J. H. KELLY.

PULVERIZING MILL.

APPLICATION FILED SEPT. 30, 1912.

1,083,283.

Patented Jan. 6, 1914.

2 SHEETS—SHEET 1.

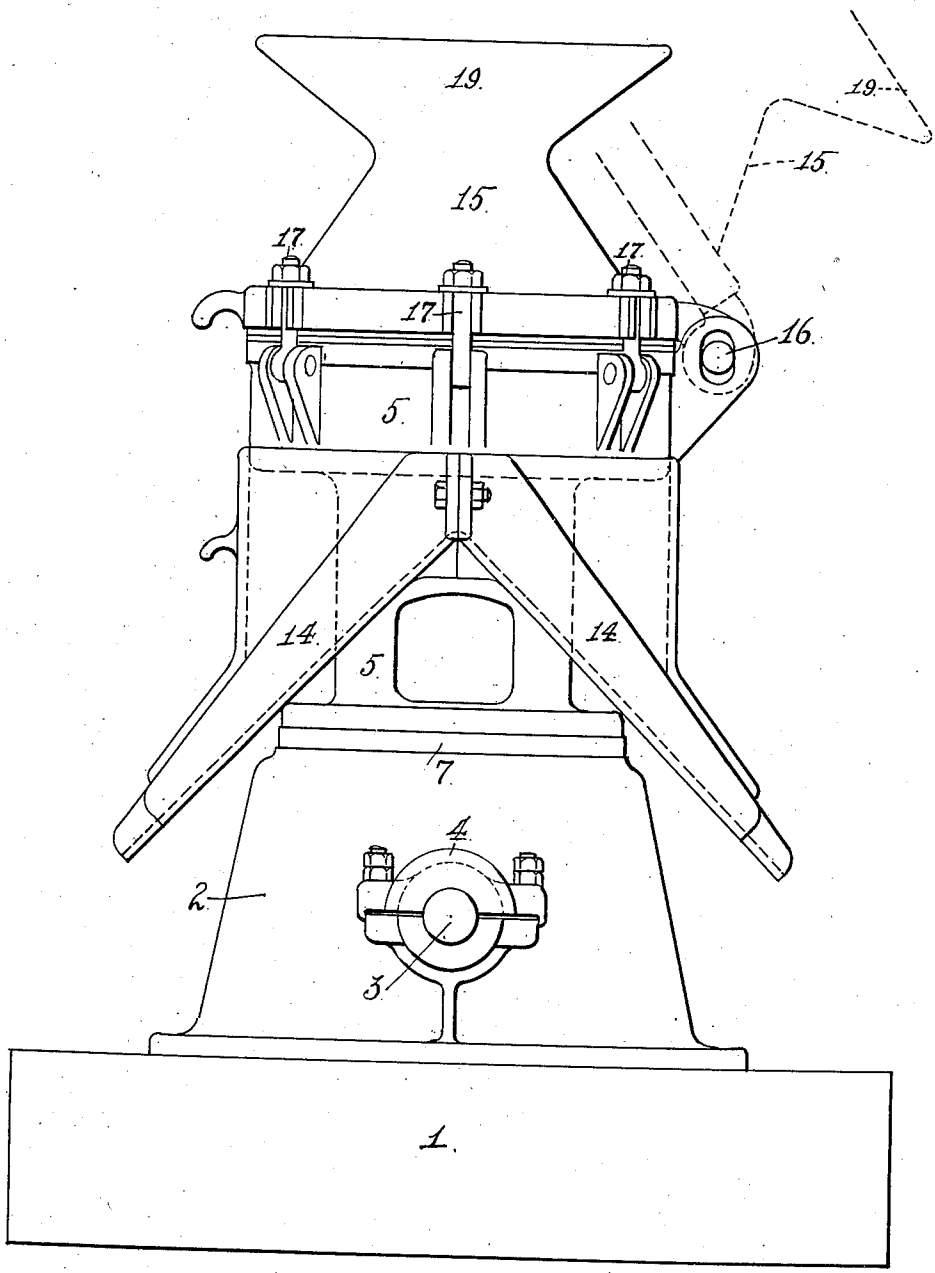


Fig. 1.

Witnesses
E. S. Lemmo
S. Constine.

Inventor:
John H. Kelly
by Wm. F. Booth
his Attorney.

