No. 856,311. PATENTED JUNE 11, 1907.

T. L. & T. J. STURTEVANT.

VERTICAL CRUSHING AND GRINDING MILL.

APPLICATION FILED JUNE 29, 1906.

2 SHEETS—SHEET 1.

Fig. 2.

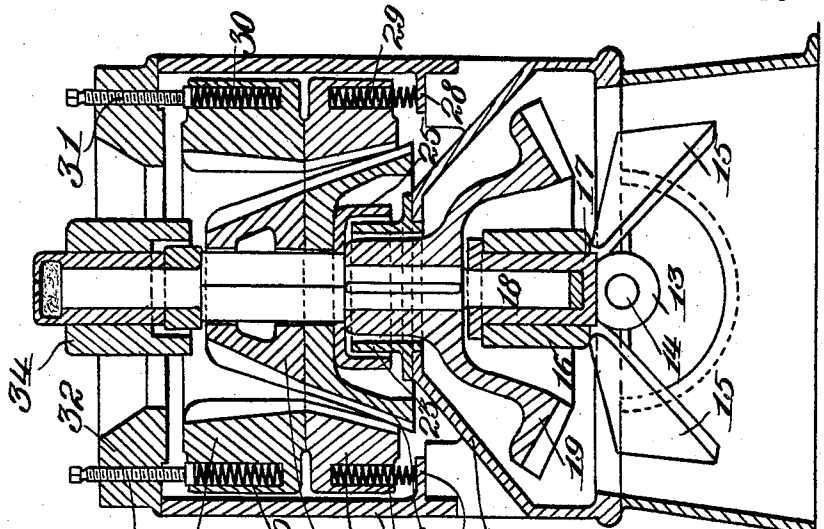

Fig. 1.

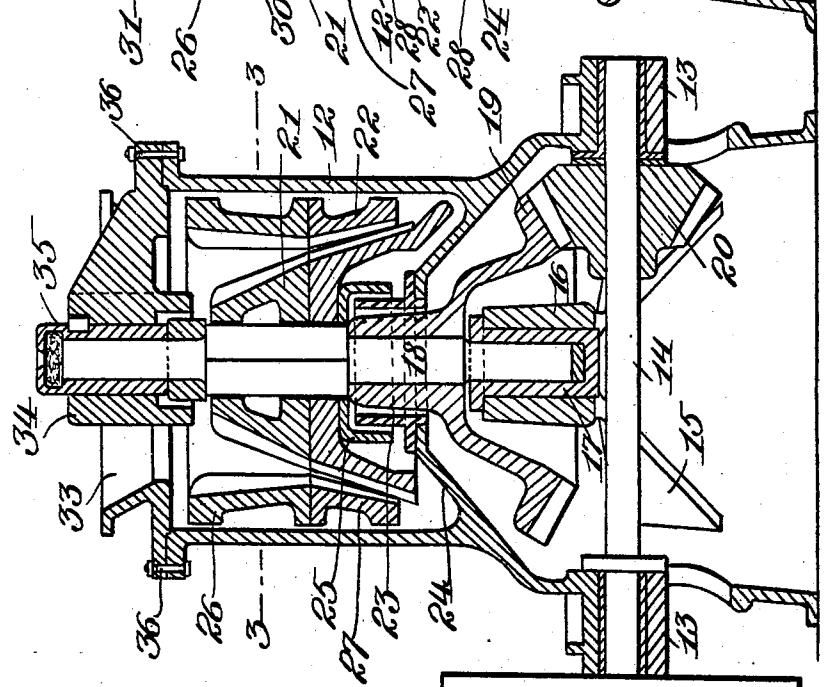

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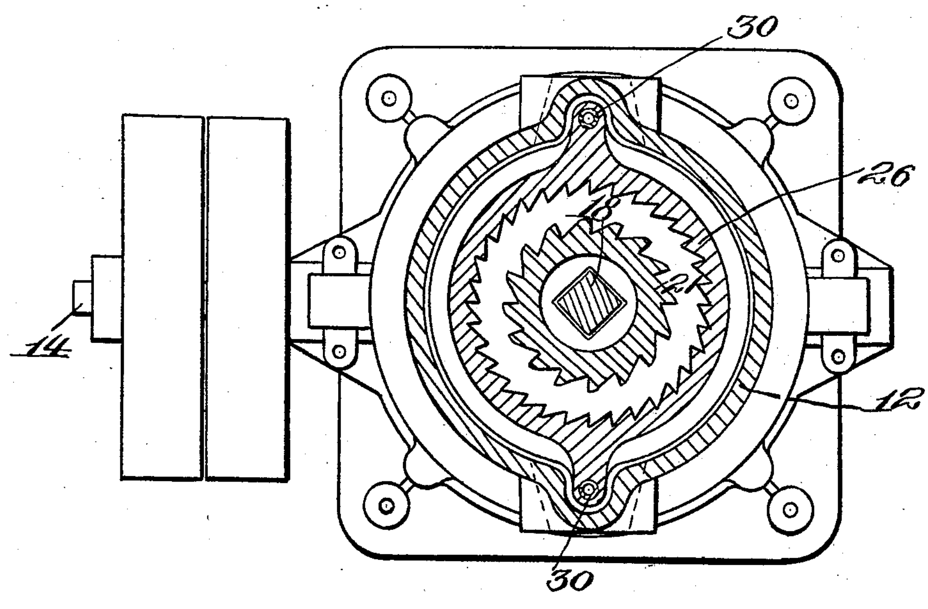
Fig. 3.



