No. 620,962. Patented Mar. 14, 1899.

F. L. PRESTON.

ANNULAR STAMP MILL.

(Application filed Aug. 13, 1896.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

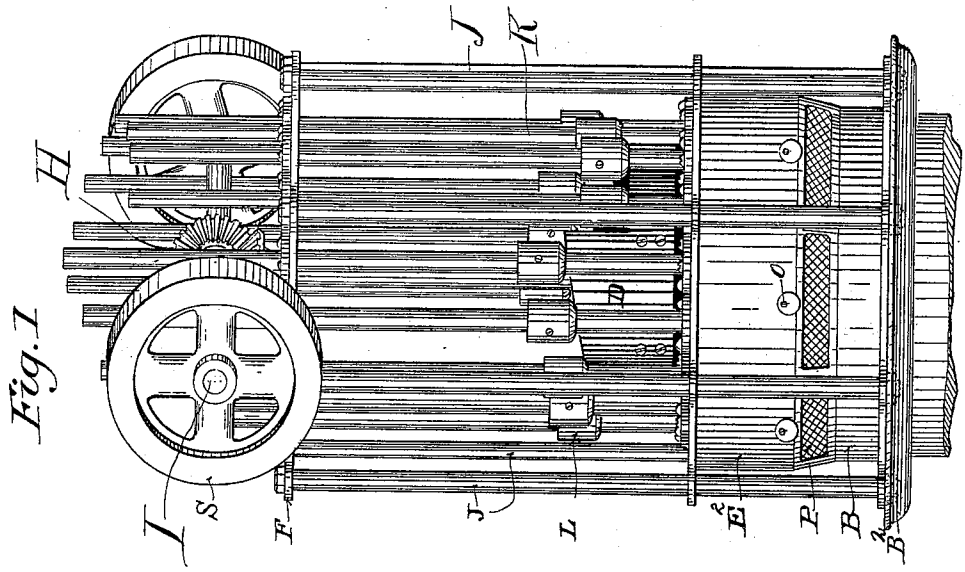
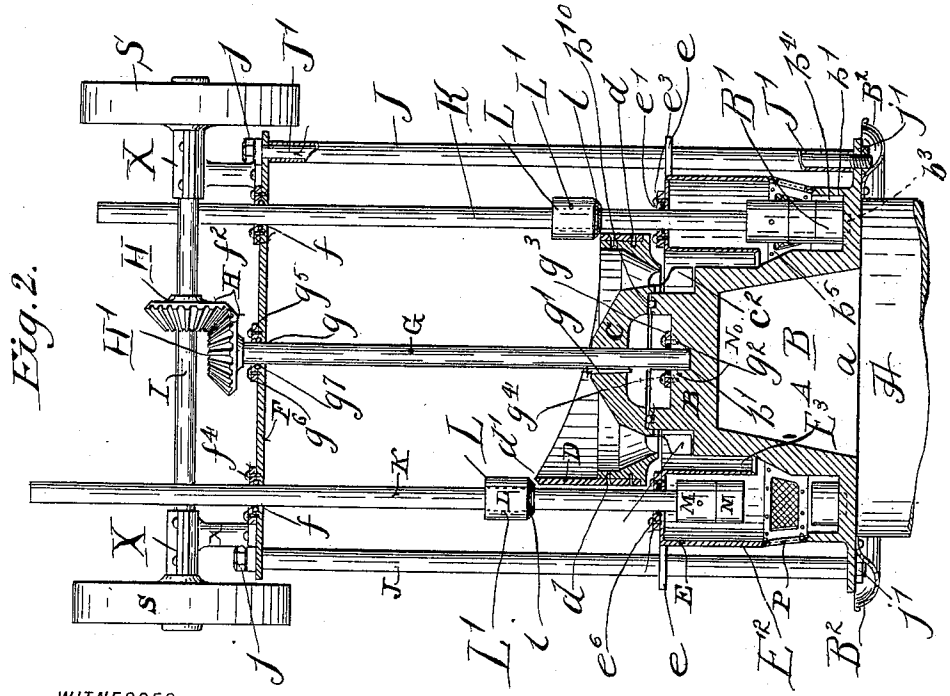


Fig. 2.



