No. 743,800. PATENTED NOV. 10, 1903.

J. C. ANDERSON.

STAMP MILL MACHINERY.

APPLICATION FILED MAR. 3, 1903.

NO MODEL. 6 SHEETS—SHEET 1.

Fig. 1

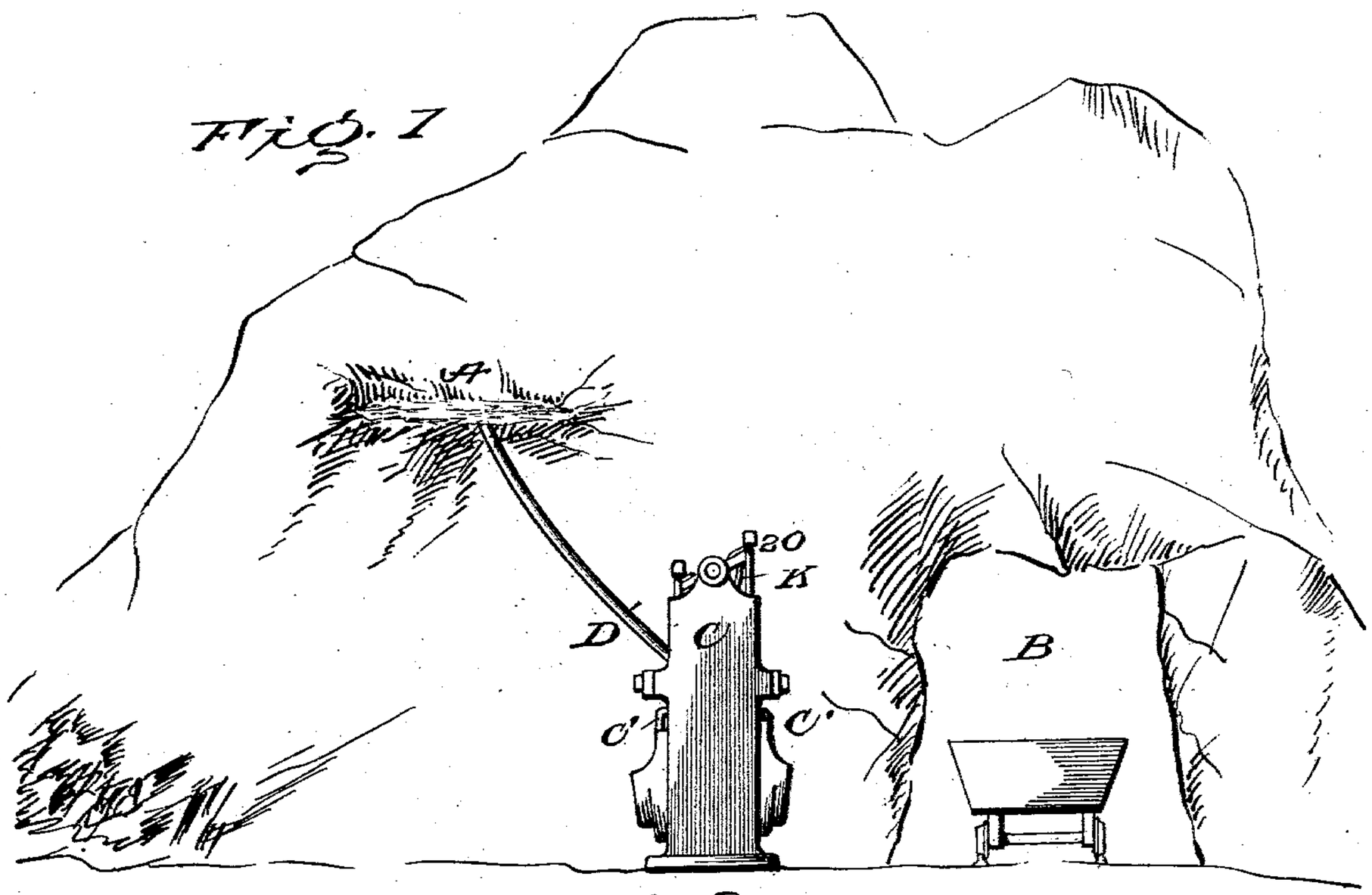
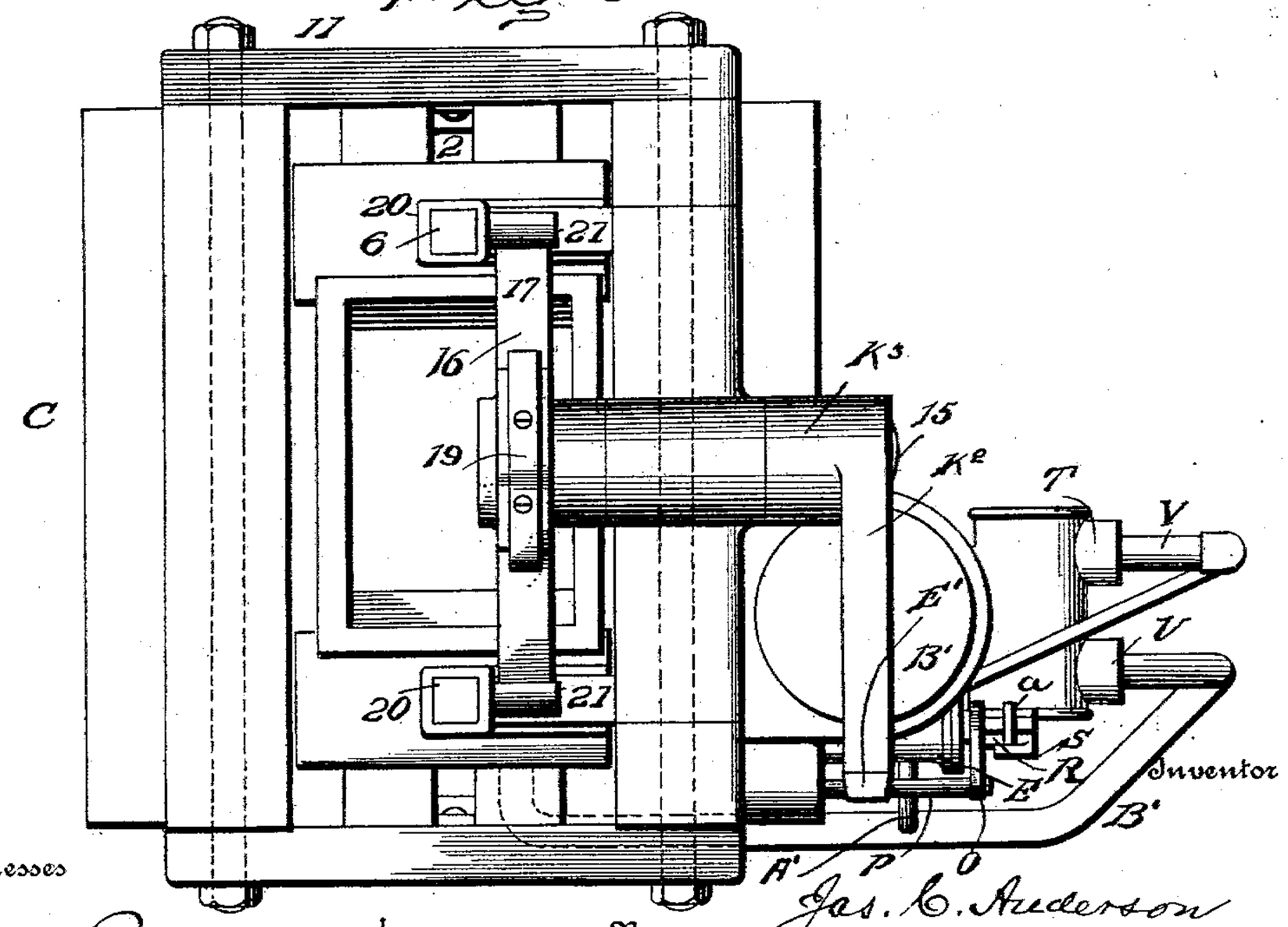


