No. 630,574. Patented Aug. 8, 1899.

T. L. & T. J. STURTEVANT.

GRINDING MILL.

(Application filed July 22, 1898.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.

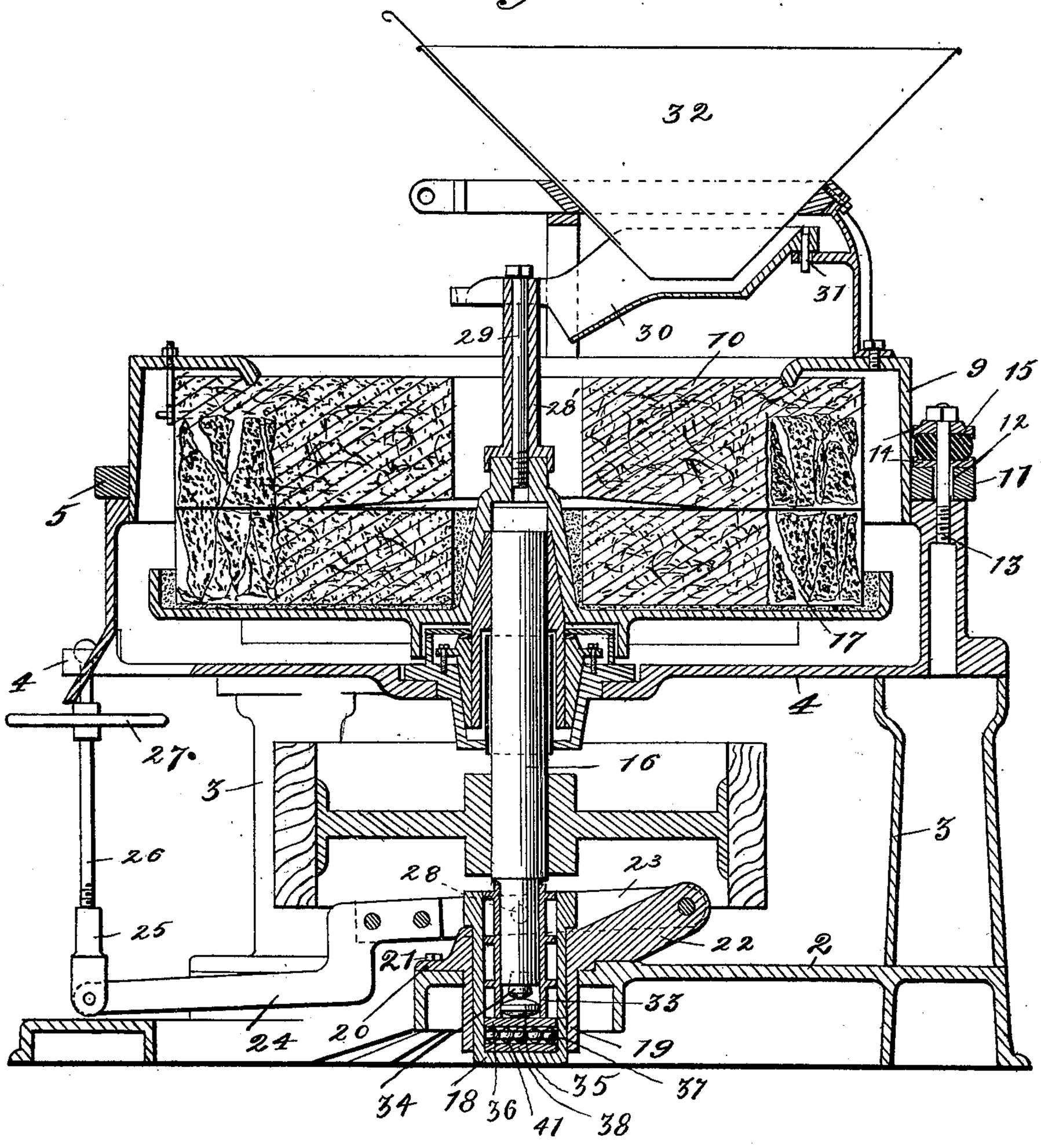
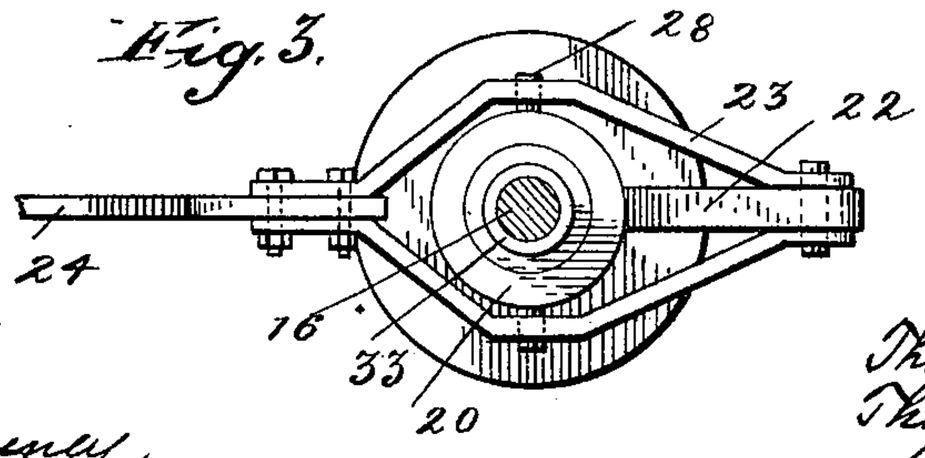