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L. Clinton Hamlink

INVENTOR

Frederick L. Preston

By: Poole & Brown

HIS ATTORNEYS

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Fig. 3.

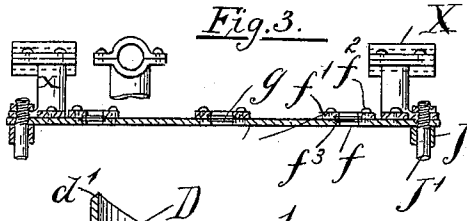


Fig. 4.

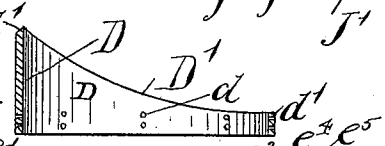


Fig. 5.

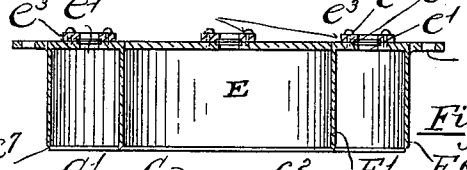


Fig. 6.

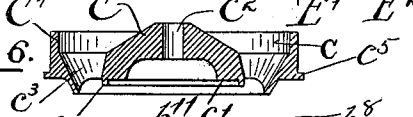


Fig. 7.

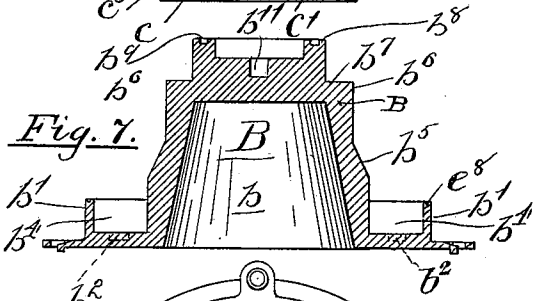


Fig. 8.

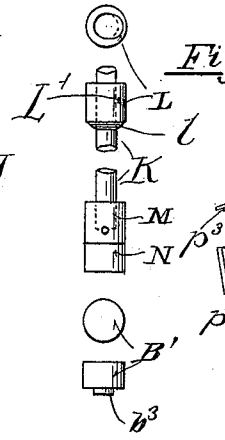


Fig. 9.

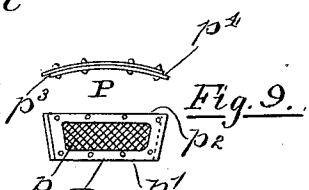


Fig. 10.

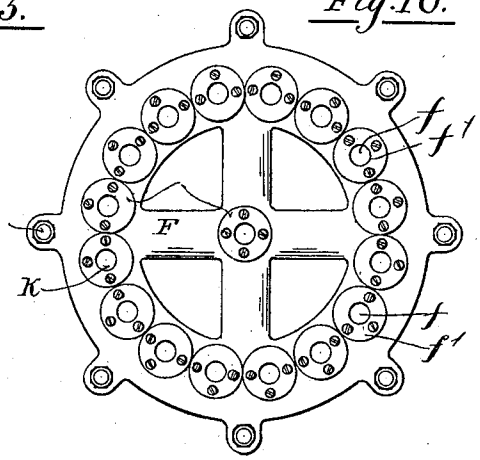


Fig. 11.

