

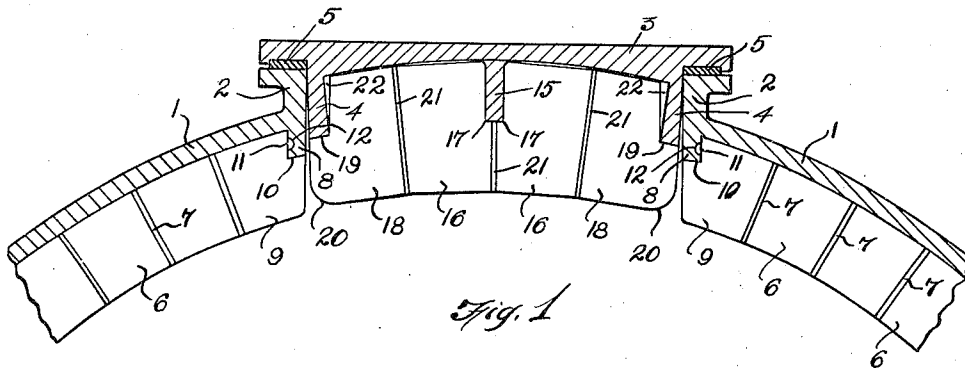
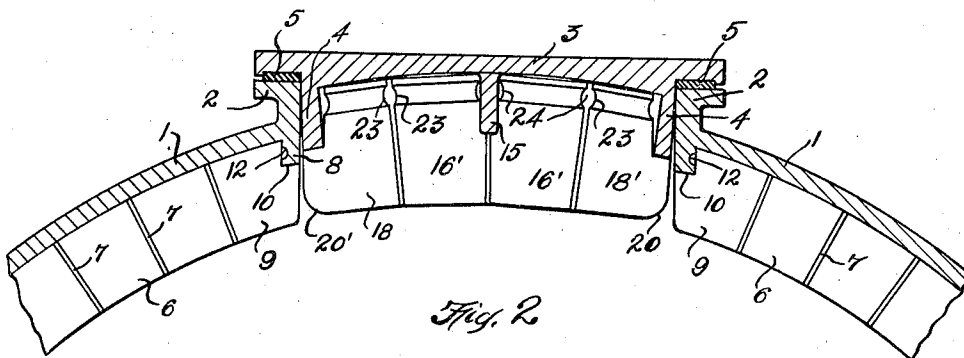
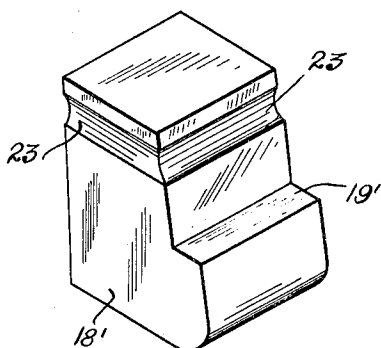
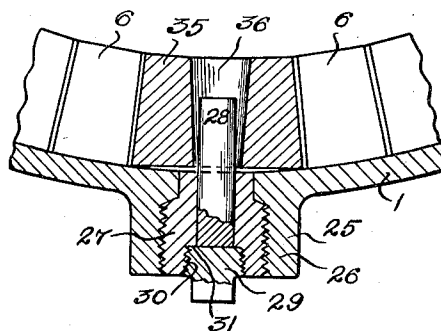
April 19, 1938.

J. C. RUMBARGER ET AL

2,114,640

LINING FOR BALL MILLS AND THE LIKE

Filed July 3, 1935



INVENTORS

John C. Rumbarger and
Richard S. Schwendler

BY

Day, Oberlin & Day
ATTORNEYS

UNITED STATES PATENT OFFICE

2,114,640

LINING FOR BALL MILLS AND THE LIKE

John C. Rumbarger, Lakewood, and Richard S. Schwendler, Cleveland Heights, Ohio, assignors to The Enamel Products Company, Cleveland, Ohio, a corporation of Ohio

Application July 3, 1935, Serial No. 29,670

1 Claim. (Cl. 83—9)

The present invention relates to a novel and improved construction for a non-metallic lining for enclosed grinding mills, such mills being more commonly referred to in practice as tube, ball or pebble mills.

The general object of the invention is to prevent contamination of the product by metal particles which heretofore have been ground off from the mill shell. The accomplishment of this object is particularly important in the grinding treatment of enamel and paint pigments. More specifically, the object of the invention is to provide a non-metallic lining, composed of porcelain, silex or the like, together with improved means for securing such lining in place in the interior of the mill shell, whereby such lining completely covers and prevents exposure of the metal parts of the shell and door, even after an appreciable amount of the lining has been worn away by the grinding action. Additional objects and advantages shall become apparent during the following description.

To the accomplishment of the foregoing and related ends, said invention, then, consists of the means hereinafter fully described and particularly pointed out in the claim.

The annexed drawing and the following description set forth in detail certain structure embodying the invention, such disclosed means constituting, however, but one of various structural forms in which the principle of the invention may be used.

In said annexed drawing:—

Fig. 1 is a fragmentary sectional view of a portion of a cylindrical mill shell and door showing the lining in place on the interior thereof; Fig. 2 is a view similar to Fig. 1 but showing an alternative form of the lining tile; Fig. 3 is an enlarged perspective view of one of the tile shown in Fig. 2; Fig. 4 is a fragmentary section of the mill shell and vent plug.

