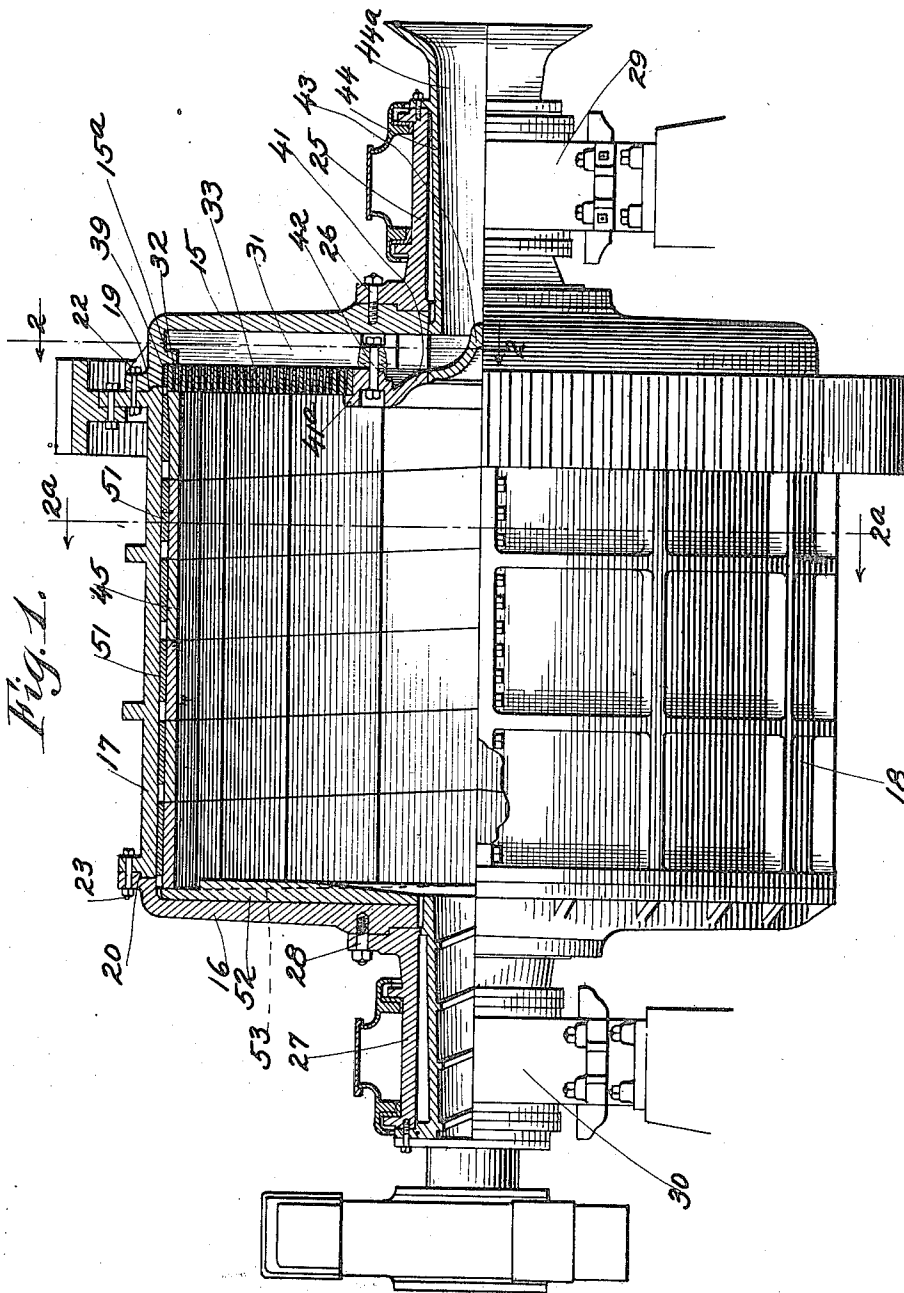


1,282,914.

3 SHEETS--SHEET 1.



CC Surnap By

Inventors
Benjamin A. Mitchell
Frank G. Janney, Jr.

Sheridan, Wilkinson & Scott, Attys

B. A. MITCHELL & F. G. JANNEY, JR.
 GRATING FOR BALL MILLS AND METHOD OF MAKING SAME.
 APPLICATION FILED MAY 27, 1916.

1,282,914.

Patented Oct. 29, 1918.

3 SHEETS—SHEET 2.

Fig. 2.

