No. 789,983. PATENTED MAY 16, 1905.

W. R. MACKLIND.

SLIP MILL.

APPLICATION FILED SEPT. 19, 1903.

2 SHEETS—SHEET 1.

Fig. 1a.

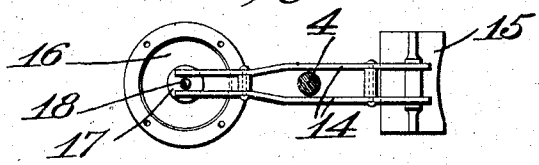
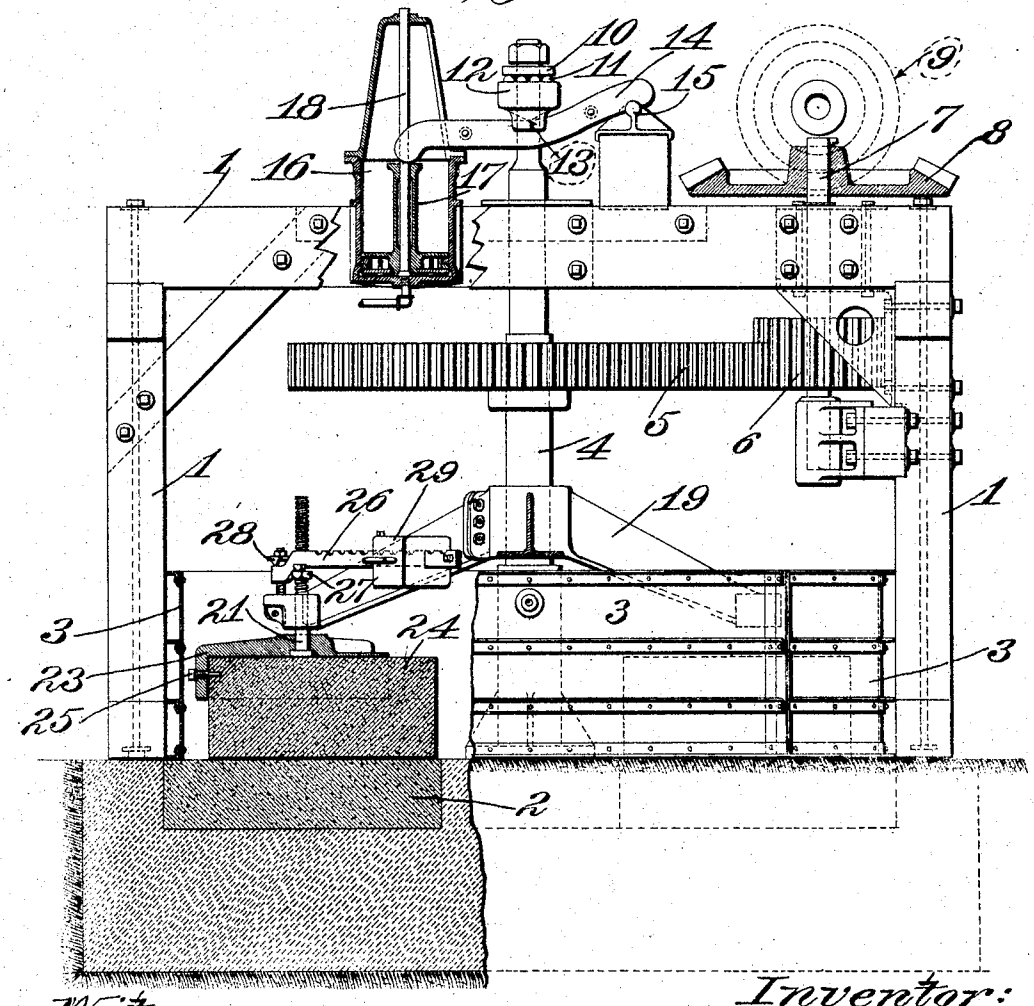


Fig. 1.



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2 SHEETS—SHEET 2.

Fig. 2.

