J. M. THOMPSON.

Ore Stamp-Mill.

No. 227,189. Patented May 4, 1880.

Fig. 1.

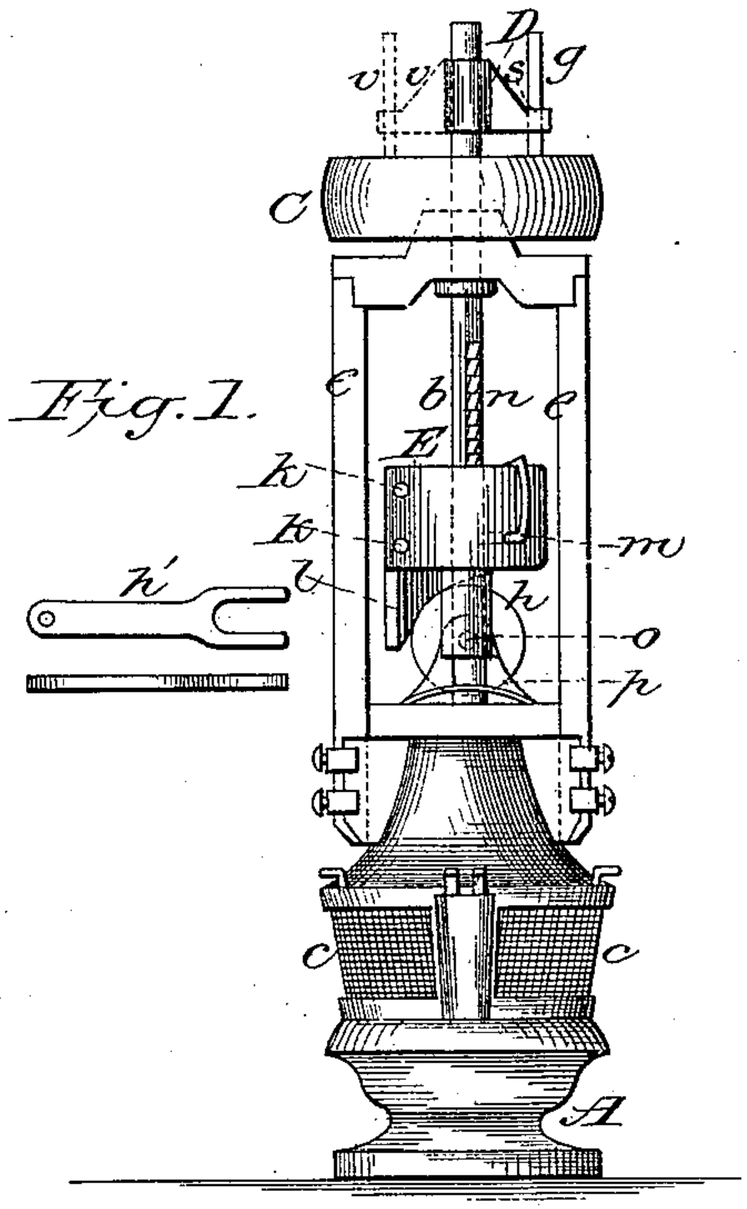


Fig. 3.

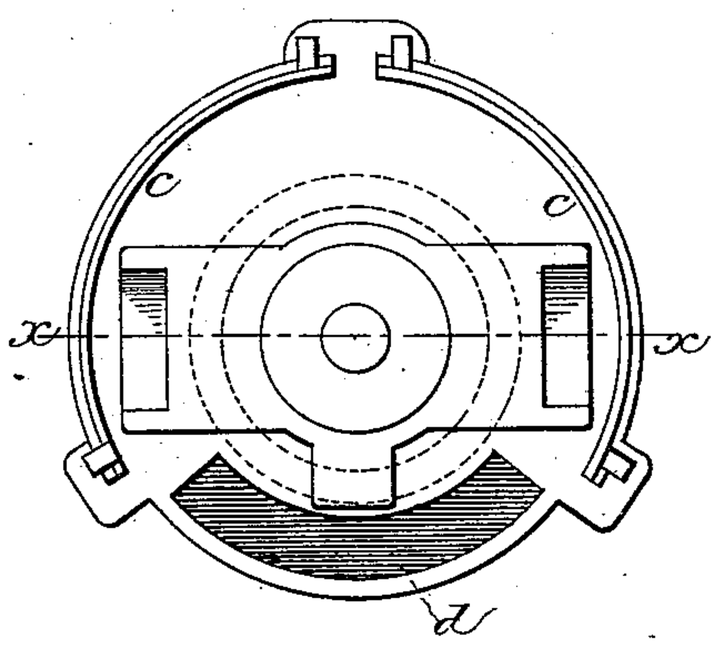


Fig. 2.

