E. A. WALL.

ORE CRUSHER.

APPLICATION FILED FEB. 8, 1911.

988,749. Patented Apr. 4, 1911.

3 SHEETS—SHEET 1.

Fig. 1.

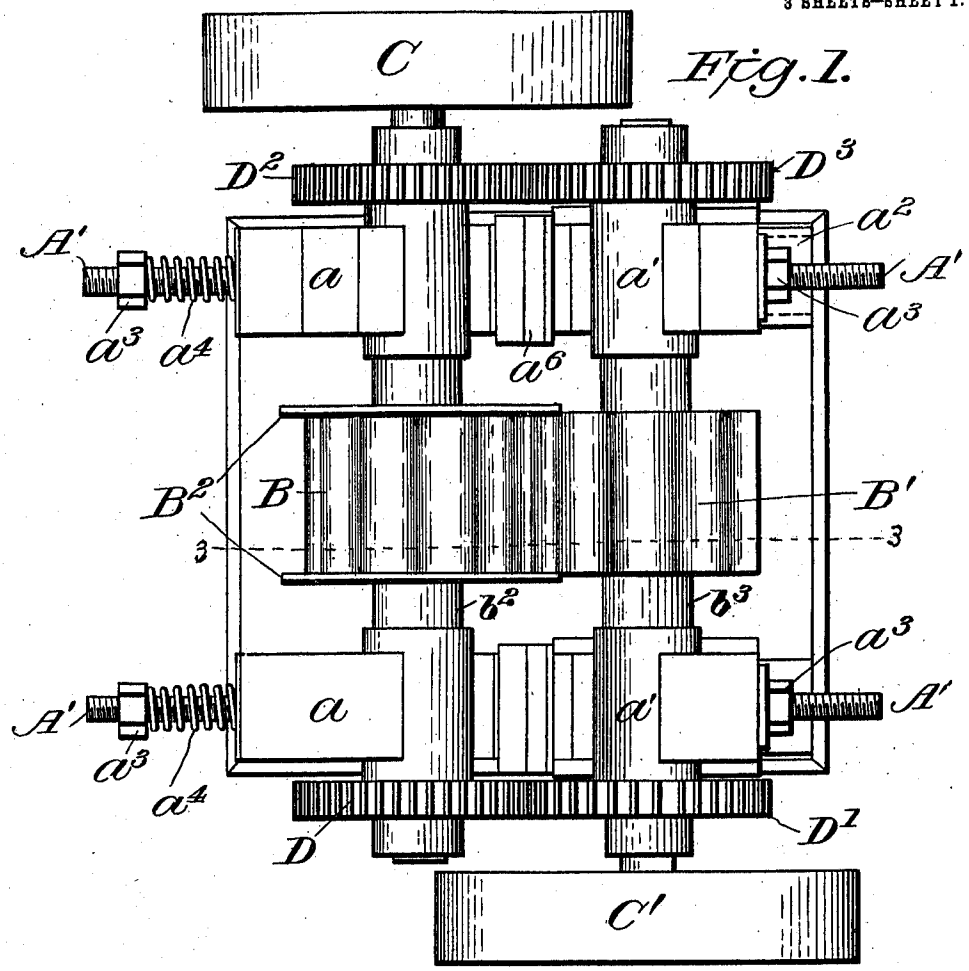
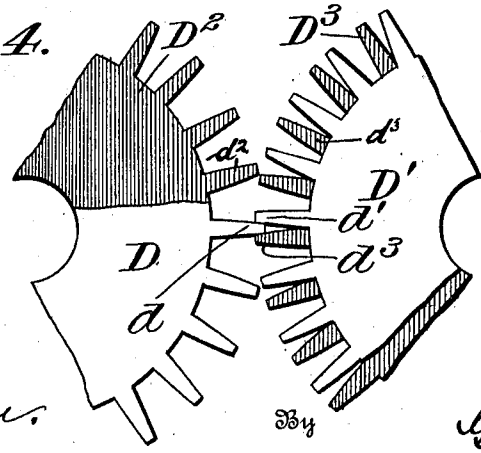


Fig. 4.



Witnesses

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3 SHEETS—SHEET 2.

Fig. 2.

