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CRUSHER.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, RAY C. NEWHOUSE, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented a certain new and useful Improvement in Crushers, of which the following is a specification.

This invention relates to improvements in the construction of crushers for rock and ore.

The object of the invention is to produce a crusher of the type in which one of the pair of opposed crusher elements is gyrated to produce crushing, and both of the elements are rotated to cause feeding of the material through the crusher chamber by centrifugal force, which is simple in construction and efficient in operation, and especially in which the friction is reduced.

The primary features of the crusher herein disclosed are claimed in co-pending application S. N. 609,649 filed Feb. 20, 1911.

A clear conception of one embodiment of the invention can be had by referring to the drawing accompanying and forming a part of this specification in which like reference characters designate the same parts in different views.

Figure 1 is a transverse vertical section through a crusher and its inclosing casing. Fig. 2 is a transverse horizontal section through the crusher, the section being taken along the line II-II of Fig. 1, looking in the direction of the arrow.

The crusher supporting frame 15 consists essentially of a central cylindrical portion provided at its upper end with a flange 151 upon which the crushing members are supported, and at its lower end with a gear housing 152. Liners 30 are mounted upon the upper end of the frame 15 and these together with the cap 10 form the inclosing housing for the crushing members. The frame 15 is provided with an inclined portion directed toward the discharge opening 26, along which the crushed material can flow by gravity during its passage from the crushing chamber to the discharge opening 26. The cap 10 is provided with a lined hopper 1 which is adapted to direct the raw material to the crushing chamber. The cap 25 closes the lower end of the gear chamber within the housing 152 and forms a bearing for the gyrating eccentric 22. The cap 23 is provided with oil distributing ports 24.

The caps 10, 25, are removable, thus permitting ready inspection of the crusher elements.

The concave crushing roll or member 5 is provided with a central inlet opening and has its crushing surface protected by liners 3. The convex crushing roll or member 4 is conical in shape and extends within the concave member 5. The crushing chamber 2 is formed between the opposed crushing surfaces of the members 4, 5, and has a continuous discharge opening adjacent the outer peripheries of these members. The convex member 5 is supported by a flange 9 formed in one with the shaft 14 by means of a series of collars 6 and washers 61 which permit adjustability of the parts to vary the distance between the crushing surfaces. The flange 9 has a lower plane surface which acts with bearing plates 17, these bearing plates resting directly upon an upper plane surface of the flange 151 formed on the frame 15. The convex member 4 has a lower plane surface which coacts directly with the bearing plates 18, the lower plane surface of which coacts directly with the upper plane surface of the flange 9. The outer hollow shaft 14 closely fits the bore of the wearing bushing 16 having a liner 161, which is secured to the frame 15. The inner shaft 12 has a tapered end 7 which extends into a recess in the member 4. The tapered end 7 of the shaft 12 coacts along one side of the bore of the cylindrical bushing 8 secured in the recess of the member 4. The tapered intermediate portion 11 of the shaft 12 extends through the bore of the bushing 13 which is secured within the outer shaft 14. The portion 11 of the shaft 12 coacts along one side of the bore of the bushing 13. The shaft 12 is suspended from the outer shaft 14 through the bushing 13 by means of a collar 120 formed on the inner shaft 12 directly above the tapered portion 11. It will thus be seen that the entire weight of the crushing members and their driving shafts is carried by the frame 15 through the bearing plate 17. It should also be noted that the shaft 12 has rolling engagement with the bushings 8, 13, since there is no positive connection between the shaft and these elements.

The lower end of the outer or hollow shaft 14 is provided with a gear 19 which meshes with a pinion 20 carried by the shaft 28.

The lower end 23 of the shaft 12 extends into a bore in the gyrating eccentric 22, the upper end of which is provided with gear teeth which mesh directly with the second pinion 21 secured to the end of the shaft 28. The shaft 28 has a driving pulley 29 secured to the outer end thereof and is supported in a bearing 27 secured to the base of the frame 15.

