No. 682,170. Patented Sept. 10, 1901.

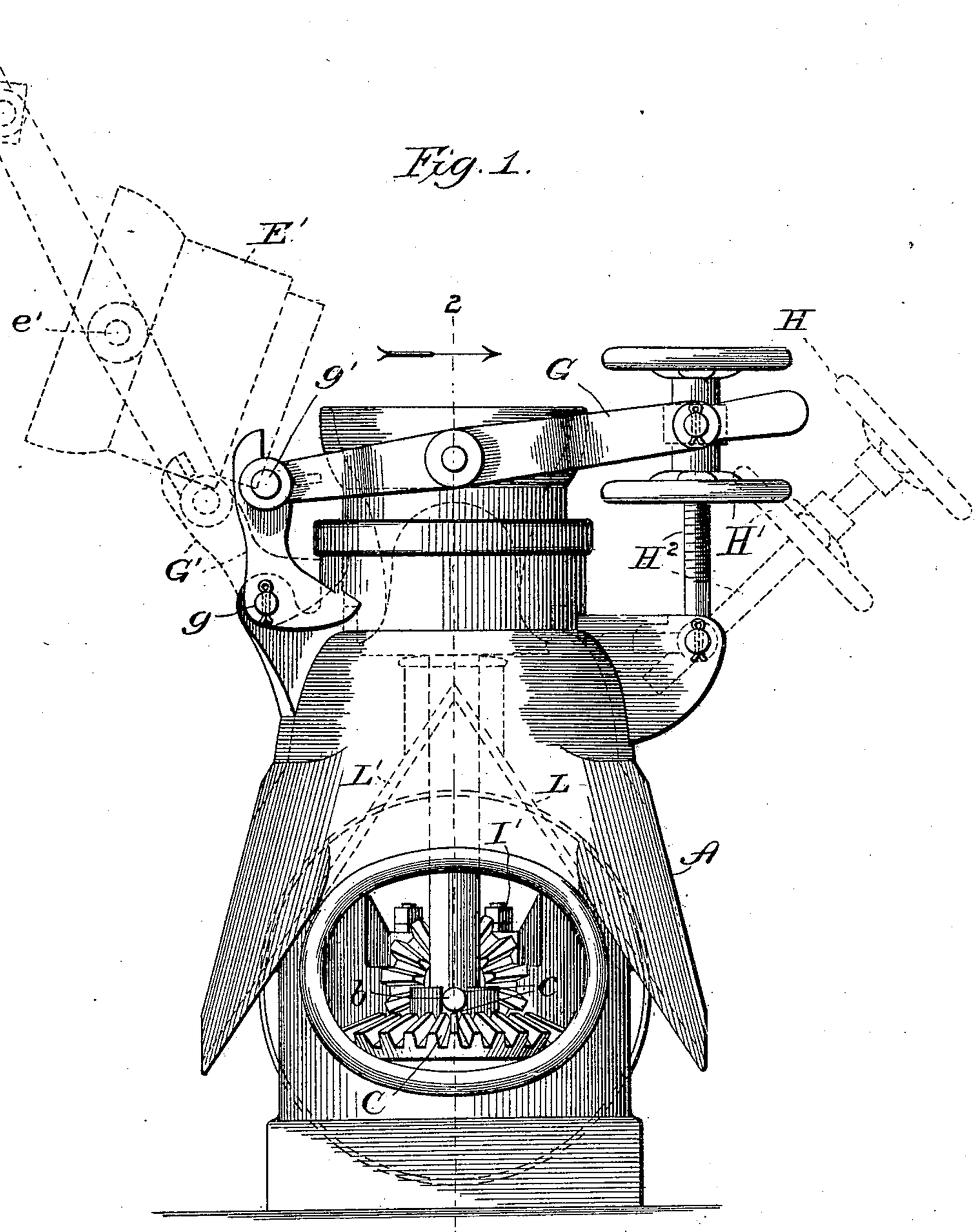
T. W. CAPEN.

ROCK AND ORE PULVERIZER.

(Application filed Jan. 18, 1900.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.



Witnesses:
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(No Model.) 3 Sheets—Sheet 2.