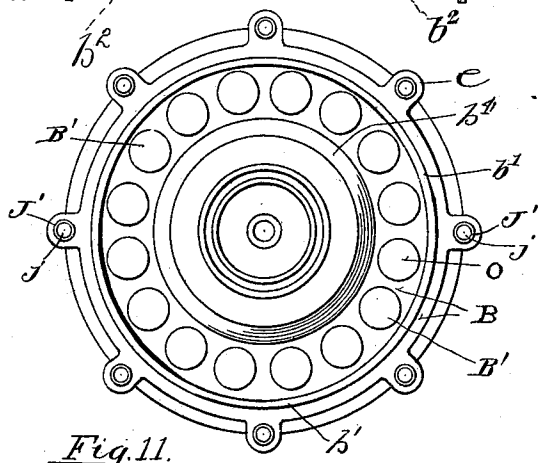
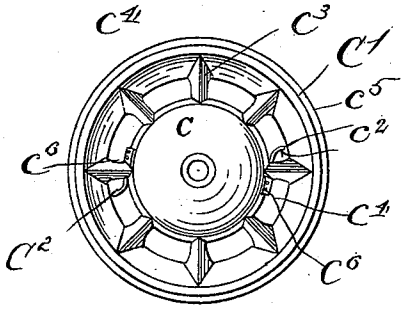


Fig. 12.



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UNITED STATES PATENT OFFICE.

FREDERICK L. PRESTON, OF BELOIT, WISCONSIN.

ANNULAR STAMP-MILL.

SPECIFICATION forming part of Letters Patent No. 620,962, dated March 14, 1899.

Application filed August 13, 1896. Serial No. 602,629. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK L. PRESTON, a resident of the city of Beloit, in the county of Rock and State of Wisconsin, have invented certain new and useful Improvements in Annular Stamp-Mills; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in stamp-mills for the crushing of ores, and particularly to that class of ore stamps or batteries of the annular or circular description and provided with frames in which the stamp-stems are supported and guided and in which they are arranged annularly. In batteries of this class the stamps are lifted by the revolving action of a cam or cams, which engage the under side of a suitable tappet upon the stamp-stem, and at a proper time the tappet drops from the cam, and thus the stamps are successively raised and dropped. In machines of this class the cam or cams are horizontally arranged and the load or the lifting of the stamps is vertical. Consequently it is desirable to provide antifriction-bearings wherever possible.

My invention therefore consists, first, in providing the movable parts of an annular stamp-mill with my improved antifriction-bearing.

The invention consists, second, in the various devices and combinations of devices hereinafter described, and which will be more particularly pointed out in the claims.

The object of the invention is to provide an improved stamp-mill for the trituration, stamping, and pulverizing of rocks and ores which shall at the same time be simple, cheap, and durable in construction, effective in operation, not liable to get out of repair, and which will require the minimum amount of power for its operation.

With these objects in view I now proceed to describe the drawings accompanying this specification.

Figure 1 illustrates an exterior elevation of a stamp-mill embodying my invention. Fig. 2 is a central vertical sectional view of the same, showing, however, but two stamp-stems, one raised and the other down. Fig. 3 is a vertical sectional view of the upper plate. Fig. 4 is a sectional view showing one of the vertical or curved lifting-cams detached. Fig. 5 is a vertical sectional view of the double-flanged lower plate of the machine-frame. Fig. 6 is a vertical sectional view of the wheel with conical hub, to which the lifting-cams are secured. Fig. 7 is a sectional view of the mortar detached. Fig. 8 is a fragmentary view showing in detail, in plan, and side elevations a portion of the stamp, the collar or tappet thereon, the stamp-head, the shoe, and the die. Fig. 9 is an interior elevation and a top plan view of one of the circular screens. Fig. 10 is a top or plan view of the circular top plate of the machine-frame. Fig. 11 is a similar view of the mortar, and Fig. 12 is a similar view of the wheel shown in Fig. 6.

A is a mortar-block of any approved construction upon which the mortar B rests. In this instance the block is provided with conical vertical extension a, adapted to engage in a suitable recess or socket b in the mortar B.

E and F are circular plates, the latter arranged at the top of the machine. These plates and the mortar B are secured in position by hollow standards J, which rest upon the mortar B and underneath the plate F, but which pass through suitable apertures in lugs e in the plate E. Bolts J′ pass through the standards J to secure the parts together by means of nuts j j' at the top and bottom thereof, respectively. These standards J are conveniently arranged, so that the three parts F, E, and B constitute the rigidly-secured frame of the machine. The lower portion of the mortar B is provided with a vertically-arranged flange b', between which and the main portion there is thus formed an annular groove provided with a plurality of vertical recesses b^2, corresponding with the number of dies to be inserted.