Fig. 3



Witnesses

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Wm. C. W. Estes Attorney

No. 743,800. PATENTED NOV. 10, 1903.

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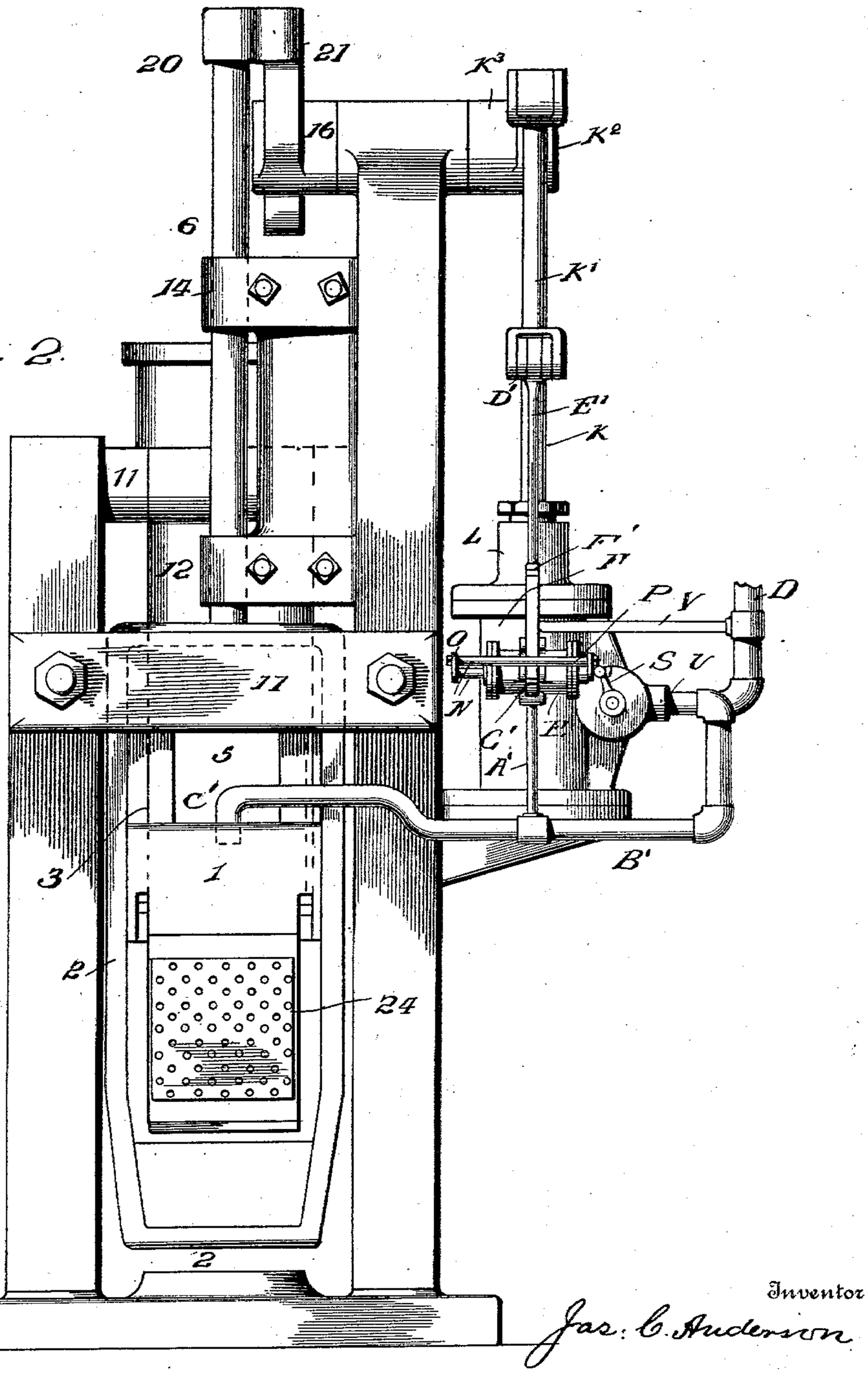
NO MODEL. 6 SHEETS—SHEET 2.

FIG. 2.