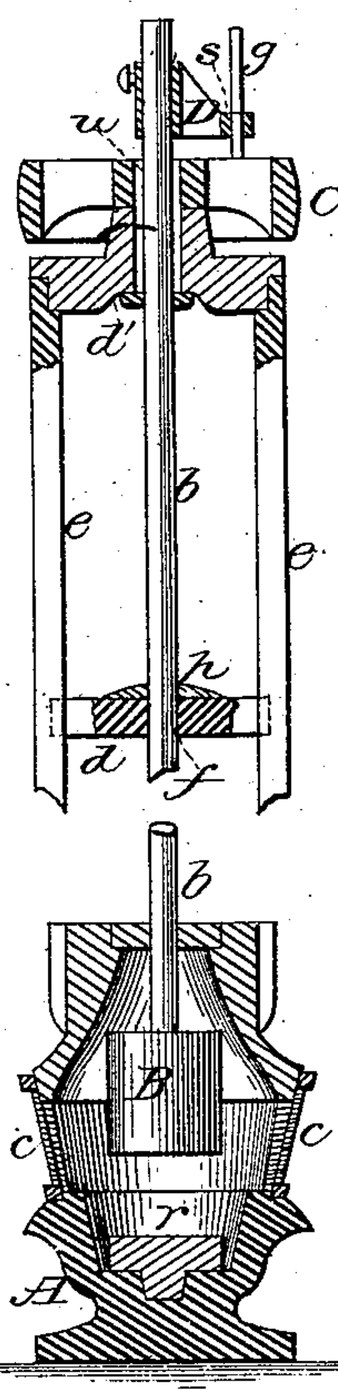
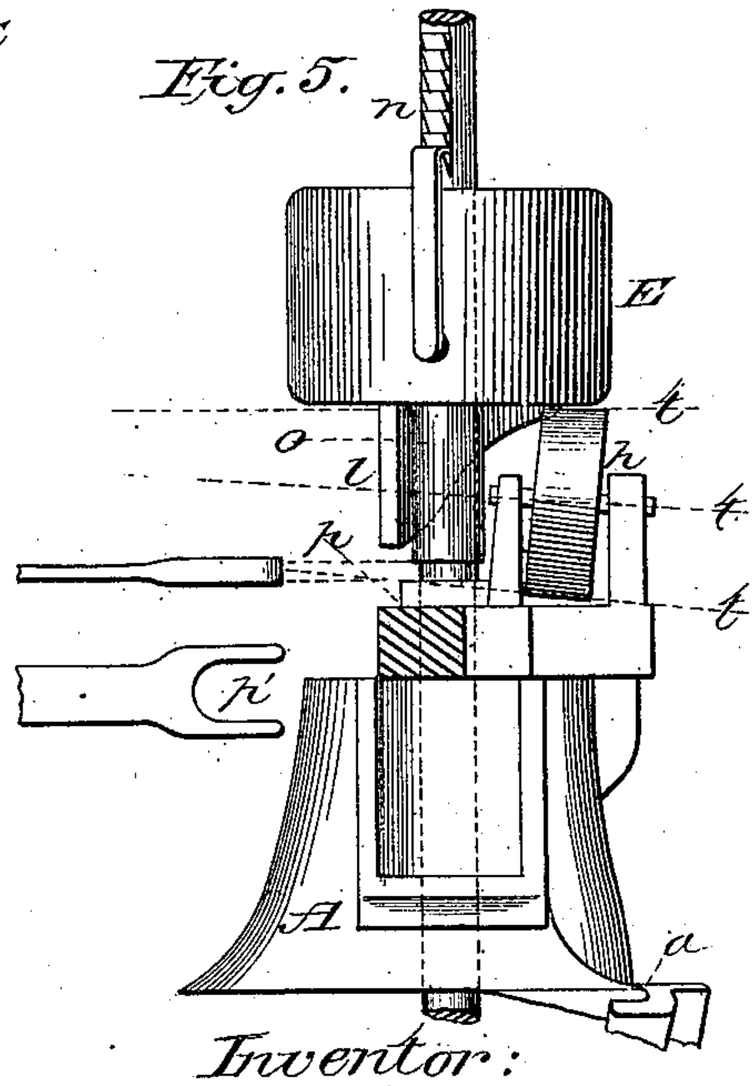


Fig. 4.