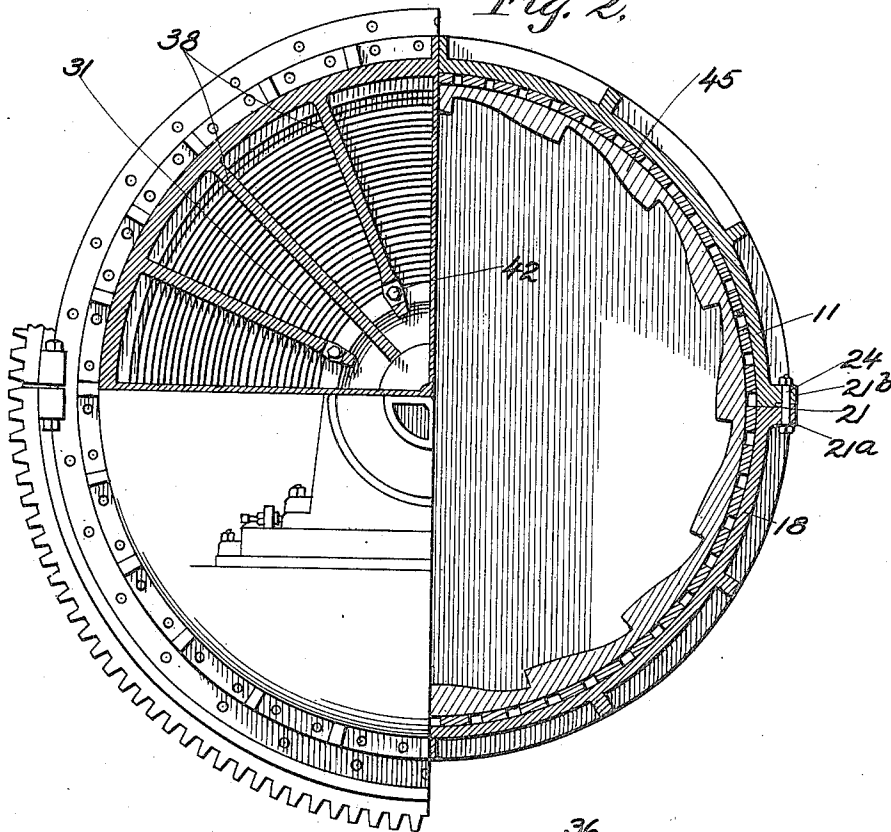
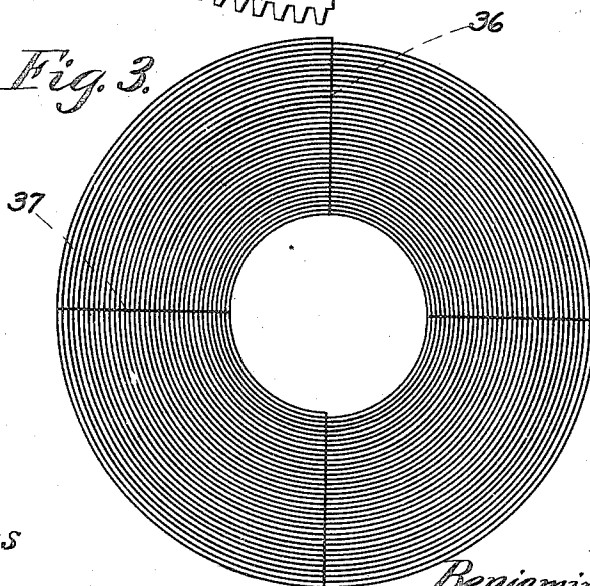


Fig. 3.



Witness

C. C. Dunlap

By *Sheridan, Wilkinson & Scott, Attys*

Inventors:

Benjamin A. Mitchell

Frank G. Janney, Jr.

