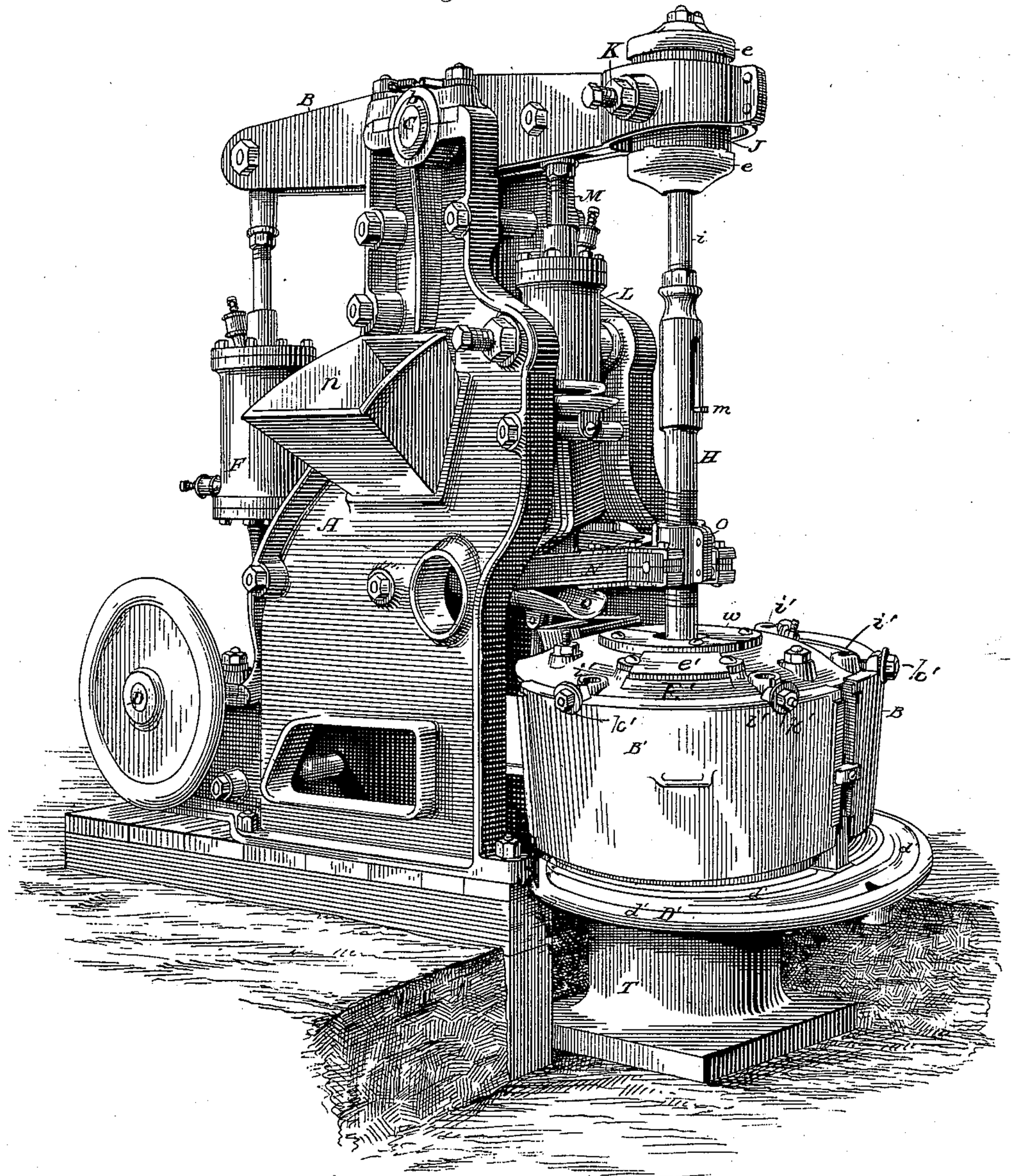
3 Sheets—Sheet 1.

J. C. BUTTERFIELD.

Stamp Mill.

No. 230,611. **Patented Aug. 3, 1880.**

Fig. 1.



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3 Sheets—Sheet 2.

J. C. BUTTERFIELD.

Stamp Mill.

No. 230,611. **Patented Aug. 3, 1880.**

Fig. 2.

