage k to the shell I, between the heads p and p', and thence through the passage I^3 to the exhaust-pipe I^2. The steam which is admitted through the cored passage r' in the valve to the lower end of the valve-chamber passes freely out through the ports l', m', and m^2 to the interior of the cylinder about the recessed portion e of the piston, and thence around the cylinder to the passage n', and thence to the port i^2, leading into the exhaust-passage I^3. On the other hand, the steam passing through the cored passage r is held at the upper end of the valve-chamber by reason of the fact that the port m, which permits its conveyance to the interior of the cylinder, and port n, which permits its escape from the cylinder, are closed by the solid part of the piston F. As the piston F rises the recessed portion e passes beyond the ports m' n' and opens the ports m n, ports m' n' being closed by the lower head of the piston F. This permits the steam at the upper end of the valve-chamber to exhaust through the passages l m n i' and I^3, while the steam between the head p^3 and the lower wall of the chamber forces the slide-valve upward. This action is repeated while the stamp is in

operation. The lower passage r', as before described, is of greater dimensions than the upper passage r, causing a more rapid action of the valve in its upward than in its downward movement. In order that the movement of the piston F may be checked, thereby to reduce the impact of the stamp when desired, the additional port m^3 is provided, and its operation is as follows: It will be remembered that the passage r' admits a greater quantity of steam to the lower end of the chamber than is admitted to the upper end, but that the port m^2 for the normal exhaust of steam from this passage is of the same dimension as the port m, leading from the upper passage r. This has the effect of causing the greater volume of steam passing to the lower end of the slide-valve to counteract the weight of the valve and make its movement uniform, and it will be apparent that when the piston moves to uncover the passage n' the escape of steam from the lower end of the valve-chamber will be the same as the escape from the other end at the opposite end of the stroke of the piston. In the ordinary operation of the stamp this is desired; but when by reason of the nature of the material between the stamp-shoe and anvil it is desired that the force of the impact shall be reduced with or without reducing the length of the stroke, the additional passage m^3 is opened by manipulating the plug o, thereby increasing the area of the exhaust-passage from this end of the valve-chamber—that is to say, instead of the escape of the steam from the lower end of the valve-chamber being the same as its escape from the upper end it is more rapid, thus presenting earlier communication between the steam-passage k and the live-steam pipe I' and causing the steam in greater volume to be admitted below the piston on the downstroke, thereby increasing the steam-cushion.

The ball-and-socket connection P N N' at the top of the cylinder forms the support thereof, the purpose of which is to permit the cylinder and stamp to be moved in any direction without difficulty while held firmly in the suspended position. The reason for this provision is that the plunger-stem becomes liable in use to a variation in the line of its motion which would result in a binding of the plunger-stem in the cylinder were the latter not permitted to adjust itself to the vibrations thereof.

At the top of the casing B the plunger passes through a guide-bearing R, consisting of a box affording four receptacles s for blocks s' of antifriction metal, such as Babbitt metal. As in operation these blocks become worn and it is desirable that the plunger shall have but little play in the bearing the blocks may be adjusted about the plunger-stem to take up wear. This adjustment is effected by means of adjusting-screws t, as shown in Fig. 14. The bearing-box R is integral with or firmly secured to a disk S, firmly fastened in the top of the casing B about the plunger-stem. The disk S has a guide-opening through it for the plunger-stem and toward its lower end is provided with an annular chamber v, having an outlet around the stem. This chamber communicates by means of a pipe v' with the water-supply. The water received through the pipe v' besides serving to lubricate the plunger-stem has an additional function. It escapes readily downward around the stem in a continuous stream and by its direction prevents the rise of any dust or other foreign matter from the mortar into the stem-bearings.

In the operation of the stamp-mill the triturated ore is discharged through the screens b in the usual manner. The copper plate d under the chute B^3 is coated with quicksilver and serves as a means for catching and amalgamating any of the valuable particles of metal that splash against it. If desired, amalgamating-plates may be disposed around the interior of the mortar. I have dispensed with them in the present instance on account of the danger of injury thereto; but this danger is not present in the case of the amalgamating-plate shown, because it is shielded by the chute B^3.