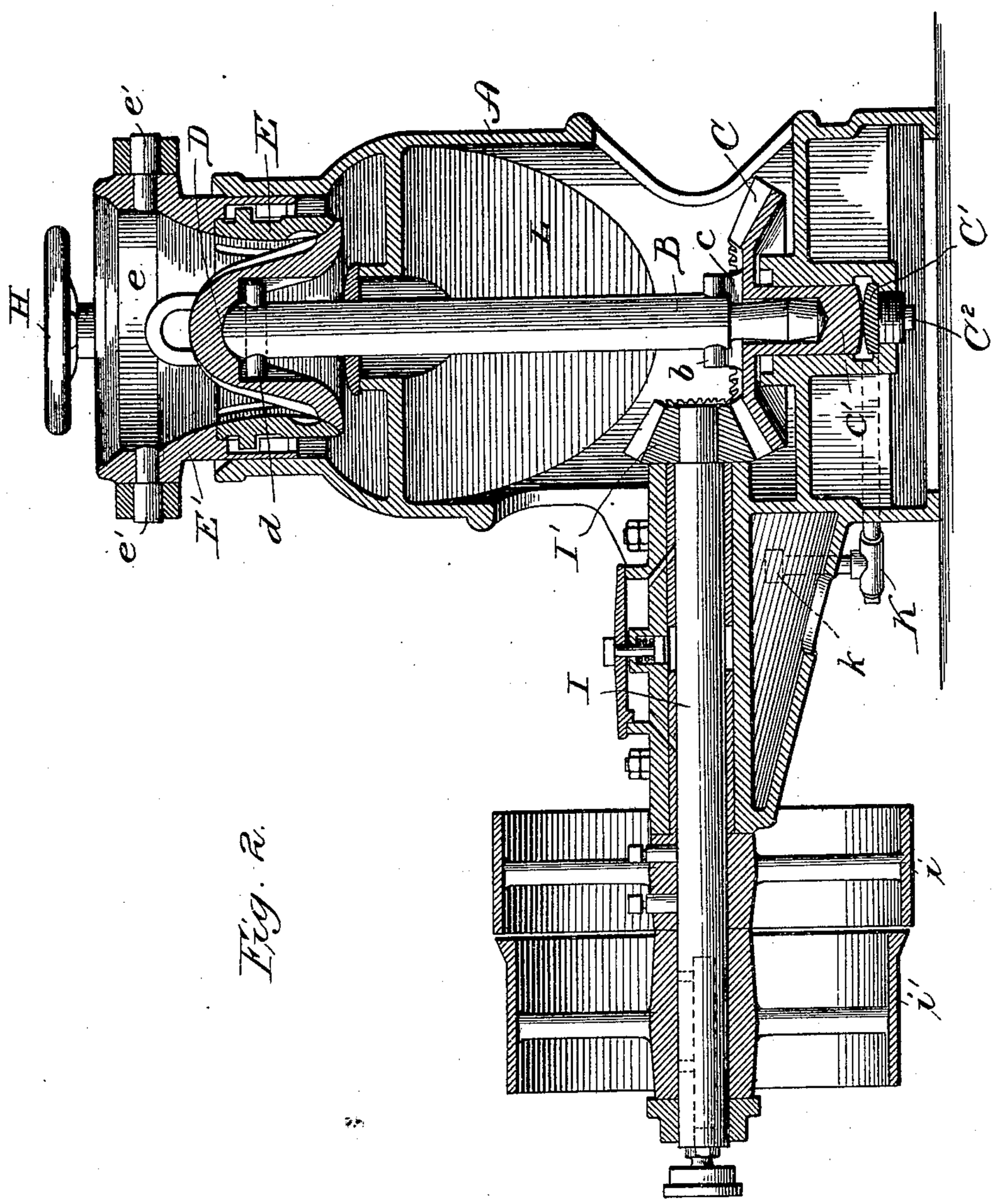

Fig. 2.

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Fig. 4.