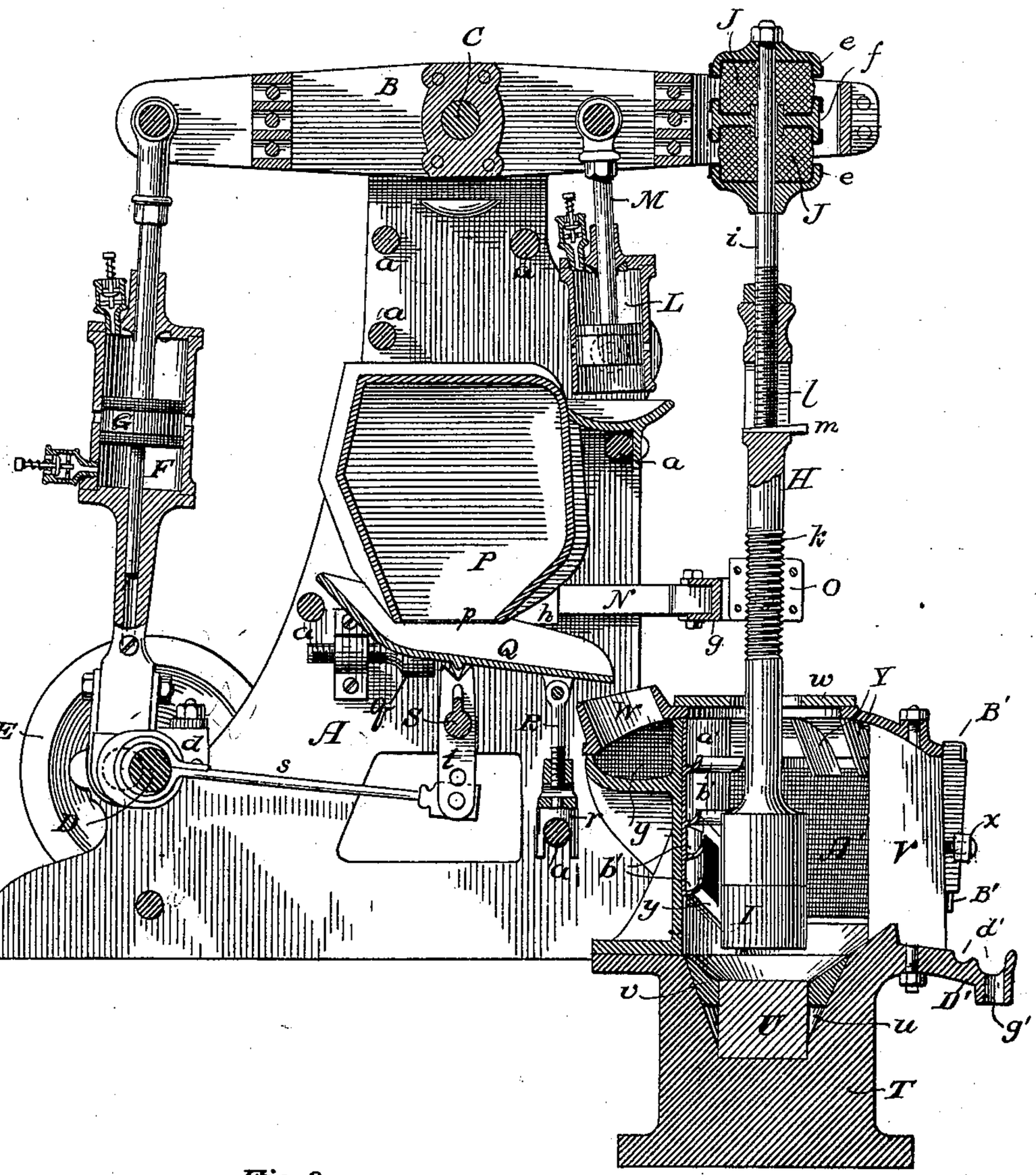
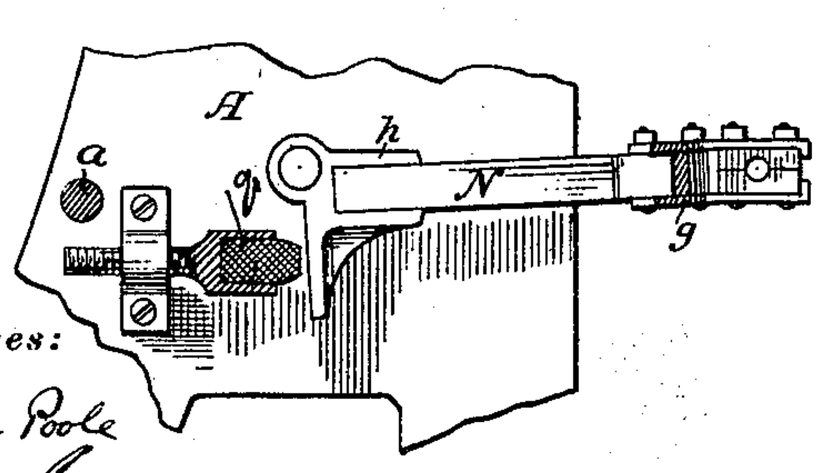


