

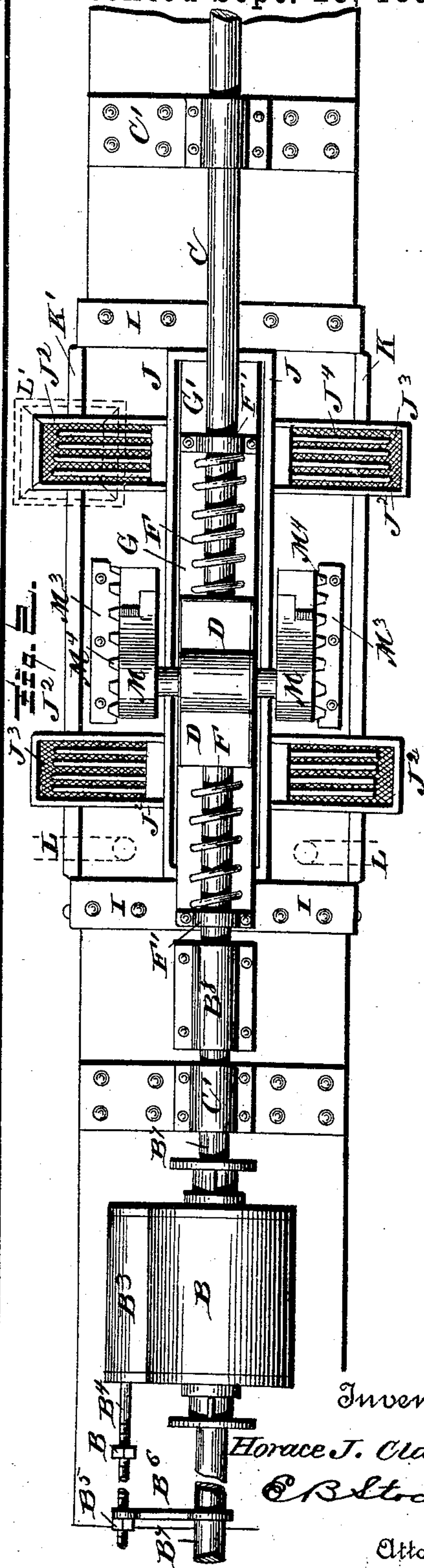
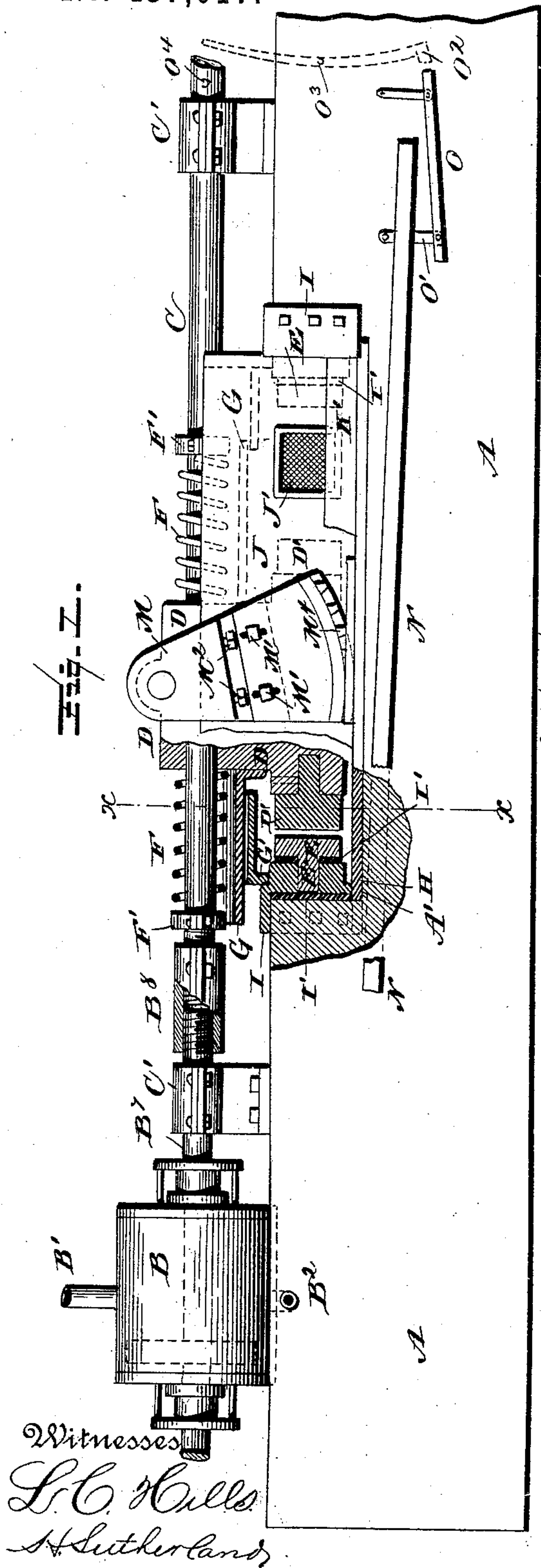
(No Model.)

