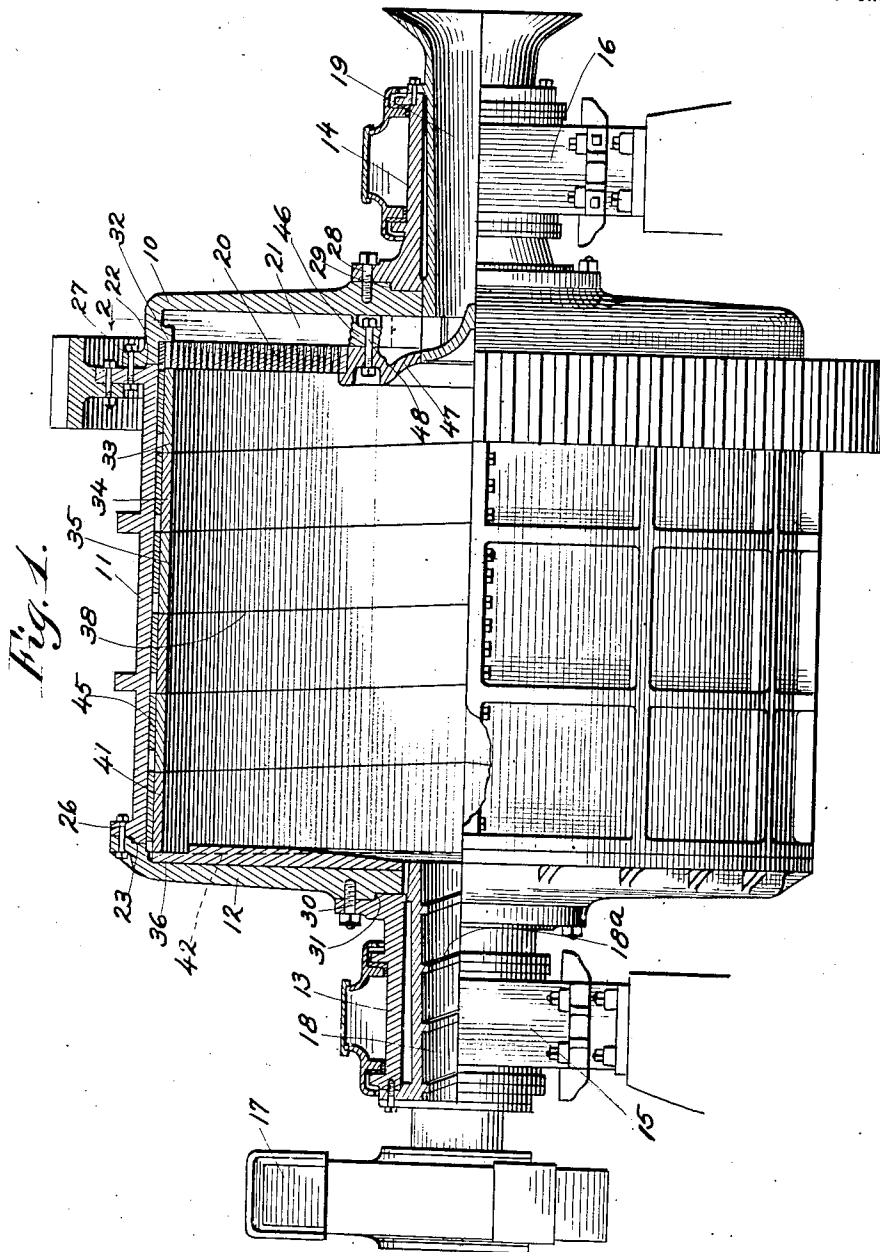


B. A. MITCHELL AND F. G. JANNEY.
SECTIONAL LINING CONSTRUCTION FOR MILLS.
APPLICATION FILED FEB. 17, 1917.

1,370,699.

Patented Mar. 8, 1921.
2 SHEETS—SHEET 1.



Witness:

C. Durnap

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Inventors:

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Fig. 2.