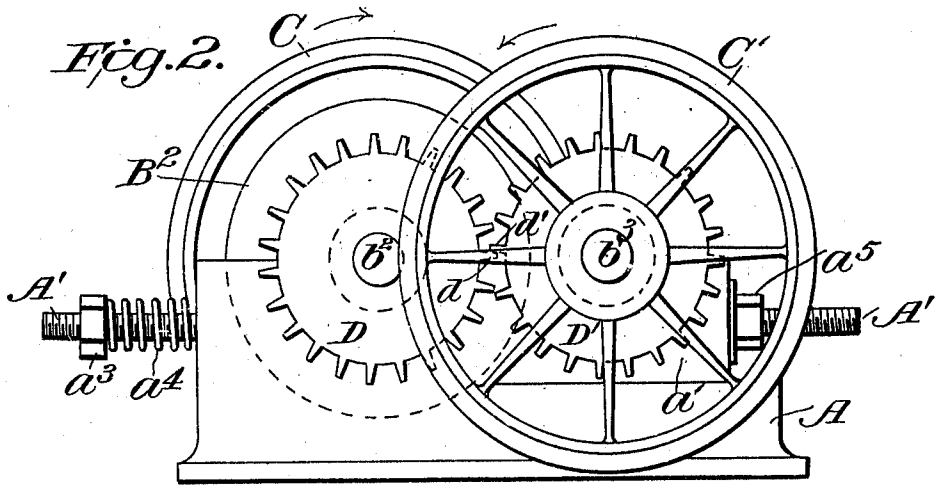


Fig. 3.

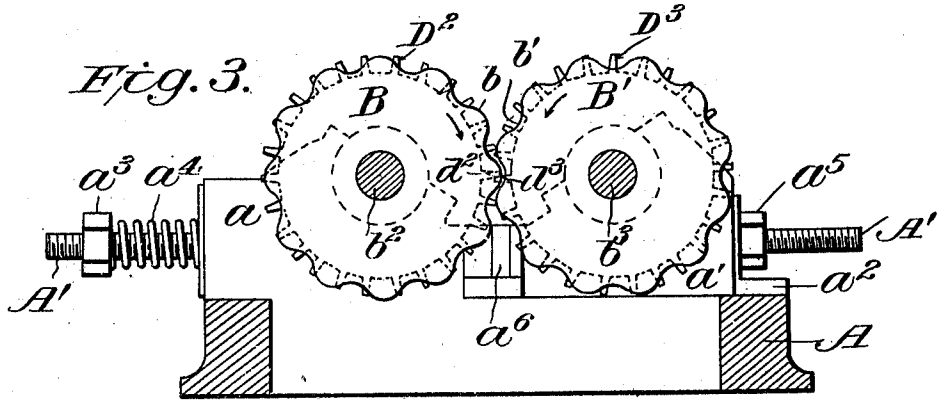
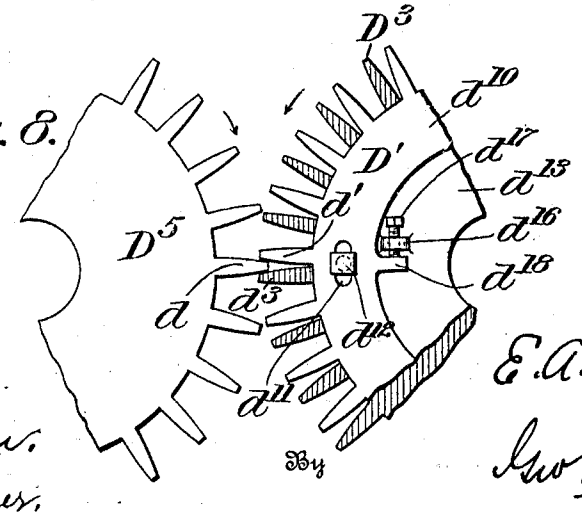


Fig. 8.



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3 SHEETS—SHEET 3.

Fig. 5.

