W. BRINTON.

LINING PLATE FOR BALL MILLS.

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1,132,909. Patented Mar. 23, 1915.

Fig. 1.

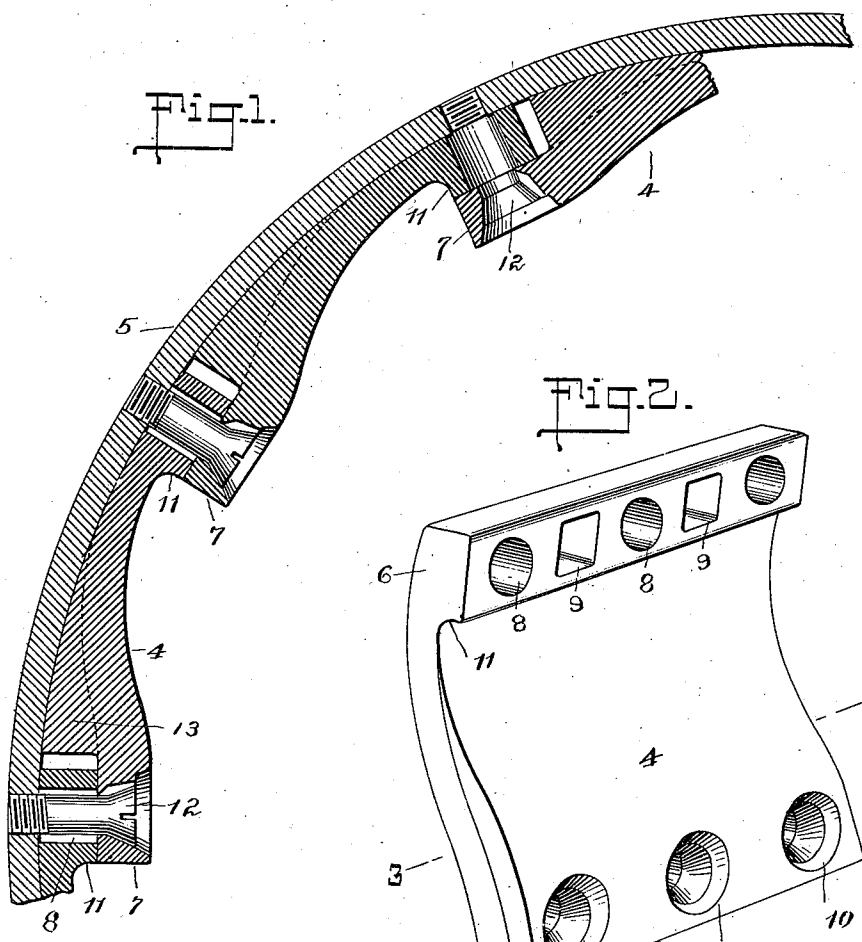
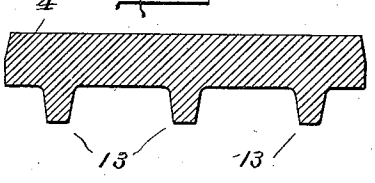


Fig. 2.

Fig. 3.



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LINING-PLATE FOR BALL-MILLS.

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To all whom it may concern:

Be it known that I, WALTER BRINTON, a citizen of the United States, and a resident of 1602 Washington street, Wilmington, in the county of New Castle and State of Delaware, have made and invented certain new and useful Improvements in Lining-Plates for Ball-Mills, of which the following is a specification.

My invention relates to an improvement in ball mills, and more particularly to the lining or comminuter plates therefor. In mills of this type it is well known that there is a great tendency of these plates to expand and break, and particularly the rear end or heel of the plate, which, in all instances is of much less thickness than the forward end or toe of the plate, the heel being also weakened by reason of the holes, slots or recesses provided to receive the bolts or rivets intended to hold the plate to the outer shell of the mill, this spreading, peening, or distortion of the plate being due to the continual blows or pounding of the balls employed to do the crushing or pulverizing.

The object of my invention is to provide a plate so constructed as will show the least tendency to expand or break in service, this result being accomplished by increasing the thickness of the heel end of the plate in which the bolt openings or recesses are formed, and completely covering, protecting or housing the heel by the toe of the adjacent plate, and to such an extent that no slotted or perforated portion of the heel is exposed to wear, or to the action of the pulverizing balls or pebbles, an amount of metal being removed from the under side of the toe of the plate equivalent to that employed for reinforcing the heel, the general outline or contour of the grinding or pulverizing surface of the plates being left the same as that of the plates now in general use.

In order to more fully understand the invention, reference may be had to the accompanying drawings, in which—

Figure 1 is a sectional view of a portion of the outer shell of a ball mill having applied thereto plates constructed in accordance with my invention. Fig. 2 is a perspective view of one of the comminuter or lining plates. Fig. 3 is a sectional view taken on the line 3—3 of Fig. 2.