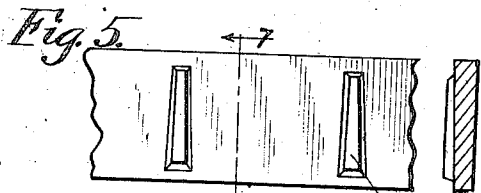
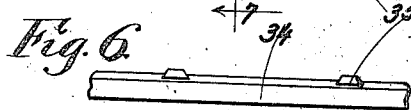
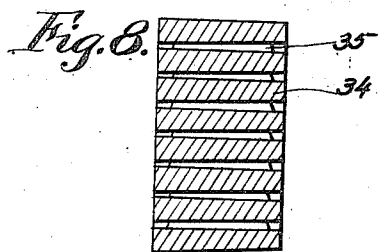
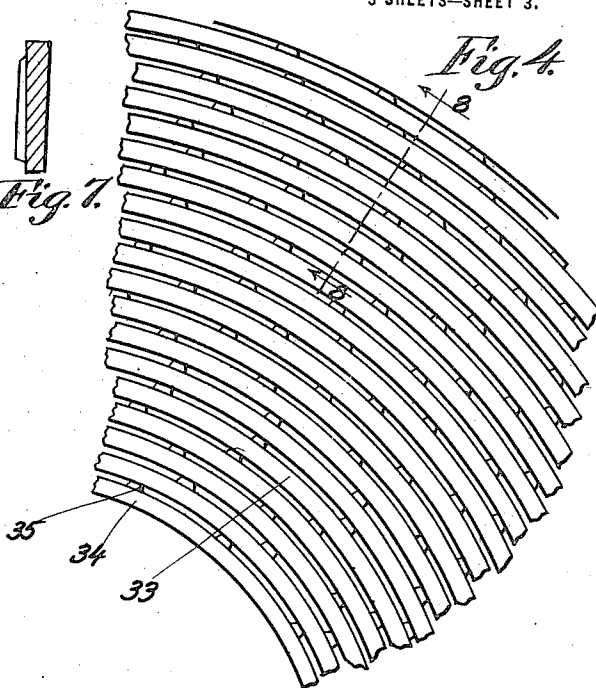
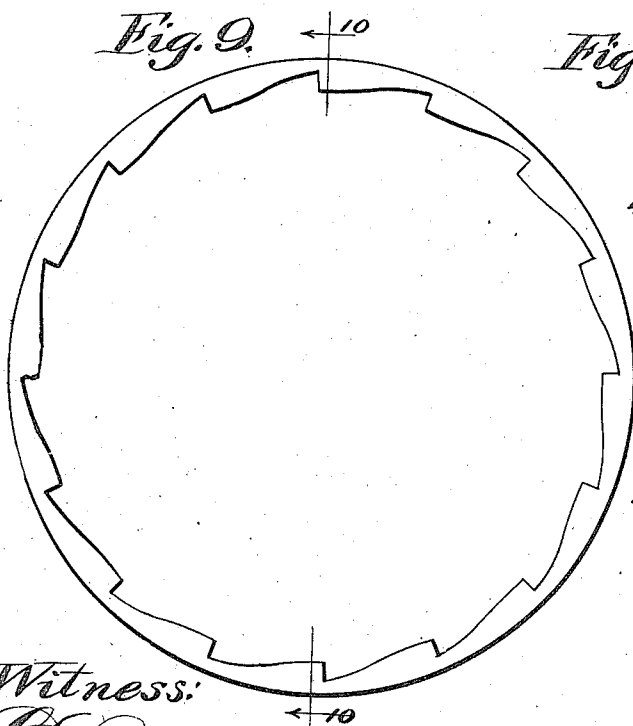
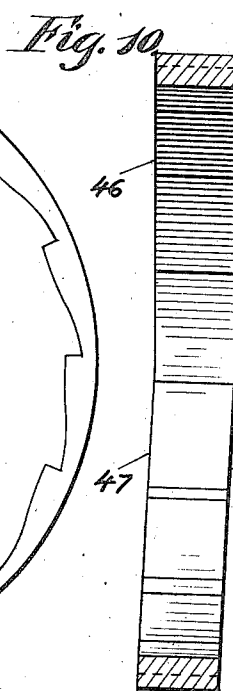
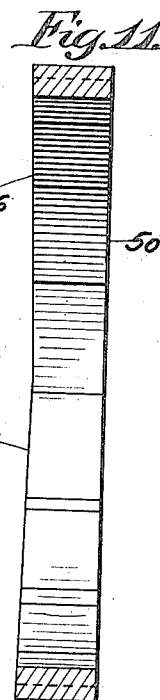
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3 SHEETS—SHEET 3.



Witness:

C. Burnap

By *Sheridan*

Inventors:

Benjamin A. Mitchell

Frank G. Janney, Jr.

Wilkinson & Scott, Attys

UNITED STATES PATENT OFFICE,

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

GRATING FOR BALL-MILLS AND METHOD OF MAKING SAME.

1,282,914.

