June 5, 1923.

1,457,487

J. S. BARTLEY

GRINDING MILL

Original Filed April 5, 1919

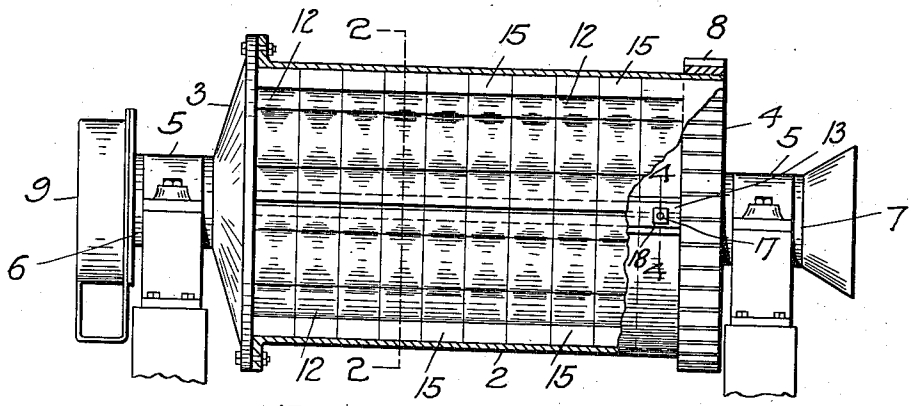


FIG. 1

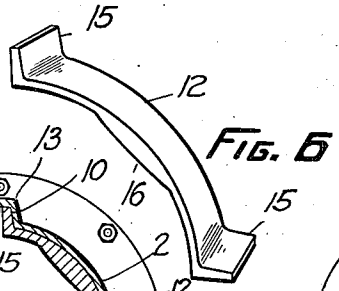


FIG. 6

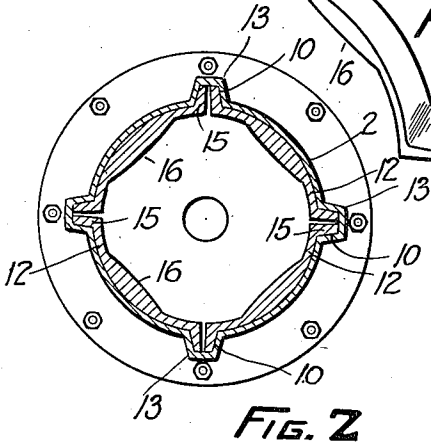


FIG. 2

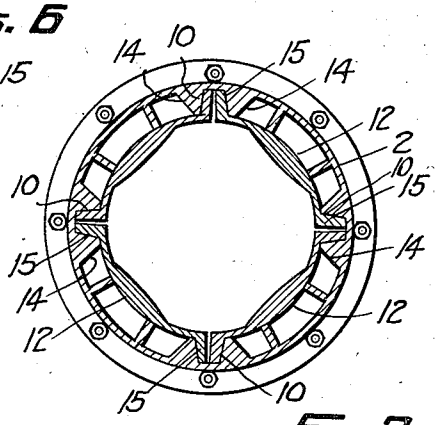


FIG. 3

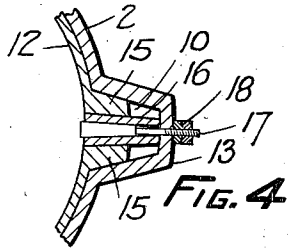


FIG. 4

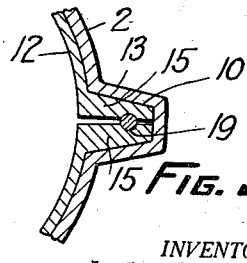


FIG. 5

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UNITED STATES PATENT OFFICE.

JOSEPH S. BARTLEY, OF DENVER, COLORADO.

GRINDING MILL.

Application filed April 5, 1919, Serial No. 287,706. Renewed August 19, 1922. Serial No. 583,037.

To all whom it may concern:

Be it known that I, JOSEPH S. BARTLEY, a citizen of the United States, residing at Denver, in the county of Denver and State of Colorado, have invented certain new and useful Improvements in Grinding Mills, of which the following is a specification.

This invention relates to crushing machines of the ball or tube-mill type and its object is to provide a mill of this character in which a sectional lining is held in place by means other than the large number of bolts employed for this purpose in the majority of mills at present in use.

Another object of my invention is to provide a sectional ball-mill lining in which a single key-element locks several series of sections, and pluralities of sections comprised in each series, against relative displacement and in which each section cooperates with the others to hold the entire structure in position upon the circumferential surface of the shell to which it is applied.

I attain these objects by the construction and arrangement of parts illustrated in the accompanying drawings in the several views of which like characters of reference designate corresponding parts, and in which—

Figure 1 represents a partially sectional side elevation of a mill to which my invention is applied;

Figure 2, a transverse section on the line 2—2, Figure 1,

Figure 3, a similar section showing a modified construction of the invention;

Figure 4, an enlarged fragmentary section through the locking element of the lining taken on the line 4—4, Figure 1;

Figure 5, an enlarged section through a portion of the shell at which adjoining lining sections meet, showing the application of a filler for holding the sections against relative displacement, and

Figure 6, a perspective view of one of the sections of which the lining is composed.

Referring specifically to the drawings, the reference numeral 2 designates the cylindrical shell of a ball or tube mill closed at its ends by heads 3 and 4 and supported for rotation in suitable bearings 5 by hollow trunnions 6 and 7.

A gear-wheel 8 secured exteriorly of the shell, provides means for its rotation by connection with a conveniently located driving element, and a scoop 9 on the trunnion at the head end of the mill dips, in practice, into a supply trough to feed the material into the shell by the rotary movement of the same.