2 Sheets—Sheet 1.

H. J. CLARK.
ORE MILL.

No. 437,017.

Patented Sept. 23, 1890.



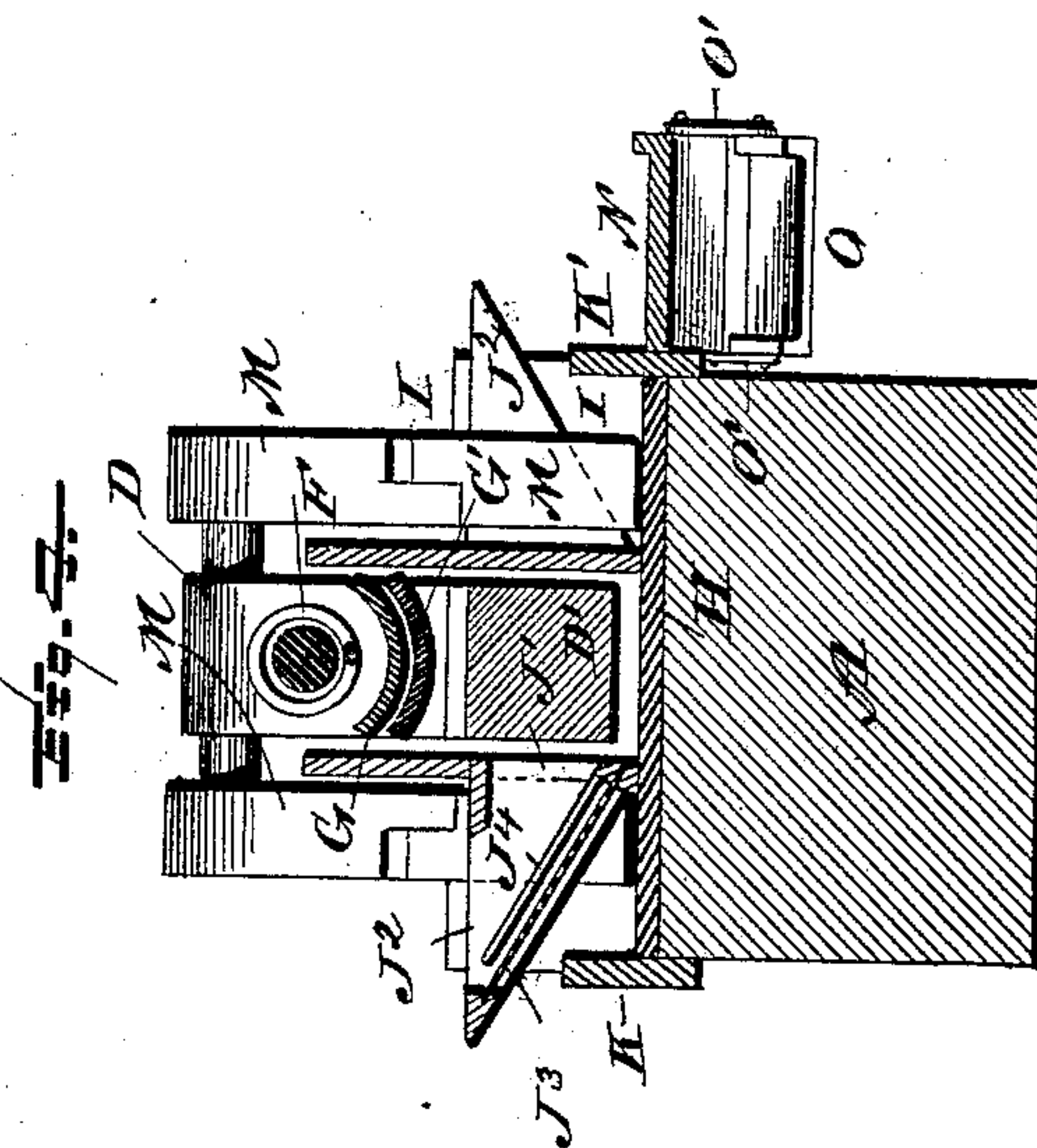
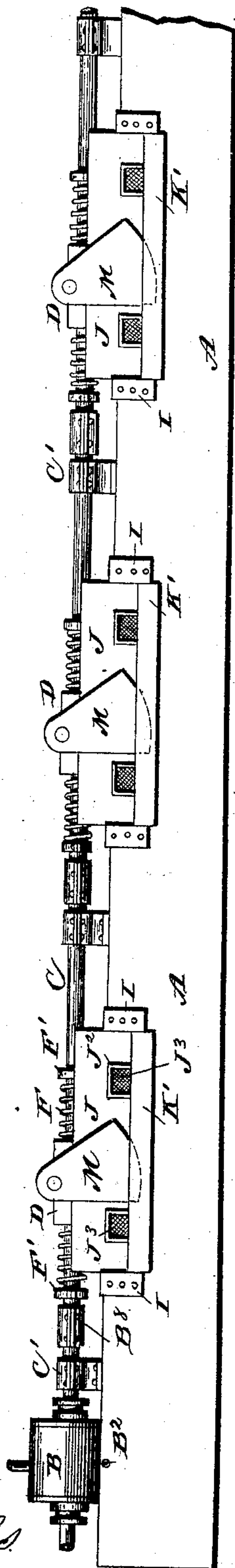
(No Model.)