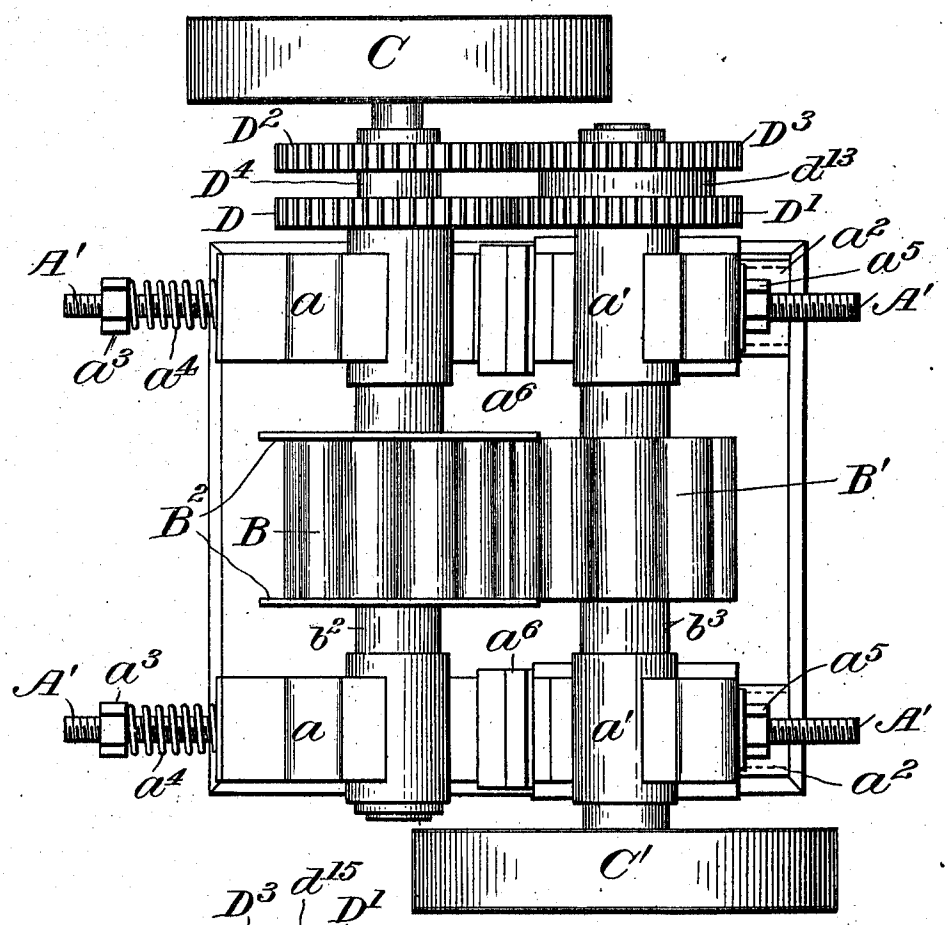


Fig. 6.

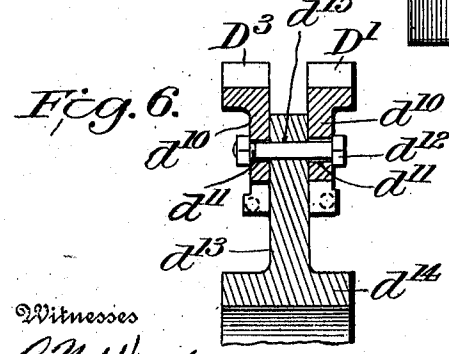
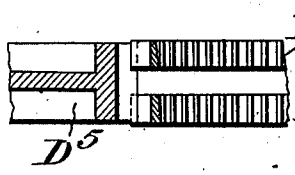


Fig. 7.



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UNITED STATES PATENT OFFICE.

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ORE-CRUSHER.

988,749. Specification of Letters Patent. Patented Apr. 4, 1911.

Application filed February 8, 1911. Serial No. 607,329.

To all whom it may concern:

Be it known that I, ENOS A. WALL, a citizen of the United States, residing at Salt Lake City, in the county of Salt Lake and State of Utah, have invented certain new and useful Improvements in Ore-Crushers, of which the following is a specification.

My invention relates to that class of ore crushing mills in which the surfaces of the rolls are provided with intermeshing longitudinal corrugations. In such crushers where one roll only was driven by a pulley, as heretofore, the crushing effect of the rolls would be limited to one side only of each corrugation. This action is due to the fact that the other one of the rolls was rotated by a "finger-gear" engaging in like gear on the opposite driven roll, and whenever the corrugations of the gear-driven roll assumed a relation to the corrugations of the pulley driven roll, corresponding to the relation of the teeth of the finger-gears, the gear-driven roll, by reason of the pressure of the corrugation of the opposite roll upon the intervening rock sought to be crushed, would be forced forward, at increased speed, until arrested by the next succeeding tooth of the finger-gear, that is, to the extent of the "back-lash" or clearance space between the teeth of the finger gears, with the result that large pieces of rock would pass between the rolls without being crushed at all. Finger-gears or gears with widely spaced teeth are necessary with this class of rolls owing to the frequent adjustment of the rolls due to their rapid wear, as finger-gears allow of a wide adjustment while ordinary driving gears would not allow the worn rolls to be adjusted toward each other.