Fig. 3.



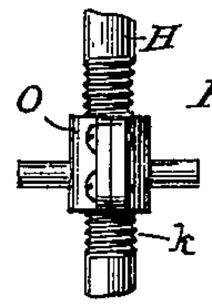


Fig. 4.

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3 Sheets—Sheet 3.

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Stamp Mill.

No. 230,611. **Patented Aug. 3, 1880.**

Fig. 5.

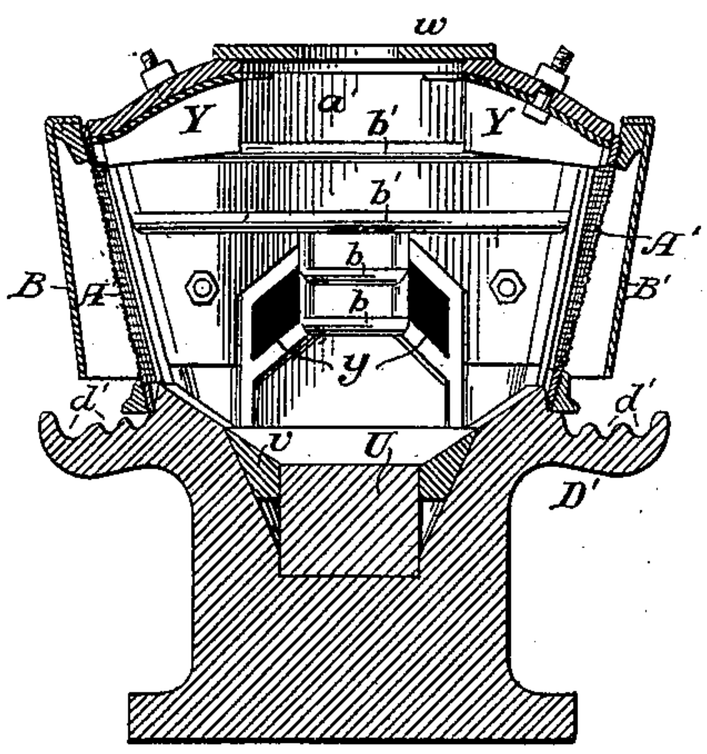


Fig. 6.

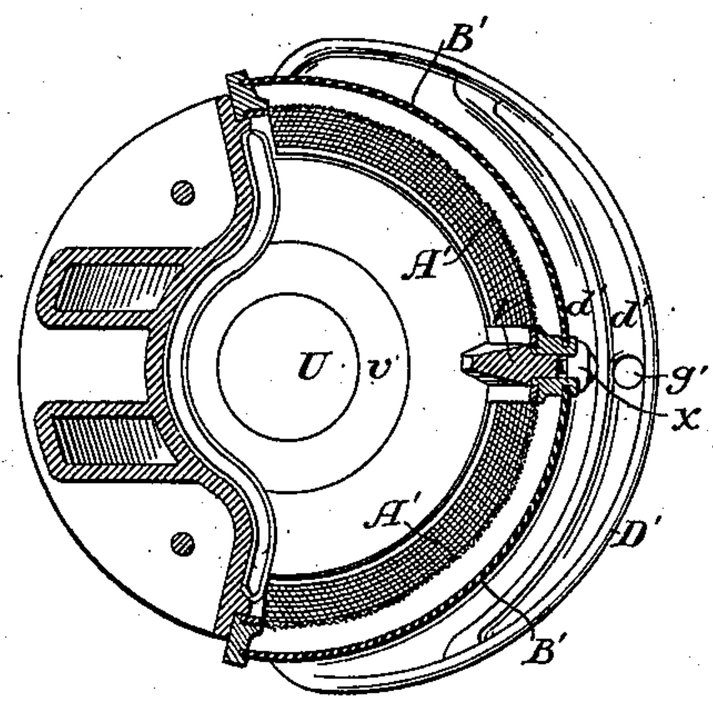


Fig. 7.