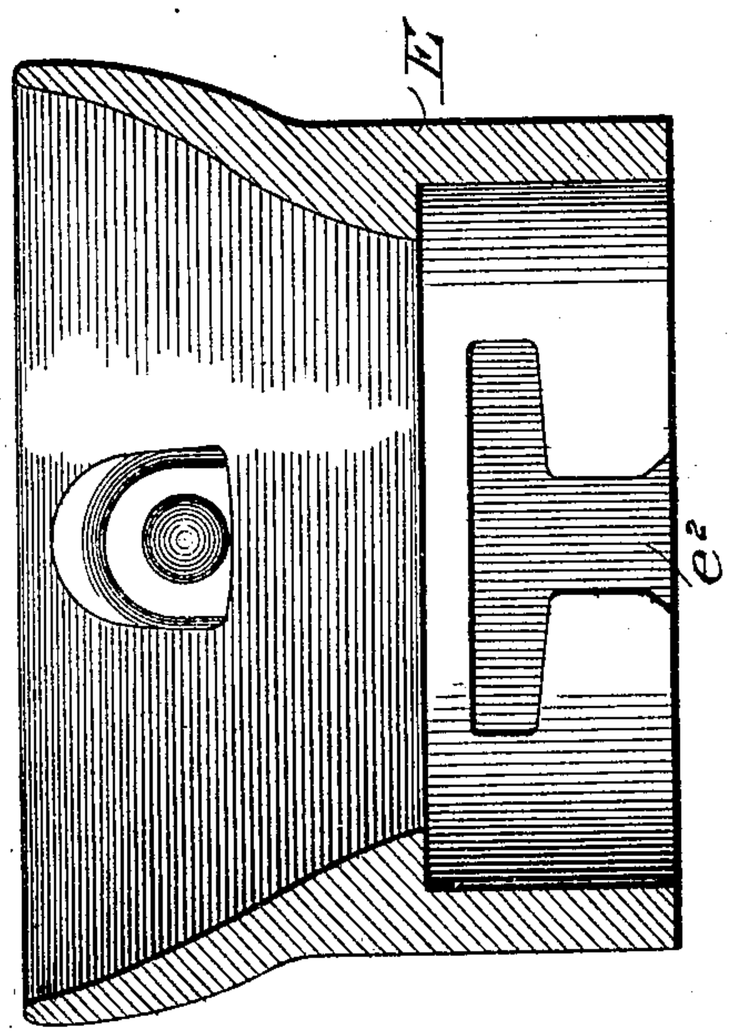


Fig. 5.

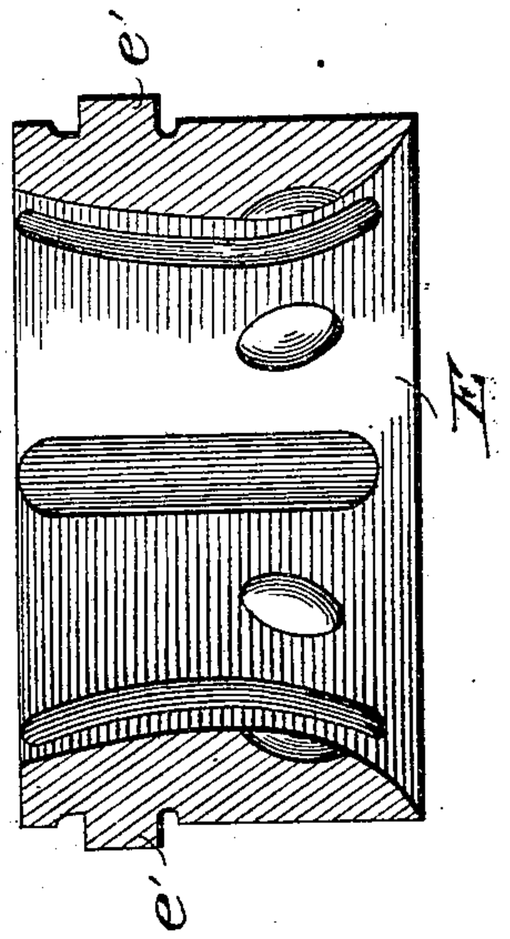
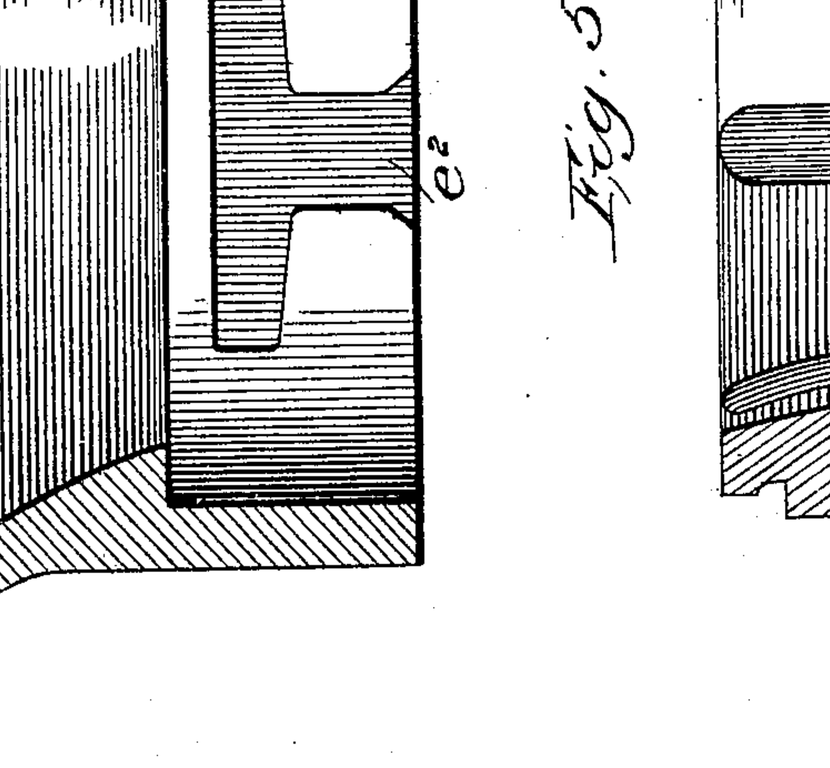


