Sheet 1, 3 Sheets.

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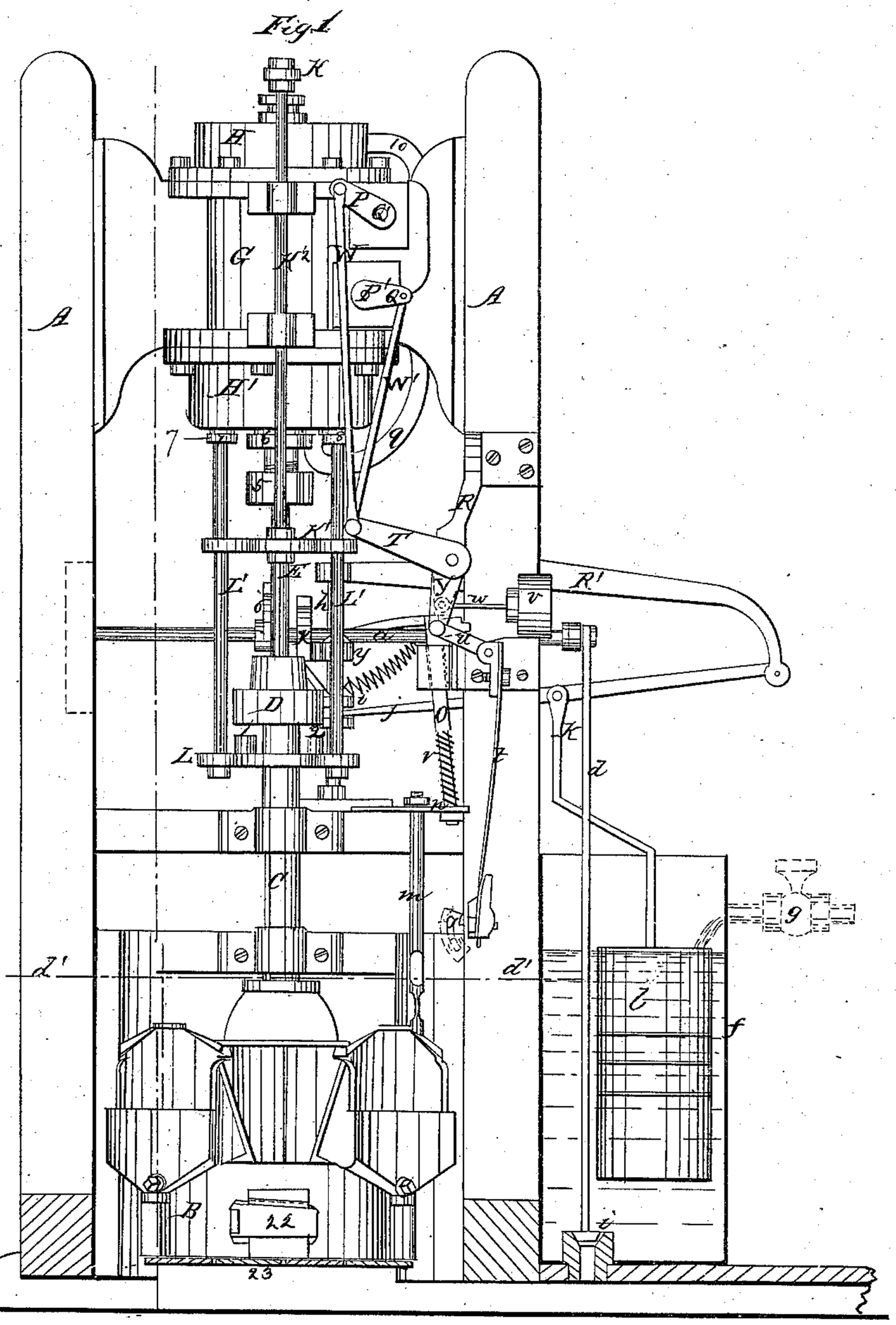
Ore Stamp.

No. 79,034. Patented Jun. 16, 1868.

Fig. 1.



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Sheet 2, 3 Sheets.

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No. 79,034. Patented Jun. 16, 1868.

Fig 2.