Specification of Letters Patent.

Patented Oct. 29, 1918.

Application filed May 27, 1916. Serial No. 100,341.

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, Jr., 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 Gratings for Ball-Mills and Methods of Making Same, of which the following is a specification.

This invention relates to grates or screens for ore grinding mills, more commonly known as ball mills or tube mills.

The object of our invention is to provide a grate of very rigid construction and durable form, which will withstand the severe conditions to which grates are subjected in such a mill without its parts becoming loose and requiring frequent repair or renewal.

Grates or screens as commonly constructed are built up of separate bars in sets, each set forming a segment of a circle. These bars are held in place on the head of the mill by wedge-shaped clamp bars which are bolted to the head. We have found that this style of construction is very insecure, and that it is impossible to hold grate bars in this manner for any length of time, as they become loose and cause a great deal of delay in the operation of the mill.

Our grate, which constitutes the present invention herein described, is made up of a rolled steel member in the form of a long flat bar, and at suitable distances on this bar are formed bosses projecting from one of the flat sides. This bar is wound or bent into spiral form. At regular intervals, preferably along two diameters at right angles, the adjacent convolutions are welded, or otherwise secured together. The solid grate thus formed is placed in a seat in the head of the mill covering the outlet, and is held in place by a lining made up of interlocking sections. The mill shell is constructed of parts fitted together and held by bolts wholly exterior to the joints in the shell.

The above objects and advantages, as well as others, will be rendered more apparent in the following specification and claims, taken in connection with the accompanying drawings, in which—

Figure 1 is a side elevation, partly in section, of a mill with our improved grate embodied therein.

Fig. 2 is an end elevation, with portions

in section, taken substantially along the lines 2—2 and 2^a—2^a of Fig. 1.

Fig. 3 is a diagrammatic view showing the manner in which the bar is formed into a spiral, and the lines along which the adjacent convolutions are welded together.

Fig. 4 is an enlarged view of a portion of the grate.

Fig. 5 is a detail through a small portion of the bar.

Fig. 6 is a view at right angles to the view shown in Fig. 5.

Fig. 7 is a sectional view, taken along the line 7—7 of Fig. 5.

Fig. 8 is a sectional view of a portion of the grate, taken substantially along the line 8—8 of Fig. 4.

Fig. 9 is a side elevation of one of the lining sections.

Fig. 10 is a cross section of the same; and

Fig. 11 is a cross section of the particular lining section which lies against the grate.

Similar letters of reference apply to similar parts in the different views.

The body of the mill consists of a hollow cylindrical shell composed of heads 15 and 16, to which semi-cylindrical members 17 and 18 are fitted. These semi-cylindrical members are fitted together along longitudinal elements at opposite sides, one being let into the other, as shown at 21 in Fig. 2. After being thus fitted together, bolts 24 are passed through the flanges 21^a, 21^b in holes which are exterior to the shoulders at 21. In this way the necessity for bolt holes which open into the interior of the shell, and which might provide a chance for leakage, is prevented. In a similar manner the circular ends of the shell are shouldered into the heads at 19 and 20, and are held in place by bolts 22 and 23 through flanges wholly exterior to said shoulders. The shoulders are preferably slightly tapered in order to permit the bolts to draw the parts into close contact.

At the centers of the heads the hollow trunnions 25 and 27 are secured thereto by the studs 26 and 28, these trunnions being suitably shouldered into the heads, and being supported in the bearings 29 and 30. Suitable provision is made for rotating the mill, but this does not form a part of the present invention.

The head 15 is provided with channels 31, between ribs 38, leading to the outlet 44 in the tube 44. Against these ribs is placed

the grate 33, its outer circumference lying against a circular rib 32 projecting inwardly from the outer portion of the head. The grate is formed of a rolled bar 34 of suitable length, said bar being given the required length by welding together a suitable number of rolled bars of commercial length. Upon these bars at regular intervals are formed bosses 35 for spacing the adjacent convolutions of the grate, as will be described below. The bar thus formed is rolled or bent into a spiral form, an opening being left in the center of considerable size, as shown in the drawings. The spacing bosses 35 insure the proper spacing of the successive convolutions of the spiral during the process of rolling or bending. When the spiral is completely formed to the desired outer diameter a considerable number of bosses 34 are welded to the adjacent convolutions, these welded joints being preferably made substantially along two diameters 36 and 37 of the spiral. The bosses and adjacent portions of the bar may be fused and united together by any suitable process, such, for instance, as the thermit process, or by any suitable welding process in which the metal may be properly heated and fused together.