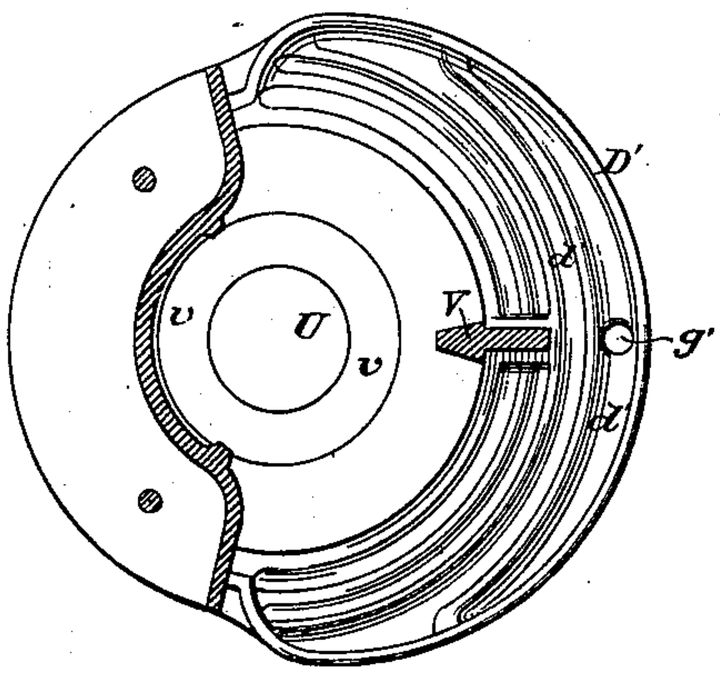


Fig. 8.

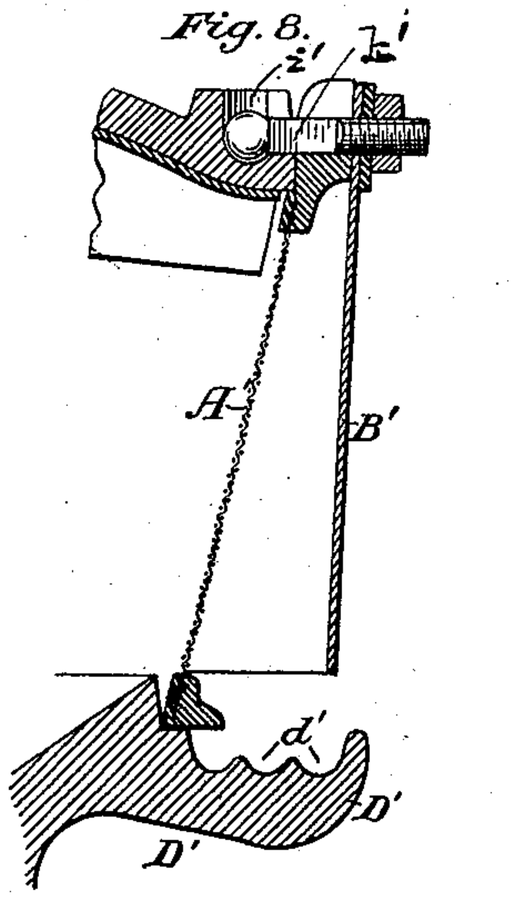
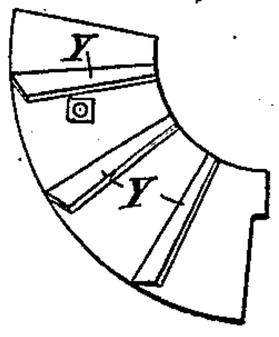


Fig. 9.



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UNITED STATES PATENT OFFICE.

JOHN C. BUTTERFIELD, OF CHICAGO, ILLINOIS.

