(No Model.) 2 Sheets—Sheet 1.

W. L. CARD.

CRUSHER AND PULVERIZER.

No. 347,869. Patented Aug. 24, 1886.

Fig. 1.

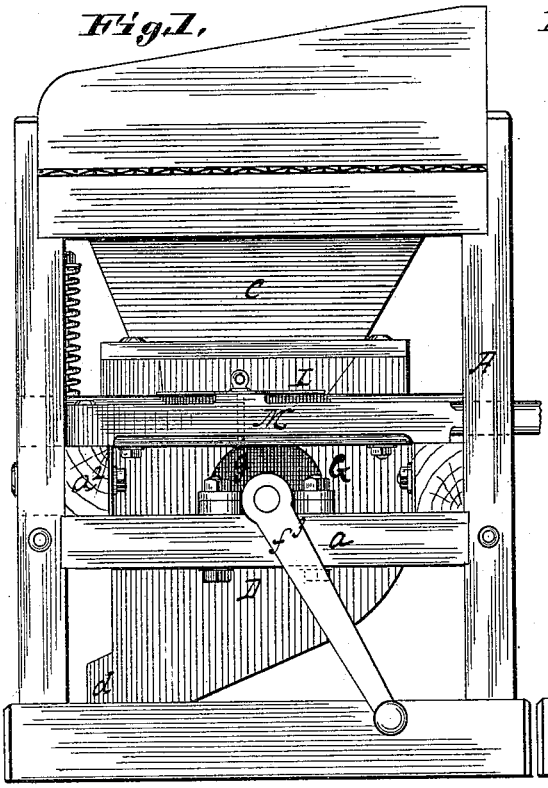


Fig. 2.

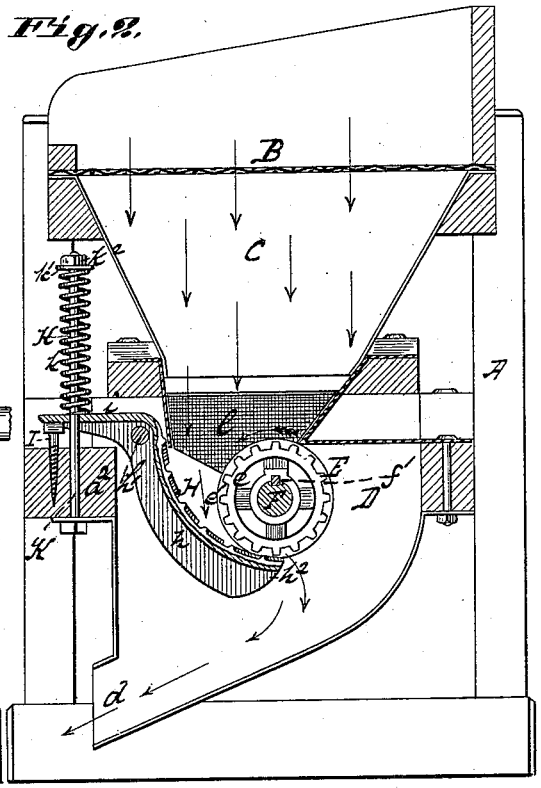


Fig. 3.

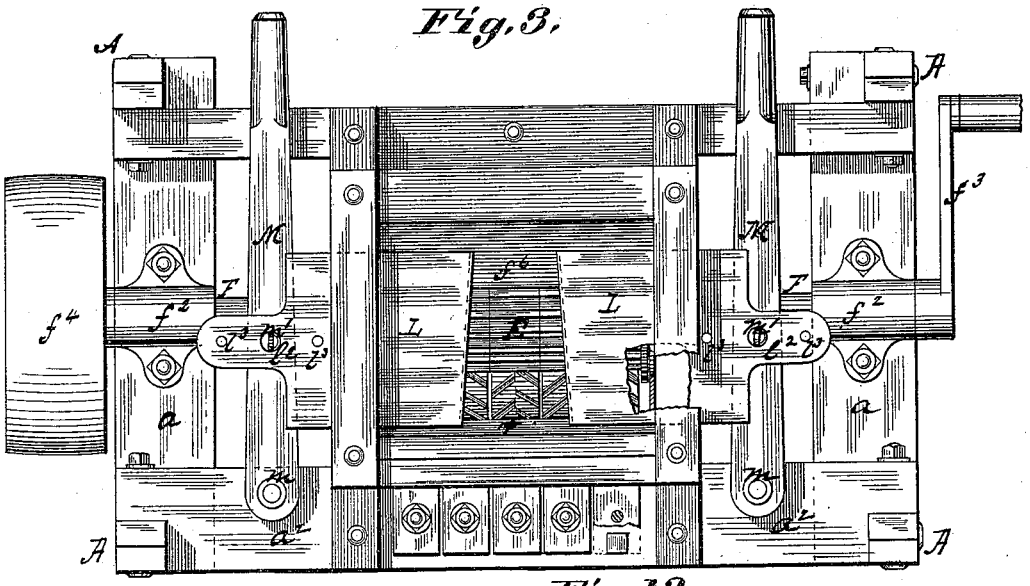
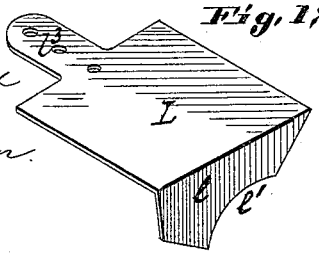