Fig. 3.



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3 Sheets—Sheet 2

Fig. 2.

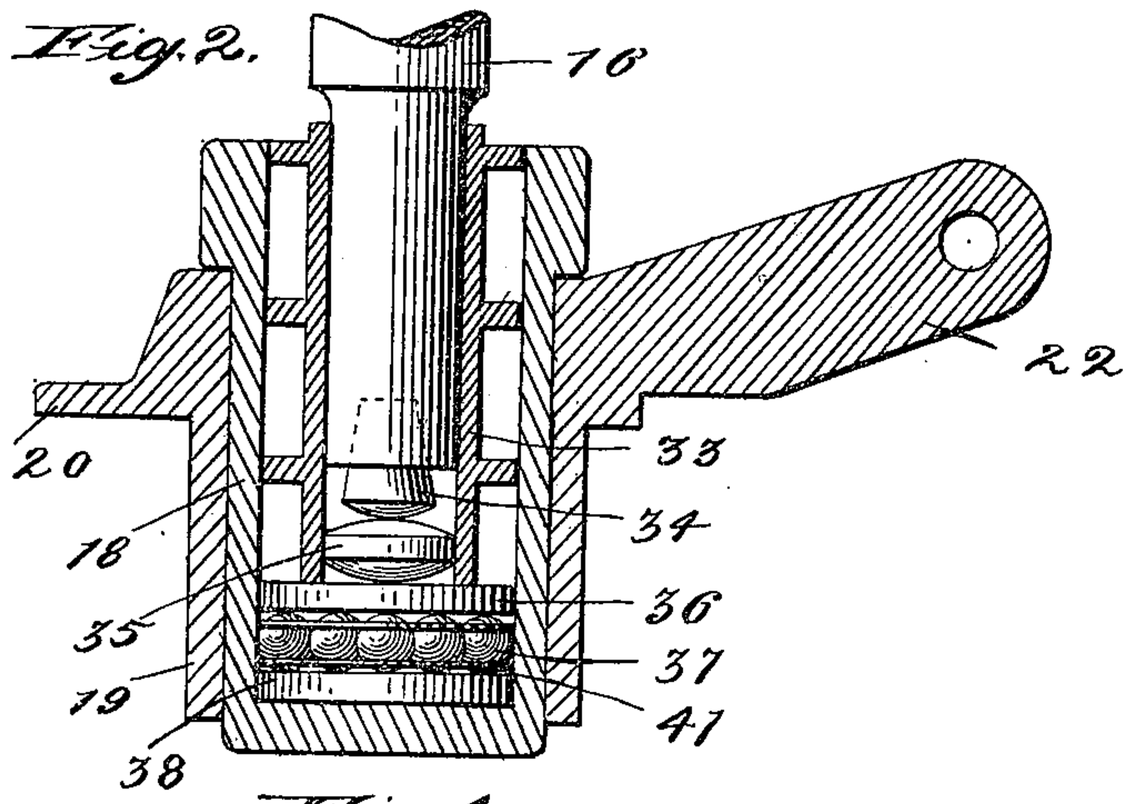