STAMP-MILL.

SPECIFICATION forming part of Letters Patent No. 230,611, dated August 3, 1880.

Application filed October 23, 1879.

To all whom it may concern:

Be it known that I, JOHN C. BUTTERFIELD, of Chicago, Cook county, in the State of Illinois, have invented new and useful Improvements in Stamp-Mills for Crushing Ores and for other Analogous Purposes; and I do hereby declare that the following is a full description of the same.

Heretofore the stamps of ore-crushers have generally been actuated by revolving cams or tappets, which raise the stamps and permit them to fall by their gravity only. Steam has also been occasionally employed to drive the stamps.

My invention consists, first, in a frame composed of two corresponding side plates secured the together by tie-bolts and adapted to support bearings of the operative parts, and provided with a walking-beam, to one end whereof a stamp-rod is connected with an interposed shock-absorbing cushion, and to the other end whereof a pneumatic cylinder is attached, whereby the driving-power is transmitted; second, in a parallel brace jointed to the frame and to the stamp-rod, whereby its parallelism of motion is preserved; third, in an elastic buffer to cushion the downward motion of the parallel brace; fourth, in the adjustable coupling between said brace and the stamp-rod, whereby the brace may be made parallel to the walking-beam; fifth, in devices for mounting and operating the chute; sixth, in the structure of the mortar-block; seventh, in the arrangements of inlets to the mortar and the amalgam plates surrounding the same.

I do not claim herein anything as to the principles involved or general mode of operation of the driving mechanism. I will, however, briefly describe the operative parts, having reference to the accompanying drawings, wherein—

Figure 1 is a perspective view of my machine. Fig. 2 is a sectional elevation of the same. Figs. 3 and 4 are details of the driving mechanism. Fig. 5 is a sectional elevation of the mortar. Figs. 6, 7, 8, and 9 are details of the same.

A is the metallic frame of my mill, which I prefer to construct of two plates of cast metal attached by bolts *a a*, which rigidly hold said plates in proper position and constitute a single rigid structure. At the top the frame A is provided with boxes *b* for bearings for the journal C of the walking-beam B. At the rear of the frame A, near the bottom, there are boxes *d* for the crank-shaft D, which receives motion from the driving-motor by means of the pulley E upon said shaft D.

Between the crank of shaft D and the rear end of the beam B there is a pneumatic cylinder, F, and piston G, one of said parts being mounted upon the crank and the other connected to the walking-beam. In the drawings said cylinder is represented as mounted upon the crank; but, so far as principles are concerned, it is immaterial which of said parts is attached to the crank and which to the walking-beam. For convenience, however, the description will be confined to the arrangement shown.

As the crank D is rotated the cylinder F is caused to move up and down, and the inclosed air is alternately compressed in the lower and upper ends of the cylinder, between the piston and the respective cylinder-heads.

When the resultant pressure is sufficient to overcome the resistance the piston and the parts connected therewith are carried along with the cylinder, and the walking-beam B is thereby oscillated in its bearings. The perfect elasticity of the air inclosed in the cylinder is such that the shaft D can be revolved rapidly, so as to impart a correspondingly rapid oscillation to the beam B without strain and shock upon the parts.

At the front end of the walking-beam the stamp-rod H is attached by a transverse bearing, and at its lower end the steel or chilled iron shoe I is attached. The stamp-rod H is made in two parts, united by a screw or otherwise, so as to be adjustable as to length to compensate for wearing away of the stamp, shoe, and die.

The coupling which attaches the stamp-head H to the beam B is composed of three metallic plates, *e e f*, with interposed elastic cushions J J. The plate *f* is connected to the beam B by transverse journals K, and does not touch the rod, while the plates *e e* are attached to the rod H and do not touch the plate *f*. The vibration in the rod H at every blow of the stamp I is therefore ab-

sorbed in the elastic cushions J, and is not transmitted to the beam B and frame of the machine.

The inertia of the stamp on its upward motion with a rapid speed is considerable, and it is desirable to cushion it to prevent wear of the boxes. For this purpose I place a pneumatic cylinder, L, upon trunnions between the side plates of the frame and couple its piston-rod M to the walking-beam B in front of the journal C. At each upstroke of the stamp air is compressed in the top of the cylinder L, and said pressure increases until the upward motion of the stamp is checked, but with a cushioning effect as perfect as is the elasticity of the inclosed air.

