2 Sheets—Sheet 1.

J. A. COLLINS.

Ore Crusher.

No. 79,954. Patented July 14, 1868.

Fig. 1

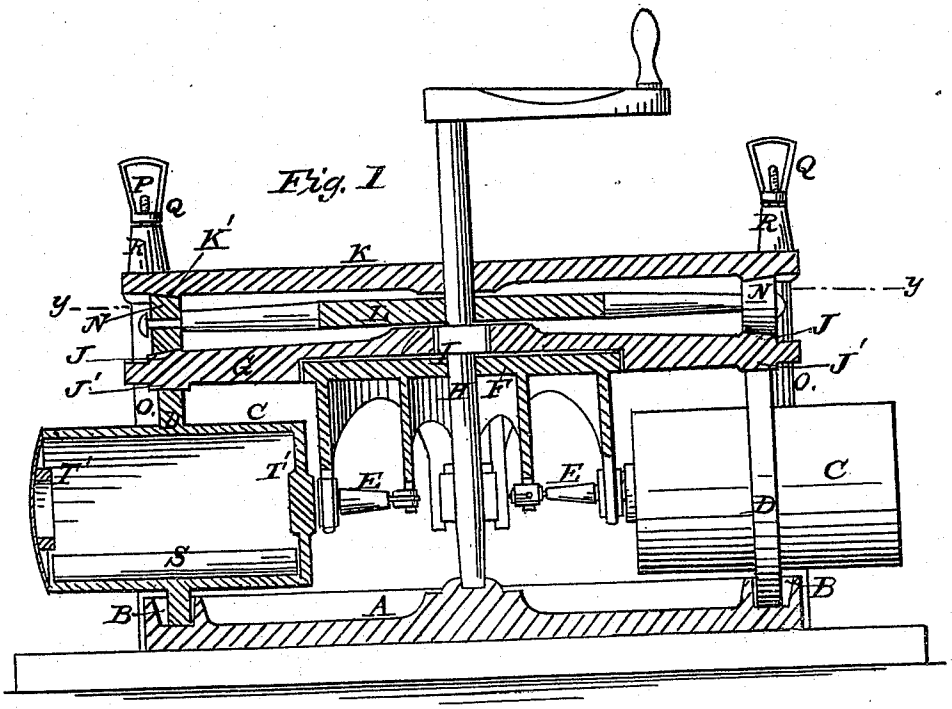
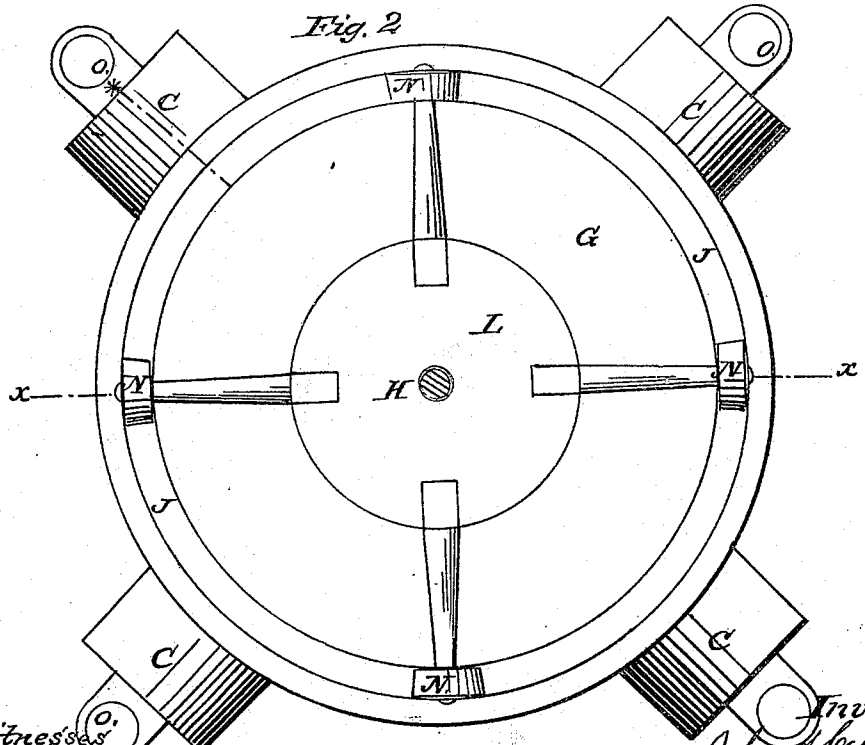


Fig. 2



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2 Sheets—Sheet 2.

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Fig. 3.

