(Model.)

J. M. THOMPSON.

ORE STAMP MILL.

No. 245,030. Patented Aug. 2, 1881.

Fig 1.

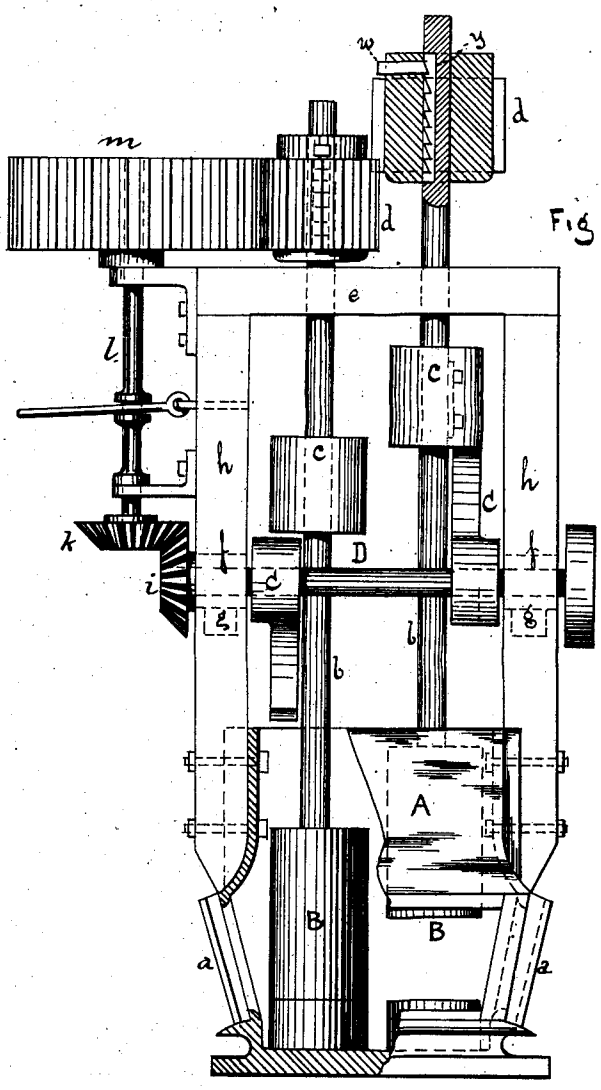


Fig 5

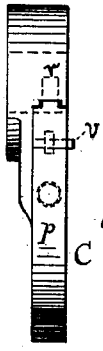


Fig 4

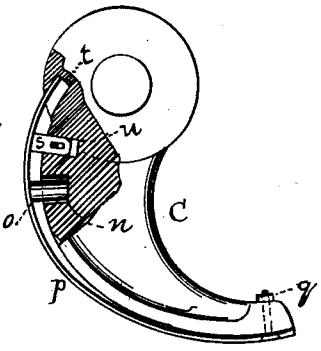


Fig 2

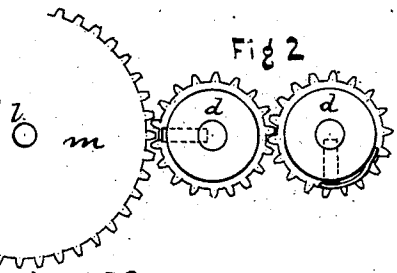
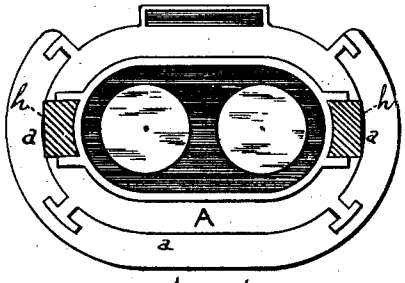


Fig 3



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JAMES M. THOMPSON, OF SAN FRANCISCO, CALIFORNIA.

ORE-STAMP MILL.

