Sept. 9, 1924. 1,507,970

A. A. LAZIER

ORE CRUSHER

Filed Jan. 24, 1923 2 Sheets-Sheet 1

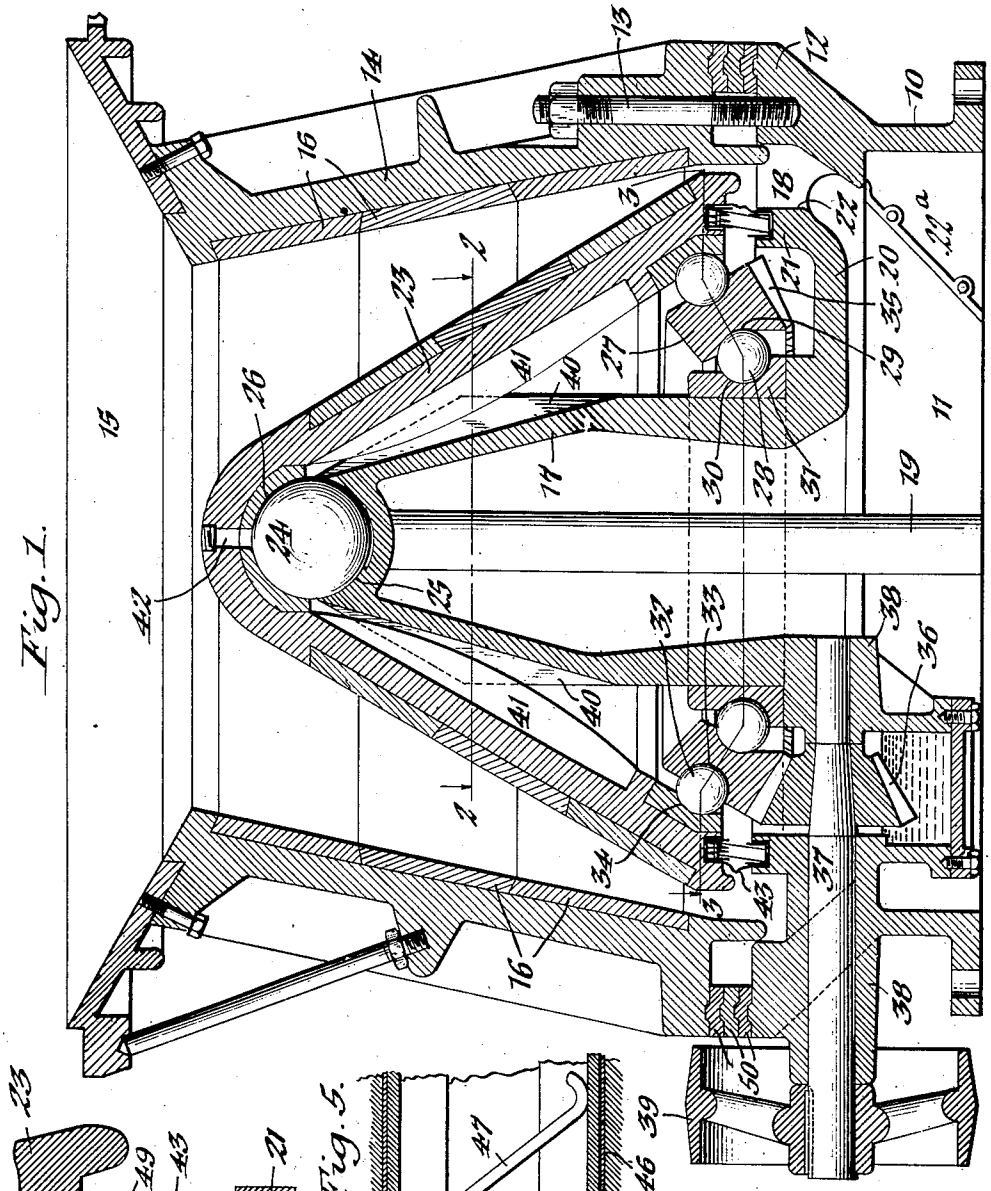


Fig. 1.

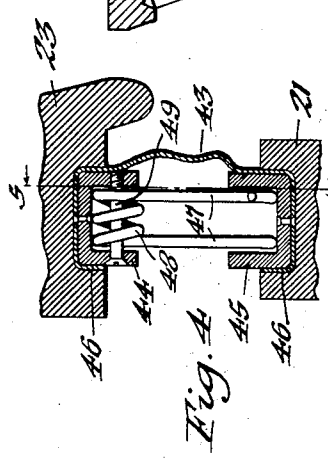


Fig. 4.

