Nov. 6, 1928. 1,690,495

F. E. MARCY

MILL

Original Filed June 7, 1927

Fig. 1.

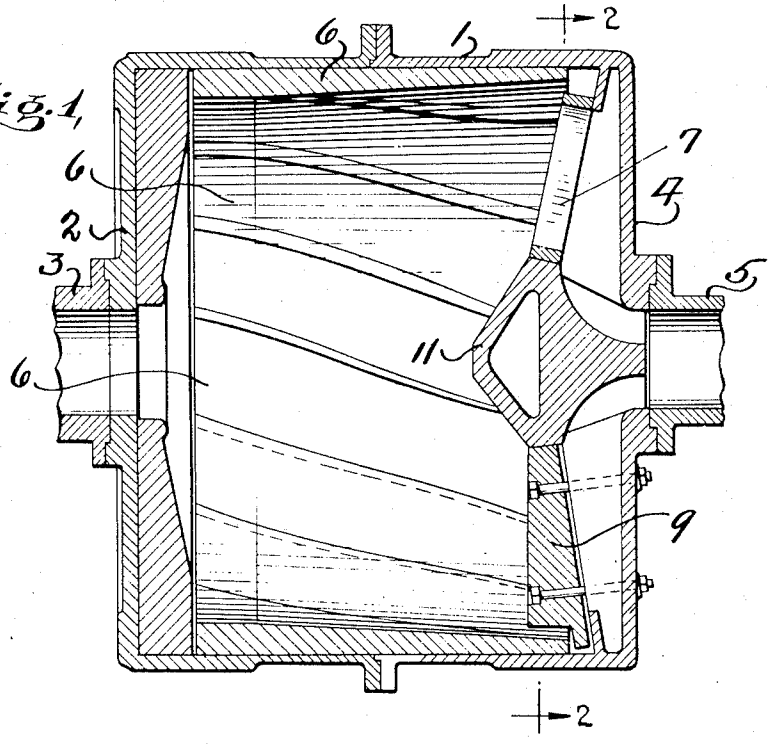


Fig. 3.

Fig. 2.

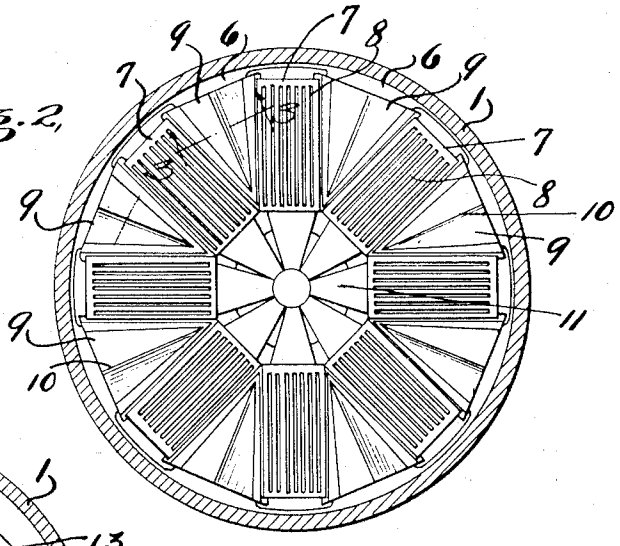
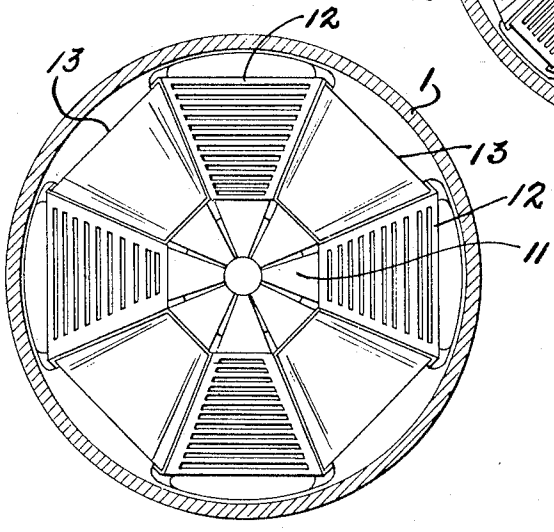


Fig. 4.



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UNITED STATES PATENT OFFICE.

FRANK E. MARCY, OF SAN DIEGO, CALIFORNIA.

MILL.