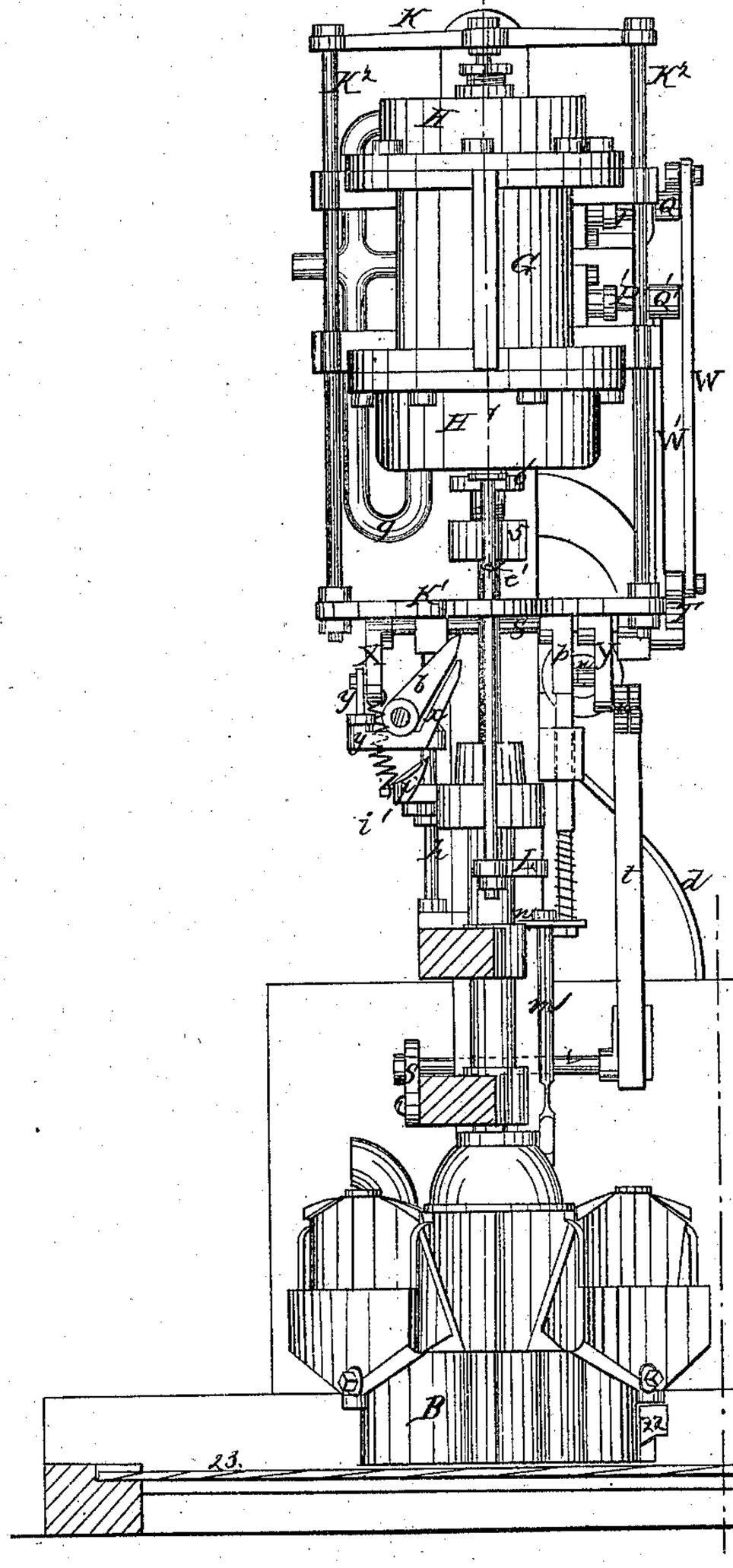

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Fig. 3.

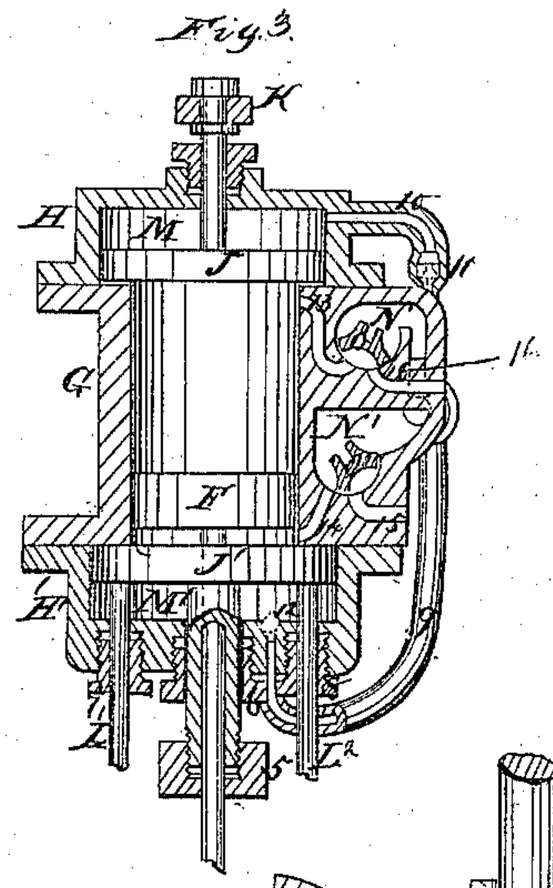


Fig. 4.