SPECIFICATION forming part of Letters Patent No. 245,030, dated August 2, 1881.

Application filed April 5, 1880. (Model.)

To all whom it may concern:

Be it known that I, JAMES MONROE THOMPSON, of the city and county of San Francisco, and State of California, have invented a new Improvement in Ore-Stamp Mills; and I do hereby declare that the following is a full and exact description thereof.

My invention relates to ore-stamp mills, and my object is to increase their efficiency and crush or pulverize a greater amount of ore with a given amount of power and number of stamps. The method by which I accomplish the object is to rotate the stamp more rapidly and at the same time lift it more quickly than heretofore, so as to allow it to give its blows faster, and also have more time for "grinding" the material on the face of the die. It consists in the employment of a new combination of the means or devices for lifting and at the same time continuously rotating the stamp, and by which it is made practicable to increase the rapidity of its drops or blows by lifting it more quickly, and by which it is also rotated more rapidly, and its crushing-power thereby increased, as more fully hereinafter explained.

In the accompanying drawings, in which similar letters of reference indicate like parts, Figure 1 is a front elevation, showing mortar in part section and pinion for rotating the stamps. Fig. 2 is a plan of the rotating gear-wheels. Fig. 3 is a plan of the mortar, showing arrangement of the discharging-screens. Fig. 4 is a plan of the cam partly broken away. Fig. 5 is a face view of the same.

A is the mortar of a two-stamp mill, and having the usual openings in its side and ends, over which the screens *a a* are secured, and through which the pulverized material is discharged.

B B are the stamps, and the stamp-stems *b b* have secured to them the usual tappets, *c c*, and also the pinions *d d*, which engage each other, and the stamp-stems *b b* are kept in upright position by the guides *e e*.

C C are single-arm cams secured to the horizontal shaft D, which is supported by and rotated in the usual boxes, *f f*. The boxes *f f* rest on springs or buffers *g g*, and are secured in position in the usual manner, except that the holes in their upright flanges, (when they have any,) as well as those in the upright timbers *h* of the frame which supports the boxes *f f*, are elongated, so as to permit them and the cam-shaft D to be depressed at the instant the cam C strikes against the face of the tappet *c*. These springs or buffers *g g* are for the purpose of lessening the effect of the blows of the cams against the tappets, and also to prevent the Babbitt metal, with which the boxes *f f* are usually lined, from being cracked or broken up by the concussion produced by the said blows.

The bevel-gear wheel *i* is secured to the cam-shaft D, and engages the bevel-gear wheel *k* on the lower end of the upright shaft *l*, which is secured to the side of one of the upright timbers *h* of the stamp-frame, and the pinion *m*, which is secured to the upper end of the upright shaft *l*, engages the pinion *d* on one of the stamp-stems *b*.

The pinions *m* and *d d* are elongated, as shown, so that they will engage each other all the time during the lifting and dropping of the stamp.

The cam C (shown in Figs. 4 and 5) has formed in its face, at or near the part where it strikes the tappet *c*, a recess, *n*, in which a rubber buffer, *o*, is placed, and the steel or iron strap *p* is secured on and over the buffer and the face of the cam by the bolt *q*, near its end and that of the cam, and by its arm or extension *r*, which projects into the recess *t* in the hub of the cam in such a manner as to allow its end or part over the buffer *o* to oscillate, so that when its face strikes against the face of the tappet *c* it will be free to be pressed by the force of the blow against and compress the spring or buffer *o*.

Another method of securing the strap *p* in its position is shown in the same figure.

s is an arm, which is secured to the strap and extends into the recess *u* in the face of the cam, through which a hole is made near its end, and also through the cam, across and near the bottom of recess *u*, and a key, *v*, is driven tightly into and secured by any of the usual means in the hole in the cam, and also passes loosely through the hole in the arm *s*, the hole being elongated sufficiently to keep the strap *p* (to which it is secured) on (and also allow it when it strikes the tappet to have free play against) the buffer *o*. This device can also be used for securing the end of the strap *p* at the end of the cam, instead of the bolt *q*.