The shell is provided with a number of equidistantly separated longitudinally extending channels 10 of slightly tapering section to receive flanges at the ends of the sections of which the lining is composed.

The channels may be formed by providing the shell with external ridges 13 as in the form shown in Figure 2 or they may be provided between spaced pairs of inwardly extending ribs 14 upon which the lining is supported as shown in Figure 3.

The lining of the mill which, as usual, is made of a hard and wear-resisting material, is composed of a plurality of sections 12 arranged in adjoining series which conjointly provide the cylindrical surface upon which the material under treatment is ground by the action of a moving mass of balls or pebbles.

Each section consists of an arcuate plate having at its ends outwardly extending flanges 15 and upon its inner surface a curved ridge 16 which in the operation of the mill assists in causing an upward movement of the material and the mass of grinding balls or pebbles with which it is intermixed.

In assembling the lining sections in the shell they are alined in series against the circumferential surface thereof with their flanges within the tapering channels 10.

Each channel is of sufficient width to freely admit juxtaposed flanges of the sections in adjoining series so that when the series are assembled to conjointly form the cylindrical lining, each section cooperates with the others to hold the entire structure in place.

The sections are placed one after another within the channels of the shell beginning at one end thereof, and in order to permit of the last section being placed in its proper position with relation to the others, one of its flanges is spaced from the flange of the adjoining section with which it occupies the corresponding channel of the shell, for the installation of a key-element which locks the component members of the structure against relative displacement.

The space between the flanges of the two

sections may be produced in various ways, as for example, by reducing the width of the flange of the last section of the series or by widening the channel in which it extends, at that point.

The flanges of the sections may also be shortened to facilitate their entrance into the channel as shown in Figure 4 of the drawings.

The key-element which locks the sections of the lining structure together, consists in its preferred form of a wedge 16 which fits within the space between the flanges of the last section and the immediately adjoining one and which has a longitudinal bore to receive the tapering head of a tightening bolt 17 which extends through a hole in the outer wall of the channel and is secured by one or two nuts 18 screwed upon the exterior surface thereof.

It will be seen that in this manner the entire sectional lining is rigidly secured within the shell by the use of a single bolt, that the sections of the lining cooperate to securely hold each other against relative displacement and that in case one or more of the sections break or wear out, it is readily replaced by unfastening the key and removing enough sections to permit of the withdrawal of the defective section from the channels in which its flanges extend, and the insertion of another section in the place thereof.

In case the flanges of adjoining sections do not fit snugly together within the channels of the shell in which they are inserted, the sections may be tightened and secured against lateral motion by a filler placed between the opposite faces of their flanges. The flanges may to this end be provided with transverse grooves as shown in Figure 5 of the drawings and the filler may consist of a wooden dowel-pin 19 which is driven into the registering grooves.

It will be understood that the fillers thus applied are but temporarily required to hold the sections against lateral motion, inas much as after a short period of use, the spaces between the sections are filled with the slimes of the material under treatment which harden and thus firmly keep the sections from shifting.

By the use of fillers of the character described, all the sections of which the lining is composed may be made to fit loosely together so as to facilitate their assemblage in the shell of the mill.

While I have shown and described the improved mill construction in the best and simplest form at present known to me, I desire it understood that the channels in the shell may be formed by means other than those shown in the drawings, that the key-element by which the lining structure is secured may be of a different character or fastened in a different manner and that other variations in the construction and arrangement of the cooperating parts may be resorted to within the spirit of my invention as defined in the following claims:

1. A mill of the character described having a shell provided with longitudinal channels on its inner surface, and a lining composed of flanged sections which meet within the channels.

2. A mill of the character described having a shell provided with longitudinal channels on its inner surface, a lining composed of flanged sections which meet within the channels, and a single key locking the sections against displacement.

3. A mill of the character described having a shell provided with longitudinal channels on its inner surface, and a sectional lining composed of arcuate plates having flanges at their ends, which meet within the channels.

4. A mill of the character described having a shell provided with longitudinal channels on its inner surface, a lining made up of circularly arranged rows of end to end adjoining sections which have flanges meeting within the channels, with the exception of two sections in two adjoining rows, which are spaced from each other, and a key in said space to lock the sections against displacement.

5. A mill of the character described having a shell provided with longitudinal channels on its inner surface, lining sections having end flanges projecting in said channels, and locking means for adjacent lining sections.

6. In a mill of the character described, the combination of a rigid shell provided at its inner surface with depressions arranged at intervals, lining sections provided with terminal projections extending into the said depressions and means located in one of the depressions and engaging the adjacent projections of the lining sections and locking the said lining sections against displacement from the said depressions and also from the other depressions.

7. In a mill of the character described, the combination of a rigid shell provided at its inner surface with depressions arranged at intervals, lining sections provided at each end with a projecting flange fitting in the depressions of the shell and a key element arranged in one of the depressions and interposed between the adjacent projecting flanges and locking the lining sections from the said depression and also from the other depressions of the shell.

8. In a mill of the character described, the combination of a drum and a lining arranged within the drum and composed of curved lining sections having abutting ends, said lining sections and drum having co-

acting, interlocking means and a locking key arranged to hold the lining sections in their interlocked relation with the drum.

9. In a mill of the character described, the combination of a rigid drum and a lining arranged within the drum and composed of lining sections, said lining and drum having coacting interlocking means and the said lining sections being arranged in circular series and locking means located between the adjacent lining sections at one end of the series and maintaining the lining sections in their interlocked relation with the drum.

In testimony whereof I have affixed my signature.

JOSEPH S. BARTLEY.