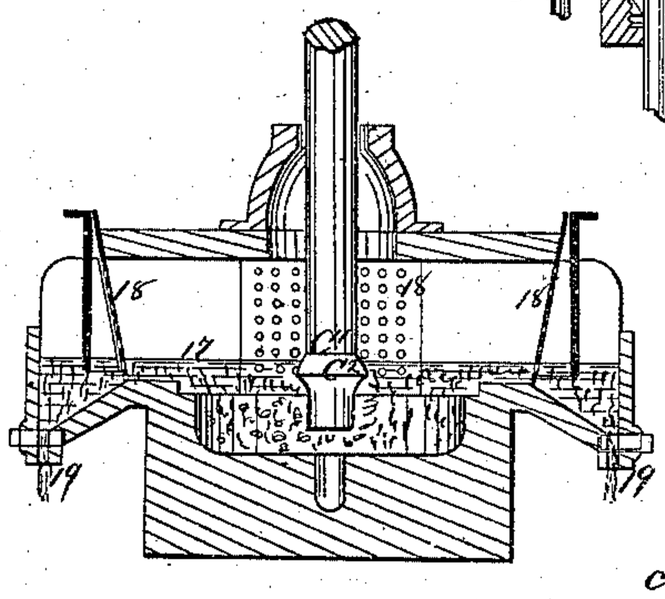


Fig. 5.

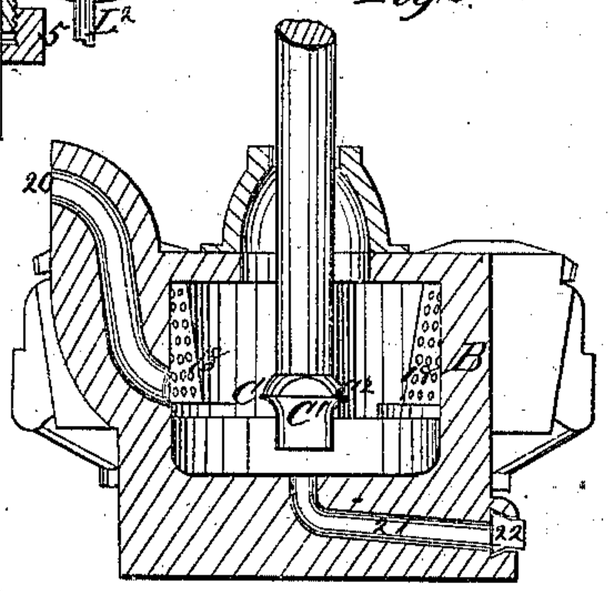
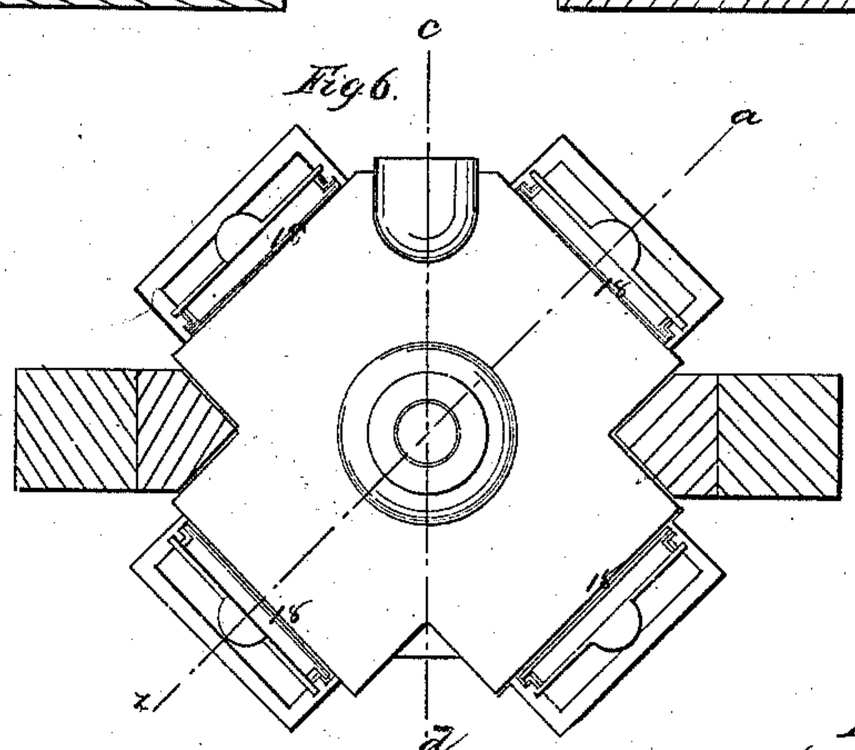