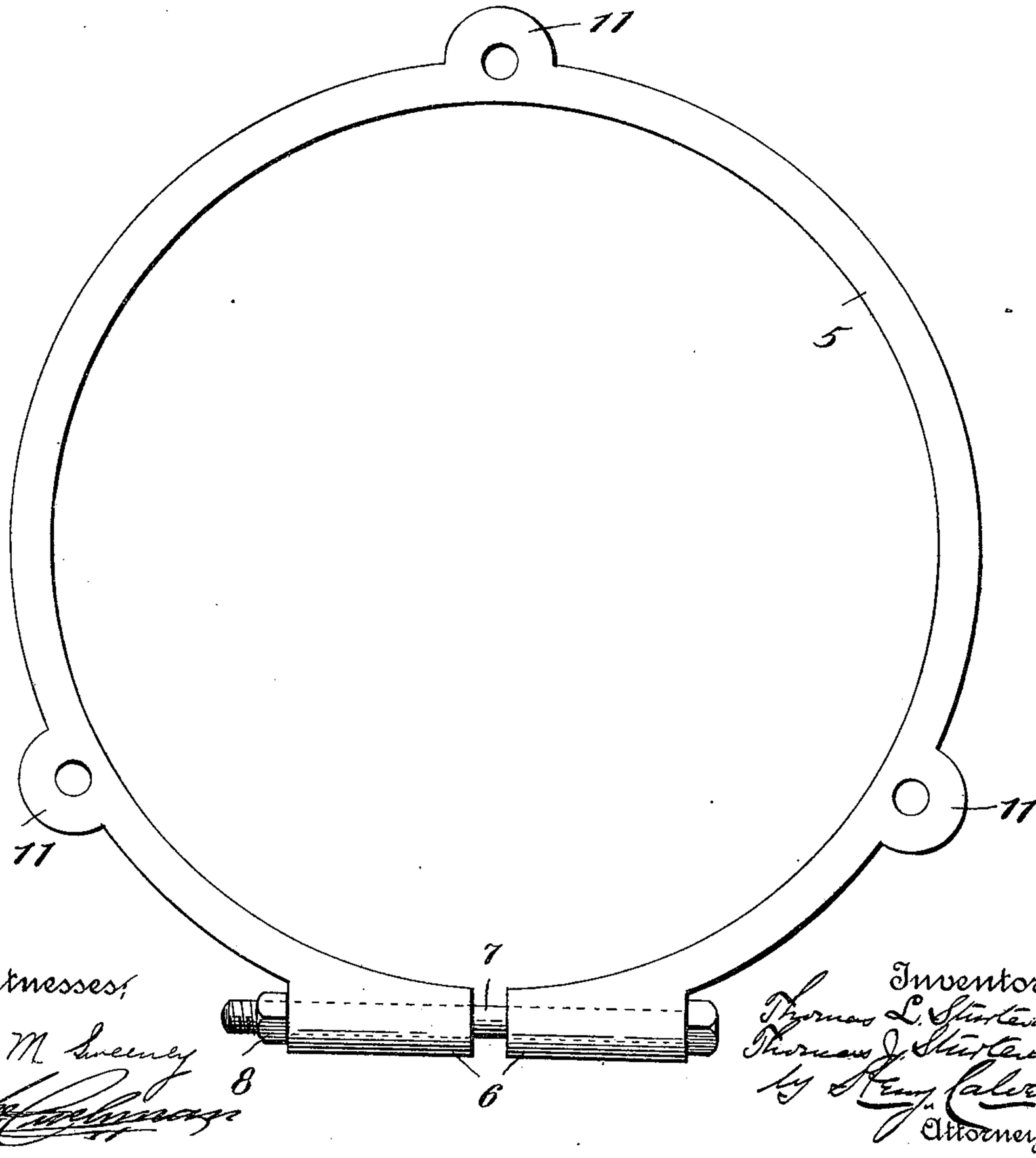


Fig. 1



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T. L. & T. J. STURTEVANT.