Original application filed June 7, 1927, Serial No. 197,054. Divided and this application filed December 28, 1927. Serial No. 243,052.

The present invention relates to an improvement in mills employing a rotary drum or barrel, in which are confined the material to be reduced and the necessary reducing medium, which may be in the form of balls, pebbles, cubes, rods, etc., the material being crushed or reduced by impact and attrition as the mill load tumbles and cascades due to rotation of the mill drum.

One of the objects of my invention is to provide a mill structure in which the efficiency of the mill is materially increased, this object being accomplished in part by providing a structure adjacent the discharge end of the mill drum for freeing the grate of oversize and reducing medium thereby preventing plugging or blocking of the grate openings and permitting of the escape of the fines.

While in mills of the type to which this invention is directed there is a constant migration of the mill load toward the discharge end of the mill due to the feeding of material to the feed end of the mill drum and the discharge of material from the discharge end, the present invention provides for increasing this migrating action, at the same time freeing the grate of oversize and reducing medium, so as to permit of the fines which are traveling forward with the migrating load to find their way readily through the grates to the outside of the mill.

In the drawings accompanying this application I have illustrated two embodiments of my invention,

Fig. 1 showing one embodiment in sectional elevation;

Fig. 2 being a section on the line 2—2 of Fig. 1;

Fig. 3 is a section substantially on the line 3—3 of Fig. 2; and

Fig. 4 is a sectional view of the modification.

Referring to the drawings in detail, 1 designates the rotary drum or barrel of the mill, this drum as will be understood by those skilled in this art, being provided with a feed head 2, feed trunnion 3, discharge head 4 and discharge trunnion 5. The trunnions 3 and 5 are mounted in suitable bearings, but inasmuch as these are well known, the same have not been illustrated.

The interior of the mill drum 1 is provided with stepped liners 6, these liners being so constructed and arranged as to provide liners sloping toward the discharge end of the mill drum on the ascending side of the drum thereby to effect an increase in the migrating action of the mill load toward the discharge end as the drum is rotating. The mill is assumed to be rotating toward the observer as viewed in Fig. 1.

Adjacent the discharge end of the mill or adjacent the discharge head 4 are a plurality of grate sections 7, these grate sections being disposed radially with respect to the mill and each section being substantially rectangular in form. The sections 7 are provided with grate openings 8 which extend lengthwise of the grate sections, that is to say, radially of the mill. Intermediate the grate section 7 are solid sections 9 by which the grate sections are retained in place. These solid sections 9 are triangular, or substantially so, in cross-section, the apex 10 of each solid section facing the interior of the mill drum and extending inwardly of the mill slightly beyond the inner face of the grate sections 7. The grate sections 7 and the solid sections 9 are all disposed about a conical member or substantially conical member 11, which, as will be seen from both Figs. 1 and 2, is centrally disposed with respect to the grate structure and extends inwardly of the grates into the mill for an appreciable distance.

The structure provided by the grate section 7 and solid section 9 is inclined outwardly as viewed in Fig. 1 to provide a substantially frusto-conical structure the base of which faces the discharge end of the mill.

In the operation of this mill the migration of the mill load toward the discharge end of the mill is accelerated by the provision of the liners 6, these liners sloping toward the discharge end on the ascending side of the mill drum causing the mill load to work toward the feed end at an increased speed. The fines traveling with the mill load will escape through the grate openings 8 in the sections 7, and to prevent these openings from becoming plugged or blocked by oversize, as well as by the reducing medium, the solid sections 9 have been provided, these members by reason of their formation carrying the oversize and reducing medium upwardly as the drum is rotated, the material then falling upon the face of the conical member 11 which, owing to its shape, will cause the reducing medium and oversize to be worked toward the feed

end of the mill, i. e., in a direction away from the grates. The net result of this construction is that the grate sections will be maintained free of oversize at all times, thereby permitting of the ready escape of fines from the mill through the grates.