Fig. 3.



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UNITED STATES PATENT OFFICE.

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ROCK AND ORE PULVERIZER.

SPECIFICATION forming part of Letters Patent No. 682,170, dated September 10, 1901.

Application filed January 18, 1900. Serial No. 1,869. (No model.)

To all whom it may concern:

Be it known that I, THOMAS W. CAPEN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Rock and Ore Pulverizers, of which the following is a specification.

My invention relates to that class of pulverizers in which there is a vertical rotating or operating shaft provided with a crushing-head at the upper end and means for driving it at the lower end and arranged to be surrounded by what is known as "crushing-concaves" for the purpose of crushing or breaking stone and ore between the same.

It has more particular relation to that class of pulverizers known technically as "sample-grinders," in which small particles of rock and ore are crushed and pulverized to a fine degree, and particularly to the means by which the crushing-concaves are adjustably held in operative position.

The object of my invention is to provide a simple, economical, and efficient rock and ore grinder; and the invention consists in the features, combinations, and details of construction hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a vertical elevation of a rock and ore grinder constructed in accordance with my improvements, showing the mechanism in operative position in the solid lines and in an inoperative position in the dotted outlines; Fig. 2, a vertical sectional elevation taken on the line 2 of Fig. 1; Fig. 3, a vertical sectional detail taken through the shell and crushing-concave, and Figs. 4 and 5 vertical sectional details of the shell and crushing-concaves shown separately.

In the art to which this invention relates and having special relation to that style of rock and ore grinder known as a "sample-grinder" it has been customary to adjust the vertically-arranged operating-shaft so as to provide for crushing material in different degrees of fineness and to compensate for wear of parts. This adjustment has been accomplished by the raising and lowering of the step-block and other parts at the lower part of the grinder, which as a consequence and owing to imperfect workmanship and other causes permitted the oil used for lubrication to pass through. The disadvantage of this style of grinder was that the oil being removed from the place where heavy frictional force was exerted permitted the parts to wear rapidly, and thus destroy the efficiency of the machine.

My invention, therefore, is intended, primarily, to overcome these objections by providing means for holding the crushing-concaves in operative position and permit of vertical adjustment of the same, all of which will more fully hereinafter appear.

In constructing a grinder in accordance with my improvements I make a frame portion A of the desired size, shape, and strength to hold the operative and other parts in position. In order to crush the material, a vertical rotating or operating shaft B is provided, having its lower end loosely held in the hub of a rotating driving bevel-gear C, the hub of which is provided with a slot or groove *c*, in which a cross-pin *b* in the operating-shaft is inserted. The hub of the driving bevel-gear forms a step *c'* for the operating-shaft and rests upon a step-block C', arranged upon a shoulder, which surrounds a central opening and in which is inserted a screw-plug C^2. The screw-plug is not a necessary adjunct of the machine. It is merely put in for the purpose of filling an opening through which a boring-bar may be inserted for the purpose of economically boring out the frame to form a bearing for the hub of the driving-gear. It will be readily seen, therefore, that this plug may be dispensed with, if it be so desired.

The upper part of the operating-shaft is provided with a crushing-head D, which is preferably loosely mounted thereon, so as to have a slot portion engaged by a cross-pin *d* in the shaft, which secures the simultaneous rotation and operation of the head and shaft. Surrounding this head the crushing-concave E is arranged, which concave is made in the form of a ring. This ring concave E is provided with one or more projecting lugs *e*, adapted to enter bayonet-shaped slots e^2 in the holding-shell E', so that no matter in what direction the crushing-head is rotated the parts 10 become more firmly locked in position, while at the same time permitting them

to readily separate for the purposes of repair or replacement. The upper part of this shell is open, as at *e*, to provide a space or hopper through which material may be inserted for the purpose of being acted upon.