Witnesses

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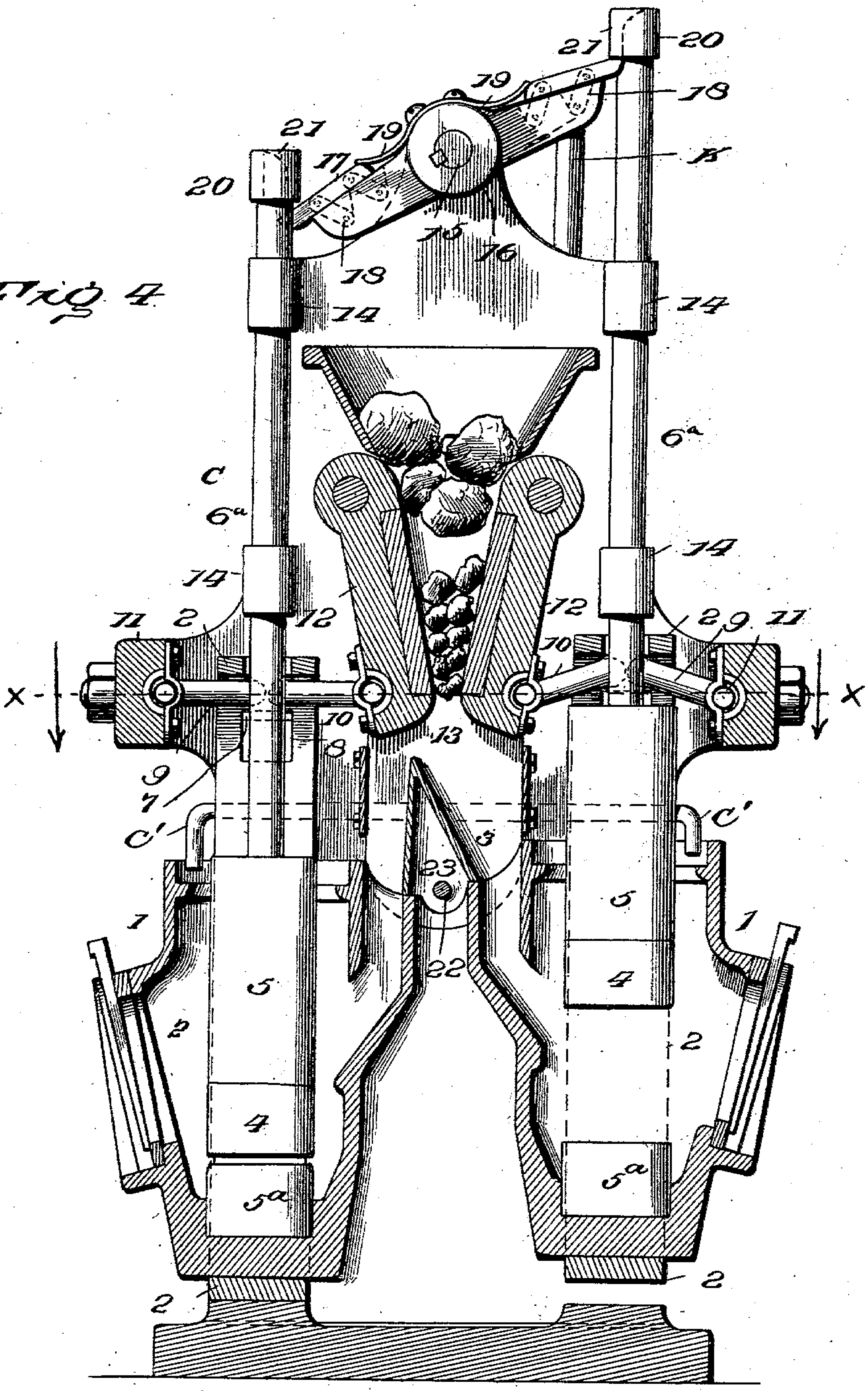
NO MODEL. 6 SHEETS—SHEET 3.

FIG. 4



Witnesses

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No. 743,800. PATENTED NOV. 10, 1903.

J. C. ANDERSON.

STAMP MILL MACHINERY.

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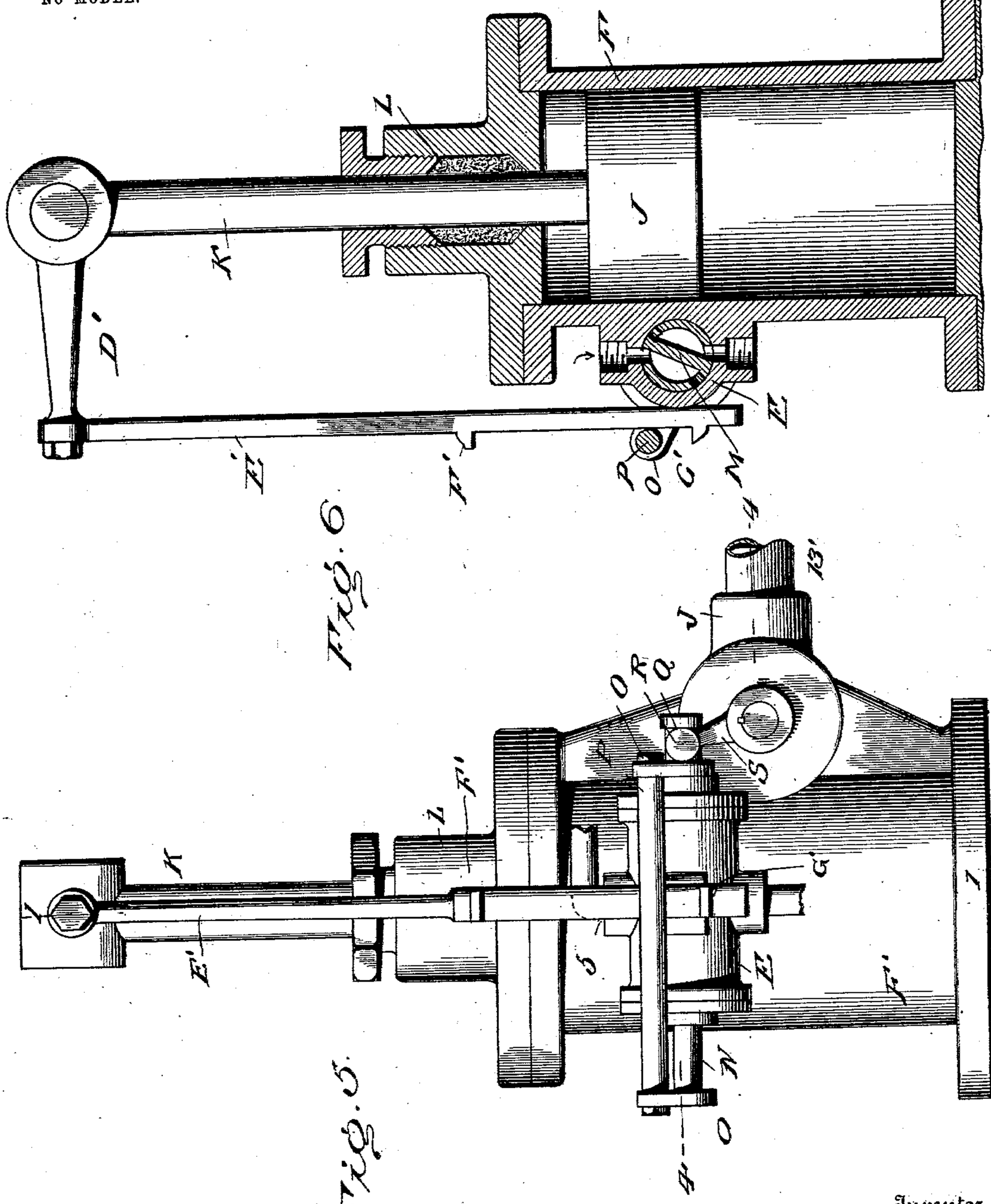
NO MODEL. 6 SHEETS—SHEET 4.



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STAMP MILL MACHINERY.

APPLICATION FILED MAR. 3. 1903.

NO MODEL. 6 SHEETS—SHEET 5.

Fig. 7.