Fig. 6.



Witnesses.
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United States Patent Office.

RICHARD UREN AND JOHN WALKER, OF HOUGHTON, MICHIGAN, ASSIGNORS.
TO THEMSELVES AND JOHN UREN, OF THE SAME PLACE.

Letters Patent No. 79,034, *dated June* 16, 1868.

IMPROVED STAMP-MILL.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL WHOM IT MAY CONCERN:

Be it known that we, RICHARD UREN and JOHN WALKER, of Houghton, in the county of Houghton, and State of Michigan, have invented a new and improved Stamping or Quartz-Crushing Machine; and we do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to make and use the same, reference being had to the accompanying drawings, forming part of this specification.

Our improved stamping or quartz-crushing machine is of that class wherein the piston is connected directly to the stamp-head, without the intervention of a driving-shaft and crank, in which it is desirable to operate the stamp so that it may have a variable throw of the stamp effected by an automatic valve-movement; and consists—

First, in providing supplementary cylinders and pistons, at each end of the main cylinder, to act as cushions, against which the force of the stamp-piston may be expended without damage, whenever, from any cause, the piston will be forced against the ends of the steam-cylinder.

Second, in providing a variable automatic cut-off to regulate the amount of steam admitted to the cylinder for raising the hammer or stamp.

Third, in providing an adjustable outlet, which may be so graduated as to regulate the discharge of water and pulverized ore from the machine,

Fourth, in providing the stamp-head with a flange of such shape as to throw the water and pulverized ore against the screens, in a manner more readily to separate the ore and discharge the pulverized portion from the machine.

Fifth, in providing, through the bottom of the mortar, an outlet for those particles of ore which do not become sufficiently pulverized to pass through the screens, and which usually in the machines, as now constructed, become packed in the mortars so as to be difficult to remove.

Having described the nature of our invention, we will proceed to describe its construction and operation, reference being had to the accompanying drawings, in which—

Figure 1 represents a front elevation.

Figure 2 represents a side elevation, one of the supporting-posts being removed.

Figure 3 represents a vertical section of the cylinder and valve-chest on line *e' e'*.

Figure 4 represents a vertical section on line *a b* of fig. 6.

Figure 5 represents a vertical section on line *c d* of fig. 6.

Figure 6 represents a section on line *d' d'*, showing a plan of the mortar.

Similar letters of reference indicate like parts.

A is the supporting-frame, consisting of two horizontal sills, supported upon a suitable bed, from which rise two vertical posts, connected together by suitable cross-ties, between which posts the machine is secured.

B is the mortar; C, the vertical stamp-shaft, which is secured to the piston-rod, E, by means of the flanged coupling, D, and which carries, at its lower end, within the mortar, the stamp C'.

G is the steam-cylinder; H and H' are the supplementary cylinders.

F is the piston, to which the piston-rod E is secured.

N and N' are valve-chests, in which the rotary valves, O and O', are arranged to effect the opening and closing of the induction and eduction-ports, as will be hereinafter shown.

9 and 10 are steam-pipes, affording communication between the boiler and supplementary cylinders H and H'. 11 and 12 are check-valves in the same. The diameter of these cylinders and their pistons is greater than the diameter of the main cylinder and piston.

K and K^1 are two cross-bars, forming a yoke when connected together by the vertical rods K^2, to which yoke the supplementary piston J is connected by its piston-rod.

L is a connecting-bar, to which the rods L^1 and L^2 of the supplementary piston J' are secured, also forming a yoke.

h is a vertical oscillating-shaft, supported at its lower end by one of the cross-ties of the frame, and at its upper end in the projecting end of the bracket, R′. *i* is an adjustable cam on shaft *h*. *x* is a fixed cam upon the same shaft. *y* is a crank, secured to the cam *x* and to the shaft *h*. This crank is connected to the crank on one end of the rock-shaft S by the connecting-rod *y*′.