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UNITED STATES PATENT OFFICE.

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VERTICAL CRUSHING AND GRINDING MILL.

No. 856,311. Specification of Letters Patent. Patented June 11, 1907.

Application filed June 29, 1906. Serial No. 324,017.

To all whom it may concern.

Be it known that we, THOMAS LEGGETT STURTEVANT and THOMAS JOSEPH STURTEVANT, citizens of the United States, residing, respectively, at Quincy and Wellesley, in the county of Norfolk and State of Massachusetts, have invented or discovered certain new and useful Improvements in Vertical Crushing and Grinding Mills, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to that class of crushing and grinding mills in which rotary crushing elements carried by a vertical shaft co-operate with non-rotating or normally stationary crushing elements fixed to the casing of the mill; and the invention has for its object to provide a crusher, of the class referred to, which is of simple construction, which is well adapted for crushers of moderate size, in which the crushing elements are removable through the top of the mill casing, and in which the adjustment of the crushing elements for regulating the fineness of the output of the mill is effected in a novel manner.

In the accompanying drawings Figure 1 is a vertical section of a crushing and grinding mill embodying the present invention, such section being taken in the line of the driving shaft of the mill. Fig. 2 is also a vertical section of the improved crushing and grinding mill taken in a plane at right angles to Fig. 1, and Fig. 3 is a horizontal section on line 3—3, Fig. 1.

Referring to the drawings, 12 denotes the casing of the mill which is preferably cast in one piece and which is provided at its lower part with suitable bearings 13 in which is journaled the driving shaft 14. The base portion of the mill comprises webs or brackets 15 surmounted by a sleeve or support 16 which receives a cup-like bearing 17 in which is stepped the vertical shaft 18 carrying a bevel gear 19 the hub portion of which is keyed to the said shaft and which beveled gear meshes with a smaller bevel gear or pinion 20 fixed to the driving shaft 14. The vertical shaft 18 is provided with a square or polygonal portion on which are mounted the rotary crushing and grinding cones 21 and 22. The lowermost grinding cone 22 is recessed at its lower part so as to overhang the hub of the bevel gear 19 which extends within a sleeve 23 supported by a flange 24 forming part of the mill casing, and which sleeve is overlapped by an inverted cup 25 the top of which surrounds the square portion of the shaft 18 so that said inverted cup will rotate with said shaft. This construction just described provides a dust-lock which prevents the material being crushed from working down in the lower bearing of the shaft 18, and in order to further protect the said lower bearing of said vertical shaft the bevel gear 19 is recessed beneath so as to overhang and provide a housing for the cup-like part 17 in which the said vertical shaft is stepped. Also the said bevel gear 19 is of such construction as to overhang and cover the bevel pinion 20, the perimeter of said bevel gear extending practically to the outer face of said pinion, thereby preventing any material coming down from above from getting between the teeth of the said gear and pinion.

Co-operating with the rotary grinding and crushing cones 21 and 22 are the non-rotating or normally stationary crushing and grinding shells or elements 26 and 27, said shells or elements being provided with internal teeth in the usual manner, and having their faces constructed so as to form a double angle with each other. Instead of depending upon a vertical adjustment of the vertical shaft and of the rotary crushing and grinding elements carried thereby, for the regulation of the fineness of the output of the mill, as has heretofore been customary, the stationary crushing and grinding shells or elements of the present improved machine are vertically adjustable relative to the rotary crushing and grinding elements, and the said stationary crushing and grinding shells or elements are preferably elastically supported upon springs which will permit them to yield vertically more or less, under strain, so as to avoid excessive jars or shocks. To this end the casing of the mill comprises internal supports 28 on which rest springs 29 which sustain the weight of the lowermost shell 27 and also of the superposed shell 26, said shell 26 being recessed for the reception of springs 30, which may be acted upon by regulating screws 31 tapped in the cap 32. The said cap 32 has a hopper opening 33 and

the central portion 34 of said cap receives a sleeve 35 which serves as an upper bearing for the vertical shaft 18; and the said cap is removably secured to the mill casing 12 by suitable bolts, as 36, or otherwise. By turning down the regulating screw 31 and thereby compressing the springs 29 and 30 the stationary crushing shells or elements will be lowered to make the output of the mill finer; or by relaxing said screws, and thereby permitting the said springs to lift the said stationary crushing elements or shells, the output of the mill will be somewhat coarser, as will be understood. Instead of the depressing adjusting screws 31 lifting adjusting screws may be employed for regulating the output of the mill by varying the vertical position of the stationary crushing and grinding elements.