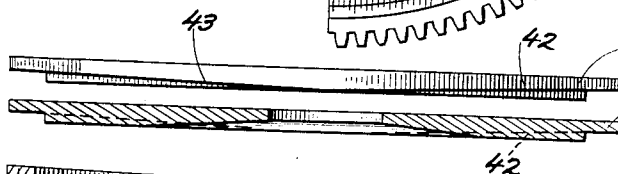
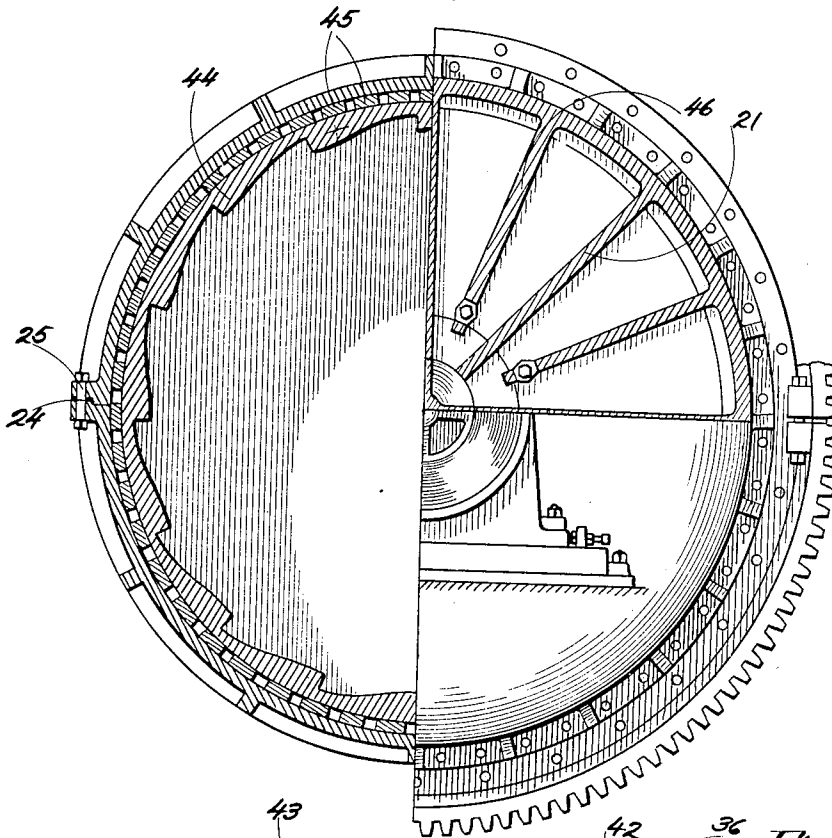


Fig. 3.

Fig. 4.

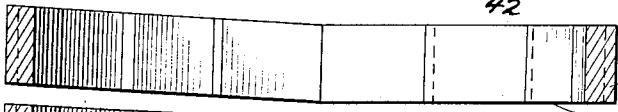


Fig. 5.

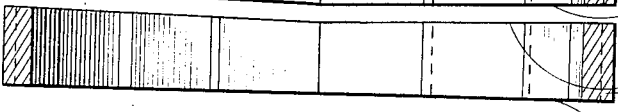


Fig. 6.

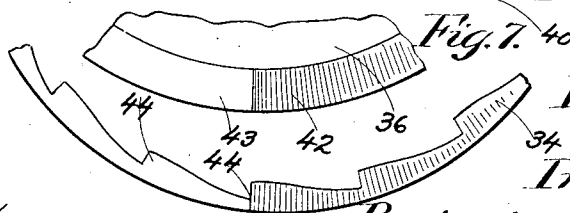


Fig. 7.

Fig. 8.

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UNITED STATES PATENT OFFICE.

BENJAMIN A. MITCHELL AND FRANK G. JANNEY, OF GARFIELD, UTAH.

SECTIONAL-LINING CONSTRUCTION FOR MILLS.

1,370,699.

Specification of Letters Patent.

Patented Mar. 8, 1921.

Original application filed May 27, 1916, Serial No. 100,341. Divided and this application filed February 17, 1917. Serial No. 149,338.

To all whom it may concern:

Be it known that we, BENJAMIN A. MITCHELL, a citizen of the United States, residing at Garfield, in the county of Salt Lake and State of Utah, and FRANK G. JANNEY, a citizen of the United States, residing at Garfield, in the county of Salt Lake and State of Utah, have invented certain new and useful Improvements in Sectional-Lining Constructions for Mills, of which the following is a specification.

This invention relates to ore grinding mills which are more commonly known as ball mills, and its object is to provide a shell and a lining for said mill, which will have numerous advantages over those now in use.

This application is a division of our prior application Serial No. 100,341, filed May 27, 1916, in which application the construction of the grate is claimed. The claims of this application cover broadly another form of grinding mill described and claimed in our copending application Serial No. 149,339, filed Feb. 17, 1917.

Among these advantages are the construction of the shell in sections having interlocking joints with fastening devices external to said joints. These fastening devices are preferably bolts passing through holes in flanges and when these holes are so located that they are wholly exterior to the joints in the shell, there is no possibility of leakage through said holes.