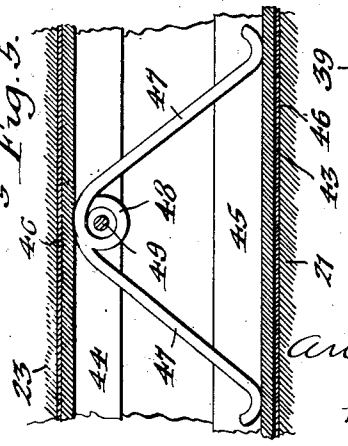


Fig. 5.

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Fig. 3.

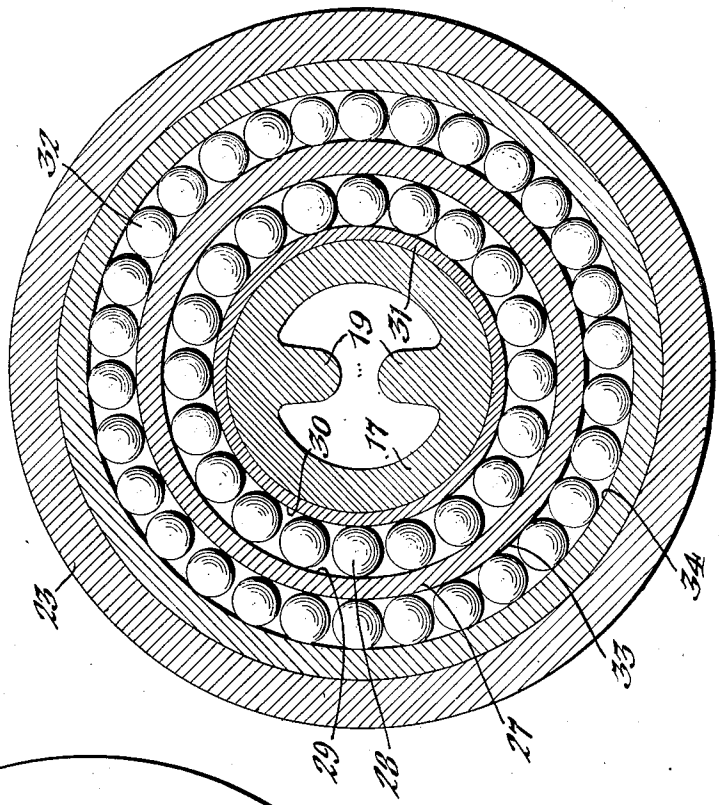
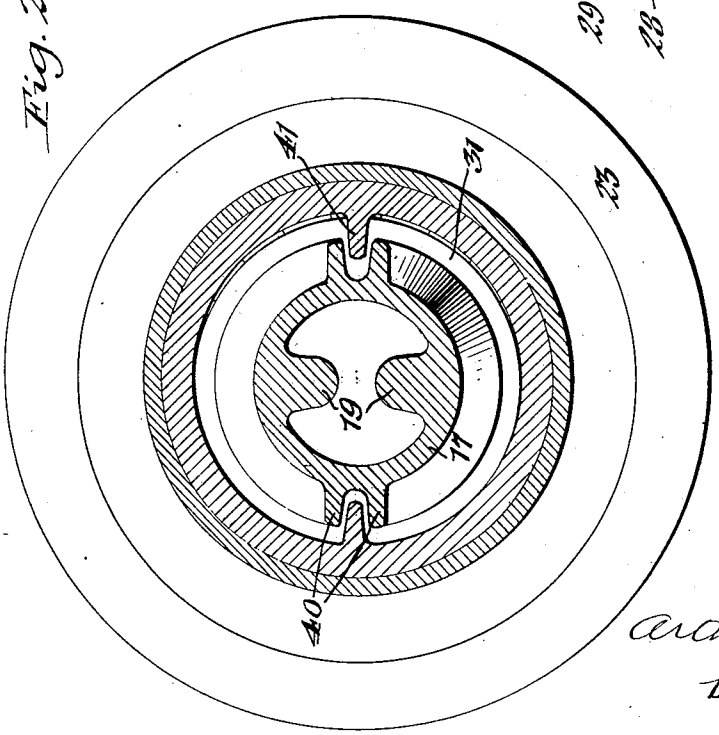


Fig. 2.



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UNITED STATES PATENT OFFICE.

ARTHUR A. LAZIER, OF BUFFALO, NEW YORK.

ORE CRUSHER.

Application filed January 24, 1923. Serial No. 614,676.

To all whom it may concern:

Be it known that I, ARTHUR A. LAZIER, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented new and useful Improvements in Ore Crushers, of which the following is a specification.

This invention relates to a machine for crushing stone and other materials.

One of its objects is the provision of a compact and powerful crusher of large capacity in which superfluous weight is eliminated.