Fig. 5.



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UNITED STATES PATENT OFFICE.

JAMES M. THOMPSON, OF SAN FRANCISCO, CALIFORNIA.

ORE-STAMP MILL.

SPECIFICATION forming part of Letters Patent No. 227,189, dated May 4, 1880.

Application filed October 10, 1878.

To all whom it may concern:

Be it known that I, JAMES M. THOMPSON, of the city and county of San Francisco, and State of California, have invented a new and useful Improvement in Ore-Stamp Mills, of which the following is a specification.

My invention relates to ore-stamp mills having mortars closed at their tops, with the exception of a small opening to admit the stamp-stem, and which have in their sides an opening or slot through which the ore is fed into the mortar and screens through which the ore is continuously discharged after being crushed.

The object of my invention is to increase the crushing power or effectiveness of the stamp; and it consists in providing means and appliances for lifting and continuously rotating it, by which its effectiveness or crushing capacity is increased and much friction and wear are avoided, and a consequent saving of power is effected.

In the accompanying drawings, in which similar letters of reference indicate like parts, Figure 1 is an elevation in perspective. Fig. 2 is a view showing the mortar in vertical section through the line *x x*, Fig. 3, and also the frame and pulley. Fig. 3 is a plan of the circular mortar with the frame removed. Fig. 4 is a detail view of the lifting and rotating mechanism. Fig. 5 is a detail view of the automatically-shifting tappet and device for securing it to the stem.

The mortar A, within which the crushing is effected by the twisting blows given by the stamp B, is provided with the usual feed opening or slot *a* and discharge-screens *c c*, and closed across or near its top, with the exception of a small circular hole large enough to permit the stamp-stem *b* to pass through it, and is generally constructed in the usual manner.

The stamp-stem *b* of the stamp B is secured in its perpendicular position directly over the center of the die *r* in the bottom of the mortar by a box or guide, *f*, secured to the lower cross-piece, *d*, of the upright timbers *e e*, which are bolted or otherwise secured to the sides of the mortar A, and also by being passed through a circular hole, *u*, through the center of the upright revolving shaft of the pulley C. The pulley C is secured in its position at the top of the frame or upright timbers *e e* by a box secured or formed in the upper cross-piece, *d'*.

It will be observed that there is no slot-key or feather in the hole *u*, nor a corresponding slot or feather in the stamp-stem *b*, the hole *u* being perfectly smooth and round, and serving only the purpose, in combination with the guide *f*, of keeping the stamp-stem *b* in its upright or perpendicular position over the center of the die *g*, other means, hereinafter described, being provided to cause the pulley C, when rotated, to also rotate the stamp-stem *b* while it is being moved up and down within its guides *f* and *u*.

The stem *b* fits in the box *f* and the hole *u* through the axis or shaft of the pulley C loosely enough to allow the stem to move freely up and down through them.

To the pulley C is secured, in a perpendicular position, the guide-pin, stop, or lug *g*, which engages or passes loosely into a hole or slot, *s*, in the arm D, which is secured to the stamp-stem *b*, (in any effective manner, so as to allow it to be shifted up and down,) so that when the arm D is rotated by the revolution of the pulley C the stamp-stem is also rotated with it. This arm or sleeve D is shown in the drawings in Figs. 2 and 4 as a single arm—*i. e.*, projecting from only one side of the stamp-stem; but any number more than one can be employed, so as to project from two or more of its sides, as shown by the broken lines *v v* in Fig. 1; or instead of one or more of these arms D a solid sleeve or collar can be substituted, and in which one or more perpendicular holes or slots can be made to engage with a corresponding number of guide-pins or stops formed on or secured to the pulley C.