2 Sheets—Sheet 2.

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ORE MILL.

No. 437,017.

Patented Sept. 23, 1890.



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UNITED STATES PATENT OFFICE.

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ORE-MILL.

SPECIFICATION forming part of Letters Patent No. 437,017, dated September 23, 1890.

Application filed May 22, 1890. Serial No. 352,690. (No model.)

To all whom it may concern:

Be it known that I, HORACE J. CLARK, a citizen of the United States, residing at Westfield, in the county of Chautauqua, State of New York, have invented certain new and useful Improvements in Ore-Mills, of which the following is a specification, reference being had therein to the accompanying drawings.

10 This invention has relation to machines for breaking stones, ore, and other substances.

Among the principal objects of the invention are to reduce the cost of manufacture, secure facility of transportation by dispensing with parts having excessive weight, increase the capacity of this class of machines, and facilitate their erection and use at points distant from its manufacture.

Other objects and advantages of the invention will appear in the following description, and the novel features thereof will be particularly pointed out in the claims.

Referring to the drawings, Figure 1 is a side elevation with parts in section, showing the internal construction of a machine embodying my invention. Fig. 2 is a plan. Fig. 3 is a side elevation illustrating a series of machines embodying my invention and connected with a single motor, and Fig. 4 is a transverse vertical section on the line x of Fig. 1.

Like letters refer to like parts in all the figures of the drawings.

A represents the base or foundation on which the working parts and their accessories are mounted. The base is provided with a recess A' , in which are arranged the stamps, the dies, and the pulverizers or rockers, as well as other accessories when all are employed.

40 The simplicity of construction of the base A is an important feature of my invention, both as regards the facility with which it can be provided in mining sections and the natural adaptation existing to the labor and stress which are put upon it when the machine is in operation. In mining sections the case is provided by simply cutting down and squaring up the body of a tree and cross-cutting the same to form the recess A' . It can even be made by bolting together a number of timbers where trees of sufficient size to form the base in one piece are not to be found.