GRINDING MILL.

Application filed July 22, 1898.

(No Model.) 3 Sheets—Sheet 3.

Fig. 5

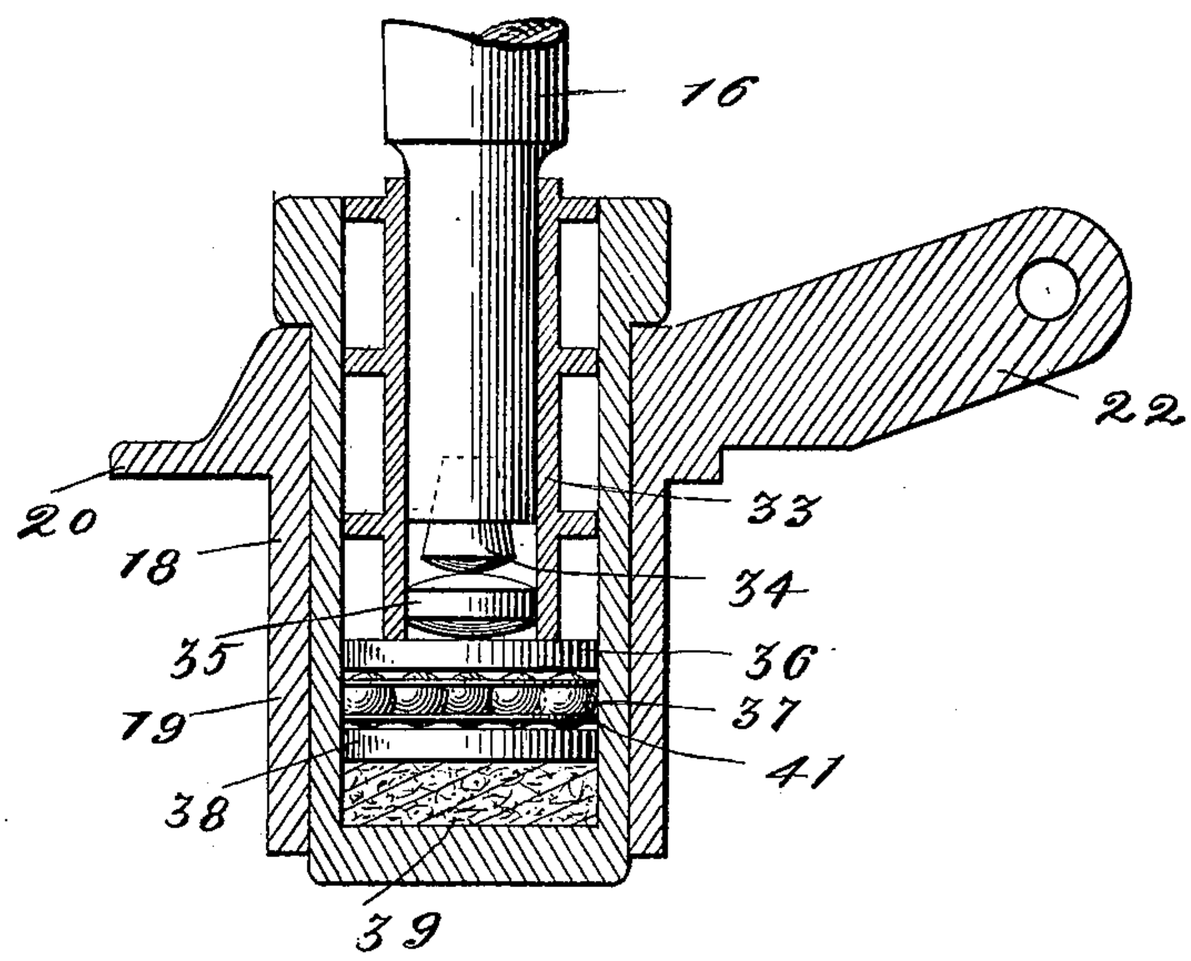
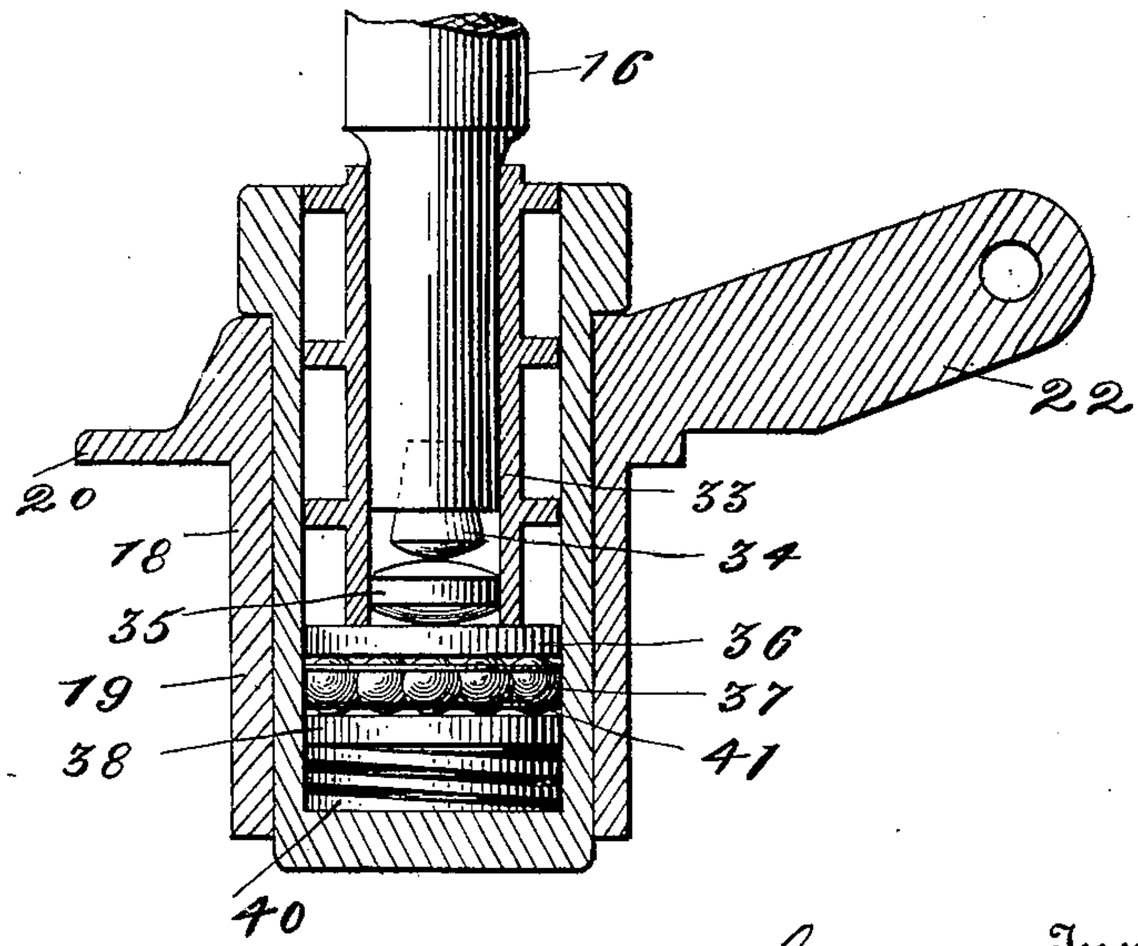


Fig. 6.



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UNITED STATES PATENT OFFICE.

THOMAS L. STURTEVANT, OF QUINCY, AND THOMAS J. STURTEVANT, OF FRAMINGHAM, MASSACHUSETTS.

GRINDING-MILL.

SPECIFICATION forming part of Letters Patent No. 630,574, dated August 8, 1899.

