(No Model.) 2 Sheets—Sheet 1.

A. P. GRANGER.

MACHINE FOR CRUSHING OR DISINTEGRATING ORES, &c.

No. 376,877. Patented Jan. 24, 1888.

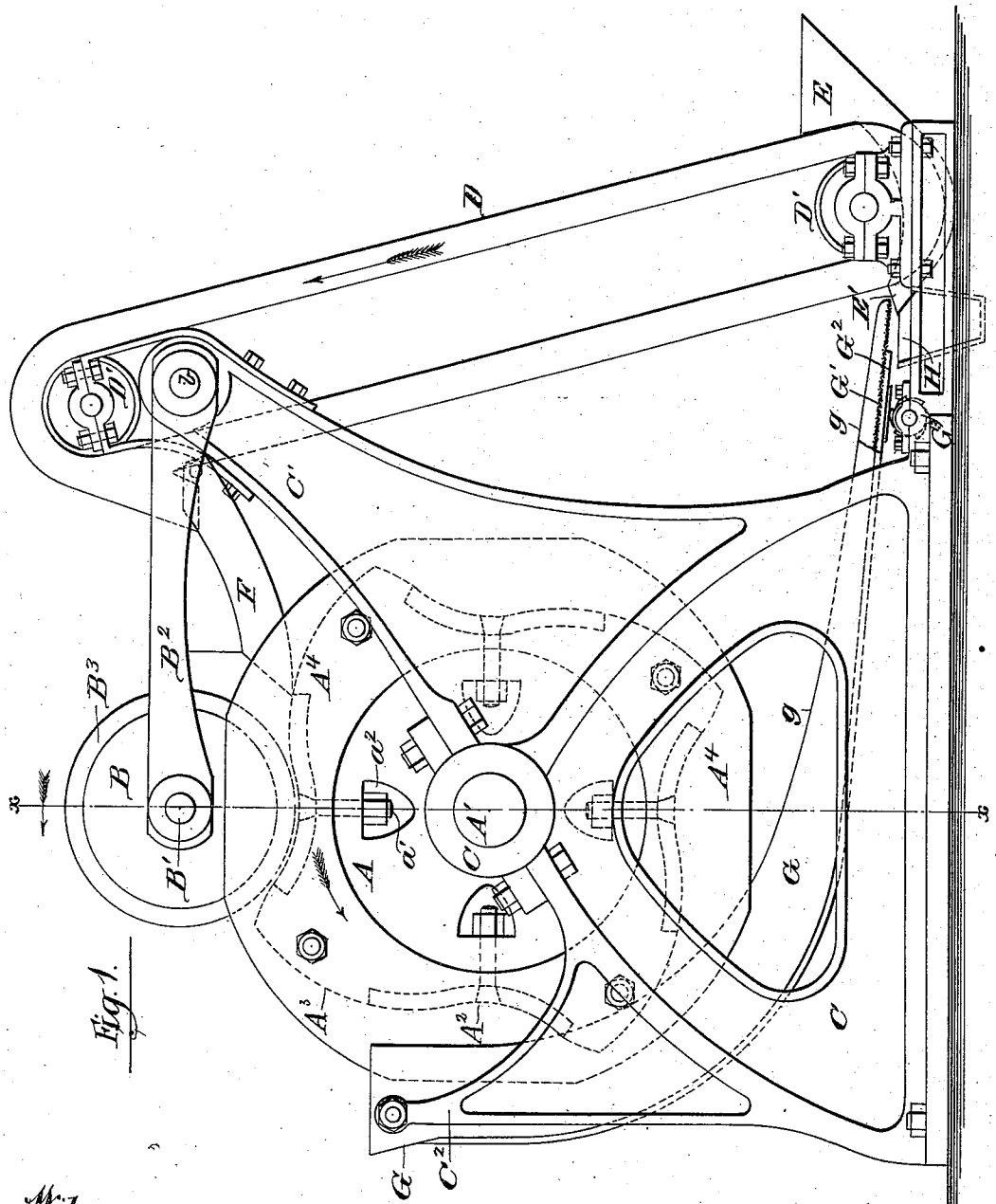

Fig. 1.

Witnesses:-
Louis W. Whitehead.
C. C. Poole.