The object of the present invention is to provide an ore crusher wherein similarly corrugated horizontal crushing rolls, having their corrugations disposed longitudinally and parallel to the axes or shafts upon which the rolls are mounted, may be held and operated in such manner that the opposite intermeshing-corrugated faces will maintain substantially equidistant relations, to each other, thereby securing a uniformly crushed product and a high degree of economic efficiency in their operation. To accomplish this result I employ a separate driving pulley upon each roll shaft, which pulleys are bolted to a common driving shaft, not shown, and adapted to revolve at the same speed, and in addition I place on both of the roll shafts, long-toothed controller wheels, with their teeth widely spaced, and the teeth of one set of wheels engaging oppositely to the teeth of the other set so as to prevent the travel or rotation of either roll, faster or slower than the other, which otherwise would result from the slipping of one of the belts and so also to allow the rolls when worn to be adjusted toward each other. This object I accomplish by the construction shown in the accompanying drawing in which—

Figure 1 is a plan of my improved ore crusher; Fig. 2 is a side elevation thereof; Fig. 3 is a sectional side elevation on line 3—3, Fig. 1; Fig. 4 is a diagrammatic view showing the relation of the two pairs of controller wheels; Fig. 5 is a plan of my improved ore crusher with the controller wheels differently arranged; Fig. 6 is a detail sectional view of one pair of controller wheels in which the rims are adjustable; Fig. 7 is a sectional plan of both sets of controller wheels further modified; Fig. 8 is a sectional side elevation of the adjustable controller wheels of Figs. 5, 6 and 7.

A designates a suitable base provided with stationary bearings a a, and adjustable bearings a', a', mounted on slideways a^2, a^2.

A′, A′, are the long adjusting bolts threaded at both ends and extending through both sets of bearings a, a'. The bolts are provided between their adjusting nuts a^3 and the stationary bearings a, with tension springs a^4, and at their opposite ends with adjusting nuts a^5, bearing against the outer sides of the adjustable bearings a'.

B, B′, are the crushing rolls provided with longitudinal corrugations parallel with the axes of the rolls; the ribs b, of one roll entering the corrugations b' of the other roll. The rolls are spaced apart so that their corrugated working faces do not contact at any point during their rotation. The shaft b^2 of roll B, is mounted in the bearings a, and the shaft b^3 of roll B′ is mounted in the movable bearings a'.

B², are circular plates at the ends of roll B and of a diameter to overlap the adjacent portion of roll B′ and so prevent the escape of the material being crushed, at the ends of the rolls.

The movable bearings are held in their

outermost positions by spacing blocks a^6 placed between their inner ends and the inner ends of the stationary bearings.

Each shaft b^2, b^3, is provided with a large belt pulley C, C′, respectively, belted to a common drive shaft, not shown, so that they and the rolls will be rotated at the same rate of speed in the direction of the arrows, Figs. 2 and 3.

In order that either of the rolls of Figs. 1, 2, 3, may be positively held against rotating faster than the other, should either of the belts slip, I provide two pairs of long-toothed controller gears D, D′ and D², D³ mounted on the shafts b^2, b^3, at their outer ends. The near controller wheels D, D′, are shown in Fig. 2 and the far controller wheels are shown in Fig. 3, and both pairs are diagrammatically shown in Fig. 4. The teeth of these controller wheels are long and are spaced farther apart than the teeth of drive gears and serve to prevent one roll from moving faster than the other should its belt slip. Furthermore the form of controller wheel will allow of the adjustment of the rolls toward each other as worn down without the necessity of applying different sizes of gears to the roll shafts as would be necessary were ordinary driving gears employed. Moreover, the teeth of the controller wheels D, D′, are oppositely engaged from the teeth of the controller wheels D², D³, as will be seen from Figs. 2, 3 and 4. In Figs. 2, 3 and 4, it will be seen that the upper side of tooth d of wheel D, is engaged by the lower side of tooth d', of wheel D′, while the lower side of teeth d^2 of wheel D² engages the upper side of the tooth d^3 of wheel D³. Thus, while possessing the advantages of regular driving gears in preventing all back-lash or unequal rotation of the rolls, and thereby preserving the proper relation of their corrugated surfaces, my controller wheels as thus oppositely arranged, may be moved together with the rolls as the latter wear down just as the ordinary single pair of finger gears may be so moved together, without, however, any danger of the unequal movement or back-lash due to the employment of a single pair of finger gears. To produce this opposite arrangement of the teeth of the controller wheels it is only necessary to set the wheel D³ with its teeth d^3 in alternation with the teeth of the wheel D′, that is, one set of teeth is in parallel lines to the other instead of in transverse alinement. It will be seen, therefore, that by preserving the proper relation of the ribs of one roll to the corrugations of the other, the crushing will be effected by the entire surfaces of the coacting ribs and corrugations thus insuring the production of a uniform granular product entirely free from refractory slimes.