Another feature of this invention lies in the lining which is made in hollow cylindrical sections having helical edges and a grate at one end of the mill held in place by said sections. The helical edges of the sections cause a longitudinal movement thereof when any slight rotary displacement takes place, thereby crowding and locking the grate as well as the sections more firmly in place.

Other features and advantages of our improved mill will appear in the following specification when taken in connection with the accompanying drawings, in which—

Figure 1 is a longitudinal section partly in elevation of a rotary mill with our improvements applied thereto.

Fig. 2 is a cross-section of the same partly in section.

Fig. 3 is an edge view of a circular lining member which lies against one head of the mill.

Fig. 4 is a sectional view of said lining member.

Fig. 5 is a sectional view of a cylindrical lining member.

Fig. 6 is a sectional view of another cylindrical lining member, being the one which lies against the grate at one end of the mill.

Fig. 7 is a detailed elevation of a portion of the circular lining section at the end of the mill.

Fig. 8 is a detailed elevation of a portion of one of the cylindrical lining sections.

Referring to the accompanying drawings, it will be seen that the shell of the mill is composed of sectional members 10, 11, 12, etc. The members 11 are semi-cylindrical in form, while the members 10 and 12 are substantially circular and flat and close the ends of the cylindrical space formed by the sections 11. At the center of the ends or heads 10 and 12, are hollow journal members 13 and 14 which are suitably fitted to supporting bearings 15 and 16. Attached to the journal 13 is a feeding scoop 17. The ore picked up by said scoop is caused to enter the mills through the hollow lining 18 of the journal 13. The lining 18 has a helical internal rib 18^a to cause an inward movement of the material. A similar discharge passage 19, comprising a hollow lining fitted to the journal 14, is provided. Adjacent the head 10 of the mill is a grate, or lining member 20, which is provided with a plurality of fine openings for egress of the pulverized ore in the mill while retaining the larger particles. This grate is of special construction, not forming the subject-matter of the present application, but is fully described in our above mentioned co-pending application Ser. No. 100,341.

The sections of the shell are interlocked by means of slightly beveled shoulders 22, 23 and 24. Bolts 25, 26 and 27 firmly draw the sections together and cause a tight joint at said shoulders. Similar bolts 28 and 30 cause a tight joint at the shoulders 29 and 31 where the journals are attached to the heads of the mill.

The grate 20 lies against the flat seat 32 in the head 10 of the mill, and a hollow cylindrical lining member 33 bears upon the grate on the opposite side in a manner such as to press it against said seat. Other cylindrical lining sections 34 and 35 of the same general dimensions are placed within the

shell in alinement with the section 33 and bear upon said section and each other at their edges. The edges of these sections where they bear upon each other are of helical form sloping in one direction through a portion of their circumference, and of a similar form sloping in the opposite direction through another portion of their circumference. By means of this helical form of the edges, it will be seen that any rotary displacement of the sections in either direction will cause them to be pushed longitudinally and to become more firmly locked. They will also more firmly lock the grate 20 against the seat 32.

The section 41, at the end of the mill, is provided with similar helical edges where it bears upon the flat circular section 36 as shown at 42 and 43. The cylindrical sections are provided with steps 44 for elevating and dropping balls or other movable elements which perform the grinding operation upon the contents of the mill.

Between the sectional lining members above described and the outer shell, are placed blocks 45 of wood or other absorbent fibrous material which are adapted to expand when wet and thus become firmly locked in place. They thus firmly lock the sectional lining members in position and permit the assembling of the parts of the structure while they are in a dry condition.

The outlet passages in the head 10 are separated by ribs 21 which have radial positions and which form additional seats for the grate 20. At suitable intervals, as shown at 46, bolts 48 are passed through these ribs and into the inner section members 47, which are fitted to the inner aperture in the grate. This lining member 47 is also suitably fitted to the outlet lining member 19 to provide a continuous outlet passage for the pulverized material.

It will be seen that we have provided a new construction which may be very conveniently assembled and which when in operation is of very firm and rigid construction. It will be seen that there are no opportunities for leaking for the reason that the fastening devices for the outer shell sections are entirely exterior to the joints in said sections. It will also be seen that should any possible rotary displacement of the lining sections take place, the sections as well as other parts of the mill, are held more firmly locked by said displacement.

While we have described our invention more or less precisely as regards the details of construction, we do not wish to be limited thereto unduly as we contemplate changes in the construction and form of the parts and the substitution of equivalents without departing from the spirit of our invention.