Inventor.-
Alvan P. Granger

by:-
M. E. Dayton
Attorney.-

N. PETERS. Photo-Lithographer, Washington, D. C.

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Fig. 1.

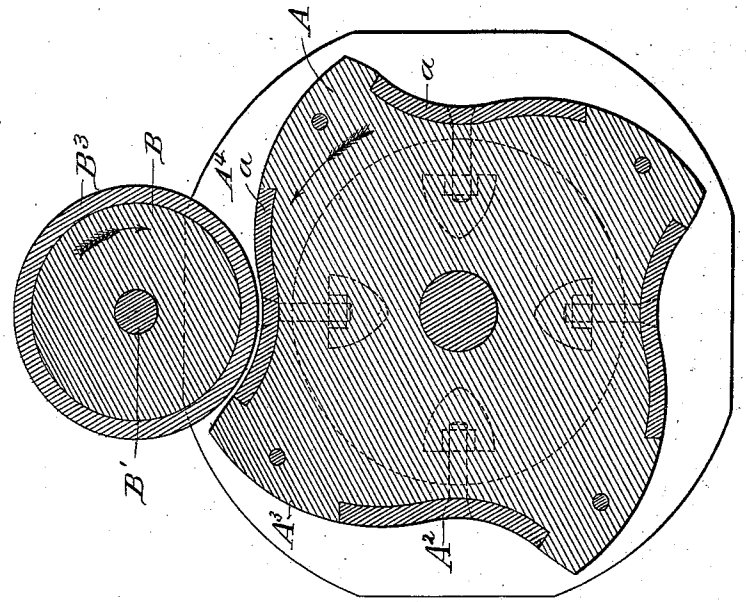
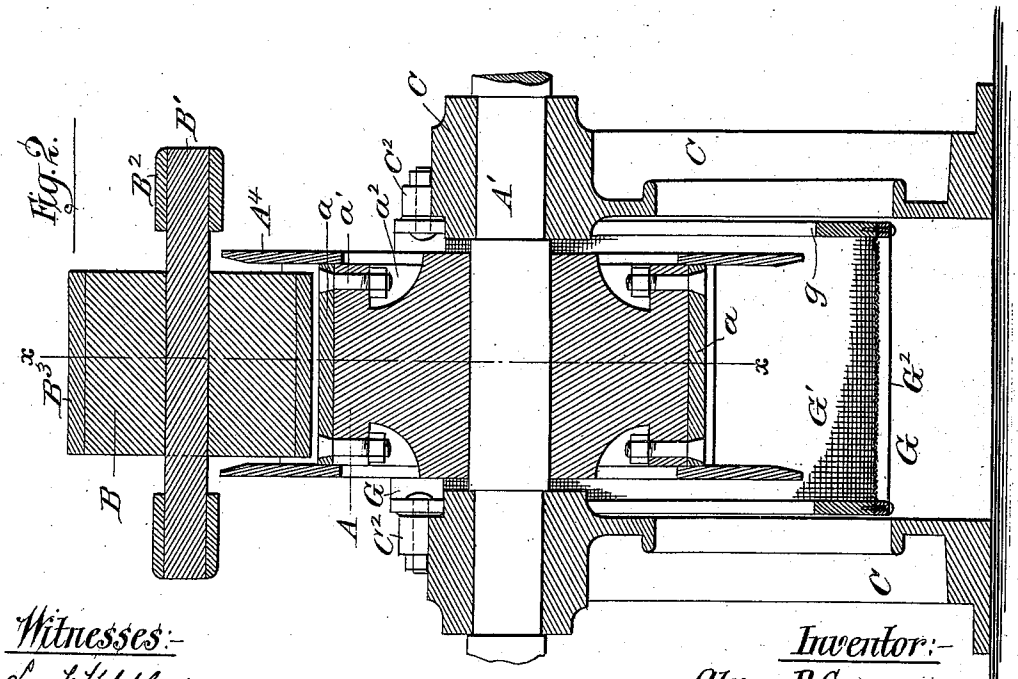


Fig. 2.



Witnesses:-
Louis H. Whitehead.
C. C. Poole

Inventor:-
Alvan P. Granger.-
by M. E. Dayton
Attorney.-

N. PETERS, Photo-Lithographer, Washington, D. C.

UNITED STATES PATENT OFFICE.