The stamp-rod H is required to have a vertical movement, and I therefore provide a parallel brace, N, which is pivoted to the frame A at some point vertically below the journal C, and when said bar N has been adjusted in parallelism with the beam B the rod H will thereafter preserve its vertical position through all parts of its stroke.

The parallel brace N is composed of two bars divergent from the screw-sleeve O upon the rod H. At their front ends they are bolted to a yoke-piece, *g*, which embraces the sleeve O and is pivoted to it at each side. At their rear ends said bars are each bolted to a cap-piece, *h*, which is pivoted to the side plate, A, vertically below the journal C. Each of said cap-pieces has a bell-crank arm, which at each downward movement of the stamp-rod engages with an elastic buffer, *q*, whereby the downward movement of said brace is cushioned, so as to prevent the shock to the parts and joints consequent upon the sudden arrest of the fall of the stamp.

The rod H has an axial bore at one end, which is tapped with a female thread to receive the coupling-rod *i*, and the rod H may be lengthened or shortened by screwing said rod *i* out of or into said bore. A set-nut on the rod *i* serves to hold it in position. The rod H has also an external screw-thread, *k*, the threads whereof are of equal pitch with the screw-thread of the rod *i*, so that when it is desired to lengthen or shorten the rod H it is only necessary to loosen the jam-nut on the rod *i* and loosen the clamp-screws of the sleeve O, when the rod H may be rotated with a wrench and its length increased or diminished accordingly.

I think it desirable to take the thrust and shock off the screw-thread of rod *i*, as the threads may after a time be stripped, and I therefore make a transverse slot, *l*, through the upper end of the rod H, so as to expose the lower end of rod *i* and permit the insertion of a block, *m*, therein under said rod.

A hopper, P, is placed between the side plates of the frame A, with its inlet-mouth *n* outside of said frame and its discharge-opening *p* at the bottom between the frame-plates and immediately over the chute Q, which in turn discharges into the stamp-mortar.

The necessary water may be introduced at the rear end of the chute Q.

The chute Q is mounted at its front end and jointed to a standard, R, the lower end of which is screwed into a saddle-piece, *r*, which straddles and rides upon the bolt *a*.

At its rear end the chute Q is mounted upon the rock-shaft S, provided with a pendent arm, *t*, which is coupled to the crank D by a rod, *s*, and the chute is thereby caused to reciprocate endwise with every revolution of the crank D, and its discharge into the mortar is thereby facilitated.

The mortar is, primarily, a heavy block, T, of cast metal, having in its upper side a conical cup or depression, *u*, within which the die U is placed. A conical ring, *v*, fits the die and fills the space between its upper edge and the upper edge of the conical cup *u*, as shown. The purpose of this structure is as follows: The die will be constantly worn away on its upper surface by use, and it will therefore be necessary from time to time to raise it up, so as to restore its level. By removing the ring *v* the die may be readily reached and raised up, and its level restored by placing plates of metal under it until it stands again at the proper height. The upper surface of the ring *v* is inclined inward and downward from all sides toward the surface of the die, so that the ore and slime which are upon said ring-surface will be constantly returned to the die.

The ring *v* may be secured in place by screws or otherwise, as may be most convenient.

The mortar is surmounted and its upper edge surrounded by a frame, V, and a cover, *w*, which is removable.

At the rear side the inlet-chute W receives the ore and slime from the chute Q, and delivers it through a divided passage, *y y*, at two points into the mortar, and in directions which may be radial to the die, so as to deliver the ore directly to the center of the stamp.

The surface of the frame V behind the stamp is covered with copper amalgam plates *a'*, and these plates are provided with horizontal troughs *b'*, which are filled with mercury to catch and hold the metal in the slime, which splashes from under the stamp at each blow. As the troughs *b* receive constant addition of metal and powdered stone, they constantly overflow, the upper into the lower one, until finally discharged at a proper outlet, whence the amalgam may be conveyed away to be reduced elsewhere. The inner surface of the roof of the mortar-frame V is also lined with amalgam plates, the linear surface of which is increased by pendent plates Y, both sides of which are amalgamated and receive the splash from the stamp.