The end walls of the recess receive the direct and full force of the blow of the crushing-hammer on the end of the grain of the wood, and thereby resist most efficiently the wear and deterioration of the machine in what are acknowledged to be the weakest and most tried parts of existing forms of similar mechanisms. The base is also self-containing, as the motor for operating the moving parts is mounted thereon.

B represents the cylinder of a motor, which is adapted to be operated by steam, compressed air, or any other well-known motive force—that is to say, instead of employing a steam-cylinder as the motor an electrical or other motor may be employed, the important condition being that whatever motor is employed it shall be mounted directly on the base.

B' is the supply, and B^2 the exhaust, of the motor shown in this instance. B^3 is the valve-chest thereof, the rod B^4 (see Fig. 2) of which is provided with adjustable nuts B^5 , between which and encircling the rod is a tappet B^6 , which is rigidly mounted on or connected with the piston B^7 . The piston-rod B^7 may be integral and extended along over the base, or a coupling B^8 may be employed to connect the piston-rod proper with the stamp-carrying rod C and any other construction. Bearings C' —one at each end of the recess A^5 —are provided and secured to the base in any suitable manner.

D represents the stamp or hammer provided with a shoe D' . The stamp or hammer D is mounted directly on the rod C, and may be rigidly secured thereto, so that it may be reciprocated by the motor B and coact with the dies E. A preferable construction, however, is to mount the stamp so as to reciprocate on the rod C and to provide cushioning devices F, which in this instance consist of springs encircling the rod C and regulated in their tension by clamps F' , which may be moved toward and away from the stamp for that purpose. I deem it important at this point to state that a horizontal reciprocating stamp connected directly with the piston-rod of a motor and provided with a single stamp proper or working face or shoe D' is a very effective means for the purpose in view. In such construction I would therefore prefer-

ably employ but one cushioning device F', and that at a side (preferably upper) of the hammer opposite its working-face of stamp proper. The purpose of the cushioning devices is to neutralize in a measure the stress upon the machine arising from a reciprocation of the heavy hammer, the approximate weight of which is five hundred pounds, it being the heaviest piece in the mill. The cushioning devices have another object, in that upon the first impact of a shoe upon the stone resting against the die the stone is broken, and in the act of breaking it the cushioning device is compressed, whereby power is stored therein and the breaking blow is immediately followed by a crushing action on the part of the stamp. In practice the cushioning devices are set at such a high tension that a moderate reciprocation of the stamp by the motor does not bring the shoe into contact with the die, although this particular adjustment is not adhered to, it being mentioned to bring out more clearly the fact that there is power stored therein to do effective work, as above described.

There are secured to the stamp hoods G, which, in connection with the similar overlapping hoods G', projecting from the recess, serve the purpose of retaining within the battery proper particles of stone, which might fly from between the shoe and die in the act of crushing.

A casting or plate H is arranged in the bottom of the recess, and castings I protect the walls of the recess and are adapted to receive the studs E' of the dies E, which are made square in cross-section, in order that unequal wear of the face may be compensated by turning the die and inserting it in a reversed position into the casting I.

Rubber or other cushions I' may be placed between the castings I in the end walls of the recess. Similar cushions may also be arranged between the die and die-seats.

The box or trough, Fig. 2, constitutes partitions extending longitudinally in the recess of the base or in the battery proper, which partitions separate the battery into three sections, in the middle one of which the stamp operates to accomplish the crushing. The two outer compartments are formed by castings or plates K, suitably secured to the base at the sides. These preferably do not extend to the top of the base, as clearly shown in Fig. 1.

In the partitions J are openings J', Fig. 4, which communicate with troughs J², the inclined walls of which are provided with screens J³ and screen-protecting grates J⁴. These troughs provide means for the introduction of material into the middle compartment for the purpose of crushing it and the egress from said compartments of the crushed material, which passes through the grates and screens into the outer compartments. Water may also be introduced by the same means, or independent pipes may be provided, as

shown at L, Fig. 2. A hopper may be provided upon one or more troughs, as indicated by dotted lines L', Fig. 2.