Application filed July 22, 1898. Serial No. 686,614. (No model.)

To all whom it may concern:

Be it known that we, THOMAS L. STURTEVANT, residing at Quincy, in the county of Norfolk, and THOMAS J. STURTEVANT, residing at Framingham, in the county of Middlesex, State of Massachusetts, citizens of the United States, have invented certain new and useful Improvements in Grinding-Mills, of which the following is a specification, reference being had therein to the accompanying drawings.

Our invention relates to that class of grinding-mills in which a horizontally-arranged running-stone carried by a vertical shaft or spindle coöperates with a stationary grinding-disk or bed-stone, our invention comprising certain improvements on the grinding-mill shown by our Patent No. 572,386, dated December 1, 1896. These improvements relate more particularly to means for sustaining and adjusting the stationary grinding-disk or bed-stone and to an adjustable step-bearing for the vertical shaft or spindle.

In the accompanying drawings, Figure 1 is a vertical section of a grinding-mill embodying our improvements. Fig. 2 is a detail sectional view to show the button and ball step-bearings. Fig. 3 is a plan view of a portion of the parts composing the adjustable step-bearing for the vertical shaft or spindle. Fig. 4 is a plan view of the bed-stone-case clamping-ring. Figs. 5 and 6 illustrate slight modifications of cushioned ball-bearings.

The frame of the machine comprises a bed-plate 2, on which rest pillars 3, supporting the lower part 4 of the casing for the grinding-stones. Resting on the support or casing 4 is a split clamping-ring 5, provided adjacent to its split portion with hollow lugs 6, through which extends a bolt 7, one end of which is threaded for the reception of a nut 8. This clamping-ring encircles the upper support or casing 9, to which the stationary grinding-disk or bed-stone 10 is secured in any suitable manner—such, for example, as is shown in our Patent No. 572,386, hereinbefore referred to. By properly screwing up the nut 8 the clamping-ring 5 is caused to tightly clasp the said upper or bed-stone casing 9, and thereby support said casing and its attached stationary grinding-disk or bed-stone on the lower casing 4. The clamping-ring 5 is provided with ears 11, having holes 12, through which extend bolts 13, suitably threaded into portions of the lower casing 4. Between the heads of the bolts 13 and the clamping-ring 5 or between washers 14, interposed between said heads and ring, are placed springs 15, herein shown as rubber blocks, although it will be understood that spiral springs might be employed instead of these rubber blocks or springs. These springs permit the upper casing and its attached bed-stone to yield upwardly when required, as when nails or other hard substances accidentally get into the mill. It will be seen that the holes 12 are of greater diameter than the bolts 13, in order to permit the clamping-ring to move horizontally when it is tightened or loosened to clamp or release the bed-stone casing 9. This construction also allows free vertical movement of the clamping-ring 5 and the bed-stone casing 9 under the stress of grinding against the pressure of the springs or cushions 15.

The rotating vertical shaft or spindle 16, with which the running-stone 17 is suitably connected, (preferably as shown in our said Patent No. 572,386,) is stepped in an oil-pot 18, which is vertically adjustable in a sleeve 19, provided with a flange 20, secured to the bed-plate 2 by means of bolts 21, said sleeve having a rigid arm 22, to which lifting-bars 23 are pivoted. Said lifting-bars 23 form a part of an adjustable lever 24, provided at its outer end with a pivoted socket-piece 25, into which is tapped the threaded lower end of a shaft 26, swiveled at its upper end to the casing 4 and provided with a hand-wheel 27, by means of which it may be turned. The oil-pot 18 is provided with trunnions 28, which rest in suitable sockets on the lifting-bars 23. It will thus be readily understood that by turning the hand-wheel 27 the oil-pot 18, and consequently the vertical shaft or spindle 16, with its attached running-stone 17, can be adjusted vertically to raise or lower the said stone, and thus bring it into proper position relative to the stationary grinding-disk or bed-stone 10. Also the said stationary disk or bed-stone 10 can be adjusted so as to bring it into proper horizontal position relative to the running-stone simply by loosening the

nut 8 of the clamping-bolt 7, thus loosening the clamping-ring 5 and permitting the said stationary disk or bed-stone to settle down by gravity onto the running-stone 17, and thereby adjust itself properly on the face of the said running-stone, and when this adjustment is effected said bed-stone will be properly secured in working position simply by tightening the said clamping-ring 5 around the upper casing 4 by screwing up the said nut 8.