In the form or embodiment of my invention illustrated in Fig. 3, the grate sections which I will here designate 12, are in the form of sectors as distinguished from the rectangular grate section 7 in the form just described. Alternating with these sectors 12 are solid sections also in the form of sectors designated 13, the grate sectors 12 and the solid sections 13 being disposed about a conical member 11 corresponding to the conical member 11 of Fig. 1. The face of each solid section 13 which is adjacent the interior of the mill, is curved as illustrated in Fig. 3, as distinguished from the triangular cross-section of the solid sections 9 of Fig. 1. The solid sections 13, however, function in the same manner as do the solid sections 9 and are provided for the same purpose. In other words, in this embodiment of my invention the grate sectors 12 and solid sections or sectors 13 cooperate with the central conical member 11 to free the grate sectors of oversize, while the liners with which this mill will be provided, and which correspond to the liner 6 of Fig. 1, will effect a migration of the mill load toward the discharge end. Consequently in operation we have the mill load being migrated toward the discharge end, that is toward the grates and means at the grates for freeing the same of oversize, whereby the fines in the load will be permitted to escape through the grate sections to increase the output and hence efficiency of the mill.

This application is a division of my copending application Serial No. 197,054, filed June 7, 1927.

What I claim is:—

1. A mill comprising in combination a rotary drum or barrel, rectangular grate sections disposed radially of the mill drum adjacent the discharge end thereof, and members of triangular cross-section intermediate adjacent grate sections for retaining said sections in place, said retaining members having their faces extended into the mill drum beyond the inner faces of the grates to free the grates of oversize.

2. A mill comprising in combination a rotary drum or barrel, rectangular grate sections disposed radially of the mill drum adjacent the discharge end thereof, and members of triangular cross-section intermediate adjacent grate sections for clamping the grate sections in place, said clamping members being so disposed that the apices thereof project inwardly of the mill beyond the inner face of the grate sections.

3. A mill comprising a rotary drum or barrel, grate sections and solid sections alternating and disposed radially of the discharge end of the mill, the solid sections cooperating with the grate sections to free the latter of oversize.

4. A mill comprising a rotary drum or barrel, rectangular grate sections and triangular solid sections alternately disposed adjacent the discharge end of the drum, the solid sections cooperating with the grate sections to free the latter of oversize.

5. A mill comprising a rotary drum or barrel, rectangular grate sections adjacent the discharge end of the mill and disposed radially thereof in spaced relation, the grate sections being provided with grate openings or slots extending lengthwise thereof, solid members filling the space between adjacent grate sections and cooperating with the grate sections to free the same of oversize.

6. A mill comprising a rotary drum or barrel, grate sections alternating with solid sections disposed across the mill drum adjacent the discharge end thereof, a conical member about which said sections are assembled, said solid sections cooperating with the grate sections and said conical member to reduce the accumulation of oversize at the grates.

7. A mill comprising a rotary drum or barrel, rectangular grate sections alternating with solid triangular sections disposed across the mill drum adjacent the discharge end, a conical member about which said grate sections and solid sections are assembled, the face of said solid sections facing the drum interior being extended inwardly of the mill beyond the inner face of the grates, and cooperating with the grates and with said conical member to free the grate sections of oversize.

8. A mill comprising a rotary drum or barrel, liners therefor sloping toward the discharge end of the drum on the ascending side thereof, grate sections adjacent the discharge end of the drum arranged radially thereof and in spaced relation to each other, solid sections filling the space between adjacent grate sections, a conical member about which the grate sections and solid sections are assembled, said solid sections cooperating with said conical member to free the grate sections of oversize thereby to expedite the discharge through the grates of the fines migrated thereto by the sloping liners.

9. A mill comprising in combination, a rotary drum or barrel, inclined rectangular sections at the discharge end of the mill, inclined triangular solid sections intermediate the grate sections, a substantially conical member about which said grate sections and solid sections are assembled, said solid sections and said conical member cooperating with the grate sections to free the same of oversize.

10. A mill comprising a rotary drum or

barrel, grate sections and solid sections alternating and disposed radially of the discharge end of the mill, liners for the mill drum sloping toward the grate sections and solid sections on the ascending side of the mill drum, said solid sections cooperating with the said grate sections to free the grate of oversize migrated thereto by the sloping liners.

11. A mill comprising a rotary drum or barrel, rectangular grate sections and solid sections alternately disposed adjacent the discharge end of the drum, liners for the drum sloping toward the grate sections on the rising side of the drum, said solid sections cooperating with the grate sections to assist in freeing the grate sections of the oversize migrated thereto by the sloping liners.

12. As an article of manufacture a solid grate-retaining member for grate mills triangular in plan.

13. As an article of manufacture a solid grate-retaining member for grate mills, said member being triangular in cross-section.

14. As an article of manufacture a solid grate-retaining member for grate mills, said member being triangular in plan and in cross-section.

This specification signed this 19 day of December, 1927.

FRANK E. MARCY.