Within the outer compartments K K' pulverizers or rockers M are arranged when employed in connection with the stamp, and these pulverizers or rockers are pivotally connected with the stamp-rod and rest upon the bottom plate of the recess. The pulverizers may be made of a single casting and with plain working-faces, as shown in Fig. 3; but it is preferable to construct said pulverizers in sections, as clearly shown in Figs. 1 and 4, and to connect said sections by suitable bolts passing through slots M' in one section and seated in the companion section. Right and left screw-threaded bolts M² may be employed also to maintain the adjustment of the sections upon each other, whereby any wear of the working-face may be compensated.

In Figs. 1 and 2 I have illustrated one means of preventing a longitudinal movement bodily of the pulverizers along the bottom plate II. The means illustrated in this instance for said purpose comprise a rack-bar M³, formed or fixed on the bottom plate II, and teeth M⁴ on the peripheral edge of the pulverizer. The plates of the mill, when the invention is embodied in a quartz-mill, are arranged on a table N, (see Fig. 1,) upon which and the plates thereon the crushed and pulverized material is conducted over the plates K and K' of the battery.

A knocking-table O may be employed in connection with the plates to treat the concentrates flowing from the plates. In this instance the table O is suspended at the side of the base by links O', pivoted to the side and to the table, and is operated by any suitable mechanism—for example, a hammer O², pivoted at O³ to the base and projecting into the path of the rod C, which has a pin O⁴, which at each outward travel of the piston-rod is brought into contact with the hammer, so as to cause it to strike the knocking-plate. These parts may be adjusted in accordance with the skill and judgment of the constructor and user so as to deliver a blow of the required power.

The purpose of the tappet B⁶ is to regulate the supply of steam in accordance with the work being performed by the stamp, and is in its nature and operation similar to well-known adjustable cut-offs. It will be noticed that in case a stone breaks easily the piston moves quickly forward, and the tappet moving with it quickly shuts off the steam. On the contrary, if the work is harder than the average the reciprocation of the stamp is retarded, and the cutting off of the steam is similarly retarded, so that the supply is extended any time in accordance with the work to be performed.

The facility with which the principal elements of this machine may be duplicated is illustrated clearly in Fig. 3 and requires no

special description, as it is a mere duplication. It may be remarked, however, if desired, a motor can be applied at each end of the series of mills; but as this would require synchronization of a motive agent, it is deemed preferable to increase the power of the motor, as required.

It is apparent that other constructions of amalgamating tables and plates and of knocking-tables may be employed than those herein shown and described. It is understood that these parts are duplicated, there being a set upon each side of the base, and that material is delivered from each of the outer compartments onto said tables; but it will readily be seen that such an inclination can be given to the bottom of the battery proper as to deliver the material at one side only, and, if desired, but one pulverizer or rocker M' may be employed, and that other pulverizers or rockers than those which are constructed to oscillate might receive motion from the hammer or from its reciprocating and adjacent parts.

It will be noticed that the stamp proper is connected with the reciprocating mechanism at one side of a line extending through longitudinally its working-face. (See Fig. 1.) By this particular feature of construction I adapt the stamp to be reciprocated horizontally without complicating the mechanism employed and without the necessity of arranging the means of reciprocation within the battery, where it would be subjected to undue abrasion by the material being crushed.

The direct pivotal connection of the pulverizers or rockers with the stamp results in two important advantages. The one is that it utilizes the weight of the stamp at the working-face of the pulverizer, and the other is that the weight of the pulverizers or rockers act to neutralize any springing out of a working-line on the part of the stamp, and these features of the mode of operation I consider of great value, and hence I do not wish to be understood as limiting my invention to the reciprocation of the stamp by means which are connected with it only at one side of its working-path.

What I claim is—

1. A horizontally-reciprocating ore-stamp operating to crush at either end, in combination with a die arranged in line with its working-face, substantially as specified.

2. A reciprocating ore-stamp having working-faces on its opposite ends and operatively supported at a side of its working faces, and a piston-rod serving also as a guide for the reception of the stamp, in combination with dies arranged at the opposite ends of the path of the stamp, and a piston-rod extending through the stamp and through fixed bearings on either side thereof, whereby said piston-rod acts also as a guide for the reception of the stamp, substantially as specified.