B′ are dies provided with the usual lip or extension b^3, the latter being adapted to be inserted within the recesses or apertures b^2 in the mortar B. In Fig. 11 these dies are shown in position. The inner wall of the annular die space or chamber b^4 terminates in an upwardly-diverging wall or surface b^5, that connects with a vertical wall b^6. At the upper

portion of this vertical wall is an annular shelf b^7, arranged for the purpose hereinafter mentioned.

C is a wheel, Fig. 6, arranged to rest upon the upper portion of the mortar B. Its meeting surface is provided with a downwardly-extending flange c, that engages with the surface b^8 in the upper part of the mortar. An annular groove b^9 is made in this portion of the mortar adapted for the reception of the antifriction-balls b^{10}. The interior diameter of the flange c of the wheel is such as to nicely fit over or around the exterior margin of the surface b^8 in order that the surface c' will engage the antifriction-balls b^{10} of the mortar, the flange serving to prevent access of dust or grit to the bearings. A vertical opening or bearing c^2 in the wheel corresponds with a step-bearing b^{11} in the mortar and both are adapted for engagement with the shaft which operates the wheel C. The wheel C is provided with an outer rim C', which is connected with the inner portion by radial ribs c^3, that are broader at their base than at their top, as clearly shown in Fig. 12, whereby spaces c^4 are formed between said ribs, and whereby deposits above the wall may be passed through without finding lodgement therein. The outer lower margin of the outer rim C' of the wheel is provided with an annular horizontally-extending flange c^5.

D D are circularly-arranged lifting-cams adapted to rest on their lower edges upon the flange c^5 and at its interior diameter corresponds with the external diameter of the outer rim C' of the wheel C. The cams D may be secured to said outer rim by screws d or by any other convenient means. D' is the inclined or lifting cam-surface, and it will be noticed that said lifting-surface (see Fig. 4) is inclined with respect to the vertical surface of the cam, as more clearly shown at d', Fig. 4.

Upon the upper plate F, mounted in suitable journal-bearings X X, is a driving-shaft I, to which motion may be communicated by the wheel S from any suitable source of power. Upon the shaft I is a driving bevel-wheel H, which meshes with a driven wheel H', the latter being mounted above the plate F upon a vertically-arranged shaft G. The shaft G passes through a suitable aperture g in the plate F through the opening c^2 in the cam-ring C and rests at its lower end in the step-bearing b^{11} in the mortar B. Ring C is secured to the shaft G to rotate therewith by means of a key g' or by other suitable means. Surrounding the shaft G at its lower end adjacent to the step-bearing b^{11} is a plurality of antifriction rollers or balls g^2, which are held in position by an annular ring or plate g^3, secured to the mortar B by screw-bolts g^4 or other suitable means, the inner margin of the ring g^3 being curved or cut away sufficiently to accommodate the balls g^2. A similar ring g^5 is secured to the plate F by screw-bolts g^6 or other suitable means and serve as a means of securing the antifriction-balls g^7 in position around the upper portion of the shaft G. By this simple arrangement I find that I am enabled to obtain a ball-bearing for the shaft G that is very inexpensive to construct, but which is very efficient in operation. I find also that by providing the shaft G with said ball-bearings and by providing the cam-ring C with a ball-bearing upon the mortar B, as previously explained, I am enabled to do very efficient and positive work with the cams D without having any unnecessary torsional strain upon the shaft G.

Through the upper plate F and the lower plate E are a plurality of vertically-arranged apertures, (lettered f and e', respectively,) which register with each other and through which the respective stamp stems or rods K are reciprocated. Surrounding each of these openings is a ring f' e^3, respectively, held in position by screw-bolts f^2 e^4, respectively, and each ring being curved or cut away at f^3 e^5 for the purpose of supporting or inclosing antifriction-roller balls f^4 e^6, respectively, which latter surround the stamp-stems K in a manner similar to the antifriction-balls which surround the driving-shaft G, the difference, however, being that in the latter case the balls g^2 rotate upon their vertical axes because the shaft G has a rotary motion, while in the former case the balls f^4 e^6 rotate upon their horizontal axes because of the vertical movement of the stamp-stems K, as well as upon their vertical axes.