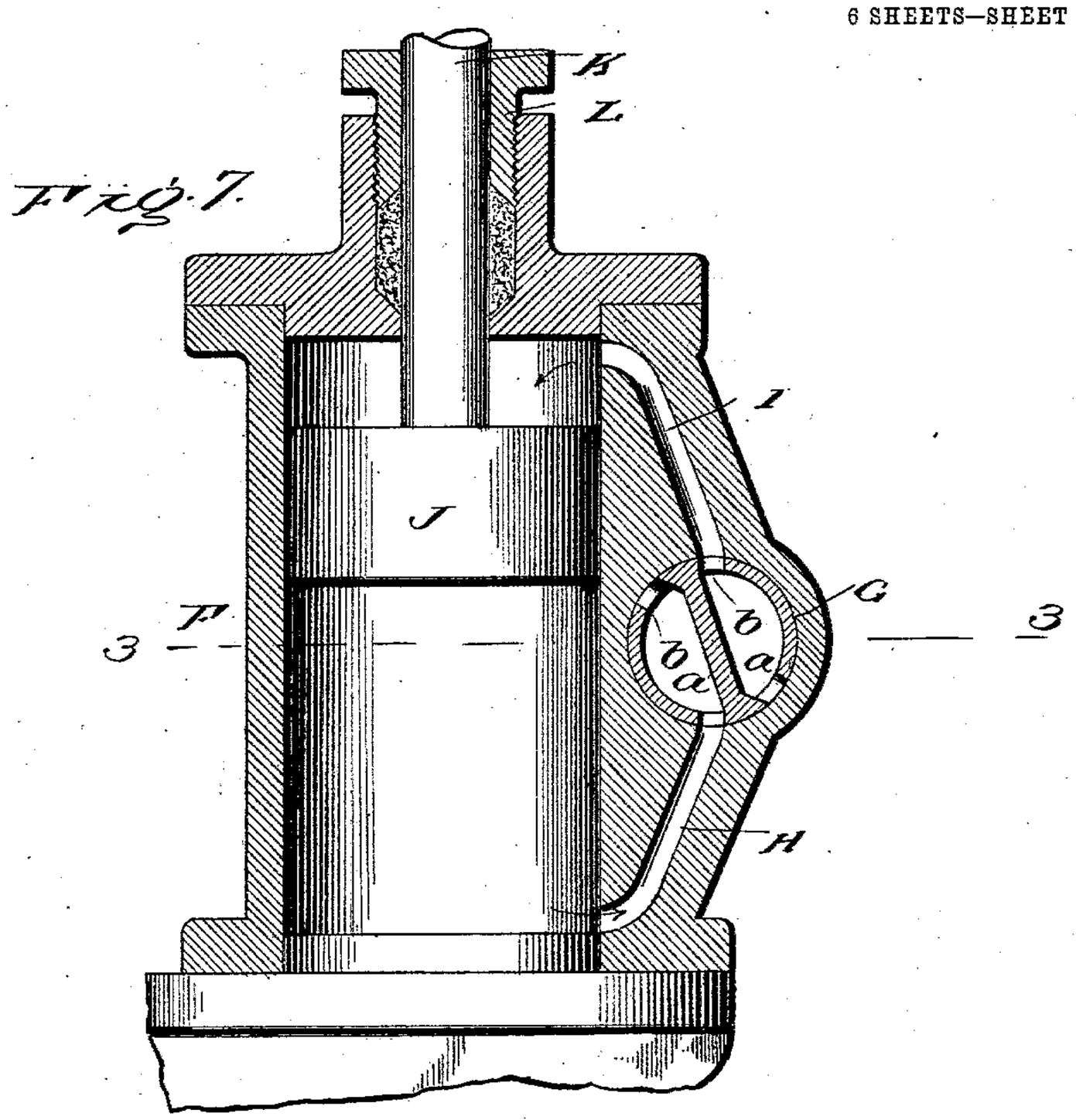


Fig. 8

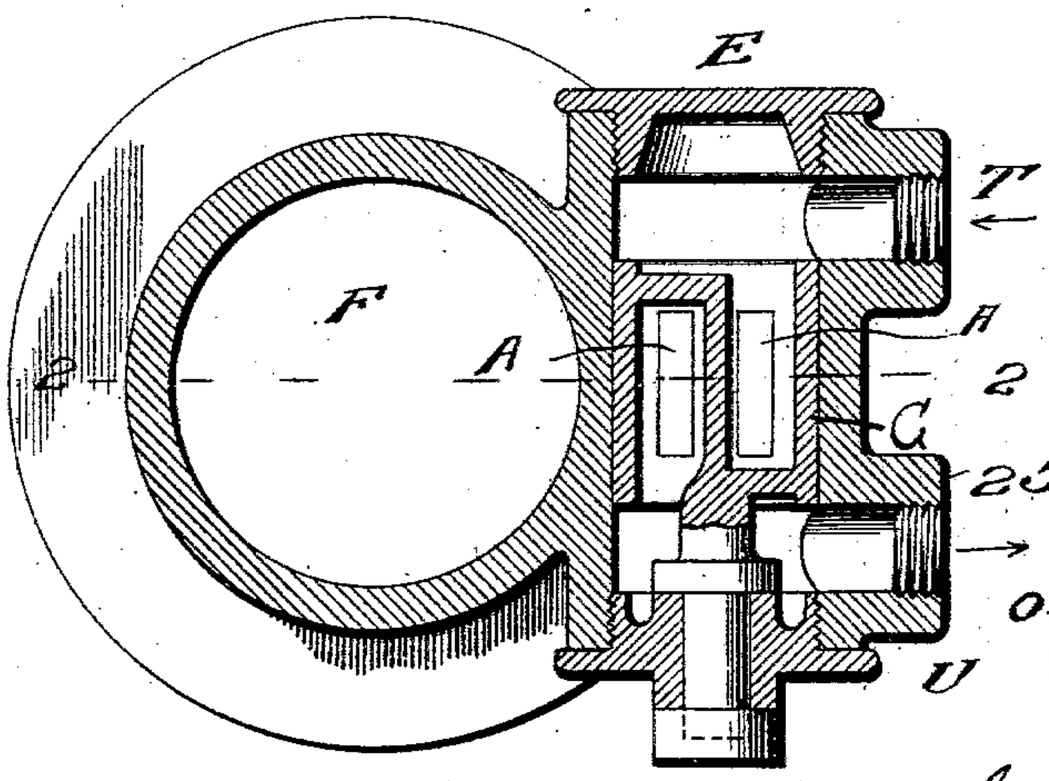
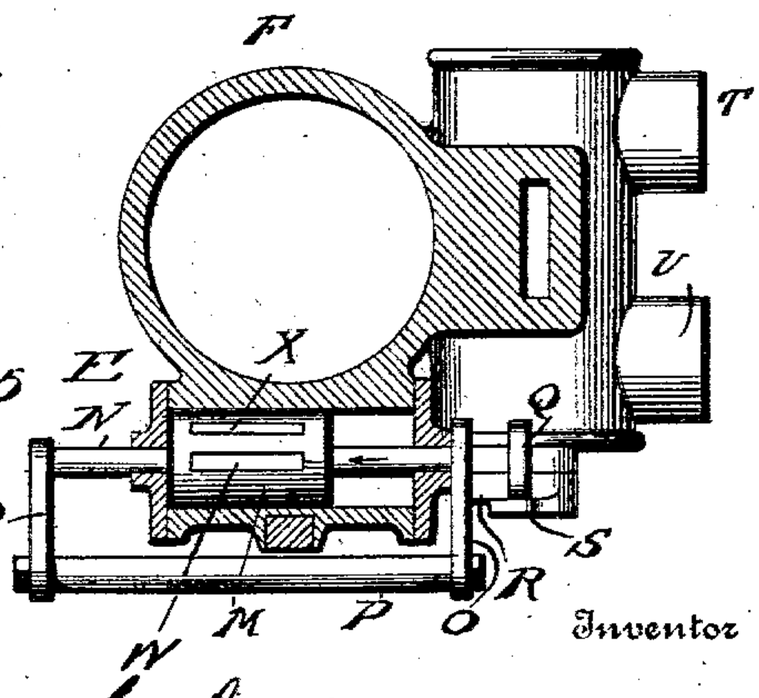


Fig. 9.