ALVAN P. GRANGER, OF DENVER, COLORADO.

MACHINE FOR CRUSHING OR DISINTEGRATING ORES, &c.

SPECIFICATION forming part of Letters Patent No. 376,877, dated January 24, 1888.

Application filed December 7, 1885. Serial No. 185,015. (No model.)

To all whom it may concern:

Be it known that I, ALVAN P. GRANGER, of Denver, county of Arapahoe, and State of Colorado, have invented certain new and useful Improvements in Machines for Crushing or Disintegrating Ores and Similar Materials; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form part of this specification.

This invention relates to a new form of machine for crushing ores and other similar materials; and it consists in the several matters hereinafter set forth, and pointed out in the appended claims.

In the accompanying drawings, Figure 1 is a side elevation of a machine containing my invention. Fig. 2 is a central vertical transverse section, taken in the line *x x* of Fig. 1, looking in the direction of the arrow applied to said line. Fig. 3 is a central vertical section of the operative parts, taken in the line *x x* of Fig. 2.

A represents a heavy revolving metal wheel mounted on a driving-shaft, A′, which affords trunnions for said wheel, that are fitted to suitable bearings in a frame, C. The wheel A has on its periphery alternating transverse depressions and intervening prominences, respectively marked A^2 A^3. The undulations of the peripheral surface which form these depressions and prominences are not necessarily of the particular form shown, though I prefer, for some purposes of the machine, that the hollows shall descend somewhat abruptly at their forward or more advanced sides, reference being had to the direction in which the wheel rotates, as indicated by the arrow on Figs. 1 and 3.

A^4 are flanges applied to or formed upon the sides of the wheel A and extending beyond the periphery, so as to form substantially a peripheral trough about the wheel. I term the irregular wheel A a "mortar-wheel."

B is a heavy roller placed above the mortar-wheel and fitted to enter the depressions A^2. It is also adapted in some suitable way to rise and fall freely as the latter is rotated beneath it. In the present instance the roller B is thus movably held in proper relation to the mortar-wheel by means of arms or "radius-bars" B^2, which receive the trunnions B′ of said roller at one end, and at their opposite ends are pivoted to arms C′ of the machine-frame.

D is an endless-belt elevator, reaching at its foot into a hopper or receptacle, E, into which the material to be operated upon is placed. At its upper end it delivers by a suitable spout into the peripheral trough on the mortar-wheel A at a point in front of the roller B. As a preferred construction, I have shown a spout, F, which is pivoted to the elevator-box or to the frame, and at its outer or free end rides on the undulating surface of the mortar-wheel. It thus receives a suitable motion to discharge freely, (though this might be effected by its pitch,) and it also prevents the material fed by it from escape beneath the spout.

G is a screen-chute, which desirably extends from a point about on a level with the axis of the mortar-wheel, and is curved forward beneath the mortar-wheel to a point adjacent to the lower end of the elevator. This screen-chute consists of a sheet-metal bottom or board, G^2, side boards, *g*, and a screen-cloth, G′, secured to said side-boards or otherwise sustained at a suitable distance above or inside the bottom G^2. The screen structure G is pivoted at its upper end to arms C^2 of the frame C, and at its lower end rests upon a shaker, G^3, by rotation of which the chute is agitated. The screen-cloth is arranged to deliver into the rear end, E′, of the hopper E, while the bottom board, G^2, stops short of the screen and delivers into a suitable receptacle, H.

Adequate means for the rotation of the mortar-wheel, the elevator-drum D′, and shaker G^3 being provided, it is evident that the operation will be as follows:

Material placed in the hopper E will be delivered upon the periphery of the mortar-wheel by the elevator D and spout F, and in its progress with the surface of the wheel, on which it rests, will be carried beneath the roller B and be thereby crushed. Passing onward with the traveling surface of the wheel A, it will fall therefrom upon the screen G, through which the properly-reduced particles will pass, while the portion not sufficiently reduced will be carried on and delivered by the

screen into the hopper E, to be again raised and acted on by the crushing-roller B, as before.