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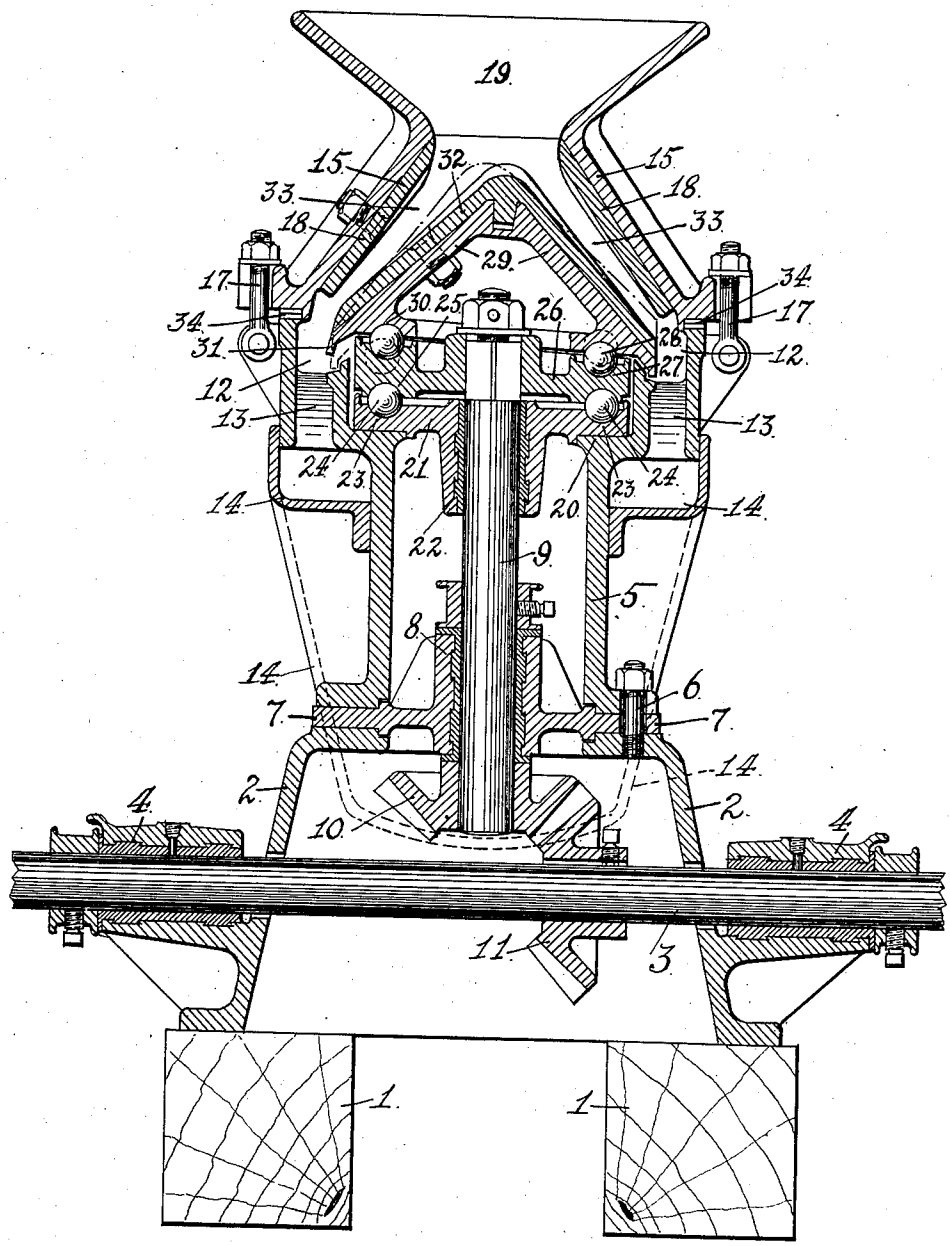


Fig. 2.

Witnesses.

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UNITED STATES PATENT OFFICE.

JOHN H. KELLY, OF SAN FRANCISCO, CALIFORNIA.

PULVERIZING-MILL.

1,083,283. Specification of Letters Patent. Patented Jan. 6, 1914.

Application filed September 30, 1912. Serial No. 723,027.

To all whom it may concern:

Be it known that I, JOHN H. KELLY, a citizen of the United States, residing in the city and county of San Francisco and State of California, have invented certain new and useful Improvements in Pulverizing-Mills, of which the following is a specification.