Fig. 12.



Attest:
G. A. Tackesschmidt.
Edwin D. Clarkson

Inventor:
William L. Card
by F. W. Ritter Jr.
atty

(No Model.) 2 Sheets—Sheet 2.

W. L. CARD.

CRUSHER AND PULVERIZER.

No. 347,869. Patented Aug. 24, 1886.

Fig. 4

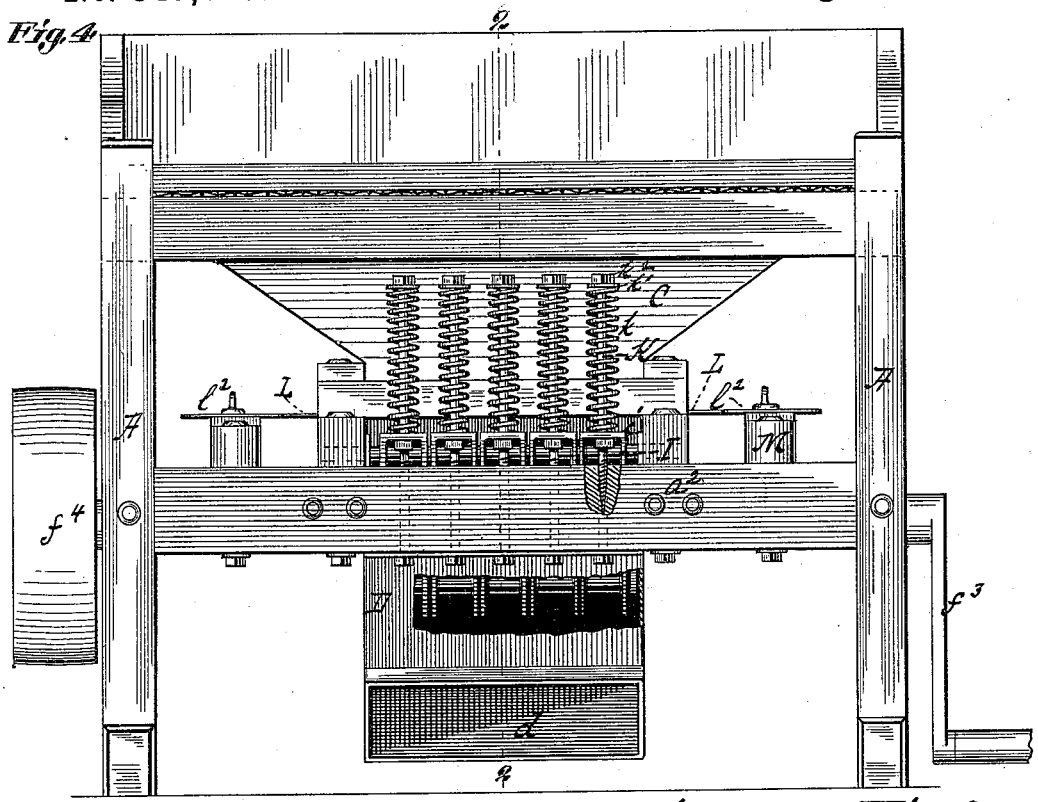


Fig. 5.