During the operation of the crusher, the material is admitted to the crushing chamber 2 through the hopper 1 and the central opening in the crushing member 5. The external shaft 14 is rotated by means of the pulley 29, shaft 28, pinion 20, and gear 19, causing the material entering the chamber 2 to travel toward the periphery thereof due to the action of centrifugal force on the material. The larger pieces of material admitted to the chamber 2 soon become wedged between the opposed crushing surfaces of the concave crushing member 5 and the convex crushing member 4, causing the member 4 to rotate by friction in the same direction and at substantially the same speed as that of the member 5.

As the shaft 28 is rotated, causing the crushing members to rotate as above described, it transmits rotary motion through the pinion 21 to the eccentric 22, thus at the same time causing the eccentric 22 to be rotated in a direction opposite to the direction of rotation of the crushing members 4, 5. This rotation of the eccentric 22 causes the shaft 12 to roll upon the inner cylindrical surfaces of the bushings 13, 8, giving the convex crushing member 4 a gyratory motion in addition to its rotary motion. The gyration of the member 4 causes each portion of the crushing surface thereof to periodically approach and recede from an adjacent portion of the crushing surface of the concave member 5. As these crushing surfaces approach and recede from each other the material which is simultaneously advanced along the surfaces by centrifugal force is successively crushed and advanced until it has been reduced to an extent permitting its discharge from the annular discharge passage formed between the crushing members at their portions of greatest diameter. The material leaving the crushing chamber 2 is discharged against the liners 30 from which it drops by gravity to the inclined portion of the frame 15, being finally discharged through the opening 26.

It will be noted that with the present construction the pressures against the eccentric bearing at the bottom of the shaft 12 may, with a proper designing of the parts, be reduced to a minimum since the shaft 12 operates as a lever having the portion 11 as a fulcrum. The power is applied at the portion 23 and the work is done at the portion 7 thereof. The engagement, during operation

of the device, between the portion 7 and the bushing 8, as well as between the portion 11 and the bushing 13, is a rolling contact along a line being very much similar to well known suspensions used in gyratory crushers. This feature is an important one as it reduces the friction to a minimum. The feature of permitting feeding of the material through the crushing chamber by the rotation of the crushing members, provides a simple and efficient means for quickly progressing and discharging the crushed material. The use of a single shaft 28 and pulley 29 for oppositely rotating and gyrating the crushing members, provides a simple and effective method for utilizing a single power source to operate the entire crusher. It will also be noted that by changing the ratios of the pinions and gears, the relative rates of speed of the crushing members 4, 5, and gyrations of the convex member can be made any desired amount.

It should be understood that it is not desired to be limited to the exact details of construction shown and described, for obvious modifications will occur to a person skilled in the art.

It is claimed and desired to secure by Letters Patent,—

1. A crusher comprising a pair of crushing members, means for causing rotation of said members to feed material from end to end thereof by centrifugal force, and a shaft for gyrating one of said members, said shaft being disconnected from said member and having its axis inclined relative to the axis of said member.

2. A crusher comprising a pair of crushing members having a crushing chamber formed between them, means for rotating said members to feed material through the crushing chamber by centrifugal force, and a shaft for gyrating one of said members, said shaft having rolling engagement with said member.

3. A crusher comprising a pair of crushing members having a crushing chamber formed between them, means for rotating said members to feed material through the crushing chamber by centrifugal force, means for gyrating one of said members, said means having rolling engagement with said member, and means for actuating said gyrating means.

4. A crusher comprising a pair of crushing members having a crushing chamber formed between them, means for rotating said members to feed material through the crushing chamber by centrifugal force, means for gyrating one of said members, said means having rolling engagement with both of said members, and means for actuating said gyrating means.

5. A crusher comprising a pair of crushing members having a crushing chamber

formed between them, means for rotating
said members to feed material through the
crushing chamber by centrifugal force,
means for gyrating one of said members,
5 said means having rolling engagement with
one of said members, and means for actuat-
ing said gyrating means.

In testimony whereof, the signature of the
inventor is affixed hereto in the presence of
two witnesses.

RAY C. NEWHOUSE.

Witnesses:

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