To the hub of the runner-stone is firmly secured the damsel 28′ by means of a bolt 29, screw-threaded into the top of the runner-stone hub, the upper end of the damsel 28′ being notched so as to shake the feed-trough 30, pivoted at 31 below the hopper 32. It will be seen that by thus firmly securing the damsel to the runner-hub the usual upper bearing for the damsel may be dispensed with.

In order that the vertical shaft or spindle 16, carrying the heavy running-stone, may be run rapidly and easily, it is desirable that the said shaft should be provided with a ball or roller step-bearing; but in the class of mills to which our invention relates considerable difficulty has been experienced in providing the vertical shafts with ball or roller step-bearings for the reason that the balls or rollers are liable to be crushed by the great weight which they support and the shocks which they sustain, and when a ball or roller becomes broken the bearing is liable to be ruined. In order to guard against this trouble incidental to breaking of the balls, it is desirable that large balls should be employed, and it is also desirable that a considerable number of these balls should be used, so that the weight which they sustain may be distributed over a considerable number of balls. It is furthermore desirable to provide an alternative anti-friction-bearing on which the shaft may run should one or more of the balls of the ball-bearing be crushed, thus obviating the liability of injury to the bearing. To this end we have provided an improved step-bearing, which will now be described.

The chamber of the oil-pot 18 is made considerably larger in diameter than the lower end of the vertical shaft or spindle 16, and a bushing 33, preferably of brass, is interposed between the lower end of the said shaft and the inner wall of said oil-pot. The said bushing 33 serves to center the vertical shaft or spindle 16 in the chamber of the oil-pot 13, and which chamber is, as just above stated, made considerably larger in diameter than the lower end of said shaft. The said shaft or spindle is preferably provided with a steel plug 34, having a convex lower face resting on the convex upper face of a button 35, the lower face of said button being also convex. The button 35 rests on a circular plate or washer 36 about equal in diameter to the said bushing 33 and which washer in turn rests upon a series of balls 37, practically filling the area of the ball-chamber and preferably held in a cage 41, and between said balls and the bottom of the oil-pot is preferably placed a second plate or washer 38. Owing to the fact that the chamber of the oil-pot is considerably larger in diameter than the shaft or spindle 16 a considerable number of large balls may be received in the space provided for them beneath the disk or washer 36, and the weight of the shaft or spindle and its attached running-stone will thus be distributed over a considerable number of large balls. Ordinarily the friction between the plug 33 and button 35 will be greater than the friction between the disk or plate 36 and the balls 37, so that said plug, button, and plate or washer will all turn, the said plate or washer running on the said balls. If, however, one of the balls should accidentally become broken, the friction on the ball-bearing will be increased, and in such case the plug 33 will turn on the button 35 or the said button 35 will turn on the plate or washer 36, the said button or plug and button thus serving as an alternative bearing, which will run under such circumstances, and thereby prevent the ball-bearing from becoming ruined by the broken ball or balls before the damage has been discovered and remedied. The double bearing which we provide being assembled, as shown, beneath the spindle or shaft and with the button and ball bearings in proximity to each other, it will be apparent that upon the breaking of a ball or other serious damage to the lower or ball bearing said ball-bearing will cease to operate and the work will be transferred to the button-bearing above it, this result occurring as soon as the ball-bearing runs less easily or with more friction than the button-bearing, as will be obvious.