Upon each stamp-stem K is secured a suitable collar or tappet L, beveled at its under side at l to correspond with the inclination of the bearing-surface d of the cam D. The tappet L is adjustably secured upon the stem K by a screw-bolt L' or by other suitable means. Upon the lower end of the stem K is the usual stamp-head M, and secured thereto is the usual shoe N. There will of course be arranged any convenient number of stamps, each stamp comprising the stamp-stem K, the shoe N, and the die B'.

The forming of beveled surfaces l and d' of the tappet-collars and cam on a uniform inclination with respect to the central axis of the cam-wheel is of great practical importance, as it affords a perfect bearing between said parts which will not be changed in the use of the machine, but will remain uniform. Another practical and important advantage of this construction is that the bearings between the tappet-collars and cam-wheel at the point at which the collar drops off the wheel is of the same area and is capable of supporting the same weight as in other parts of the wheel, so that the weight of the stamp and stem will not be thrown upon an unsupported and salient corner of the cam at the point at which the tappet-collar leaves the same, with the result of breaking away said corner, and thereby impairing the efficiency of the cam.

It will be obvious that upon rotation of the shaft G the several tappets will be raised from

their lowermost position—to wit, that shown in the right-hand portion of Fig. 2—to their uppermost position—to wit, that shown in the left-hand portion, Fig. 2—and as soon as the highest portion of cam D passes a given tappet the die-stem K, to which that particular tappet is secured, will fall by gravity and crush between the shoe end and the die B′ any ore that has found lodgment upon the die B′, that particular stem K remaining then in its lowermost position until the cam D again moves around and raises it, when the operation is repeated. In the drawings for this specification I have illustrated sixteen of such stamps, which are conveniently operated by two cams and which perform the work very promptly and efficiently.

I will describe the means for feeding the ore to the dies B′ and for removing the crushed material from the die-chamber. It will be observed that the lower plate E is provided with two vertically-arranged annular flanges E′ E^2, the latter being the outermost flange. It is in the space between these two flanges that the die-head and shoe reciprocate. The interior diameter of the inner annular flange E′ is such that when the plate E is positioned with respect to the mortar B an annular circular passage-way E^3 is afforded between said flange E′ and the upper vertical portion of the mortar B. The ore is delivered from the ore-crusher to the interior of the rotating ring C and falls through the spaces c^4 between the ribs c^3 upon the shoulder b^7 of the mortar. From this shoulder it is swept by rotating blades c^2, secured to the ring C by screw-bolts c^6 or other suitable means, into the passage-way E^3, from whence it falls into the die chamber or space b^4 upon the dies B′. The lower outer margin-flange E^2 is cut away, as shown at e^7, and the upper surface-flange b' of the mortar is curved, as shown at e^8. A series of screen-frames P, carrying screens p, are arranged to fill the space between the upper portion of the flange and the lower portion of the flange E^2, the lower margin or edge p' of each screen P resting in the groove e^8 and the upper margin p^2 resting in the groove e^7 of the flange E^2 and being thus held in position by a turn-button O, pivotally secured by a screw-bolt o or otherwise to the outer side of said flange E^2 in such position as to be turned down from the upper edge of said screens P, as more clearly seen in Fig. 1, thus holding the screen in position. The screen P is provided with two offsets or shoulders at its ends p^3 p^4, one directed inwardly or to the conical side of the screen-frame and the other directed outwardly to the convex side of the frame, whereby it will be apparent that the adjacent ends of such screens overlap each other and which also tends to hold the screens in proper position. As the several stamps descend forcibly by their weight or gravity and fall upon the dies B′ the material is pulverized and stamped in the usual manner and is scattered and forced outwardly through the screens P in a familiar manner. Surrounding the lower portion of the mortar B below the screens is an annular trough B^3.