3. The combination, with the piston-rod of an engine, of a stamp carried by the rod and dies arranged in the path of the stamp and

opposite each end thereof, substantially as specified.

4. The combination, with the piston-rod of an engine, of a stamp movably mounted on said rod, which rod passes through the stamp and through bearings on either side thereof, and cushioning devices arranged on the rod, one at each side of the stamp, substantially as specified.

5. The combination, with the piston-rod of a steam-engine, of a stamp movably mounted thereon for reciprocation and through which and through bearings on either side thereof the piston-rod extends, and adjustable cushioning devices arranged one at each side of the stamp, substantially as specified.

6. The combination of a reciprocating stamp and a rocking pulverizer pivotally connected with the stamp, substantially as specified.

7. The combination of a reciprocating stamp, dies coacting therewith for crushing purposes, and rocking pulverizers, substantially as specified.

8. The combination, with the piston-rod of a steam-engine, of a stamp mounted thereon for reciprocation, and rockers pivotally connected with the stamp, substantially as specified.

9. The combination, with the piston-rod of a steam-engine, of a stamp mounted thereon for reciprocation, and rockers pivotally connected with the stamp and provided with means to prevent movement of their working-faces other than about the pivots thereof, substantially as specified.

10. The combination, with the piston-rod of a steam-engine, of a rod arranged in line therewith and connected thereto, a stamp mounted on the rod for reciprocation, cushioning devices arranged one at each side of the stamp, rockers pivoted to the stamp and provided with teeth, and a bed provided with teeth meshing with those of the rockers, substantially as specified.

11. A base having a recess therein, in combination with a cylinder, of a motor mounted on the base, a rod connected with the piston of the cylinder and mounted in a bearing on the base beyond the recess, dies arranged on the end walls of the recess, and a reciprocative stamp mounted on the rod and moving between the dies, substantially as specified.

12. An integral base having a recess and having castings forming die-seats and longitudinal partitions, combined with a reciprocating stamp, substantially as specified.

13. An integral base having a recess and castings for dividing the recess into three longitudinal compartments, combined with the stamp and rockers, substantially as specified.

14. An integral base having a recess, castings forming end, side, and bottom walls, and partitions, the latter provided with screen-openings, combined with the stamp and rockers, substantially as specified.

15. The combination, with a base having a

recess forming a space for a battery, of a motor mounted on the base, a bearing also mounted on the base at the end thereof opposite the motor, a rod connected with the piston of the motor and extended longitudinally through the recess, and a stamp mounted on the rod and extending into the recess, substantially as specified.

16. The combination of a reciprocating stamp having a hood, with a battery having a hood overlapping the hood of the stamp, substantially as specified.

17. The combination, with the piston-rod of a motor, of a stamp mounted on the piston-rod, and a tappet also mounted on the piston and movably connected with the valve-rod, substantially as specified.

18. The combination, with the piston-rod of a motor, of a stamp, dies for co-operating with the stamp, a knocking-table, a hammer, and means connected with the piston for operating the hammer, substantially as specified.

19. The stamp D, in combination with the rod C and with the springs F, a spring and collar being arranged at each side of the stamp, and adjustable collars F', substantially as specified.

20. The stamp D, in combination with the rockers or pulverizers M, pivotally connected

with the stamp at the top thereof, substantially as specified.

21. The combination of a stamp D, the rockers M, provided with the teeth M⁴, and the bottom plate H, provided with the rack-bar M³, substantially as specified.

22. The rocker or pulverizer M, formed in sections, with the distance between the axis of the rocker or pulverizer and the bed fixed, and securing-bolts for maintaining the radius of the rocking crusher by adjusting said bolts to compensate wear, as set forth.

23. The combination, with the sectional rockers M, of the adjustable securing-bolts and the spacing-bolts M², arranged at substantially right angles thereto.

24. The combination, with the piston-rod of a motor, of a series of reciprocating horizontal stamps arranged in line with each other and in the same vertical plane with said piston-rod, and through which the piston-rod extends, substantially as specified.

In testimony whereof I affix my signature in presence of two witnesses.

HORACE J. CLARK.

Witnesses:

HEATH SUTHERLAND,
L. C. HILLS.