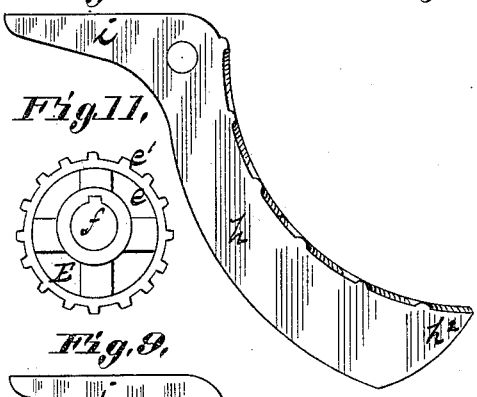


Fig. 6.

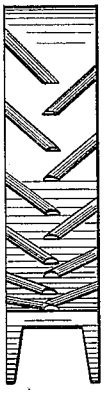


Fig. 7.

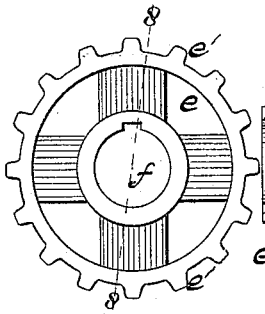


Fig. 8.

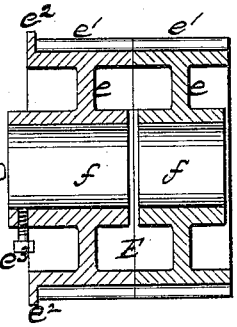


Fig. 11.

Fig. 9.

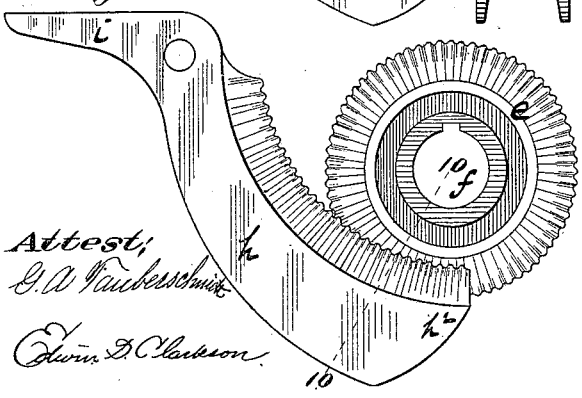
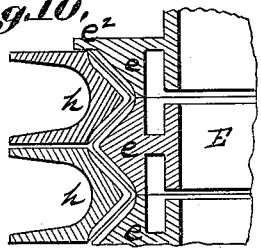


Fig. 10.



Attest,
G. A. Faulkenschmidt
Edwin D. Clarkson

Inventor,
William L. Card
by F. W. Ritter Jr
Atty

UNITED STATES PATENT OFFICE.

WILLIAM L. CARD, OF LA CROSSE, WISCONSIN, ASSIGNOR TO THE TIERRA SECA MINING COMPANY.

CRUSHER AND PULVERIZER.

SPECIFICATION forming part of Letters Patent No. 347,869, dated August 24, 1886.

Application filed March 26, 1886. Serial No. 196,735. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM L. CARD, a citizen of the United States, residing at La Crosse, in the county of La Crosse and State of Wisconsin, have invented certain new and useful Improvements in Crushers and Pulverizers; and I do declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, in which—

Figure 1 is a side elevation of a crusher and pulverizer embodying my invention. Fig. 2 is a vertical section (central) of the same. Fig. 3 is a top or plan view of the same. Fig. 4 is an elevation of the rear or discharge end of the machine. Fig. 5 is a side, and Fig. 6 a face, view of one of the narrow sections or fingers which form the concave. Fig. 7 is an end view, and Fig. 8 a sectional view, of roller-sections adapted to coact with the narrow sections or fingers shown in Figs. 5 and 6. Figs. 9 and 10 are similar views of modified forms of fingers and rollers. Fig. 11 is an end view of a roller-section with shaft-opening eccentric, which is the preferred form for crushing and pulverizing some classes of material. Fig. 12 is a perspective view of one of the sliding feed-gates and its lip.

Like letters refer to like parts wherever they occur.

My present invention relates to the construction of crushing and pulverizing mills adapted for general use wherever such mills are needed, but is especially adapted for use in disintegrating and finely comminuting or pulverizing earth—such as placer-dirt or auriferous earths—for separating the precious metal by the dry process, for preparing brick-clays, and for many other like purposes where a combined crusher and mill light-running and durable is required.