It is manifest that by providing an undulating or irregular surface on the mortar-wheel, and thus producing a vertically-reciprocating movement of the crushing-roller B, the latter will act with a power greater than that due to its weight simply at the points at which its downward movement is arrested or reversed. It is also manifest that by giving the mortar-wheel a sufficient speed (not great) or by making the forward ends of the depressions abrupt the roller B may be made to drop with considerable force against the bottom of the depressions and thus to act as a stamp in a common stamp-mill. It is this contemplated use and action (which will more commonly be resorted to) that has suggested the name above given to the wheel A. In view of such severe action of the roller B upon the mortar-wheel, I have shown at *a* steel or chilled plates applied as facings to the more exposed surfaces of the mortar-wheel and a continuous steel or chilled shell, B^3, to the surface of the rollers B. For holding the plates *a* countersunk bolts *a'* are shown, terminating at their threaded ends in recesses a^2 in the sides of the wheel which accommodate the holding-nuts. The casing or shell B^3 of the roller is preferably shrunk upon the roller, though, obviously, it may be otherwise secured.

In the use of a vertically-vibrating spout, F, which drops immediately after passing the prominences A^3 of the mortar-wheel, it is evident that the principal discharge from said spout will be into the depression A^2, and that the pitch of said spout may be so arranged that it will discharge only into said depressions. These various adjustments and operations and the raising of the roller-stamp and of the free end of the spout by other means than those of the prominences A^3, as may manifestly be done, are intended to be all embraced in my appended claims.

In the understanding, also, that a wheel, A, rotating on a horizontal axis and having an undulating peripheral surface, in combination with a radially-movable crushing-roller, is new, I do not wish to be restricted to the particular form of the undulations of the wheel, to the details of its construction, or to the particular form of the various accessories. Neither do I wish to be restricted to the location of the crushing-roller at the exact point shown, or to the radius-bars, as the means for holding it in place while allowing the desired radial movement thereof.

I claim as my invention—

1. In a crushing-machine, the combination, with a rotating wheel mounted on a horizontal axis and having depressions in its periphery, of a crushing-roller of suitable form to enter the depressions, arranged to ride said wheel, substantially as described.

2. The combination, in a crushing-machine, of a rotating wheel mounted on a horizontal axis, and having on its periphery concaved or curved depressions alternating with elevations whose surfaces are continuous with those of the depressions, and a vertically-movable crushing-roller fitted to enter the depressions and arranged to ride the periphery of the wheel, substantially as described.

3. A rotating wheel having a succession of curved depressions and elevations in its periphery, the descent of the depressed surfaces being relatively more abrupt at their advanced than at their rear ends, in combination with a vertically-movable crushing-roller fitted to enter the depressions and arranged to ride the wheel, substantially as described.

4. The combination of a rotating wheel having a series of peripheral depressions to contain material to be crushed, a movable stamp adapted to enter said depressions, and cam-acting surfaces carried by the wheel, operating to lift the stamp preliminary to its descent into the depressions, substantially as described.

5. The combination of a rotary wheel having a series of peripheral depressions to contain material to be crushed, a movable stamp-roller adapted to enter said depressions, and cam-acting surfaces carried by the wheel, operating to lift the roller preliminary to its descent into the depressions, substantially as described.

6. In combination with a vertically-movable crushing-roller, a wheel having a succession of depressions and elevations upon its periphery, and flanges at the margins of the periphery, forming a peripheral trough in which the crushing-roller rides, substantially as described.

7. In combination with a rotating mortar-wheel having a series of depressions in its periphery and a crushing-roller, a feed-spout which rises and falls with the surface of the periphery of the wheel, substantially as described.

8. The combination, with the mortar-wheel and crushing-roller, of an elevator and a vertically-vibrating spout leading from the elevator to the wheel, substantially as described.

9. The combination, with the mortar-wheel, a crushing-roller, and a hopper, of elevator mechanism which raises the material from the hopper to the upper surface of the mortar-wheel and a screen arranged to receive the crushed product and to deliver the tailings back to the hopper, substantially as described.

10. The combination, with the rotating mortar-wheel and a stamp operating on the upper surface of the wheel, of a curved screen-chute extended beneath the wheel and pivoted at its upper end, and a shaker for the chute, substantially as described.

ALVAN P. GRANGER.

Witnesses:
JOHN ROGER,
CHARLES H. MURRAY.