To compensate for the metal taken out of the cam by making the recess *n* in it, its side opposite the recess and next its hub is thickened, so that the strength of the cam is preserved.

Instead of the rubber buffer *o*, a spiral steel spring, or one similar in shape and construction to one-half of an elliptic carriage-spring, and secured at its center to the under side of the strap *p*, and with its ends pressing against the face of the cam, could be employed.

The bevel-gear wheels *i* and *k* and the pinion *m* are so proportioned in their diameters in relation to each other and that of the tappet and the length of the face of the cam C that the periphery of the tappet and the face of the cam will move with as nearly equal speed as possible, so that there will be less friction and wear of their faces against each other; and, besides, the force of the blows of the cam against the face of the tappet will be very much lessened on account of it being kept moving in the same direction with that of the face of the cam.

The pinions *d d* are secured to the stamp-stems *b* by any of the usual means, and spring-pawls *w*, secured in them, engage the ratchet *y* in the stamp-stem in such a manner as to allow the pinions to be forced upward on the stamp-stems (when required by the wearing away of the shoes and dies) by placing a stop on the top of the guide *e*, on which (when the stamp falls) the lower end of the pinion will strike and be driven up on the stamp-stem, the pawl and ratchet permitting it to move up, but preventing it from being forced down on the stamp-stem by the blows of the stamp, so that the pinions can be forced upward on the stamp-stems as the shoes and dies wear away without stopping the operation of the mill. These pinions *d d* could be secured to the stamp-stems *b b* below instead of above the upper guides, *e e*, and used to supply the place of the tappets *c c*, in which case there would be two of them on the stamp-stem next the shaft *l;* also, instead of being keyed or secured to the stamp-stems *b b* and moving up and down with them, the pinions *d d* could have round hollow central arms or shafts extending downward into and secured and rotating in the upper guides *e e*, and not move up and down with the stamp-stems *b b*, and the usual means of a key or feather and groove employed to cause the pinions to rotate the stamp-stems, in which case the pinions need not be elongated, as shown in the drawings. I, however, prefer the elongated pinions, and secured to the stamp-stems, as shown and herein described, as thereby much friction and loss of power are saved, for the pressure of the teeth of the pinions against each other is much less than that of keys or feathers would be against the sides of grooves in the pulleys.

The operation of my improved stamp-mill is similar to the ordinary stamp-mill, the stamps B B being lifted by the cams C C in the usual manner; but, in addition to being lifted, the stamps B B are also continuously rotated by the bevel-gear wheel *i* on the cam-shaft D, the bevel-gear wheel *k* and pinion *m* on the upright counter-shaft *l*, and the pinions *d d* on their stems in such a direction, and the cams C C are secured in such positions on the cam-shaft D and sides of the stamp-stems *b b*, as to cause the faces of the tappets and cams to move together and at approximately the same speed.

By continuously rotating the stamp-stems in such a direction and with such a speed, and securing the cams in such positions on their shaft as to cause the faces of the tappets and cams to move in the same direction and at the same approximate speed, the force of the concussion produced by the striking of the cams against the faces of the tappets is very much reduced; also, by the single cam, in combination with the means herein described for rotating the stamps, an increased grinding effect is obtained above that produced by the rotation of the stamps in any other rotating stamp-mill, (of which I have any knowledge,) because of the rotation of the stamp being much more rapid, it being nearly three times during one drop, while in those mills in which the stamp is raised by its rotation, or in those where double cams have been tried, there is and can be practically but one revolution of the stamp to each drop, unless the stamps were rotated at such speed as to cause the faces of the tappets to rotate or travel faster than the faces of the cams, which would cause much friction and soon wear away the faces of the cams and tappets.