The guide-pin or stop can be formed on or secured to the arm or collar D, and the hole or slots can be made in the pulley C, or in an extension of it or part secured to it, as may be found the most convenient or effective, the result in either case being the same and produced by equivalent mechanical means, the result being that the stamp-stem *b* is rotated simultaneously with the pulley C, and is at the same time allowed to move up and down within its guides *f* and *u*; and the means being one or more guide-pins, projections, or

grooves formed on or in the pulley C, or in an extension or part secured to it, which engage or impinge against the sides of one or more slots, grooves, or projections formed on or in a like number of the arms D, or equivalent sleeve or collar secured to the stamp-stem *b*. By this means the stamp-stem is rotated and lifted with much less friction than by the means heretofore employed of squaring the stamp-stem and making a corresponding square hole through the shaft of the pulley, as the pressure of the stop or guide-pin *g* against the side of the hole or slot S in the arm D, which is produced during the lifting of the stamp by the revolutions of the pulley C, is much less than that of the sides of a square stem against the sides of a square hole, or than that of an equivalent feather or key against the sides of a groove or slot in the side of a round hole through the axis or shaft of the pulley C, as the leverage or distance of the stop or guide-pin *g* from the center of the motion is much greater than that of the sides of the stem and hole in the pulley C.

Whether one or more of the arms D, as shown in Figs. 1 and 4, or a solid sleeve or collar is employed, in either case they must be made solid and strong enough to stand the crystallizing action of the blows of the stamp.

The circular tappet E is secured to the stamp-stem *b* immediately above the anti-friction wheel *h* by the usual gib and keys *k k*, and has an incline or cam, *l*, formed on its lower end, which, as the tappet is rotated by the rotation of the stamp-stem, strikes against and travels on the face or periphery of the anti-friction wheel *h* and raises the stamp until its top or apex passes over the wheel, when the stamp is allowed to drop by its own weight, and is again raised when, by the rotation of the tappet E, the face of its incline or cam *l* is again pressed or strikes against the face of the anti-friction wheel *h*.

I am aware that an incline or cam on a rotating stamp-stem, in combination with a wheel or pulley, has been heretofore patented to Jabez Burns in Patent No. 127,561, dated June 4, 1872, and that it is a common device employed for lifting or causing a transverse motion; but my improvements consist in making the tappet E much larger in diameter than heretofore, so that the incline or cam *l*, at its periphery, can be made of the requisite length for lifting the stamp a sufficient height within a less part, or about one-third, of its revolution, instead of one-half, as heretofore, and at the same time without increasing its steepness or abruptness, which would increase the friction. Also, by this enlargement of the relative diameter of the tappet E, and forming its incline or cam *l* by extending a portion of its periphery on or beyond its lower end, as shown in Figs. 4 and 5, the cam is made much stronger and more durable, and the entire space between it and the stamp-stem *b* (or its arm O when used) is open, there being no portion of it taken up by the side of the tappet, as is the case when the incline or cam is formed on its side, and more space is therefore afforded for the box or bearing of the end of the shaft of the anti-friction wheel *h* next the stamp-stem, and which it is absolutely necessary to provide in order to keep the anti-friction wheel in position and to withstand the blows of the cam against it when the stamp-stem is rotated.

By lifting the stamp during a less part of its revolution it is given a greater length of time for dropping, and it can therefore be rotated and dropped faster without any danger of the cam *l* striking against the wheel *h* while the stamp is dropping. Or, if it is not desired to rotate and drop the stamp faster, it can, by my device of increasing the diameter of the tappet E, be lifted higher during the same part of its rotation without increasing the steepness or abruptness of the cam or incline *l*, and thereby its crushing power increased. Also, I graduate the inclination or steepness of the cam *l*, giving it at and near its base but little inclination, and gradually increasing it until near its top, and then lessening it. By this means the force of the blow of the cam *l* against the anti-friction wheel *h* is lessened, and the ascent of the stamp is made more easy and gradual.

Each end of the shaft of the anti-friction wheel *h* is supported by and rotates in boxes which are firmly secured in a proper position over or on the top of the mortar A. The face of this wheel is slightly beveled or made conical, and its shaft also slightly inclined, so as to give its upper face, on which the cam moves, a horizontal position corresponding to that of the face of the cam, as shown by the dotted lines *t t* in Fig. 5, so that there will be no twisting or grinding and consequent friction and wear of the face of the wheel on that of the tappet.

In addition to the ordinary gib and keys *k k*, or any other of the devices usually employed for securing the tappet E to the stamp-stem *b*, I also provide a spring-pawl, *m*, which is secured to the tappet E and passed loosely through a hole in it from its periphery to its center, and engages a steel or metal ratchet, *n*, which is secured to the stamp-stem *b*, and the notches in which are formed in such a manner as to prevent the tappet E from being forced downward on the stem *b* by the blows of the stamp B; but to allow it to be moved upward on the stem, so that when, by the wearing away of the stamp and die, the stamp-stem and tappet E are caused to drop lower, the end of its extension or sleeve *o* will strike against the stop *p* and force the tappet to move up the stem, by which means a uniform drop of the stamp is maintained without stopping the operation, and there is not the necessity of driving the keys *k k* into the tappet as tight as is necessary to be done when that is the only means of preventing it from being forced downward on the stem by the blows of the stamp, and by which tappets are frequently burst.