Its main feature may be broadly stated to consist in the combination, with a longitudinally-ribbed roller, of a concave composed of a series of narrow curved ribbed sections of limited width, each of which sections is free below and independently pivoted at its upper end, and so supported by a spring as to exert an upward pressure sufficient to coact with the roller in crushing or rubbing the dirt from rocks or stones on which it may be caked and comminuting said dirt, while the section is at the same time at liberty to yield throughout its length, and especially at its lower end, to any extent required to discharge the stone or rock after the dirt has been rubbed therefrom, and in effecting this discharge of any and all stones or rocks without disturbing the usual operation of other parts of the machine.

It also consists in such a construction and arrangement of the feed-gates with relation to the roller and concave that the material operated on shall tend from the feed-gates and from the flanged ends of the crushing-roller, whereby the mill is rendered more durable and light-running, or requires less power, and does the required amount of work.

There are other minor details of construction and arrangement of special value in a practical machine, and which will hereinafter more fully appear.

I will now proceed to describe my invention more specifically, so that others skilled in the art to which it appertains may apply the same.

In the drawings, A indicates a suitable frame for the support of the operative parts of the mill; B, a screen, which may, if desired, be placed above the hopper C, to remove rocks and rubbish from the material; C, the hopper, and D a casing and chute terminating in the discharge-spout *d*, all of which may be of the character shown or of any other approved form.

E indicates the crushing and pulverizing roller, which is preferably formed of a series of sections, *e*, having ribs *e'* and a shaft-hole, *f*, which latter may be in the axial center, as shown in Fig. 8, or somewhat eccentric, as shown in Fig. 11. The end sections may have flanges e^2 and hubs with set-screws e^3, for clamping them to the shaft F, and the several sections are prevented from rotating on the shaft by a feather or spline, *f'*.

The roller E is composed of several of said sections *e*, secured on a shaft which is journaled in suitable boxes or bearings, f^2, on the cross-timbers *a* of the frame, and said shaft may have a crank, f^3, at one end and a pulley, f^4, at the other, for applying power; or, if designed for hand-power only, a fly-wheel may replace the pulley f^4. The roller E is cased in by means of side plates, G, each having a

circular opening, g, somewhat smaller than the flange e^2 of the roller E, said plate being adjusted very close to the flange of the roller and secured to the cross-timber by bolts, or in any other suitable manner.

H indicates the concave, which is made up of a series of independent curved sections or fingers h, having ribbed or corrugated faces pivoted on and supported by a cross rod or shaft, h', which passes through the cross-timbers, about on a line with the top of the roller E, as shown in Fig. 2. These fingers or sections h have rearwardly-extending projections or heel-pieces i, which project over the cross-timber a^2 of the main frame A, (or over any suitable support;) and in said timber a^2, directly under each extension or heel i, is a lag-screw, I, which can be raised or lowered at will to permit the toe h^2 or end of the section or finger h to approach the roller E more or less closely, according to the degree of pulverization required in the product. These sections or fingers h are held up to their work, and in line to form the concave, by means of springs; and for this purpose I prefer for each section h one or more spiral springs, k, (if several are used they can be nested,) inclosing a bolt, K, which bolt passes through the heel-piece i or rear extension of the section h, and through the frame-timber a^2, which supports the lag-screw I. This spring k is confined between the rear extension of the section h and a washer, k', so as to exert its force on the section h in holding the section up to its work; and in order to regulate the power of the spring and take up wear the bolt is threaded and a nut, k^2, applied over the washer k'. The relation to the roller of the individual finger or section of the concave is clearly shown in Fig. 2, while the relation of the sections h to each other and the relation to the roller E of the concave H as a whole is to be readily understood from the plan view, Fig. 3.

In conjunction with the crushing and pulverizing roller and the concave I employ sliding feed-gates L, of particular construction, arranged at the bottom of the hopper. These gates L (see Fig. 12) have downwardly-projecting lips or flanges l, cut out, as at l', so as to closely embrace the roll, which flanges prevent the material operated on from spreading to the ends of the roller and getting between the flanges e^2 thereof and the shell or casing G.

In order to relieve the descending material from pressure and packing, and to avoid its being forced under the flanges or lips l, and between them and the roller E, the flanges are not bent straight across or at right angles to the sides of the slides L, but slightly angling, (see Fig. 3,) so that the space between the flanges is less at the front, f^6, than it is at the rear, r; or, in other words, the space widens out from the front to rear, so as to relieve the lateral pressure in proportion as the pressure on the material by the concave and roller increases. The slide-gates L have each an extension or strap, l^2, having a series of perforations, l^3, to permit of its adjustable connection with the levers by means of which the gates are operated.