My invention relates to the class of pulverizing or crushing mills.

The object of my invention is to provide a simple and effective mill of this class; and to this end my invention consists in the novel pulverizing or crushing mill, and in the construction, arrangement and combination of its parts, which I shall hereinafter describe, by reference to the accompanying drawings, in which—

Figure 1 is an elevation of my mill. Fig. 2 is a vertical section of the same.

1 are foundation timbers which support the bed 2 in which the main shaft 3 is mounted in suitable bearings 4.

5 is the body-casting bolted at 6 to the bed, with a plate 7 intervening, said plate having the babbitted bearing 8 for the central shaft 9 which is driven by the bevel gear 10 on its lower end and the bevel gear 11 on the main shaft 3.

The upper end of the body-casting 5 is formed with an annular passage 12, traversed by webs or ribs 13, at intervals, said ribs being tapered upward to an apex as is indicated by the shade lines in Fig. 2. The base or lower side of the passage 12 opens directly into a pair of oppositely disposed discharge chutes 14, which, as seen in Fig. 1, are bolted together about the exterior of the body-casting 5.

Upon the top of the body-casting 5 is the crushing cap 15, hinged thereto at 16, as shown in Fig. 1, and secured by swinging bolts 17, as shown in Fig. 2. This cap is in its best form conical, and forms the fixed crushing wall being provided on its inner surface with the removable crushing shoe 18, the face of which may be plain or, as here indicated, it may be ribbed or roughened in any suitable manner. The upper portion of the cap 15 is outwardly flared to form the hopper 19.

The top of the body-casting inside the annular passage 12 is formed with a shelf 20 upon which is seated the fixed supporting plate 21 which has a central bearing 22 in which the central shaft 9 is mounted. This plate has a race-way 23 in which are balls 24, and upon these balls through a race-way 25 is carried the muller-operating plate 26, which is fast upon the upper end of the shaft 9 and is rotated by said shaft.

The bearing faces of the fixed supporting plate 21 and the rotating plate 26 are parallel, but the upper or functional face of the muller-operating plate 26 is inclined to the axis of the plate's rotation, as is shown in Fig. 2. In this inclined upper face is a race-way 27 in which are balls 28.

29 is the muller. It is in its best form a conical piece, with a race-way 30 in its base, and a peripheral lip 31 adapting it to close down over the top of the inner wall of the body passage 12. This muller is a free one, and rests freely upon the balls 28 of the muller-operating plate 26; it is not otherwise connected with said plate, nor with the body casting, as it simply rests in place by its own weight. The outer or functional face of the muller is provided with a removable crushing die 32, the surface of which may be plain, or as is indicated in Fig. 2, it may be ribbed, toothed or otherwise indented. Between the shoe 18 of the cap 15 and the die 32 of the muller 29 is formed the crushing space or area 33 which on account of the different angles of the parts is wider above than below, as is usual with such spaces. As the shoe and die wear, compensation is had by means of shims 34 placed between the cap and the body-casting.

In operation, the material is fed to the hopper 19 and is crushed in its passage through the space 33, between the shoe 18 and die 32, and thence drops into the annular passage 12, being well directed and distributed by the tapered ribs 13 therein, and discharged freely and without clogging into the chutes 14. The crushing is effected by the movement of the free muller 29 relatively to the crushing cap 15. It will be seen that on account of the inclination of the upper face of the muller-operating plate 26 to the axis of rotation of said plate, said muller freely resting upon this inclined face, is subjected to a circumferentially traveling wave-like movement so that each radial plane in the entire circumference of the muller experiences successively a moving wave-crest under which it approaches the opposing crushing surface of the cap, thereby grinding and pulverizing the material, and

upon its recession freeing the pulverized material and feeding it down through the crushing space into the annular passage 12 of the body casting. Thus the entire face of the muller is called into equal action and the grinding is distributed equally throughout the crushing space. Friction of contacting parts is reduced to a minimum by the ball bearings. The muller is entirely free with respect to its rotation or the want of it, for if no material be in the mill, the muller may and will rotate with whatever speed it may receive from its ball bearing contact with its operating plate, and on the other hand if the mill be fed to its capacity, the biting or crushing function of the muller upon the material will so overcome the ball bearing friction that the muller will not turn on its axis at all but will have only its traveling wave like movement by reason of which it crushes, grinds and pulverizes. Between these extremes, the muller may turn on its axis more or less, but this, if it play any part at all, is beneficial in assisting the grinding. Also the freedom of the muller is of advantage in yielding to undue stresses.