Witnesses

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No. 743,800.

PATENTED NOV. 10, 1903.

J. C. ANDERSON.

STAMP MILL MACHINERY.

APPLICATION FILED MAR. 3, 1903.

NO MODEL.

6 SHEETS—SHEET 6.

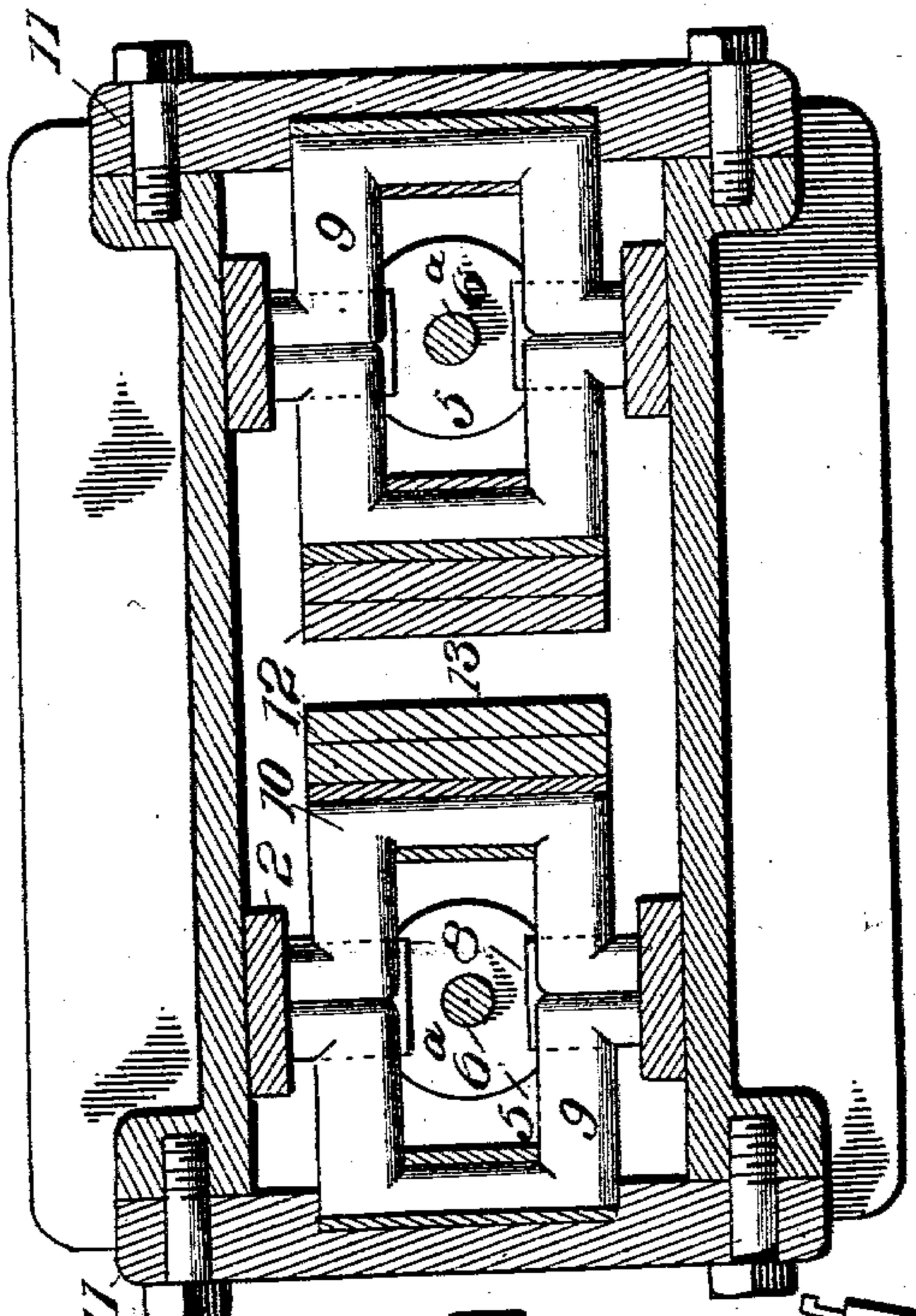

Fig. 11.