Now referring more particularly to the drawing, the ball or pebble mill consists of a cylindrical shell 1 having an outwardly projecting flange 2 which defines a door opening. A door 3 has an inwardly depending flange 4 which is adapted to fit within the shell flange 2. The top of the door 3 also extends laterally over the end of the flange 2 and a sealing gasket 5, composed of rubber or the like may be interposed therebetween for the purpose of tightly sealing the door to the frame. Customary clamping means for holding the door 3 in position on the mill shell 1 are of course employed, but since such means are well known in the art and form no part of the

present invention, they are not herewith shown or described.

A series of porcelain brick or tile 6, which are of rectangular cross section are located around the inner wall of the mill shell 1 and bonded to each other by a cementing material, such as white Medusa cement placed in the spaces 7 between the adjacent walls of the tile 6. Where the porcelain or tile lining meets the mill door opening or frame, which is defined by the inwardly extending flange 8, the brick or tile 9 are located. These latter form of tile 9 have a shoulder 10 on one of their sides, which is adapted to fit over the outer end of the flange 8. The tile 9 also have their inner or bottom portions 11 in the form of a wedge which is adapted to make a dove tail fit between the adjacent straight sided tile 6 and the mill frame flange 8.

The mill frame flange 8 also has a semi-cylindrical groove 12 located on its side adjacent the tile 9. The groove 12 is for the purpose of receiving bonding or cementing material, which, when it becomes hardened or set, functions as a key locking the tile 9 into the groove 12.

The mill door 3, which has the inwardly projecting marginal flanges 4 and the central inwardly projecting rib 15 is lined in its medial portion by the tile 16 having the shoulder 17 fitting over the outer end of the rib 15. The tile 16, it will be noted, are wedge shaped and make a dove tail fit between the rib 15 and the adjacent tile face. The outermost tile 18 composing the lining of the door 3 have a shoulder 19 which is adapted to fit over the outer end of the flange 4. The outermost corners of the tile 18 are rounded off, as indicated at 20, in order to eliminate any sharp corners which could be more easily chipped or ground off by the grinding balls or pebbles. The tile 16 and 18 are bonded or cemented in position on the door 3 by means of white Medusa cement, for example, located in the spaces 21 between the adjacent tile walls and in the spaces 22 between the outer tile walls and the inner face of the flange 4.

In order to obtain a more secure locking or bonding of the lining tile to the inner side of the door 3, such tile may be made in the form as illustrated in Figs. 2 and 3. In this alternative form, the tile 16' and 18', which are otherwise similar to the previously described tile 16 and 18 respectively, have a groove 23 extending around their side walls at a point adjacent the base of the tile and the inner wall of the door 3. The cementing material filling the groove 23 will then form a key, as at 24, firmly lock-

ing the tile 16' and 18' in place. A vent opening and vent plug which is provided for the mill shell 1 and preferably located at a point diametrically opposite the door 3, is illustrated in Fig. 4. An annular flange 25 extends outwardly from the mill shell 1 and is interiorly threaded as at 26 for the reception of a bushing 27. A metallic plug 28 fits into the interior of the bushing 27 and has an enlarged head portion 29 which threadably engages the bushing 27 by means of the threads 30. A shoulder 31 is located between the body or shank of the plug 28 and its head 29 and seats on a complementary shoulder in the bushing 27. The shoulder 31 is for the purpose of preventing any minute particles of ground material which might sift down along the walls of the plug 28 from reaching the threads 30 and thereby causing any abrading or clogging action which would tend to damage the threads 30. A tile 35 has a tapered hole 36 which is adapted to fit over the inner end of the vent plug 28. The outer walls of the vent plugs 28 and the inner walls of the tapered hole 36 form wedge-like spaces into which particles of the ground material will become lodged and serve as a cementing and sealing material further locking the tile 35 in place and further sealing the metallic vent plug 28 from the interior of the mill. It should also be noted that the exposed face of the tile 35 extends beyond the inner end of the vent plug 28 so that the latter will not be contacted by the grinding balls or pebbles whereby metallic particles thereof might be ground off and become introduced into the material which is being treated.

From the foregoing description, it will be seen that the non-metallic lining, composed of the several tile, completely covers all of the inwardly projecting portions of the mill. Furthermore, the lining tile have their exposed surfaces located at a substantial distance inwardly beyond any such metallic projections whereby they may be subjected to wear and grinding action for substantially their entire useful life before any metallic parts of the mill will be exposed.

Other modes of applying the principle of our invention may be employed instead of the one explained, change being made as regards the mechanism herein disclosed, provided the means stated by the following claim or the equivalent of such stated means be employed.

We therefore particularly point out and distinctly claim as our invention:—

In a ball mill, the combination of a cylindrical shell having a vent opening therein, a plurality of non-metallic tile lining said shell, one of said tile having a tapered opening in registry with said vent opening, said opening having inwardly diverging walls, a cylindrical metallic plug of smaller diameter than said opening adapted to extend into and to be outwardly withdrawn from both of said openings, and a threaded head on said plug for engagement with said shell, said head being of greater diameter than the body of said plug to form a shoulder therebetween, said last-named tile extending inwardly of said shell beyond the inner end of said plug.

JOHN C. RUMBARGER.
RICHARD S. SCHWENDLER.