A further object is to improve the means for supporting and actuating the oscillating crushing member or muller, with a view of eliminating shafts or other obstructions from the feed hopper of the machine and preventing so-called "bridging" of the stone therein and clogging of the same.

An additional object is to provide simple means for preventing the crushed stone or dust from escaping into the driving mechanism of the machine and injuring or breaking the same, as well as preventing the escape of the lubricating oil from the space within the muller into the passage between it and the stationary shell.

In the accompanying drawings: Figure 1 is a vertical section of a machine embodying my improvements. Figures 2 and 3 are horizontal sections on the correspondingly numbered lines in Fig. 1. Figure 4 is an enlarged transverse section of the protective apron and adjacent parts. Figure 5 is a longitudinal section on line 5—5, Fig. 4.

Similar characters of reference indicate corresponding parts throughout the several views.

10 indicates the base or supporting frame of the machine which may be of any appropriate form and construction and which is hollow and open at its bottom to form a discharge passage 11 for the crushed material. Secured upon the rim 12 of the base by bolts 13 or other fastenings is a substantially frusto-conical shell or casing 14 which is provided at its upper end with a hopper 15 into which the material to be crushed is fed. The inner wall of this shell is preferably provided with renewable wear plates or liners 16 of manganese or other suitable material.

Carried by the base 10 and extending upwardly into the shell 14 is a supporting post or standard 17. In the drawings, this post is shown as cast integral with said base, the same being joined thereto by radial ribs 18 and vertical ribs 19, as seen in Fig. 1. Said post is centrally located with reference to the shell and its bottom 20 terminates in an upstanding annular flange 21 which is concentric with the discharge opening 11 of the base and spaced therefrom to form an annular passage 22 from which leads a chute 22^a.

23 indicates the hollow muller or mantel of the machine which is suspended from the post 17 and to which is imparted an oscillating or wabbling motion for crushing the material between it and the surrounding shell 14. In the preferred embodiment shown in the drawings, this muller is conical or bell-shaped and its apex is suspended centrally from the post by means of a swivel bearing in the form of a comparatively large ball 24. The latter is seated in a substantially hemispherical socket 25 formed in the top of the supporting post, and the top of the muller is provided with a similar socket or bearing 26 which receives the upper side of said ball. There is sufficient play between the opposing edges of these sockets to permit the necessary oscillating movement of the muller on said bearing ball.

The means for oscillating the muller about its ball support 24 as a fulcrum preferably consists of a rotary horizontal cam or wedge-ring 27 which encircles the lower portion of the post 17 and is journaled on a ball bearing 28, the balls which run in races 29, 30 formed on the opposing sides of said cam ring and a fixed collar 31 applied to the lower end of the muller-support post. A similar ball bearing 32 is interposed between the outer face of the cam ring and the opposing inner side of the muller, the balls running in races 33 and 34, respectively. The balls and races of the lower or inner bearing 28 are arranged concentrically with the axis of the muller-supporting post and ball 24, while the balls and races of the upper or outer bearing 32 are arranged eccentrically to said supporting ball and said lower bearing, as shown in Figs. 2 and 3, the ball race 33 forming the functional face of the rotary cam ring which oscillates the muller through the interposed balls. The cam ring is provided on its lower side with beveled teeth 35

which mesh with a bevel pinion 36 mounted on the inner portion of a horizontal drive shaft 37 journaled in a suitable bearing 38 on the base 10, a driving pulley 39 being fixed to the outer end of said shaft. The ring 27 thus forms a combined bevel gear and circular cam of gradually increasing thickness, with its thickest and thinnest portions diametrically opposite each other, as shown in Figs. 2 and 3.

By supporting the muller in this manner, its weight, together with that of the stone being crushed, is borne by the post 17 and the suspension ball 24 and not by the ball bearings 28 and 32, thereby eliminating undue wear of these bearings. Furthermore, the stroke of the muller is comparatively small at the top and increases toward the bottom, affording the greatest crushing power or leverage in the upper part of the shell 14 where the largest stones lodge, while at the bottom of the muller, where less power is required to crush the partly-broken stone, its stroke is greatest and the leverage is less.

Lubricant may be supplied to the upper and lower bearings of the muller by any suitable means. In the construction shown, the muller is provided in its head with a normally-plugged feed-duct 42 leading to the suspension ball 24.

While it is necessary to permit oscillation of the muller, it is important to prevent its rotation with the cam ring 27, otherwise its comparatively great weight is liable to loosen the machine or shake it from its foundation, owing to the uneven or eccentric motion of the muller. For this purpose, the post 17 is preferably provided at opposite sides with spaced lugs 40 which loosely embrace vertical ribs 41 formed on the inner side of the muller, as shown in Figs. 1 and 3.