Referring now to Fig. 5, it will be seen that the controller wheels are all at one side of the machine instead of at opposite sides as in Fig. 1. Both wheels D, D², are fixed or formed on a common hub or they may be formed as a single wide toothed wheel D⁵; see Figs. 7 and 8 which is in effect a pair of controller wheels owing to its width being increased to engage with the other pair of controller wheels D′, D³; the teeth of the wheels D′, D³, in Figs. 7 and 8, engaging opposite sides of the teeth of the wheel D⁵ just as do the teeth of the controller wheels in Figs. 2, 3, and 4.

In Figs. 6 and 8 the controller wheels D′, D³, are in the form of toothed rings having flanges d^{10}, provided with slots d^{11}, and these flanges are secured by bolts d^{12}, to the opposite sides of a flange d^{13}, on a hub d^{14} the bolts extending through said slots d^{11}, and through registering apertures d^{15}, in the hub flange d^{13}. The inner periphery of each rim flange d^{10}, has a lug d^{18}, which lugs are engaged by set screws d^{17}, mounted in lugs d^{16}, on opposite sides of the hub flange d^{13}, so that proper adjustment of the toothed rims may be had by first loosening the bolts d^{12}, and setting up the set screws d^{17}.

In all of these several forms the same idea is involved, viz: the engaging of the controller teeth of one roll shaft oppositely with the teeth of the other controller shaft, no matter whether the pairs of controller wheels D, D², are made as actually separate, or spaced apart on one hub, or made as a double width wheel. In using the term pair of controller wheels, or pairs of controller wheels I intend to cover them whether actually in pairs or made as just described.

What I claim is:—

1. An ore crusher comprising, relatively adjustable, longitudinally corrugated crushing rolls, separately driven belt pulleys upon the roll-shafts adapted to drive the rolls inwardly in opposite directions at the same rate of speed, long toothed controller wheels on both shafts, the teeth of one pair of controller wheels engaging opposite sides of the controller teeth of the other shaft and thereby synchronizing the speed of said rolls and preventing the rotation of either roll faster or slower than the other, and also allowing the controller wheels and rolls to be adjusted toward each other as the rolls wear down.

2. An ore crusher comprising, relatively adjustable, longitudinally corrugated crushing rolls, separately driven belt pulleys upon the roll-shafts adapted to drive the rolls inwardly in opposite directions at the same rate of speed, a pair of long-toothed controller wheels on each shaft; one pair of wheels comprising a common hub and two adjustable toothed rims thereon the teeth of which engage opposite sides of the controller teeth of the other shaft to thereby

synchronize the speed of said rolls and prevent the rotation of either roll faster or slower than the other and also allow the controller wheels and rolls to be adjusted toward each other as the rolls wear down.

3. An ore crusher comprising, relatively adjustable, longitudinally corrugated crushing rolls, separately driven belt pulleys upon the roll-shafts adapted to drive the rolls inwardly in opposite directions at the same rate of speed, a double-width, long-toothed controller wheel on one shaft, controller wheels on the other shaft having two long-toothed rims adjustable thereon and their teeth engaging opposite sides of the teeth of the first named controller wheel to thereby synchronize the speed of said rolls and prevent rotation of either roll faster or slower than the other and also allow the controller wheels and rolls to be adjusted toward each other as the rolls wear down.

In testimony whereof I affix my signature in presence of two witnesses.

ENOS A. WALL.

Witnesses:
A. M. PARKINS,
GEO. H. EVANS.