The horizontal rock-shaft S is supported at one end in bearings in the bracket R′, and at the other end in bearings in the bracket R, and has secured to its end, near the bracket R, a crank, T, which is connected to the valve-stems P and P′ by means of the connecting-rods W and W′ and cranks Q and Q′.

On the rock-shaft S, inside of the bracket R, are secured a crank, Y, and a cam, *p*. To the outer end of the crank Y is secured the upper end of the spring *t* by means of connecting-rod *u*. The lower end of spring *t* is secured to the horizontal rock-shaft *r*. The said shaft *r* has a bearing in one of the supporting-posts of the machine, and at its end, opposite to that to which the spring is secured, it carries a segment of a disk, which has, near its periphery, a curved slot, through which slot a set-screw works, by which means the tension of the spring *t* may be adjusted.

Projecting upward from the top of the mortar B is a rod, *m*, which, at its upper end, passes through the spring *n*, and is held down to the spring *n* by means of a nut on its upper end above the said spring. Through the outer end of spring *n* works the vertical spring-catch o^2, which is secured in its place by the guide Z. Around the lower portion of the said spring-catch o^2 is arranged a coiled spring, which has a constant tendency to force it upward. Near the upper end of the spring-catch it has a projection, which extends a short distance in the line of travel of the cam *p*, and is curved to a circumference equal to that described by the outer end of the said cam *p*, the upper end of the vertical portion and the outer end of the curved projection constituting a double catch.

a is a horizontal shaft, supported in bearings upon the supporting-posts, to which is secured the cam *b*, about midway between the posts. At one end is secured the crank *c*, to the outer end of which are connected the valve-rod *d* and valve c^1.

f is a water-tank, which receives its supply through the gauge-cock *g*. Within the said tank is a float, *l*, which is connected to the lever *j* by the bent rod *k*. The said lever *j* has a fulcrum at one end in the bracket R′, and is forked at the other end, so as to take into the annular groove in the adjustable cam *i*.

On reference to figs. 4 and 5, 19 represents the adjustable outlets, which, in this example, consist of ordinary stop-cocks, but which may be made in any suitable manner; 18 represents the screens, one of which is arranged in front of each of the outlets; 20 shows an aperture, through which the ore and water may be conveyed to the mortar; c^2 represents a flange upon the top of the stamp, the under side of which is curved, so that when it is plunged down into the water, the latter will be thrown violently against the screens; 21 shows an aperture, passing outward from the centre of the bottom of the mortar; 22 represents a slide, for closing or opening the said aperture; 23 represents a spring-bed, upon which the mortar rests, of sufficient flexibility to allow it to yield under the blows of the stamp.

The operation of our machine is as follows:

The position of the piston being that represented in fig. 3, steam will be admitted below it, causing it, together with the piston-rod and stamp, to ascend until the upper face arrives at a position nearly on a level with the induction-port 13, and the upper portion of the coupling D nearly to the lower cross-bar K^1 of the yoke. During the ascent to this point, the coupling D comes in contact with the cam *i*, so as to cause a partial revolution of the rock-shaft *h*, which communicates a similar movement to the rock-shaft S, through its connection with the same. The cam *p* on the shaft S is, by the same movement, caused to pass over the projecting upper end of the spring-catch o^2, which is forced up, by the spiral spring *q*, behind the end of the said cam or tappet *p*. The same movement of rock-shaft S operates the valves O and O′ to such an extent that the valve O′ shuts off the admission of steam below the piston. The piston is continued in its ascent by the expansion of the steam already in the cylinder, during which further ascent the coupling D comes in contact with the cam *x*, also on the rock-shaft *h*, causing, through the same connections, a further oscillation of shaft S, moving the cam *p* beyond the end of the curved projection on the spring-catch o^2, when it is again forced up behind the end of the cam by the spiral spring *q*. The cam rests against this projection until the descent of the stamp.

By this second movement of the shaft S, the valve O′ is again moved, so as to open communication between the induction-port 14 and the exhaust-port 15, and the valve O is moved so as to open communication, through the induction-port 13, with the upper end of the cylinder and the boiler. The valves are held in this position, by the spring-catch o^2 and cam *p*, against the action of the spring *t*, until the stamp has descended upon the ore in the mortar, which it does with such force as will deflect the spring-bed of the mortar in a downward direction, by which operation the rod *m* communicates a downward movement to the spring-catch o^2 through the spring *n*, and disengages the said catch from the cam *p*, when the spring *t* throws the valves back to the original position, as shown in fig. 3, when steam will again be admitted below the piston, and the operation continued as long as it may be desired.