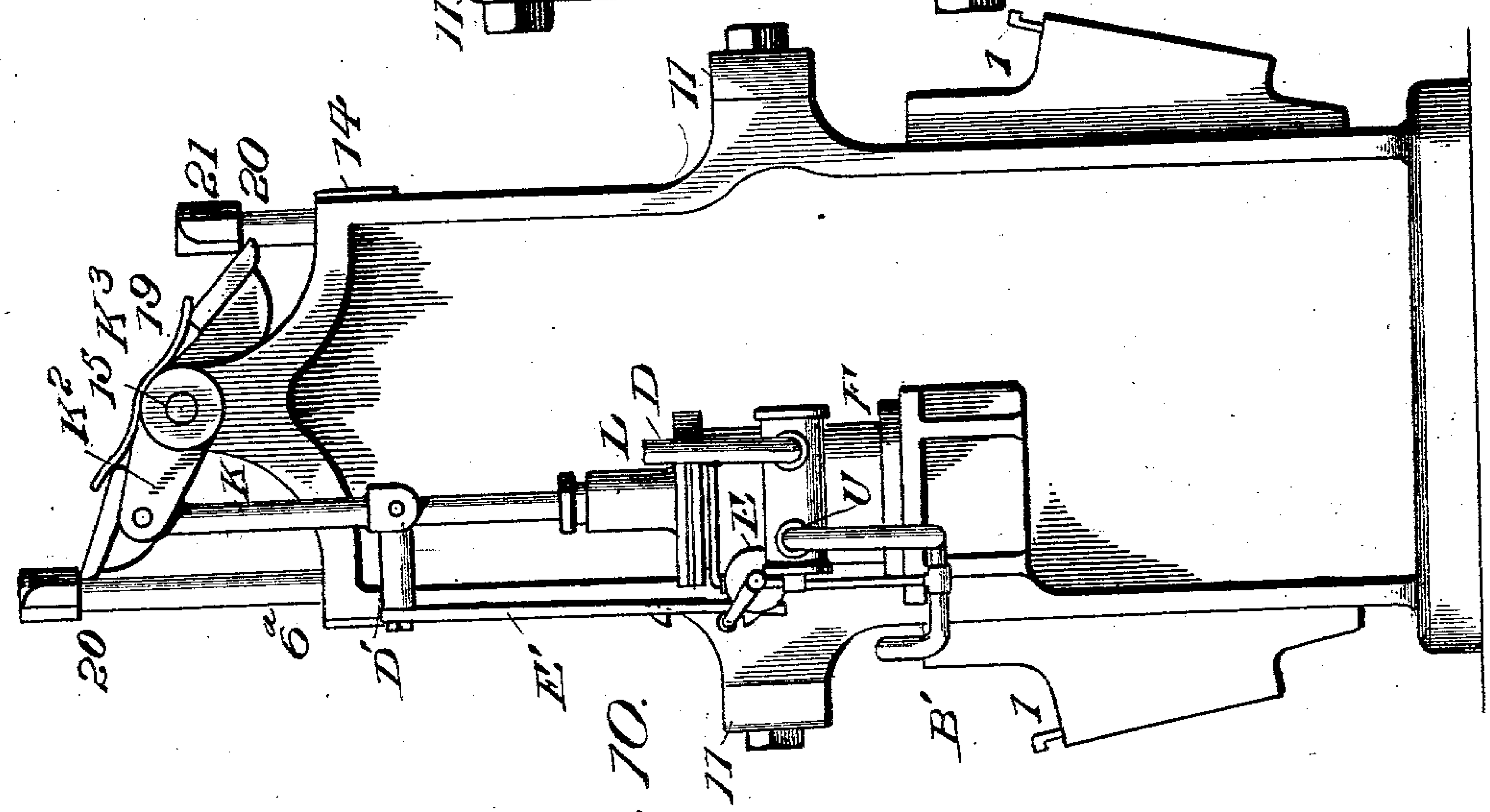

Fig. 10.

Witnesses

[signatures]

Inventor

James C. Anderson

By Wm. C. McIntire

Attorney

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 743,800. Patented November 10, 1903.

UNITED STATES PATENT OFFICE.

JAMES C. ANDERSON, OF HIGHLAND PARK, ILLINOIS.

STAMP-MILL MACHINERY.

SPECIFICATION forming part of Letters Patent No. 743,800, dated November 10, 1903.

Application filed March 3, 1903. Serial No. 145,995. (No model.)

To all whom it may concern:

Be it known that I, JAMES C. ANDERSON, a citizen of the United States, residing at Highland Park, in the county of Lake and State of Illinois, have invented certain new and useful Improvements in Stamp-Mill Machinery; 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 certain new and useful improvements in stamp-mill machinery for extracting the minerals from ores, and is especially designed for successfully carrying out the generic steps of process or method described in a concurrent application filed by me and bearing Serial No. 145,994.

In the application referred to I have described and illustrated the possibility of utilizing in mountainous regions a limited supply of water for operating a "stamp-mill" which would be wholly inadequate to operate similar machinery under the ordinary conditions necessary for its successful operation and involving the necessary accompaniment of a steam-boiler, engine, and skilled attendant for the steam plant.

My present invention is designed to provide a plant which shall render unnecessary in all ordinary mining operations the necessity for the employment of the cumbrous and weighty steam boiler and engine and the attendance of a skilled mechanic for running the steam appliances of such a plant, and has for its object to provide means whereby a limited and otherwise inadequate supply of water, such as may be found in mountainous regions or which may be procured by artificial means, may be successfully used to operate a stamp-mill of minimum or ordinary capacity; and with these ends and objects in view my invention consists in the details of construction and operation of the mechanism hereinafter more fully set forth.

In order that those skilled in the art to which my invention appertains may fully understand the same and appreciate its advantages over the ordinary system employed for reducing ores and recovering the precious metals therefrom, I will proceed to describe the construction and operation of the same, referring by characters to the accompanying drawings, in which—

Figure 1 represents a landscape view of a mountainous region with my improved milling plant properly installed. Fig. 2 is a side elevation of a two-stamp mill involving the details of my invention. Fig. 3 is a top or plan view of the same. Fig. 4 is a vertical section taken on the line *x x* of Fig. 3, the dies and their stems being shown in elevation. Fig. 5 is a side elevation, on enlarged scale, of the improved motor or hydraulic piston for driving the stamp-mill mechanism. Fig. 6 is a central vertical section taken on the line 1 1 of Fig. 5. Fig. 7 is a similar view taken at right angles thereto and on the line 2 2 of Fig. 8. Fig. 8 is a horizontal section taken on the line 3 3 of Fig. 7. Fig. 9 is a similar view taken on the line 4 4 of Fig. 5. Fig. 11 is a horizontal section taken on the line *x x* of Fig. 4, and Fig. 10 is a rear elevation looking from the right of Fig. 2.

Similar characters of reference indicate like parts in the several figures of the drawings.

Referring to Fig. 1, which represents, as stated, a mountainous region, A indicates a natural or artificial basin or reservoir designed to impound the waters from melted snow, springs, or other sources.

B represents the working entrance to a mine from which precious ores are extracted, and C is one of my improved stamping-mills and accompanying ore crushers or breakers erected upon a suitable foundation or plateau adjacent to the mine-entrance.

Leading from the reservoir or basin A is a pipe or hose D, the lower end of which is suitably connected with a valve-cylinder E on one side of a hydraulic piston-cylinder F.

In the piston-cylinder F and at right angles to the valve-cylinder E is arranged an oscillatory valve G and inlet and outlet ports H and I, leading to opposite sides of the piston-head J, the rod K of which extends through a suitable stuffing-box L at the upper end of the cylinder and is connected with one end of a walking-beam, presently referred to, and which is mounted upon a shaft at the top of the frame.

Within the valve-cylinder E is arranged an oscillating and reciprocating valve M, the stem N of which reciprocates through suit-

able stuffing-boxes at each end of the cylinder. Keyed to this valve-stem at each end are radial arms O, which carry a longitudinal bar or shaft P.

The extreme right-hand end of the valve-stem N is equipped with a disk or head Q a suitable distance from the radial arm O to form therewith a housing for a wrist-pin R on the outer end of a radial arm S, keyed to the end of the shaft of the wing-valve G of the piston-cylinder F, so that as the valve M of the valve-cylinder E is reciprocated, as will be hereinafter explained, the wing-valve G will be oscillated to alternately open and close the inlet and outlet ports H and I, so that hydraulic pressure may be alternately exerted on opposite sides of the piston J.