What we claim is:

1. The combination in a rotary grinding mill having inlet and outlet openings, of a grate adjacent said outlet opening, and locking means for said grate tending to increase its pressure on said grate during the operation of said mill.

2. The combination in a rotary grinding mill having inlet and outlet openings, of a grate adjacent said outlet opening, and means including a plurality of parts located within said mill for exerting an increasing locking pressure on said grate by the relative movement of said parts.

3. The combination in a rotary grinding mill having inlet and outlet openings, of a grate adjacent said outlet opening, and a lining comprising a plurality of parts adapted by relative movement thereof to exert a locking pressure on said grate and to set up a locking pressure between the parts of said lining.

4. In a rotary grinding mill of the class described having inlet and outlet openings, a grate adjacent said outlet opening, and means including a lining for said mill for automatically effecting an increasing pressure on said grate when said mill is in operation and thereby effecting the simultaneous securing of said lining against movement, said lining being composed of alined hollow cylindrical sections, one of which abuts against said grate.

5. In a rotary grinding mill of the class described, having inlet and outlet openings, a grate adjacent the outlet opening, a seat for said grate, and a lining for said mill engaging said grate opposite said seat, said lining being formed of interlocking relatively movable sections, said sections having contacting edges of helical form.

6. A rotary grinding mill of the class described comprising a shell, and a plurality of continuous relatively movable circular lining sections located within said shell and contacting with each other along their lateral edges to form a cylindrical lining, the contacting edges of said sections being inclined to a plane normal to the axis of rotation of said mill.

7. The combination in a rotary grinding mill, of an outer shell, a tubular lining located in said shell, and an end lining mounted at the end of said tubular lining, said tubular lining and said end lining having coacting inclined surfaces respectively for setting up a locking pressure between said lining members upon relative movement thereof.

8. The combination in a rotary grinding mill, of an outer shell, and a cylindrical lining extending throughout the length of said shell, said lining being formed of a plurality of substantially cylindrical complemen-

5 tary relatively movable parts provided with coacting inclined surfaces adapted to set up a pressure between the ends of said shell and said lining upon relative rotation of said substantially cylindrical parts.

10 9. In a rotary grinding mill comprising a cylindrical shell, circular end members within said shell at the ends thereof, and a plurality of continuous integrally formed circular lining members interposed between said end members and coacting with each other along their lateral edges, said coacting edges being inclined to a plane normal to the axis of rotation of said mill, said sections being capable of relative rotation limited by the pressure set up between them.

20 10. In a rotary grinding mill of the class described, having inlet and outlet openings, a lining for said mill formed of hollow cylindrical sections capable of limited relative movement, said sections being in axial alinement and bearing upon each other at their edges, said edges being inclined in one direction in one portion of the circumference and in an opposite direction in another portion of the circumference, and a shell for said mill.

30 11. In a rotary grinding mill of the class described having inlet and outlet openings, a lining for said mill formed of hollow cylindrical sections bearing upon each other at their edges, said edges of said sections having inclined surfaces adapted to increase the pressure between the coacting edges upon relative rotative movement of said sections, and a lining for the inlet opening of said mill adapted upon relative rotation thereof with respect to said mill to increase the pressure between said cylindrical sections.

12. In a rotary grinding mill of the class described, having inlet and outlet openings, a lining for said mill formed of hollow cylindrical sections, said sections being in axial alinement and bearing upon each other at their edges, said edges being inclined in one direction in one portion of the circumference and in an opposite direction in another portion of the circumference, a flat circular lining section at one end of said mill, said section having oppositely inclined surfaces to match the oppositely inclined edges of the adjacent cylindrical lining section, and a shell for said mill.

13. The combination in a rotary grinding mill of an outer shell, and a lining comprising a plurality of relatively movable parts having coacting surfaces adapted to exert a locking pressure between said lining and said shell upon relative movement of said parts, whereby said lining is maintained in position without being attached to said shell.

14. The combination in a rotary grinding mill, of a shell comprising a cylindrical body portion and circular end walls, said cylindrical body portion being formed in sections having outwardly extending longitudinal flanges at their joints, said body portion and said end walls having radially extending flanges at the ends of said shell, said flanges being provided with wedging surfaces, and means extending through said flanges for uniting the parts of said shell.

In testimony whereof, we have subscribed our names.

BENJAMIN A. MITCHELL.
FRANK G. JANNEY.

Witnesses:

L. M. FOSTER,
O. W. KUMROW.