Referring now generally to the operation, the ore is passed from the ore crusher or breaker in any suitable manner upon the conical hub of the ring C, passes therethrough, is swept by the blades C^2 into the passage-way leading to the die-chamber, and as the wheel C revolves, the cams being in contact with the inclined surfaces l of the tappet, not only raises the stamp-stems vertically, but imparts a rotary motion the same time, which gives a greater execution to the stamp when dropped. I claim that this is a very important feature of my invention and a departure from previous devices. When the ore is stamped, it passes out through the screens P in the usual manner, either wet or dry, as may be preferred.

It will be noted that in the sixteen-stamp circular battery, such as are shown, two stamps are dropped at the same time, one being directly opposite to the other, by which construction I am able to strictly balance the mill at all times, the stamps being dropped continuously and successively one after the other upon opposite sides of the machine. This arrangement thoroughly distributes the ore in the die-chamber of the mortar and requires no backlash, as is common in the old straight battery or stamp-mill.

While I do not care to limit my invention to any particular speed, I find that very great efficiency can be obtained by imparting to the wheel C a speed of seventy revolutions per minute.

My machine is comparatively inexpensive to construct, easy to assemble, is not complicated to get out of order, is very efficient in operation, and is so compact that sixty-four stamps may be provided in a room of the size usually occupied by twenty of the old style of stamps.

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

1. In an annular stamp-mill, the combination with a mortar-frame provided with a die-chamber, a supporting-frame secured upon or adjacent to said mortar-frame, a plurality of stamps mounted to reciprocate in said die-chamber having stems which rotatively engage said supporting-frame, and tappet-collars on said stamp-stems, of a centrally-arranged wheel mounted to rotate on said mortar-frame provided with a plurality of cam-surfaces engaging the several tappet-collars of said stamp-stems, the adjacent parts of the collars and cams being provided with beveled surfaces which are formed on a uniform inclination with respect to the vertical axis of said wheel, and means for rotating said cam-wheel.

2. In an annular, central-feeding stamp-mill, the combination with a mortar-frame provided with an annular die-chamber, and stamps mounted to reciprocate therein, of a

cam-wheel mounted to rotate on the upper surface of said mortar-frame and having engagement with upwardly-extending stems secured to said stamps by means of which said stamps are reciprocated, openings in said wheel through which ore may drop upon said mortar-frame, means operated by said wheel to scrape the ore from the frame to the die-chamber and means for rotating said wheel.

3. In an annular central-feeding stamp-mill, the combination with a mortar-frame provided with an annular die-chamber, stamps mounted to reciprocate therein and an annular ledge or shelf on said frame adjacent to the upper surface thereof, of a cam-wheel mounted to rotate on the upper surface of said mortar-frame to operate said stamps, provided with a conical hub and a plurality of apertures through which ore may drop upon said annular ledge, plows mounted on said wheel and adapted to scrape the ore from said ledge to the die-chambers, and means for rotating said cam-wheel.

4. A stamp-mill comprising a mortar provided near its upper end with an annular ledge or shelf and at its opposite end with an annular die-chamber, a plurality of dies therein, a plurality of stamps mounted to coact with said dies, provided with vertically-extending rotatable stems, a frame mounted on said mortar adapted to support and guide said stamp-stems, tappet-surfaces on said stems, a cam-wheel rotatively mounted on said mortar the cam-surfaces of which have rolling contact with said tappet-surfaces, apertures between the periphery of said wheel and the hub thereof for the passage of ore therethrough upon the annular ledge or shelf, a plurality of plows secured to said wheel and adapted to scrape ore from said shelf, and means for rotating said wheel.

In testimony that I claim the foregoing as my invention I affix my signature, in presence of two witnesses, this 11th day of August, A. D. 1896.

FREDERICK L. PRESTON.

Witnesses:
TAYLOR E. BROWN,
W. L. HALL.