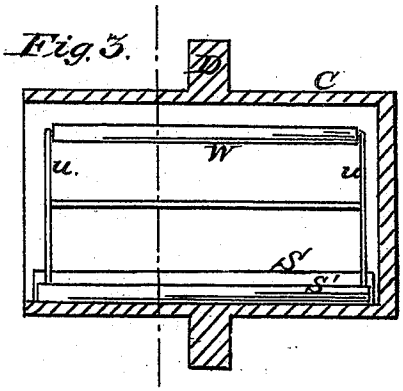
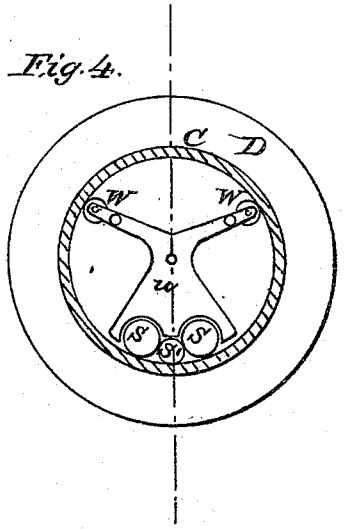


Fig. 4.



Witnesses:
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Inventor:
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United States Patent Office.

JOHN A. COLLINS, OF VIRGINIA CITY, NEVADA.

Letters Patent No. 79,954, *dated July* 14, 1868.

ORE-CRUSHER, GRINDER, AND AMALGAMATOR.

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

TO ALL WHOM IT MAY CONCERN:

Be it known that I, JOHN A. COLLINS, of Virginia City, county of Storey, State of Nevada, have invented an Improved Crusher, Grinder, and Amalgamator; and I do hereby declare the following description and accompanying drawings are sufficient to enable any person skilled in the art or science to which it most nearly appertains, to make and use my said invention or improvements without further invention or experiment.

The nature and object of my invention are to provide an improved machine for crushing and grinding quartz rock, ores, stones, and other friable substances, requiring to be crushed, ground, and pulverized, and also for amalgamating and separating gold, silver, and other substances therefrom.

My invention consists in the employment of a foundation-plate or circular disk, of any desired diameter, having a curve or flange around the periphery, slightly bevelled to accommodate the outside swing of the crushing-wheels, and another flange within, so as to form an annular channel or groove around the circumference of the bed-plate.

From the outer surface project three or more lugs or ears, for the accommodation of bolts, by which the machine is firmly bound together.

In this groove or annular channel I place three or more crushing-wheels, from about two to six feet in diameter, having a face, six inches, more or less, and made of sufficient strength to resist the weight or pressure to which they will be subjected.

Each of the crushing-wheels encloses a cylinder or barrel, in which I place three or more rollers, of unequal size, of about the length of the barrel, that they may roll freely therein. The two outside rollers have a diameter about one-eighth of that of the barrel. The middle roller is somewhat smaller than its companions. By this arrangement, the double impingement of the larger ones, while in motion, causes the smaller roller to rotate in an opposite direction, giving it the grinding efficiency of the pan and shoes, while the four lines of rolling contact between the large rollers and the smaller one, and between the same and the outer cylinder or barrel, quadruple its reducing capacity as compared with a single roller.

To guard against any derangement of these rollers, in case of precipitation and packing of the substance in the pulp, a holder is employed which is carried along with the rollers as they rotate.

For the further illustration and description of my invention, reference is had to the accompanying drawings and letters marked thereon, of which—

Figure 1 is a side sectional elevation, taken through *x x*, fig. 2.

Figure 2 is a horizontal sectional view, taken through *y y*, fig. 1.

Figure 3 is a side sectional elevation of a cylinder.

Figure 4 is an end sectional view of a cylinder.

A represents the lower disk or base-plate, made of iron, having an annular ring or track, B, on its periphery. In this track rotate three or more iron barrels C C C, about five feet in diameter, and six feet in length, each encircled at the middle with a rim or tire, D, about one foot in width, and one foot or more in thickness.

Each of these barrels has a fixed axle, E, with journals turning in boxes at the ends of the arms projecting downwards, (as shown in fig. 1,) from a central plate, F, turning in a circular recess in the driving-plate G above it.

A heavy circular iron driving-plate, G, of the same diameter as the circular trough, rests on the crushing-tire of the four barrels, and is actuated by a central shaft, H, having its step in the centre of the lower disk or bed-plate, it being made square, and bevelled above and below from the centre, where it passes through the driving-plate at I, so that, in turning this plate, it is caused to rotate independent of the central plate F, and adjust itself to the rise and fall of the driving-wheels. This driving-plate has a track, J J′, on its upper and lower faces, near the periphery, which are bevelled, the lower one towards the axis of revolution, and the upper towards the periphery; or the driving-plate may be driven by segment-gearing and belt.

Above the driving-plate is a top plate, K, the lower face of which is provided with a track, K′, which is

also bevelled towards the periphery. Between the driving-plate and the top plate is placed a small plate, L, with radial arms, to the centre of which three or more friction-rollers, N N, are attached, directly on a line above the crushing-wheels, and are bevelled towards the axis of revolution.