A detached tool or stop, *p'*, (shown in Figs.

1 and 5,) can be placed on the face of the fixed stop *p* when, by the wearing away of the stamp and die, the end of the stem or extension *o* of the tappet is made to strike, or nearly strike, the stop *p*, which, when the stamp falls, will cause the tappet to be forced upward on the stamp-stem a distance equal to the length of one of the notches of the ratchet *n*, in which position it will be kept by the pawl *m* and gib and keys *k k* until, by the further wearing away of the stamp and die, it becomes necessary to again force it upward another notch by again placing the stop *p'* on the face of the fixed stop *p*.

The extension or arm *o* on the tappet E will not be required in ordinary stamp-mills in which the stamp is lifted by a cam which is secured to and rotated by a horizontal shaft, as in these mills the tappets have no inclines or cams to interfere with the use of the stop *p'*; also, if it is found necessary to prevent the tappet from turning on the stamp-stem, the ratchet *n* can be made to project a little from the surface of the stem and into a corresponding groove in the central hole of the tappet through which the stem passes.

The operation of my device is as follows: The pulley C being rotated, and its guide-pin or stop *g* also rotating, and projecting into the hole or slot *s* in the arm D, will cause it to rotate and rotate the stamp-stem *b* to which it is secured, and by the rotation of the stamp-stem the tappet E, which is secured to it, will also be rotated, and its incline or cam *l* will be forced against the face of the anti-friction wheel *h*, and travel on it, and lifting the stem and stamp B with it until its top or end passes over the wheel, when the stamp is allowed to drop by its own weight, and is again raised and dropped during the next revolution of the stamp-stem, in the same manner as before. Meantime the ore or material to be crushed is regularly fed into the mortar A through its feed-slot *a* as fast as required, and, when crushed fine enough by the crushing and grinding force or effect of the stamp B, is forced or driven by the blows of the stamp through the openings in the discharging-screens *c c*, and then conveyed by suitable means to a place for further treatment.

Having thus described my invention, what I claim is—

1. In an ore-stamp mill, the tappet E, secured to the revolving stamp-stem *b*, and having its incline or cam *l* graduated, as described, in combination with the conical or beveled anti-friction wheel *h*, having its shaft inclined, as shown and described, substantially as and for the purposes set forth.

2. In a revolving stamp-mill, the horizontal driving wheel or pulley C, having the round hole *u* through its center, and through which the stamp-stem *b* moves, and having secured to or connected with it the pin or stop *g* at some distance from the stem and parallel to it, in combination with the arm D, secured to the stamp-stem *b*, and having in it the hole or guide-slot *s*, substantially as and for the purpose described.

3. In a revolving stamp-mill, the stamp-stem *b*, having secured to it the arm or collar D, with its hole or slot *s*, and the tappet E, with its incline or cam *l*, in combination with the anti-friction wheel *h* and the driving wheel or pulley C, having its pin or stop *g*, substantially as and for the purposes described.

4. The automatically-shifting tappet E of an ore-stamp mill, held in position on the stamp-stem by any of the usual means, and having secured in it the spring-pawl *m*, in combination with the ratchet *n* on the stamp-stem *b* and the stop *p*, substantially as and for the purpose described.

5. In a revolving stamp-mill, the movable tappet E, having its incline or cam *l* formed at its periphery on its lower end, in combination with the anti-friction wheel *h*, having both ends of its shaft supported in fixed bearings, substantially as and for the purposes described.

6. In a revolving stamp-mill, the guide *f*, in combination with the horizontal driving wheel or pulley C, having through its center the smooth round hole *u*, and having secured to it the projection or stop *g*, which engages with and rotates the arm or collar D, which is secured to the stamp-stem *b*, substantially as and for the purposes described.

In testimony that I claim the foregoing I have hereunto set my hand and seal this 30th day of September, 1878.

JAMES M. THOMPSON. [L. S.]

Witnesses:
PHILIP MAHLER,
WM. MURRAY.