In order to provide for the vertical adjustment of the crushing ring concave and different grades of crushing material, the shell is loosely fitted in the frame portion, so that it may be raised or lowered whenever it is desirable or necessary, and it is further provided with trunnions *e'*, which are engaged by adjustable compound holding-levers G and G', pivoted to the frame at *g* and together at *g'*. These adjustable holding-levers are connected together by means of a cross-bar, upon which a sleeve g^2 is mounted and which is adjustably held in position by means of the hand-wheel nuts H and H', which have threaded engagement with the pivoted holding-screw H^2. From an inspection of the drawings it will be seen that the holding-levers may be raised and lowered by the adjustment of the hand-wheels and held in any desired position and at the same time permit the removal of the shell entirely from engagement with the frame, as is shown in dotted outline, whenever it is desirable or necessary.

To transmit power and motion to the driving-gear from any prime mover, the frame of the machine is provided with a horizontal driving-shaft I, having tight and loose pulleys *i* and *i'* mounted thereon, one end of the driving-shaft having a bevel-pinion I', which engages with the driving bevel-gear of the operating-shaft.

To oil the step, an oil-supply pipe K is provided, having a cap portion *k* on the vertical part thereof, the other end of the pipe being secured to the frame at or adjacent to the point where the block and step contact.

To discharge the crushed material, the frame is provided with inclined chutes L and L', leading out of openings at each side of the frame portion through which the material may be discharged after it has been crushed.

As above stated, this specific class of pulverizer is what is technically known as a "sample-grinder." In use this style of grinder, which is used largely in assay-work, must be provided with means for removing the shell with the crushing ring concave from the frame of the machine, so as to thoroughly clean the entire machine; otherwise the "assay" of the succeeding sample would be practically worthless. An inspection of the drawings and of the foregoing description will show that I have provided an advantageous machine, in that the means for removably holding the shell of this crushing ring concave is independent of the adjustment. In other words, the shell of this crushing ring concave may be removed without disturbing the adjustment, so that the same degree of fineness may be had in a large number of sample grindings. The adjustment, therefore, is only necessary to compensate for the wear of the parts.

I claim—

1. In a rock and ore pulverizer, the combination of a frame portion, a vertical operating-shaft provided with a crushing-head, crushing-ring-concave mechanism surrounding the crushing-head between which elements material may be fed and ground, and lever mechanism for holding the crushing-ring-concave mechanism in operative position and entirely removing and holding such ring without the operative sphere of the head, substantially as described.

2. In a rock and ore pulverizer, the combination of a frame portion, a vertical operating-shaft provided with a crushing-head on the upper end thereof and rotatably mounted within the frame a ring concave surrounding the crushing-head, a shell in which the grinding ring concave is removably held, and lever mechanism for adjustably holding the shell with its crushing ring concave in operative position and entirely removing and holding it without the operative sphere of the head, substantially as described.

3. In a rock and ore pulverizer, the combination of a frame portion, a vertical operating-shaft provided with a crushing-head on its upper portion, a beveled driving-gear in which the lower end of the crushing-shaft is mounted and forming the step therefor, a crushing ring concave surrounding the crushing-head, a shell in which the crushing concaved ring is removably mounted, and means for adjustably holding the shell with its crushing ring concave in operative position and entirely removing it without the operating sphere of the crushing-head, substantially as described.

4. In a rock and ore pulverizer, the combination of a frame portion, a vertical operating-shaft mounted therein, a crushing-head loosely mounted thereon so as to rotate therewith, a crushing concaved ring surrounding the crushing-head, a shell portion in which the crushing concaved ring is held and lever mechanism for adjustably holding the shell with its crushing ring concave in operative position and entirely removing it without the operative sphere of the crushing-head, substantially as described.

5. In a rock and ore pulverizer, the combination of a frame portion, a vertical operating-shaft mounted thereon and provided with a crushing-head at its upper portion, a crushing ring concave surrounding the head portion, a shell in which the concaved ring is removably mounted, lever mechanism pivotally secured to the frame portion and to the shell portion for holding it with its crushing ring concave in operative position and entirely removing it without the same, and screw mechanism for adjustably holding the lever with its other parts in operative position, substantially as described.

6. In a rock and ore pulverizer, the combi-

nation of a frame portion, a vertical operating-shaft provided with a crushing-head mounted thereon, a crushing ring concave surrounding the crushing-head, a shell portion in which the crushing ring concave is removably mounted, compound lever mechanism pivoted to the frame portion and to the shell for raising and lowering the shell and holding it in different positions, a holding-screw pivoted to the frame portion, and hand-nuts on the holding-screw for adjustably holding the levers, shell and other parts in operative position, substantially as described.

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