The increased speed at which the stamp can be rotated when a single cam, in combination with the other devices described, is employed for lifting and rotating it is because the shaft of a single cam can be rotated three times as fast as that of a double cam and allow the stamp the same time for dropping, and therefore the face of a single cam can travel three times as fast as that of a double cam; and as the stamp-stem (in order to avoid too much wear, as before explained) must be rotated with such speed as to cause the faces of the tappets to move with approximately the same speed as the faces of the cams, it follows that with the combination of a single cam with the rotating mechanism described the stamp can be rotated three times as fast as it could practically be rotated with a double cam.

It has heretofore been attempted to rotate stamps continuously while being lifted independently by double cams; but, owing to the stamp-stems and tappets being rotated faster than the speed of the faces of the double cams, there was found to be too much friction and loss of power, and the experiment was abandoned. Besides, if the speed of the faces of the tappets and cams had been made equal, although much of the increased friction and wear would have been avoided, yet there would have been but very little increase of the crushing or

grinding effect of the stamp produced by such a slow rotation; and, also, there being three times as much time required for lifting the stamp with a double cam as with a single one, there could be but very little time given the stamp to twist on or grind the material between its face and that of the die, so that, rotating only one-third as fast and being less time in contact with the die, there would be very little gained by its rotation at all, unless the number of the drops per minute were materially decreased, which would then decrease the crushing effect of the stamp more than its grinding effect would be increased; and it would not be practicable to increase the number of drops and rotations of the stamp by the use of a single cam without the means herein shown and described (or other means not known to me) of lessening the effect of the blows of the cam against the tappet.

I do not broadly claim continuously rotating a stamp while being lifted or dropped; nor do I claim lifting a stamp by means of its rotation, as that is covered by patents heretofore granted; but my invention embraces an improved means for rotating the stamp in such a direction and at such a speed as to cause the faces of the tappets and cams to move with each other and at the same approximate speed when in contact with each other, for the purpose not only of avoiding as much friction and wear as possible, but also of decreasing the force of the concussion produced by the blow of the cam against the tappet, as well as to increase the grinding effect of the rotation of the stamp, which last improved result is obtained by the use of the single-arm cam in combination with the other devices described, as before explained. It also embraces the elastic cam formed as herein described, as an additional means for lessening the effect of the blows of the cam against the tappet; and, also, the combination of the rubber or elastic seats *g g* with the boxes in which the cam-shaft rotates, as a further means of lessening the same, as well as also to prevent the cracking or breaking of the Babbitt metal in said boxes by the concussion.

My invention also embraces the use of a single cam, in combination with the herein-described devices, (for rotating the stamp and lessening the violence or effect of the concussion produced by the blow of the cam against the tappet,) for the purposes of increasing the number of the drops of the stamp per minute (and with the same height of drop) over that which can be made with a double cam fully one-half, and of increasing the rapidity of the rotation of the stamp, and which would not be practicable with the use of a single cam without also the combination with it of the said devices, as, in order to increase the rapidity of the drops of the stamp fifty per cent. over that produced by a double cam, the shaft of a single cam must rotate three times as fast as that of a double cam, and the blow will consequently be very much greater.

Having thus described my invention, what I claim is—

1. In a rotating stamp-mill, the automatically-shifting elongated pinions *d d*, having secured to them the spring-pawl *w*; in combination with the ratchet *y* in the stamp-stems *b b*, substantially as described.

2. In a stamp-mill, the combination, with the cam C, of the strap *p* and the buffer or spring *o*, substantially in the manner and for the purpose described.

3. In a stamp-mill, the cam-shaft D, in combination with its bearings or boxes *f f*, which rest on the rubber or elastic springs *g g*, and with its cams C C, which are secured to it, and having in combination with them their straps *p p* and buffers or springs *o o*, substantially as and for purposes described.

JAMES MONROE THOMPSON.

Witnesses:
E. D. JUDD,
F. E. MONTEVERDE.