On the stem G is a cup-shaped tappet T, which in operation works an automatic feeder (not shown) which feeds the ore into the opening at c. The tappet is made cup-shaped on its upper side and filled with waste or other absorbent material to catch any oil that may drip from the bearing at M and to prevent the oil from dripping into the mortar to mix with the triturated ore and prevent or interfere with its amalgamating.

Although I have taken pains in the foregoing description to point out the specific nature of various details, and although I prefer to construct the apparatus with all these details in the exact form illustrated I do not desire to limit my invention thereto. It will be quite within the province of the skilled mechanic to change the apparatus in many parts without departing from those particular features which are involved in my invention and covered by the claims.

In the foregoing specification I have described my improvements as a "steam-stamp," because that is the term by which devices of this nature are generally called in the art. It is obvious that any equivalent elastic fluid, such as compressed air, may be employed as the motive power instead of live-steam, and I wish to be understood both in the description and claims as including any such equivalent motive fluid in the use of the term "steam" wherever it occurs.

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

1. In a steam-stamp, the combination with the cylinder and plunger-carrying piston therein, of a valve-chamber, ports leading from the valve-chamber to the cylinder at both ends thereof, a slide-valve in said cham-

ber, ports leading from the middle to each end of the valve-chamber through the slide-valve, exhaust-passages leading from opposite ends of the slide-valve all opened and closed by the piston in the cylinder, and adjustable exhaust-regulating means in one of said passages for controlling the speed of the exhaust from that end of the slide-valve in the movement of the said piston, substantially as and for the purpose set forth.

2. In a steam-stamp, the combination with the cylinder and the plunger-carrying piston therein and with the slide-valve shell and the slide-valve therein, said shell and cylinder-wall having ports for conveying steam to each end of the cylinder, of passages for admitting live steam to opposite ends of the slide-valve shell, exhaust-passages leading from said opposite end of the shell, means for closing said exhaust-passages by the movement of the piston in the cylinder, and an additional exhaust-passage m^3, leading from one end of the slide-valve shell and provided with independent means for opening and closing it whereby the size of exhaust from this end of the slide-valve shell may be increased if desired, substantially as and for the purpose set forth.

3. In a steam-stamp, in combination, a cylinder E, piston F having the intermediate reduced part *e*, said cylinder having the passages *k k' n n' m* m^2 m^3, said passage m^3 being opened and closed by an adjustable plug *o*, valve-shell I having a steam-admitting port and cored exhaust-passage I^3 and having the exhaust-ports at the opposite ends, and a slide-valve having four heads dividing the valve-shell into five chambers, said slide-valve having cored passages of different diameters leading, respectively, from the middle chamber to the opposite ends, the parts being arranged to operate substantially as and for the purpose set forth.

4. In a steam-stamp, the combination with the frame, the steam-cylinder therein and the plunger-stem and stamp, of means for adjustably supporting the cylinder comprising an adjusting-screw and a ball-and-socket connection between the adjusting-screw and cylinder, substantially as and for the purpose set forth.

5. In a steam-stamp, the combination with the frame, the steam-cylinder therein, and the plunger-stem and stamp, of means for adjustably supporting the cylinder comprising a screw P', a collar carrying and supporting said screw and means for tightening said collar to clamp said screw against turning, a ball at the lower end of the screw and a socket comprising members N N' secured to the top of the cylinder and embracing said ball, substantially as and for the purpose set forth.

6. In a steam-stamp, the combination with the cylinder and piston, plunger-stem connected with the piston, and stamp upon the stem, of a support to which the cylinder is pivotally secured, substantially as described, whereby the cylinder will adjust its alinement to the alinement of the plunger-stem, substantially as and for the purpose set forth.

ELIEL L. SHARPNECK.

In presence of—
A. C. KITTLESON,
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