The wing-valve G, as clearly shown at Fig. 7, consists of a hollow cylinder with a diametric partition and with ports *a a* and *b b*, which are oscillated into and out of register with the ports H and I of the hydraulic cylinder F, so that the pressure of the water conveyed by the pipe or hose D may be alternately exerted on opposite sides of the piston J by admission through the connections T and U. (See Fig. 8.) The wing-valve G is operated through the medium of the reciprocating and oscillatory valve M, and this valve is reciprocated by hydraulic pressure of the water delivered against the opposite heads thereof through a pipe V, connected with the main pipe or hose D and connected with the nipple T, and as the valve M is formed with diametric ports W and X the water conveyed through the nipple T is alternately delivered against the heads of the valve and exhausted through the pipe A′, which is connected with the exhaust-pipe B′ of the hydraulic cylinder E, which exhaust-pipe leads by suitable branches C′ to the two mortars 1 1, so that the exhaust-water from the piston-cylinder F and the valve-cylinder E is conveyed to the respective mortars.

It will thus be seen that through the independent action of the valves M and G the water in the closed conduit or pipe D is periodically delivered below and above the piston J in the hydraulic cylinder and is correspondingly exhausted from opposite sides of said piston. The piston and its stem K are reciprocated, and as the upper end of the piston-rod K is pivotally connected with a rod K′, the upper end of which is pivotally connected with the end of a radial arm K^2 on a hub K^3, keyed to the rock-shaft 15, said shaft is rocked by the action of the piston J. The walking-beam lever 16 being also keyed to the rock-shaft 15, it follows that as said shaft is rocked the walking-beam lever will be correspondingly moved, and through the medium of the spring-latches on the ends of the lever and the coöperating collars on the die-stems 6, hereinafter referred to, the dies are alternately lifted and released, so that they may descend by gravity and entirely uninfluenced by the mechanical means employed to lift them. The ends of the walking-beam lever alternately latch with and are released from the collars on the upper end of the die-stems 6, and obviously when one of the die-stems and its die has been released and travels vertically by gravity it cannot be again caught by the walking-beam lever until the end thereof has traveled downwardly a sufficient distance for the latch to interlock with the collar on said stem, whereupon and on the return or reverse movement of the walking-beam lever said die and stem will be again lifted.

The stem K of the piston J carries a horizontal arm D′, which is connected to the upper end of a vertical rod E′, provided with tappets F′ and G′, (see Fig. 6,) which are designed to alternately contact with the rod or shaft N of the valve M at each end of the stroke of the piston J, and consequently the valve M is oscillated to the extent necessary to alternately bring the ports W and X into communication with the water entering through the inlet-pipe V, so that, as will be clearly seen, the valves G and M and piston J all cooperate and control the action of one another in the following manner, to wit: With the valves and the parts controlled thereby in the positions indicated in the drawings and which show the piston J as having been raised to its limit and started on its downward movement and the valve M in position to admit water from the pipe V into one of the inlet-ports W thereof such water is operating to reciprocate the said valve in a direction opposite to that shown at Fig. 5, and in such movement the valve G of the piston-cylinder has through the medium of the wrist-pin R and radial arm S been oscillated to bring the inlet-port *b* into register with the port I of the hydraulic cylinder F, and the water from the closed conduit D is permitted to flow between the upper end of the cylinder F and the piston J, while as the exhaust-port *a* of the valve G and the exhaust-port H of the cylinder F are in register the water below the piston J and by which the latter was lifted is exhausted through the valve G and out through the nipple U and its connections, the arrows on Figs. 7 and 8 indicating the course of the water in both directions. When the piston J is completing its downstroke, the rod E′, which is connected by the arm D′ with the piston-rod K, also travels downward, and the tappet F′ on said rod striking the longitudinal bar or shaft P, supported in the radial arms O, keyed to the valve-stem N, causes the valve M to be oscillated to reverse the ports W and X thereof, thus causing the water admitted through the pipe V to travel through said valve to the opposite end of the cylinder E to reciprocate the valve in the opposite direction, and consequently and through the medium of the wrist-pin R and radial arm S, as heretofore described, the valve G is reversed to cause the reverse movement of the piston J. It will therefore be readily understood that the valve M, with a minimum sup-

ply of water transmitted from the main conduit D through the pipe V, becomes the controller of the valve G, through which the main column of water is delivered and exhausted alternately to and from the opposite sides of the piston J.

The mortars 1 1 are suspended in yokes or bails 2, arranged within the frame 3, and 5 represents dies provided with shoes 4, adapted to contact with the ore delivered upon the anvils 5^a at the bottoms of the mortars.

6^a represents the die-stems by which the dies are lifted, as will be hereinafter more fully explained.

As the die 5 at one side of the stamp-mill is lifted, as shown at the right-hand side of Fig. 4, the head of the die contacts with the bridge 7 of the mortar-yoke and lifts said yoke, and consequently the adjacent ends of the toggles 9 and 10 are raised and the jaw 12 of the crusher on that side is released and sufficiently opened to permit a limited downward movement of the body of ore contained in the crusher. The die on the opposite side having reached the limit of its downward movement before the ascent of the other begins the upper end of the mortar-yoke on that side in its vertical movement has caused the toggles 9 and 10 to be straightened, as shown at the left of Fig. 4, so that when the elevated die on the opposite side falls and carries the mortar-yoke down and the toggle-levers on that side are straightened the jaw 12 of the crusher will be vibrated toward the opposite jaw, which is rigidly held by the straightened toggle-levers on that side, so that as the dies 5 alternately rise and fall the two jaws of the crusher are alternately vibrated, and during the crushing movement of each jaw the opposite one is held and rigidly braced by its toggle-levers.

The crusher 13 is rigidly secured to the frame 3 of the stamp-mill in any suitable manner, and the hydraulic cylinder and piston is mounted upon and secured to a platform extending from the frame 3 at such altitude as will secure the proper delivery of the exhaust-water through the pipes A′ B′ to the mortars 1 1.

The mortars are suspended in yokes or bails 2, as shown at Figs. 2 and 4, so that as the stems 6^a, with their respective dies 5 and shoes 4, ascend the bridge 7 of the yokes or bails will, as before explained, operate the toggle-levers 9 and 10 to open the respective jaws of the crusher, and when the dies descend and the shoes 4 contact with the ore upon the anvils 5 in the bottom of the mortars the momentum shock of the dies will cause the mortars to alternately approach the foundation, and the upper portion of the bails or yokes will obviously straighten the toggles and operate the corresponding jaw of the crusher.

The stems 6^a of the dies pass through lugs 14 on the frame 3 and are guided in their movements thereby, These stems also pass reciprocatively through the upper ends of the yokes or bails 2 and the bridges 7 thereof, and as the dies ascend and the upper ends thereof contact with the bridges 7 the yokes or bails 2 will be lifted a predetermined distance, carrying with them their respective mortars 1.

15 is a horizontal rock-shaft mounted in suitable bearings at the top of the frame 3, and keyed to said shaft is a walking-beam 16, at the outer ends of which are located latches 17, secured in place by pivoted parallel arms 18.

Springs 19, secured to the walking-beam 16, control the action of the latches in an obvious manner.