The grate thus formed is laid in the head 15 against the ribs 31 and the seat 15^a, and zinc 39 is poured around the same securely holding it in place. Within the central opening of the grate a special lining or ring 41 is placed, having a flange 41^a which lies upon the grate. Bolts 42 securely hold the ring to the head, and the ring or liner clamps the grate rigidly by means of flange 41^a. The ring matches the inner end 43 of the outlet tube 44, and the channels 31 are thus made to register with said outlet.

Within the shell is placed a lining 45 made up of narrow circular sections having sloping edges. These edges slope in opposite directions throughout the circumference of the edges, as shown in Figs. 1 and 10 more particularly. For example, in Fig. 10 a portion of the edge slopes in one direction, as shown at 46, while another portion 47 has an opposite slope. These sloping or helical edges are thereby caused to interlock in a great measure, and any relative rotary slipping of the sections will be immediately resisted thereby. The end section, shown in Fig. 11, bears against the outer portion of the grate 33, and one side of this section is therefore not made sloping or helical, but its entire surface lies in one plane where it makes contact with the grate. It will be seen that the lining has a tendency to lock the grate very firmly in place.

At the opposite end of the shell a head lining 52 is provided with sloping surfaces 53 to match the adjacent circular section of the lining. Between the lining sections and

the body of the shell are placed wooden wedges 51, which have a tendency to absorb water and expand, thereby firmly locking the lining sections in place. These wooden wedges may be easily inserted in place when dry during the process of assembling the mill.

It will be seen that the grate which we have provided is composed of a single piece of metal, instead of a number of separate bars, as has heretofore been the practice. It will be impossible for a portion of the grate to become loose and cause trouble. The grate which we have constructed is further rigidly locked in position by the lining and is backed up by the ribs 38, which are disposed at frequent intervals around the outer surface of the grate. Any tendency of the lining sections to slip immediately causes them to become more firmly locked in place, while at the same time causing a more rigid clamping and holding effect on the grate. It will be further seen that there are no bolt holes leading into the interior of the ball mill which would furnish a chance for leakage.

The combination and construction of the shell and lining herein described are claimed in our co-pending divisional application, Serial No. 149,338, filed February 17, 1917.

While we have described our invention with more or less minuteness, and as being embodied in certain precise forms, yet it will be understood that we do not desire to limit ourselves thereto unduly, or any more than is pointed out in the claims. On the contrary, we contemplate all proper changes in form, construction, and arrangement, the omission of immaterial parts, and the substitution of equivalents, as circumstances may suggest or necessity render expedient.

We claim:—

1. A process of constructing a grate from a continuous bar having spacing lugs at intervals, consisting in bending said bar into spiral form with the succeeding convolutions in contact at said lugs, and securing said convolutions together at said lugs.

2. A process of constructing a grate from a continuous bar having spacing lugs at intervals, consisting in bending said bar into spiral form with the succeeding convolutions in contact at said lugs, and securing said convolutions together by fusing and uniting the metal at said lugs.

3. In a rotary grinding mill of the class described, inlet and outlet openings, a grate adjacent the outlet opening, said grate consisting of a metal bar of spiral form, the adjacent parts of said spiral bar being spaced apart and secured together at intervals, a seat for said grate, and a lining for said mill engaging the grate opposite said seat.

4. In a rotary grinding mill of the class

described, a grate consisting of a continuous bar of spiral form having lugs projecting therefrom to engage adjacent convolutions of the spiral whereby said spirals are spaced
5 apart, said lugs being welded to the portions of the spiral with which they contact, and means for holding the central and outer portions of said grate.

10 5. In a rotary grinding mill of the class described, a grate consisting of a continuous bar of spiral form having lugs projecting therefrom to engage adjacent convolutions of the spiral whereby said spirals are spaced
15 apart, said lugs being welded to the portions of the spiral with which they contact, means

for securing the central portion of said grate to an end wall of said mill, a flange engaging one side of the outer portion of said grate, a lining engaging the outer portion of said grate opposite said flange, and a 20 metal filling completely occupying the space between the outer peripheral surface of said grate and the outer wall of said mill.

In testimony whereof, we have subscribed our names.

BENJAMIN A. MITCHELL.
FRANK G. JANNEY, Jr.

Witnesses:

O. W. KIONROW,
F. D. MUIR.