As will be seen by reference to these drawings, each of the lining or comminuter plates 4 is made in a single casting, preferably of manganese steel, this metal being particularly well suited for the purpose by reason of its characteristic toughness and resistance to abrasive wear, the plate being preferably curved in the direction of its length, as clearly illustrated in Figs. 1 and 2. In former structures; used for like purposes, it has been the custom to gradually decrease the thickness of the plate from the toe to the heel, the latter end of the plate terminating in a comparatively thin edge and provided with openings or slots to receive the bolts for securing the plates to the shell 5; as distinguished from this structure, I form a plate 4 of gradually decreasing thickness until near the heel of the plate, which end is thickened as illustrated at 6, the resultant heel being of approximately the same or somewhat greater thickness than the toe 7 of the plate, and contains sufficient stock to permit of the elongated or oval-shaped ball openings 8, and perforations 9, without in any wise detracting or impairing the necessary strength thereof. The toe of the plate is also provided with the bolt openings 10 countersunk nearly the full depth or thickness of the plate in order to securely hold the latter to the shell 5 until the plate has been worn out in service. The thickened portion of the heel being substantially equal, in cross section, to the cross-section of the overlying toe provides that the heel of the plate will not be mashed or flattened by the continual hammering effect and impact of the balls used for pulverizing the material that is being ground. From the under side of the toe of the plate is removed a sufficient amount of metal to permit of the heel 6 to be overlapped by the toe of the adjacent plate, as clearly illustrated in Fig. 1, the heel 6 forming a ledge or shelf upon which it rests, the toe 7 of the one plate overlapping the heeel of the next forward plate and completely and effectually housing and protecting the perforated and thickened heel 6 of the same, the extreme end 7 of the plate, that is, the toe

thereof, lying flush with the wall 11 of the heel of the next forward plate, and forming a shelf or step for lifting the balls or pebbles during the rotation of the mill. Through the countersunk openings 10 in the toe of the one plate pass the screws or rivets 12, the same being threaded or otherwise secured in the shell 5 for securely locking the plate, at the toe end, thereto, these screws or rivets also passing through the elongated openings 8 in the thickened heel 6 of the adjacent plate, as illustrated in Fig. 1 of the drawings, the heeel 6 properly spacing the plate at the toe end from the shell 5 and affording a rest or support for the toe end of the adjacent plate.

It will be understood from the foregoing that by reason of the construction and arrangement of the plates as above described, all danger of the peening, spreading or distortion of the heel end of the plate is overcome; in other words, the weaker end of the plate, which in service is that portion which is always broken or otherwise damaged, is not only strengthened around the weakening bolt holes or slots, but is also completely protected by the thicker or toe end of the adjacent plate, thus relieving the bolts or rivets 12 from any undue strain caused by the spreading of the heel end of the plate, and avoiding the necessity of providing ribs or shoulders on the inner surface of the shell 5 heretofore employed to prevent the creeping or movement of the plates on the shell.

On the under side or surface of the plate 4 are formed the ribs 13 extending longitudinally thereof, and from a point near the thickened heel end to within a short distance of the bolt holes 10, these ribs 13, preferably three in number, operating to properly space the plate from the shell 5 and to materially strengthen the same.

What I claim is:—

1. A lining plate for a ball mill formed with a thickened perforated heel, and a toe provided with openings for the reception of fastening bolts.

2. A lining plate for ball mills the thickness of which gradually decreases from the toe to the heel, the latter being thickened and perforated, the toe being provided with holes for the reception of fastening bolts.

3. A lining plate for ball mills gradually decreasing in thickness from the toe to the heel, the latter being thickened and perforated, and provided with a flat outer face whereby to form a seat for the toe of the adjacent plate.

4. A lining plate for ball mills having a toe and heel, the former being provided with openings for the reception of fastening bolts, and the latter being thickened and perforated and adapted to support the toe of an adjacent plate, said plate gradually decreasing in thickness from the toe to the thickened heel, the rear side of said plate being provided with longitudinal ribs.

5. A lining plate for ball mills having a toe and heel, the plate gradually decreasing in thickness from the former to the latter, said heel being provided in its thickened portion with openings and adapted to support the toe of an adjacent plate, the rear side of said plate being provided with longitudinal ribs gradually increasing in thickness toward the toe of the plate.

6. A lining plate for ball mills having a toe and heel the latter being thickened and perforated, and provided with a flat smooth face whereby to support the heel of an adjacent plate, the wall of said thickened heel being adapted to lie flush with the heel of the adjacent plate whereby to form a step or shelf.

7. A lining element for ball mills comprising a plate curved in its length and tapering or diminishing in thickness from the toe or front edge to the rear edge, a heel carried at the rear edge of said plate and of a thickness at least equal to the thickness of the toe of said plate.

8. A lining element for ball mills comprising a plate curved in its length and tapering or diminishing in thickness from the toe or front edge to the rear edge, a heel carried at the rear edge of said plate and of a thickness at least equal to the thickness of the toe of said plate; the toe of said plate elevated by the plate curvature and adapted to receive the heel of the adjacent plate therebeneath, said heel and toe provided with alined openings for the reception of securing means therein.

Signed at Wilmington, in the county of New Castle and State of Delaware, this 18th day of July A. D. 1914.

WALTER BRINTON.

Witnesses:
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