The upper ends of the die-stem 6 are equipped with collars 20, having lateral lugs or studs 21, (see particularly Fig. 3,) having their upper surface curved, as shown in dotted lines at Fig. 4, and the under sides of the latches 17 are correspondingly curved or beveled, so that as the walking-beam 16 is vibrated the latches 17 will be alternately forced inward, and thus pass the stud 21 on the stem of that die which is at rest in its lowermost position, the spring 19 forcing the latch outward and under the stud, so that the reverse movement of the walking-beam will cause such latch by its contact with the stud to lift the stem and die to its highest altitude and at which plane the latch travels from beneath the stud and permits the die to fall.

As each die is released and falls by gravity to stamp the ore upon the anvil 5^a at the bottom of the mortar 1 the momentum shock causes such mortar and its yoke or bail 2 to descend, and the upper portion of the bail straightens the toggles 9 and 10 on the same side of the crusher 13 and causes the jaw 12 on that side to approach the other jaw, which is held stationary by the position of the toggles on that side. When the die on the other side of the machine falls, a similar action takes place, and it will thus be seen that the jaws 12 of the crusher are alternately held in a rigid position and then vibrated to perform the crushing action.

The two mortars alternately rise and are forced downward, and the inner walls of the mortars contacting with the lower extremities of the walls of an A-shaped deflector 23, vibratively mounted upon a horizontal shaft 22 below the crusher, as clearly shown at Fig. 4, cause said deflector to alternately feed the ore delivered by the crusher to the two mortars.

From the construction and arrangement described it will be seen that a comparatively small column of water is applied directly and alternately on opposite sides of a piston, the function of which is simply to lift the dies to such altitude that their weight and momentum will be sufficient to properly stamp the ore in the mortars, and that the momentum shock of the falling dies constitutes the motive force for operating the crusher located above the mortars. The water employed to

operate the piston is exhausted alternately from the opposite sides thereof and is delivered through pipes, as explained, to the mortars to pulp the pulverized ore, and passing thence through the strainer 24 may be husbanded and used in any subsequent or necessary washing treatment.

The apparatus is made in such manner and in such number of parts and so connected together that its several parts may be readily transported on pack-animals to any desired locality and then readily assembled for operation.

It will be seen that with a plant such as I have illustrated and described ores which would otherwise be inaccessible or valueless on account of the cost of treatment may be profitably worked by my improved apparatus and process. It will also be seen that even where the conditions might afford a sufficient supply of water for a boiler and engine my improved plant may be used more economically than those ordinarily employed.

As an illustration of the advantages and effectiveness of my improved plant I may state that a two-stamp mill having a minimum capacity for treating one and a half to two tons of ore per hour can be successfully operated with a column of water one hundred feet high and one-half inch in diameter and that a column of water the same height and of less diameter will operate the same mechanisms, although at a less rate of speed.

Having described the construction and advantages of my improvements, what I claim as new, and desire to secure by Letters Patent, is—

1. A stamp-mill consisting of one or more mortars and dies mounted in a suitable frame, mechanical means for lifting the dies, and a closed conduit for directing a column of water from an elevated source by gravity alone directly to the die-lifting mechanism, whereby the dies after being lifted are permitted to fall by gravity and independent of the lifting mechanism, substantially as hereinbefore set forth.

2. An ore-milling plant consisting of one or more mortars and vertically-reciprocating dies mounted in a suitable frame, a cylinder and piston also mounted in said frame, means intermediate of the piston and die or dies for moving the dies upwardly with the piston; an elevated water-supply; a pipe or closed conduit leading from the water-supply, and communicating directly with the cylinder and piston and a free exhaust leading from the cylinder, substantially as and for the purpose set forth.

3. A stamp-mill consisting of one or more mortars and dies mounted in a suitable supporting-frame, a hydraulic cylinder with suitable valve-ports and piston, adjacent to and in fixed relation with mortars and dies, a hose or pipe connected at its lower terminus with the hydraulic cylinder and at its upper terminus with an elevated water-supply, and means intermediate the hydraulic piston and the stem or stems of the mortar-dies for lifting and releasing the dies, substantially as hereinbefore set forth.

4. In a stamp-mill plant for treating ores, a suitable hose or pipe connected at its upper terminus with an elevated water-supply, and at its lower terminus with a hydraulic cylinder and piston; one or more mortars and dies mounted in a suitable supporting-frame, the dies arranged to reciprocate within the mortars and having vertically-extended stems; a hydraulic cylinder and piston adjacent to the mortars, and having a stem or rod connected to a walking-beam lever; means intermediate of the walking-beam lever and the stem or stems of the dies for lifting and releasing the dies, and means for admitting and exhausting the water column to and from the hydraulic cylinder, substantially as and for the purpose set forth.

5. In a stamp-mill such as described, in combination with a pair of mortars mounted in vertically-movable yokes or bails, and provided with dies adapted to be lifted and to fall by gravity, and means for lifting and releasing the dies, an ore-crusher mounted in the stamp-mill frame above the mortars, and means intermediate of the mortar yokes or bails and the vibrative jaws of the crusher for alternately vibrating one jaw of the crusher and holding the opposite jaw in rigid relation to the vibrating jaw, whereby the momentum shock of the falling dies is utilized to operate the crusher, substantially as hereinbefore set forth.

6. In combination with the mortars and crusher mounted in the stamp-mill frame, vertically-movable yokes or bails supporting the mortars, toggle-levers horizontally disposed and connected with the vibrative jaws of the crusher, housings at the upper end of the yokes or bails for confining and operating upon the adjacent ends of the toggle-levers, and vertically-movable dies adapted to lift the yokes or bails during their ascending movement and to force the yokes or bails downward by their gravity or momentum shock, substantially as and for the purposes set forth.

7. In combination with a pair of mortars mounted in vertically-movable yokes or bails and a crusher arranged above the mortars, a deflecting feed-plate intermediate the mortars and the crusher, and adapted to be vibrated by the alternate ascent of the mortar-bails, whereby the product of the crusher is alternately fed to the mortars, substantially as hereinbefore set forth.

8. In a plant such as described, in combination with a pair of mortars and dies and a hydraulic piston, a walking-beam lever mounted in the frame and connected with the hydraulic piston, latches at each end of the walking-beam lever, and lateral lugs or projections upon each of the stems of the dies adapted to contact with the latches of the walking-beam

lever, substantially as and for the purposes set forth.

9. In a milling plant involving a crusher, mortar and die, with the mortar adapted to vertical movement resulting from the impact of the die, means intermediate the mortar and crusher for transmitting the vertical movement of the mortar and the momentum shock of the die to the crusher to operate the latter, substantially as set forth.

10. In a stamp-mill, the combination of a stamp head or die; means for lifting and releasing the die; a mortar receiving a vertical movement through the impact of the die; a crusher; and connections whereby the mortar actuates a movable jaw of the crusher.

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

JAMES C. ANDERSON.

Witnesses:
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W. M. HOLLIS.