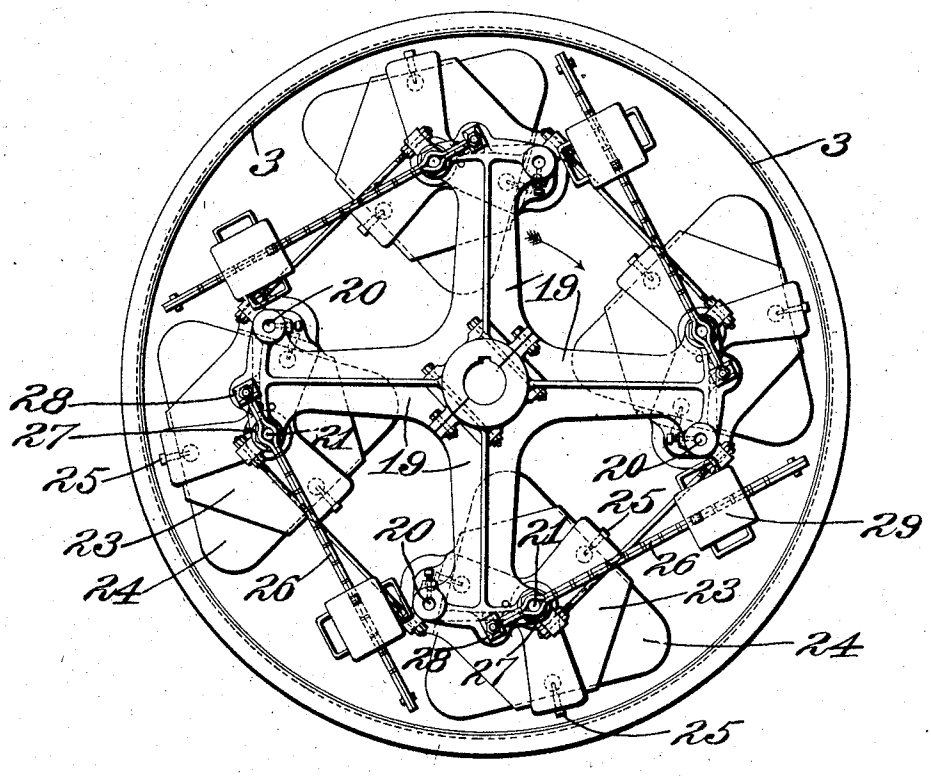
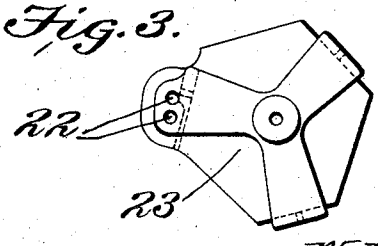


Fig. 3.



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UNITED STATES PATENT OFFICE.

WILLIAM R. MACKLIND, OF ST. LOUIS, MISSOURI.

SLIP-MILL.

SPECIFICATION forming part of Letters Patent No. 789,983, dated May 16, 1905.

Application filed September 19, 1903. Serial No. 173,854.

To all whom it may concern:

Be it known that I, WILLIAM R. MACKLIND, a citizen of the United States, residing at the city of St. Louis, State of Missouri, have invented a certain new and useful Improvement in Slip-Mills, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is an elevational view, partly in section, of my improved slip-mill. Fig. 1ª is a top plan view of the lifting-cylinder and its lever. Fig. 2 is a plan view of the spider which carries the upper grinding-stones, and Fig. 3 is a top plan view of one of the grinding-stone caps.

This invention relates to new and useful improvements in "slip-mills," as they are called, the object being to provide means for lifting the upper grinding-stones of such mills during the operation of the mill, so as to relieve the grinding-faces from accumulated particles.

Another object is to provide means for exerting adjustable pressure on the upper grinding-stones to regulate the wear thereof.

With these objects in view the invention consists in the construction, arrangement, and combination of the several parts, all as will be hereinafter described, and afterward pointed out in the claims.

In the drawings, 1 indicates the framework of the mill, and 2 the bottom or nether millstone.

3 is the casing surrounding the millstones and for containing the material to be ground. This material is usually held in suspension in water and when reduced is conducted off to some suitable point.

4 is the vertical or main shaft mounted in appropriate bearings, the lower of which is preferably a foot-bearing, which may contain balls or other antifriction devices to take up the end thrusts of the shaft in its working position. This shaft carries a gear 5, which is in mesh with a wide-faced pinion 6. This pinion 6 is mounted on a shaft 7, supported in suitable bracket-bearings, on the upper end of which is a gear 8, driven by a gear 9.

The upper end of shaft 4 is provided with a flange 10, forming a ball-race under which are arranged a series of balls 11, seated in a cup 12, mounted so as to revolve freely on the shaft. This cup 12 is provided with bearing-points 13, coöperating with a lever 14, fulcrumed on a pivot-block 15. The lever, as shown in Fig. 1ª, is composed of two pieces appropriately secured together, so as to straddle the shaft 4. The other end of lever 14 extends into a cylinder 16 over the end of a piston-stem 17. When pressure in the form of air or steam is admitted under the piston, the piston is raised, being guided in its movements by a rod 18, and carries with it the lever 14, which holds the shaft 4 and its carried parts in suspension in this raised position, with the result that the upper grinding-stones are lifted from grinding position and the mill is thus relieved. This is a very desirable feature in mills of this character, as it is not necessary to shut the mill down for the purpose of cleaning it out when it becomes choked, as it frequently does in grinding certain kinds of material.