M indicates the levers for operating the gates L, said levers having their pivots or fulcrums m on the frame-timber a^2, and being pivotally connected with the gates, as at m'.

In Figs. 5 and 6, 7 and 8, I have shown one form of concave-section and roller-section—viz., the finger or concave section with alternating inclined ribs, and the roller with transverse ribs; and in Figs. 9 and 10, I have shown another form—viz., both concave-section and roller-section with convex faces and transverse ribs, the roller-sections and concave sections or fingers being arranged to break joints, as shown in section, Fig. 10. Either may be used, as preferred.

For some purposes one form will give the best results, and for some purposes the other will be found advantageous, while the same may be said of the center-shaft sections shown in Figs. 7 and 8 and the eccentric-shaft sections shown in Fig. 11.

It will be noted that the sectional form of concave and roller is especially adapted to the construction of the eccentric-shaft roller of Fig. 11, and the corrugated roller and concave shown in Figs. 9 and 10.

The mill, being constructed substantially as hereinbefore specified, will operate as follows: The auriferous earth or other material to be pulverized, being passed through the screen B or directly into the hopper C, will pass through the feed-gates L and be directed by the downwardly-projecting flanges or lips l onto the roller E. The distance between the gates will determine the quantity fed to the pulverizer, and it may be regulated at will by opening or closing the gates more or less. The earth or other material will be carried downward by the roller between itself and the concave, (see arrows, Fig. 2,) the lumps being first crushed, and then the mass ground or triturated so as to pulverize it thoroughly. The widening out of the space between the downwardly-projecting lips will in a measure relieve the earth of lateral pressure as it is carried downward, so that there will be no tendency to force the material under the flanges l and over toward the ends of the roller. Consequently the pulverizer can be run much more rapidly and with less expenditure of power than any pulverizer now known to me.

Owing to the concave being composed of yielding sections, the stones as they descend will be turned and rubbed against each other and between the concave-sections and roller, and the presence of any stone or any other obstruction which cannot be crushed by the mill will be of very minor importance, as the adjacent finger or section will yield sufficiently to permit the obstruction to escape without deranging the operation of the rest of the machine. Moreover, as each section has an independent spring action, the concave will have much the action of the human hand in rubbing

and pulverizing clay, earth, and similar substances.

It is not intended that this machine shall be a crushing-machine in the sense of a machine which comminutes rock and like hard substances; but its special purpose is to crush and pulverize earthy matters, and to roll and rub the rocks or stones to detach the earthy matter therefrom. Auriferous placer-dirt, for the treatment of which this machine is especially intended, is, as is well known, largely composed of gravel and rock, to which the gold-bearing earth is caked, and it is not desirable to crush said gravel or rock, but only to detach and pulverize the earth. Therefore the ribs on the roller and concave are not for crushing stones, but simply to rotate and rub together the passing rocks and gravel and pulverize the earth.

Having thus set forth the nature, operation, and advantages of my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a crusher or pulverizer, the combination, with a longitudinally-ribbed roller, E, of a concave, H, composed of a series of narrow curved ribbed yielding sections, *h*, arranged in line, pivotally suspended above, as at *h'*, and free below, substantially as and for the purposes specified.

2. In a crusher or pulverizer, the combination, with a roller having its shaft eccentric, of a series of springing or yielding concave-sections, substantially as and for the purpose specified.

3. In a pulverizer, the combination, with the roller, of a concave composed of a series of independent narrow sections pivoted above and having rearwardly-extending projections or heels, lag-screws arranged beneath the heels of said sections, and springs which bear on said heels, substantially as and for the purposes specified.

4. In a crusher or pulverizer having a crushing-roller, the combination, with said roller, of feed-gates for regulating the quantity of the feed, said gates having downwardly-projecting lips or flanges, which limit the spread of the material, substantially as and for the purpose specified.

5. In a crusher or pulverizer having a crushing-roll and concave, the combination therewith of feed-gates having downwardly-projecting lips or flanges which diverge to form a feed-space whose width increases from front to rear, substantially as and for the purpose specified.

In testimony whereof I affix my signature, in presence of two witnesses, this 20th day of March, 1886.

WILLIAM L. CARD.

Witnesses:
ALBERT BLAIR,
GEO. WALKER.