By virtue of our improved step-bearing we have been enabled to increase the speed of our improved grinding-mill from twenty-five to forty per cent. over the speed possible with similar mills heretofore constructed. By reason of the fact that the ball step-bearing is carried by a part—to wit, the oil-pot 18, which is hung by its trunnions in the lifting-bars 23, forming a part of the lever 24—we are enabled, in a sense, by this construction to cushion the balls, and thereby lessen the danger of breakage thereof owing to great shocks, as when nails or pieces of iron get in between the stones of our rapidly-running mill. In other words, the lever which sustains the oil-pot carrying the ball-bearing is slightly elastic, so that the balls are somewhat cushioned from the effects of shocks liable to occur when the machine is running at high speed. Thus the manner in which the step-bearing is hung does not permit the balls to receive such a blow from shocks, which are liable to occur, as would be the case if the step ball-bearing were sustained by a solid part, as the frame of the machine.

Instead of cushioning the ball-bearing for

the shaft or spindle 16 in the manner described or supplementary thereto said bearing may be cushioned by a leather washer 39 placed below the lower washer 38, as shown in Fig. 5, or by a spring 40 below the metal plate or washer 38, as shown in Fig. 6, or in any other suitable manner.

Having thus described our invention, we claim and desire to secure by Letters Patent—

1. In a grinding-mill, the combination with a runner-stone and its shaft or spindle, of a bed-stone coöperating with said runner-stone, a support to which the said bed-stone is attached and by which said stone is sustained, a clamping-ring encircling said support and within which said support and bed-stone are adjustable, and a support on which said ring rests to sustain said bed-stone and casing in their adjusted positions.

2. In a grinding-mill, the combination with a runner-stone and its shaft or spindle, of a bed-stone coöperating with said runner-stone, a support to which the said bed-stone is attached and by which said stone is sustained, a split clamping-ring encircling said support and within which said support and bed-stone are adjustable, and a support on which said ring rests to sustain said bed-stone and casing in their adjusted positions.

3. In a grinding-mill, the combination with a runner-stone and its shaft or spindle, of a bed-stone coöperating with said runner-stone, a support to which the said bed-stone is attached and by which said stone is sustained, a clamping-ring encircling said support and within which said casing and bed-stone are vertically adjustable, and a support on which said ring rests to sustain said bed-stone and casing in their adjusted positions, bolts for attaching said clamping-ring to said support, and springs interposed between said clamping-ring and the heads of said bolts.

4. In a grinding-mill, the combination with a runner-stone and its shaft or spindle, of the casing 4, a clamping-ring 5 resting on said casing and provided with ears 11 having holes 12, bolts 13 passing through said holes, the casing 9 encircled and supported by said clamping-ring and vertically adjustable therein, and the bed-stone 10 attached to said casing 9.

5. In a grinding-mill, the combination with a vertical shaft or spindle, of a runner-stone carried thereby, a bed-stone coöperating with said runner-stone, an oil-pot in which said shaft or spindle is stepped and which sustains the weight of said shaft or spindle and of said runner-stone, a cushioned thrust or step ball-bearing for said shaft in said oil-pot and comprising a ball-chamber the area of which is practically filled with balls and which chamber is of greater diameter than said shaft, a bushing filling the area of said oil-pot outside of said shaft, and means for adjusting said oil-pot vertically to vary the working position of said shaft or spindle and the runner-stone carried thereby.

6. In a grinding-mill, the combination with a vertical shaft or spindle, a runner-stone carried thereby and a bed-stone coöperating with said runner-stone, of an oil-pot, a lower ball-bearing for said shaft in said oil-pot, and which ball-bearing comprises a mass of balls practically covering a surface of larger diameter than the said shaft, so that the weight of said shaft and runner-stone is distributed over a large number of balls, and cushioning means for said ball-bearing in said oil-pot.

7. In a grinding-mill, the combination with a vertical shaft or spindle, a runner-stone carried thereby, and a bed-stone coöperating with said runner-stone, of an oil-pot into which the lower end of said shaft extends, and a double bearing in said oil-pot beneath said shaft, said double bearing comprising a ball-bearing and a button-bearing, the latter having two convex faces, and said ball-bearing comprising a mass of balls covering a surface of greater diameter than said shaft or spindle.

In testimony whereof we affix our signatures in the presence of two witnesses.

THOMAS L. STURTEVANT.
THOMAS J. STURTEVANT.

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