To avoid the damaging effect of the piston striking the upper or lower cylinder-head, as is often the case in machines of this class, wherein the movement of the piston is not governed by a crank and connecting-rod, we have provided the supplementary cylinders H H′ and pistons J and J′.

When the piston, in its upward movement, has received an impetus greater than is sufficient to elevate it to the proper height, and just before it would strike against the supplementary piston J, the coupling D will strike the lower cross-bar K^1 of the yoke, which communicates motion to the piston J in an upward direction in the cylinder M, which is filled with steam of an even pressure of that in the boiler. The check-valve 11 prevents the escape of the steam, and causes it to act as a cushion, completely overcoming the action of the piston F, without damage or strain to the machine.

In the downward movement of the piston and shaft, the same operation takes place when the coupling strikes the connecting-bar L of the lower yoke.

In the operation of stamping-mills and forge-hammers, having an automatic valve-attachment, it is very often the case that, by reason of the variable height of the mass upon which the hammer or stamp is operating, and from other causes, the action of the valves will be also variable. The operation of the mechanism which I have provided to overcome this difficulty is as follows:

The sliding cam *i* is placed upon the shaft *h*, so as to slide freely up and down thereon. Its position on the shaft *h* is governed by the height of the water in the tank *f*, acting through the float *l*, bent rod *k*, and lever *j*. The cam *b* on the shaft *a* is arranged at such a position that when the piston is carried too high, the coupling D comes in contact with cam *b*, oscillating the shaft *a*, so as to raise the valve 2′ and allow the water to escape, by which means the cam is brought to a lower position on the shaft *h*, and is operated by the coupling D in its next ascent at an earlier period of the same to close the valve O′.

On the other hand, when the piston F does not rise high enough, the valve *e* will not be raised so as to allow the water to escape, so that the constant supply will raise the float and cam *i*, and the admission of steam will be cut off at a later period of the ascent.

The operation of the flange c^2 of the stamp-head C′, by reason of its curved formation of the under side, is such as to greatly facilitate the discharge of the pulverized ore, by splashing the water and pulverized ore directly against the screens.

By means of the adjustable apertures for the escape of the ore, it may be so regulated as to pass off only so fast as it is delivered through the screens by the action of the stamp, effecting a very material saving in the quantity of water to be supplied to the mill.

In the stamping-mills now in use a very serious difficulty is encountered, by reason of those larger portions of ore, which do not become sufficiently pulverized to pass off through the screens, becoming packed together in the bottom of the mortar, the removal of which requires the stoppage of the mill, and considerable labor in taking out the screens, and the loosening of the compact mass by the application of the pick and crow-bar. Now, all this difficulty is completely obviated in our machine by the arrangement of the discharging-aperture underneath the stamp, so that such large particles will be forced into and through the same by the action of the stamp, the slide 22 being withdrawn from time to time as the aperture becomes full.

Having thus described the construction and operation of our invention, what we claim, and desire to secure by Letters Patent, is—

1. The supplementary cylinders H H′ and pistons J J′, in combination with the cylinder G, piston F, stamp C, and coupling D, substantially as described for the purpose specified.

2. The supplementary pistons J and J′, in combination with the yokes K K¹, L, stamp C, and coupling D, substantially as described for the purpose specified.

3. The rock-shaft *h*, adjustable cams *i*, fixed cam *x*, and arm *y*, in combination with the coupling D and stamp C, substantially as described for the purpose specified.

4. The crank-shaft S, cam *p*, connecting-rods W W′, and valves O O′, in combination with the rock-shaft *h*, cams *i x*, coupling D, and stamp C, substantially as described for the purpose specified.

5. The bracket R′, lever *j*, and floats *l*, in combination with the cam *i*, stamp C, and coupling D, substantially as described for the purpose specified.

6. The horizontal shaft *a*, cam *b*, valve 2′, and valve-rod *d*, in combination with the coupling D, substantially as described for the purpose specified.

7. The combination of the spring-bed 23, rod *m*, spring *n*, spring-catch o^2, tappet *p*, arms Y *u*, and spring *t*, substantially as described for the purpose specified.

The above specification of our invention signed by us, this fourth day of February, 1867.

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JOHN WALKER.

Witnesses:

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CHAS. R. ZORN.