The open top of the mill casing 12, which is covered by the cap 32, is of such size as to permit the stationary crushing shells or elements 26 and 27 to be inserted into or removed from the chamber of the mill casing through the said top; thus adapting the mill casing to be made of a single casing, instead of being made in horizontally or vertically divided sections, as has heretofore been necessary in order to permit of the proper assembling of all of the crushing elements, and of ready access thereto in vertical crushing and grinding mills of the class to which this invention relates.

While it is deemed advisable to support the vertically adjustable non-rotating or normally stationary crushing shells or elements elastically, and to provide for their vertical adjustment by compressing or relaxing the cushioning springs, we do not limit our invention to this specific form of mounting the vertically adjusting stationary crushing and grinding shells or elements, as vertical adjustment of the stationary crushing and grinding members or elements may be provided for by other means, as will be understood by those skilled in the art to which this invention relates.

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

1. In a crushing machine, the combination with a casing having an open top, of a vertical shaft and rotary crushing elements carried thereby, non-rotating or normally stationary crushing elements elastically supported by said casing for vertical movement relative thereto, said latter elements presenting an interior surface which converges downwardly for a portion of its length and diverges downwardly for another portion of its length, said normally stationary crushing elements being adapted to be inserted or removed through the open top of said casing, and a removable cap for said open top.

2. In a crushing machine, the combination with a suitable casing, of a vertical shaft and rotary crushing elements carried thereby, and non-rotating or normally stationary crushing elements surrounding said rotary crushing elements and elastically supported from below on said casing for vertical movement relative thereto.

3. In a crushing machine, the combination with a suitable casing, of a vertical shaft and rotary crushing elements carried thereby, non-rotating or normally stationary crushing elements, elastic supports below said last-named elements interposed between the same and said casing and constructed to permit said elements to move away from said rotary crushing elements, and means for adjusting said normally stationary crushing elements vertically for regulating the output of the mill.

4. In a crushing machine, the combination with a vertical shaft and rotary crushing elements carried thereby, of normally stationary crushing elements surrounding said rotary crushing elements and having inclined inner faces which form an angle with one another, a casing surrounding said parts, and yielding means for supporting said normally stationary crushing elements, said means permitting vertical movement of said last-named elements relative to said casing.

5. In a crushing machine, the combination with the open-topped casing 12 having internal supports, the removable cap 32, a vertical shaft having an upper bearing supported by said cap, rotary crushing elements carried by said shaft, non-rotating or stationary crushing elements surrounding said rotary crushing elements and of proper size to pass through the open top of said casing, springs interposed between said supports and the lowermost of said stationary crushing elements so as to sustain the latter elastically from below, screws tapped in said cap, for adjusting the said stationary crushing elements vertically, and springs interposed between said screws and the uppermost of said stationary crushing elements.

6. In a crushing machine, the combination with a casing, of a vertical shaft within said casing, rotary crushing elements carried by said shaft, non-rotating or normally stationary, vertically adjustable crushing elements within said casing, springs by which said normally stationary crushing elements are elastically supported, from beneath, and means, operable entirely from above, and interposed between said stationary crushing elements and said casing, for adjusting said stationary crushing elements and for holding the same in adjusted position.

7. In a crushing machine, the combination with a suitable casing, of a vertical shaft within the same, rotary crushing elements carried by said shaft, non-rotating or normally stationary crushing elements sur-

rounding said rotary crushing elements, springs interposed between the lowermost of said normally stationary crushing elements and said casing by which said normally stationary crushing elements are elastically supported, from beneath, and screws by which said springs may be compressed to vary the vertical positions of said normally stationary crushing elements and thereby regulate the output of the mill.

8. In a crushing machine, the combination with a suitable casing, of rotary crushing elements within said casing, non-rotating or normally stationary crushing elements surrounding said rotary crushing elements, springs interposed between said casing and said normally stationary crushing elements for elastically supporting the latter, adjusting means for forcing said normally stationary crushing elements downwardly in opposition to said springs, and springs interposed between said adjusting means and the uppermost of said normally stationary crushing elements.

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

THOMAS LEGGETT STURTEVANT.
THOMAS JOSEPH STURTEVANT.

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