To prevent friction, these wheels are bevelled on their face, to correspond to the bevel on the upper side of the revolving plate, and the under side of the stationary plate above; and the amount of bevel given to the tracks and wheels should of course be such that the circumference of a circle, through which the outer edge of the wheel travels, shall contain the circumference of said outer edge precisely the same number of times that the circumference through which the inner edge travels contains the circumference of said inner edge.

Substantial columns of cast iron or other strong material, O O O, and hollow their entire length, which should be a trifle less than the diameter of the crushing and friction-wheels, coupled with the thickness of the revolving or driving-plate, must be placed between the lugs of the upper and lower stationary plates.

A substantial iron rod, P, firmly fastened at each end of each column, extends downwards, and penetrates the foundation from twelve (12) to thirty-six (36) inches, and is solidly bound to it by means of nuts and screws Q Q. The rods should extend upward through the lug of the stationary plate sufficiently to admit of well-hooped car-springs R, of large dimensions, surmounted by an iron plate of equal diameter, which, by means of a screw, can be made to give a weight or pressure to the crushing-wheels, independent of their own weight, that will effectually reduce the hardest rock.

The rock is fed before the wheels into the annular trough, and, if sufficient weight or pressure is applied by the set-screws, it is pulverized by a few revolutions of the wheels. If the rock is crushed dry, a scoop follows the last wheel, which plows the pulverized rock, and may carry it to a revolving screen. The finer portion, after passing through the screen, is taken by elevators to reservoirs above, where the pulp is prepared for amalgamation by adding water in the usual way.

If the rock is crushed wet, the ore or pulp is discharged, through a hole in the side of the annular trough, into a tank or elevator, to pass through the screens, and from them into the grinding and amalgamating-barrels.

The interior of these barrels is made smooth, and in them are placed three heavy iron rollers, S S′ S, of just sufficient length to work while lying lengthwise in the barrel, and are made to revolve against its side and against each other. The middle roller S′ is smaller in diameter than the two others, which causes it to revolve in an opposite direction from the larger ones, thereby causing still greater friction, and a greater reducing-capacity. These rollers might be increased to five, with perhaps good results, in which case the second and fourth should be of less diameter than the remaining ones.

Iron balls may be used for this purpose, turning in circular grooves, and separated by partitions made in the barrel, but I think the rollers above described are preferable.

For keeping the rollers against the inner surface of the barrel, I provide a holder, consisting of two end-plates, U U, suitably braced by rods. The lower ends of the plates are cut away, so as to fit over the rollers. To the upper ends or arms are attached horizontal friction-rollers, W, which reach to near the sides of the barrel above, so that when the wheels pass over uneven surfaces, or the charge of ore in the barrel becomes packed, the grinding-rollers will be kept down, and the friction-rollers will turn on the rods which pass through them by coming in contact with the sides of the barrel. Ordinarily this device may be dispensed with, or rings T′ may be attached to the inner surface of each head of the barrels.

The pulp, with the usual quantity of quicksilver used in amalgamating, is introduced into the barrel, and discharged therefrom by means of a door, made at any convenient place, outside of the line of the trough.

Additional barrels and wheels may be put into the diameter of the crushing-trough, and a second series of barrel-wheels may be placed upon the driving-plate, to work in a trough, the same as that of the bed-plate or lower disk; this second set of crushing-wheels or barrels taking the place of the friction-wheels N N, as the driving-plate would communicate motion to both series of barrels and wheels, in the same manner as above described. Thus the capacity of the mill would be doubled without occupying more ground, and without a proportionate increase of expense.

By means of the combinations above described, this mill embraces in itself crushing, grinding, amalgamating, and extracting precious metals, which has the following advantages over the machinery now in use for that purpose: As compared with a stamp and pan-mill, of equal capacity, it will cost eighty per cent. less to work the ores, will occupy less space, requires less power, and requires a less number of hands to work it.

The machine may be of any required size or material. If for grinding quartz or ores, they may be made wholly of cast iron; if for artists' colors, porcelain-clay, or other substances, they may be made of porcelain, glass, or other non-corrosive material.

Having thus described the manner in which I construct and operate my machine, what I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination and arrangement of the cylinders C, crushing-wheels D, axle E, and central plate F, with arms projecting downward, and supporting said axle, substantially as described.

2. The combination and arrangement of the driving-plate G on the shaft H, the friction-rollers N on the arms of the revolving plate L, and the stationary plate K, above it, substantially as described.

3. The combination and arrangement of larger rollers S with smaller, S′, within the cylinders C, the former rolling upon the latter and upon the cylinder, but the latter or smaller rubbing and grinding against the cylinder, as described.

In witness whereof, I have hereunto set my hand and seal.

JNO. A. COLLINS. [L. S.]

Witnesses:

C. W. M. SMITH;

GEO. H. STRONG.