The lower end of shaft 4 carries a spider 19, which is preferably in the form of a divided casting having a plurality of arms. These arms have laterally-extending lugs or ears at their ends in which are arranged drag-bolts 20 and pressure pivot-pins 21. The bolts 20, which I have termed "drag-bolts," project downwardly beneath the spider-arm and are received in one of the openings 22 of a casting 23. (See Fig. 3.) The casting 23 forms practically a cap for the grinding-stone 24, which grinding-stone is preferably triangular in shape, the same being received in the cap and held in position by set-screws 25 passing through the vertical depending legs of the cap and into the stone, as shown in Fig. 1. The center of this cap 23 is provided with an opening in which is received a pressure pivot-bolt 21. This pivot-bolt is free to move vertically through its opening in the spider-arm and coöperates with a lever 26, bearing on a nut 27, adjustably mounted on bolt 21, said lever being fulcrumed under an adjustable bearing-block 28, supported on the spider-arm and having a weight 29 adjustable on its opposite

or free end. By this construction even pressure is exerted at all times upon the upper grinding-stones 24, the pressure being directed downwardly upon the center of the stone. The weight of shaft 4 in its working position is supported by the antifriction-bearing at its lower end and the weights 29 exert their pressure upon the pivot-bolts 21, and thus pressure may be varied by adjusting the weights 29 along the levers or weight-arms 26, which are appropriately notched along their upper edges for well-understood purposes. By being fulcrumed on the spider-arms the weighted lever-arms 26 exert a lifting tendency on the spider-arms, which is transmitted back to the shaft 4, and thus the antifriction-bearings under the lower end of said shaft are relieved of pressure in proportion to the counterbalancing action of the weights 29 distributed around the spider-arms. In the event that the mill becomes choked and it is desired to lift the stones 24 from grinding position pressure is admitted under the piston in cylinder 16 and the shaft 4 and its carried spider-arms are elevated. Because the pivot pressure-bolts 21 are loosely arranged in their openings in the ends of the spider-arms it follows that the initial movement of the shaft 4 in a vertical direction will not affect the position of the stones 24, but as soon as the upper faces of the spider-arms come in contact with the nuts 27 the stones will be lifted. By adjusting these nuts vertically the point in the upward movement of the spider-arms where they engage and lift the stones may be regulated and also the wear of the stones can be taken up, so as to get the full benefit of the leverage resulting from the horizontal position of the weight-arm 26.

In the event that the stones 24 wear unevenly the drag-bolt can be inserted in a different opening 22, so as to change the line of pull.

I am aware that minor changes in the construction, arrangement, and combination of the several parts of my device can be made and substituted for those herein shown and described without in the least departing from the nature and principle of my invention.

Having thus described the invention, what is claimed as new, and desired to be secured by Letters Patent, is—

1. In a mill of the character described, the combination with a shaft having spider-arms, a threaded pressure-bolt extending through said spider-arms and movable vertically with respect thereto, a bearing-nut threaded on said bolt, an adjustable fulcrum-block mounted on the spider-arms, a lever-arm coöperating with said adjustable fulcrum-block and nut, and a weight adjustable along said lever-arm; substantially as described.

2. In a mill of the character described, the combination with a shaft having spider-arms, of drag-bolts depending therefrom, cap-castings having openings receiving said drag-bolts, said castings being movable vertically with respect to said drag-bolts, grinding-stones secured in said cap-casting, a pressure-bolt secured in said cap-casting and extending through an opening in the spider-arm, and a weighted lever-arm coöperating with said pressure-bolt; substantially as described.

3. In a mill of the character described, the combination with a stationary nether stone, of a shaft, grinding means coöperating with the nether millstone, flexible connection between the grinding means and the shaft, a collar loosely mounted on said shaft, a lever cooperating with the collar, and a fluid-controlled piston coöperating with said lever to lift the same and suspend the shaft therefrom with the grinding devices out of grinding position; substantially as described.

4. In a mill, the combination with a stationary nether millstone, of a shaft, a spider on the shaft, grinding means carried by the spider, a collar loosely mounted on the shaft, a block, a lever fulcrumed on the block and engaging the collar, a cylinder, and a piston in the cylinder and adapted to be actuated to control the lever so as to impart a longitudinal movement to the shaft; substantially as described.

5. In a mill, the combination with a rotatable shaft having spider-arms, of grinding-stones pivoted to said spider-arms, and a weighted lever-arm carried by the spider for exerting pressure on the centers of said stones; substantially as described.

6. In a mill, the combination with a rotatable shaft having an arm, of a grinding-stone pivoted to said arm, and a weighted lever carried by the arm for exerting pressure on the center of the stone; substantially as described.

In testimony whereof I hereunto affix my signature, in the presence of two witnesses, this 15th day of September, 1903.

WILLIAM R. MACKLIND.

Witnesses:

GEORGE BAKEWELL,

LENORE J. WILSON.