The front side of the mortar-frame V is provided with screens A', which are stretched upon removable frames fitted to the frame V, and secured in place at the front by the button *x* or by other suitable means. The screens prevent the escape of fragments too large to be received upon the amalgam plates, and re-

turn them to the mortar. Outside of the screens A′ there are covers B′, the inner surfaces of which are also amalgam surfaces and receive the slime which is splashed through the screen A′.

Around the front side of the mortar there is a projecting table, D′, the upper surface of which inclines downward and outward, and is provided with a number of concentric grooves or riffles, *d′*, in which mercury is placed to catch the drip from the cover-plates B′. The grooves *d′* receive the drip from the amalgam plates, and overflow one into the other until the outlet *g′* is reached, whence the amalgam may be conveyed away in a trough or pipe for reduction elsewhere, as heretofore set forth.

The top plate of the mortar-frame is provided with a suitable number of spherical sockets, *i′*, in which the heads of the clamp-bolts *k′* are seated, so that when the said frames are to be removed said bolts may be released and turned up out of the way without being removed. The clamp-bolts secure and hold the cover-plates B′ and the screen-frames also.

At one side in the cover of the mortar-frame there is an opening, E′, closed by a removable cover, *e′*, and, if it is desired, a hopper may be fitted to said opening for the introduction of soft slime or auriferous mud, which will not feed freely through the hopper P and chute Q.

Having described my invention, what I claim as new is—

1. A stamp-mill the frame whereof is formed in two side plates, A, bearing a walking-beam, B, at top, combined with a stamp-rod suspended from one end of said walking-beam by an elastic shock-absorbing coupling, J, and a pneumatic cylinder and piston driven by a crank, D, attached to the opposite end for the purpose of driving the stamp, in the manner set forth.

2. A stamp-mill the frame whereof is formed of two side plates, A, with a walking-beam, B, through which power is transmitted to the rod and stamp, combined with a hopper, P, and reciprocating chute Q, located between said plates A, as set forth.

3. A stamp-rod, H, suspended from and actuated by a walking-beam, B, combined with a parallel brace, N, pivoted to the frame A vertically beneath the walking-beam journal and adjusted parallel with said beam to preserve the vertical position of the stamp-rod throughout its stroke.

4. A stamp-rod, H, suspended from and actuated by a walking-beam, and a parallel brace, N, combined with an elastic buffer, *q*, to cushion the downward motion of said parallel brace, as and for the purpose set forth.

5. A stamp-rod, H, suspended from and actuated by a walking-beam, B, and a parallel brace, N, pivoted to the frame A vertically beneath the journal of said beam, combined with an adjustable sleeve, O, on said rod H and a yoke, *g*, pivoted to said sleeve and rigidly secured to said brace, as set forth.

6. The chute Q, mounted at its front end upon the hinged standard R, and saddle-piece *r*, which straddles and rests upon the bolt *a*, and its back end supported upon the rock-shaft S, combined with the pendent arm *t* and rod *s*, whereby the said rock-shaft is connected with the crank D and the chute Q is caused to reciprocate with each revolution of said crank.

7. The stamp-rod constructed in two parts, H and *i*, united by a screw-thread, combined with a transverse slot, *l*, through the part H and a foot-block, *m*, to receive the downward thrust of part *i*.

8. The stamp-rod made in two parts, H and *i*, united by a screw-thread, and provided with a screw-thread, *k*, of equal pitch with the thread on rod *i*, combined with screw-sleeve O at the end of the parallel brace N, whereby when part H is rotated it is raised or lowered, as the case may be, without disturbing the parallelism of brace N and beam B.

9. The mortar-block T, provided in its upper surface with the conical cup *u*, die U, and conical ring *v*, combined with a vertically-moving stamp, as set forth.

10. A mortar for a stamp-mill, provided with an inlet-chute, W, divided into two passages, *y y*, to deliver the ore at two points in the mortar, as set forth.

11. In a stamp-mill, the amalgam plates *a′*, with horizontal troughs *b′*, to hold mercury and catch the drip, as set forth.

12. A stamp-mortar provided with a surrounding screen, A′, and amalgamating-plates B′ exterior thereto, combined with a table, D′, projecting outward from the upper edge of said mortar, and provided with concentric grooves or riffles *d′* on successive lower levels, and overflowing one into another to catch the drip from said amalgam plates, as set forth.

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