As shown in Fig. 1, the lower edge of the muller is spaced from the opposing edge of the flange 21 at the bottom of the supporting post 17 to allow the muller to oscillate freely. In order to prevent dust and dirt from passing through this space into the driving gearing of the machine and oil from escaping from the interior of the muller, a suitable sealing apron or shield 43 is extended across said space. In the example illustrated in the drawings, this apron consists of a band of raw hide or other flexible material having its upper and lower margins attached to the backs of channeled rings 44, 45, respectively. These rings, which face each other, are loosely seated in annular grooves 46 formed in the opposing faces of the muller and the member 12, and are yieldingly held therein by springs located at appropriate intervals. Each of these may consist of a pair of inclined legs 47 bearing at their free lower ends upon the corresponding ring 45 and connected at their upper ends by a coil 48 which encircles a transverse bolt 49 carried by the upper ring 44.

By this construction the marginal portions of the apron are held in close frictional engagement with the muller and the member 12, but not rigidly fastened thereto, thereby maintaining a dust and oil-tight joint between the apron and those parts and at the same time preventing its distortion or destruction by the oscillation of the muller.

In the operation of the machine, the material to be treated is fed into the hopper 15 and drops by gravity into the downwardly-converging throat formed between the shell 14 and the muller, the material being crushed by the wabbling action of the muller relatively to the fixed shell. By the eccentric formation of the rotary ring or gear 27, the material on one side of the muller is crushed, while the material on the opposite side is at the same time discharged through the annular passage 22 and opening 11 into a suitable hopper or receptacle, not shown. The wabbling motion of the muller is uniform and continuous and the crushion action is equally distributed throughout the circumference of the muller and the shell.

The stroke of the muller may be varied by changing the thickness of the cam ring 27.

Shims 50 may be interposed between the rim 12 of the base and the opposing end of the shell 14 to permit vertical adjustment of the latter relative to the muller 23 for varying the size of the crushed stone.

As the supporting post 17 is located wholly within the muller and does not extend above it, the feed hopper 15 and the mouth of the shell are left clear and free from obstructions, avoiding the liability of causing bridging of the stone and preventing clogging of the machine.

This improved construction affords the further advantages of a large crushing area and a correspondingly increased capacity; it eliminates unnecessary weight, and the machine as a whole is comparatively low, avoiding excessive elevating of the raw material into the feed hopper.

I claim as my invention:

1. In a crushing machine, the combination of a shell, a supporting post extending into said shell, an oscillatory crushing member suspended from said post, means for oscillating said member, and means for holding the latter against rotation relative to said post.

2. In a crushing machine, the combination of a shell, a supporting post extending into said shell, an oscillatory crushing member suspended from said post, means for oscillating said member, and loosely interlocking elements arranged on the opposing sides of

said post and said crushing member for holding the latter against rotation, while permitting oscillation thereof.

3. In a crushing machine, the combination of a shell, a supporting post extending into said shell and having spaced lugs, and an oscillatory crushing member suspended from said post and having an internal rib arranged between said lugs to hold the crushing member against rotation.

4. In a crushing machine, the combination of a base, a shell mounted on said base, an oscillatory crushing member arranged within said shell and spaced from said base, mechanism for actuating said member located between the latter and said base, a protective apron extending from the bottom of the crushing member to the base, for excluding dust from said actuating mechanism, and means for holding the crushing member against rotation.

5. In a crushing machine, the combination of a base, a shell mounted on said base, an oscillatory crushing member arranged within said shell and spaced from said base, mechanism for actuating said member located between the latter and said base, a flexible apron bridging the space between said base and the bottom of said crushing member and loosely engaging said parts, and means for holding the crushing member against rotation, while permitting oscillation thereof.

6. In a crushing machine, the combination of a base, a shell mounted on said base, an oscillatory crushing member arranged within said shell and spaced from said base, opposing rings frictionally engaging said base and the bottom of said crushing member, springs interposed between said rings, and a sealing apron closing the space between the base and the crushing member and having its upper and lower margins attached to said rings, respectively.

7. In a crushing machine, the combination of a base, a shell mounted on said base, an oscillatory crushing member arranged within said shell and spaced from said base, said base and the crushing member having annular grooves in their opposing faces, channeled rings loosely seated in said grooves, one of said rings carrying transverse bolts, a protective apron having its upper and lower margins attached to said channeled rings, and springs interposed between said rings and each consisting of a pair of legs connected by a coil which encircles one of said bolts, the free ends of said legs bearing against the opposing ring.

8. In a crushing machine, the combination of a base, a shell mounted on said base, an oscillatory crushing member arranged within said shell and spaced from said base, said base and the crushing member having annular grooves in their opposing faces, channeled rings loosely seated in said grooves, a protective apron having its marginal portions extended over the backs of said rings, and means for loosely holding said rings in said grooves.

ARTHUR A. LAZIER.