Ready access may be had to the interior of the mill for cleaning it or repairing, adjusting or renewing its parts. The cap may be thrown back on its hinge, as shown by the dotted lines in Fig. 1, in order to expose the muller. The muller may be lifted out and all the operating parts in its vicinity may be reached with ease.

The object in having the separate plate 7 between the bed 2 and the body casting 5 is that it may carry the bearing 8, the babbitt in which may be renewed easily by simply removing said plate with its bearing.

I claim;—

1. In a pulverizing mill, the combination of a rotatable shaft, a muller-operating plate rotated by said shaft and having its functional face inclined to its axis of rotation; a free conical crushing muller independent of the said shaft and plate, and disposed with its base in free bearing relation to the inclined face of the plate; and a conical crushing cap inclosing the muller with a crushing space between their functional faces.

2. In a pulverizing mill, the combination of a rotatable shaft; a muller-operating plate rotated by said shaft and having its functional face inclined to its axis of rotation; a free conical crushing muller independent of said shaft and plate; an anti-friction free bearing between the inclined face of the plate and the base of the muller; and a conical crushing cap inclosing the muller with a crushing space between their functional faces.

3. In a pulverizing mill, the combination of a fixed supporting plate; a rotatable shaft; a muller-operating plate rotated by said shaft and bearing against the supporting plate, said muller-operating plate having its functional face inclined to its axis of rotation; a free crushing muller independent of said rotatable shaft and plate; a free bearing between the back of the muller and the inclined face of the rotatable plate; and a crushing wall opposing the crushing face of the muller.

4. In a pulverizing mill, the combination of a body-casting; a supporting plate fixed in the upper end of the body-casting; a rotatable muller-operating plate having its functional face inclined to its axis of rotation; a free-bearing between the two plates; a free muller; a free bearing between the base of the muller and the inclined face of the rotatable plate; and a crushing cap secured to the body-casting with its crushing face opposed to the crushing face of the muller.

5. In a pulverizing mill, the combination of a body-casting; a central shaft therein with means to drive it; a supporting plate fixed in the upper end of the body casting and having a bearing in which the central shaft is journaled; a muller-operating plate secured upon the upper end of the shaft, said plate having its upper face inclined to its axis of rotation; a bearing between the upper face of the supporting plate and the lower face of the muller-operating plate; a free muller; a bearing between the base of the muller and the inclined face of the muller-operating plate; and a crushing cap secured to the body-casting with its crushing face opposed to the crushing face of the muller.

6. In a pulverizing mill, the combination of a body-casting having at its upper end an annular passage; discharge chutes communicating with the lower side of said passage; a central shaft in the body-casting with means to drive it; a supporting plate fixed in the upper end of the body casting, said plate having a bearing for the central shaft; a muller-operating plate secured upon the upper end of the shaft, said plate having its upper face inclined to its axis of rotation; a bearing between the upper face of the supporting plate and the lower face of the muller-operating plate; a free conical muller; a bearing between the base of the muller and the inclined face of the muller operating plate; and a conical crushing cap secured to the body-casting with its crushing face separated from the crushing face of the muller to leave a crushing space communicating below with the upper side of the annular passage in the body-casting.

7. In a pulverizing mill, the combination of a bed; a body-casting having at its upper end an annular passage; a removable plate

secured between the lower end of the body-casting and the bed, said plate having a central bearing; discharge chutes communicating with the lower side of the annular passage of the body-casting; a horizontal main shaft journaled in the bed; a vertical central shaft journaled in the bearing of the removable plate; gears by which said vertical shaft is driven from the main shaft; a supporting plate fixed in the upper end of the body-casting, said plate having a bearing for the central shaft; a muller-operating plate secured upon the upper end of the central shaft, said plate having its upper face inclined to its axis of rotation; a bearing between the upper face of the supporting plate and the lower face of the muller-operating plate; a free conical muller; a bearing between the base of the muller and the inclined face of the muller operating plate; and a conical crushing cap secured to the body-casting with its crushing face separated from the crushing face of the muller to leave a crushing space communicating below with the upper side of the annular passage in the body-casting.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOHN H. KELLY.

Witnesses:
WM. F. BOOTH,
D. B. RICHARDS.