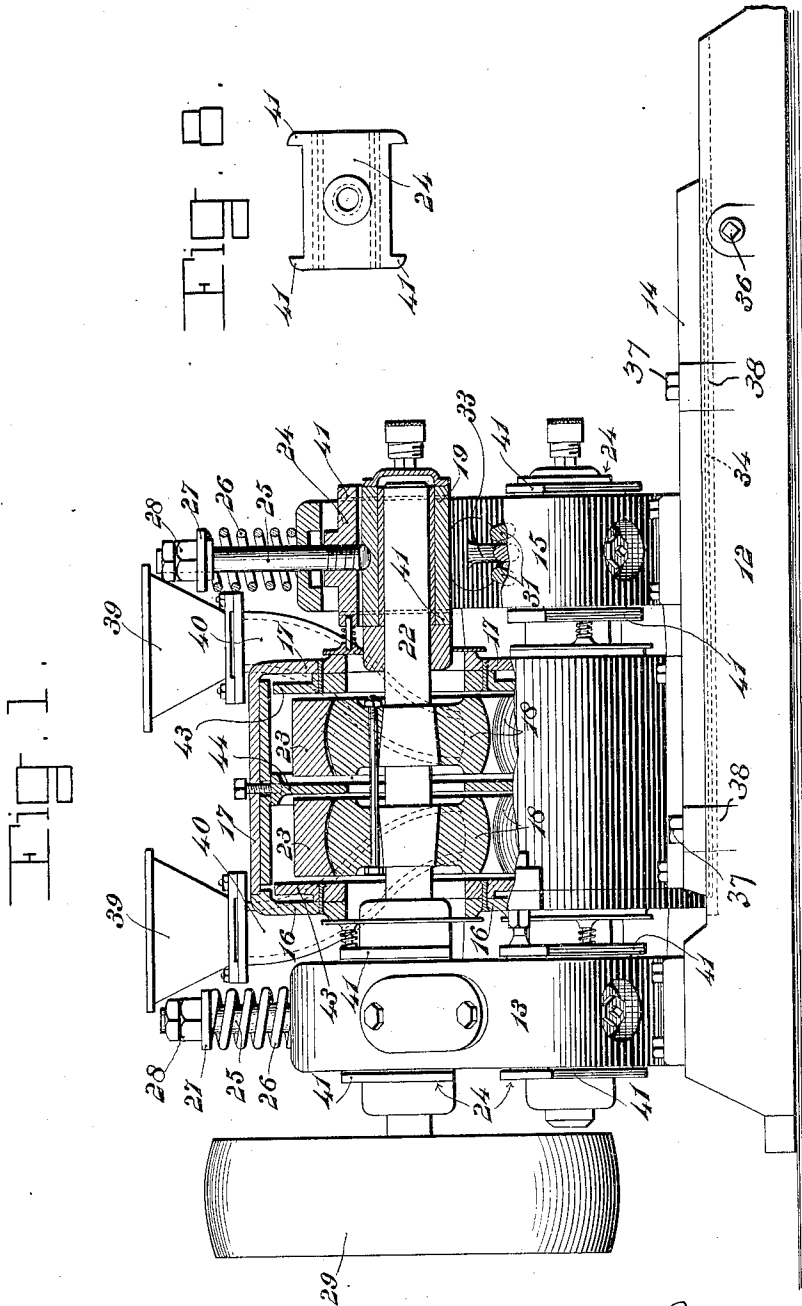


T. J. STURTEVANT.
CRUSHING MILL.
APPLICATION FILED DEC. 13, 1911.

Patented Apr. 7, 1914.
3 SHEETS—SHEET 1.

1,092,185.



WITNESSES:

Harry King
C. M. Sweeney

INVENTOR:

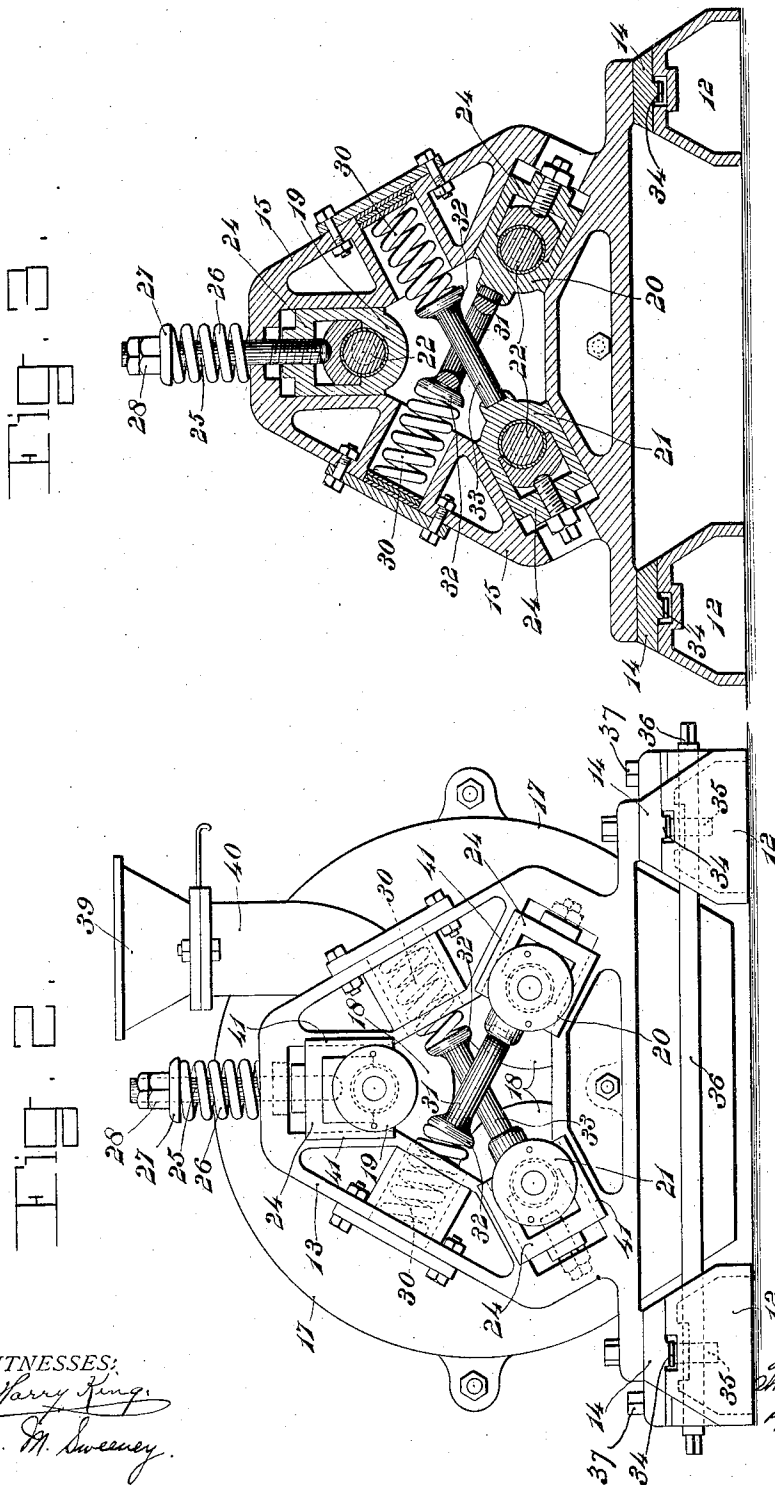
Thomas J. Sturtevant
by C. M. Sweeney
Attorneys.

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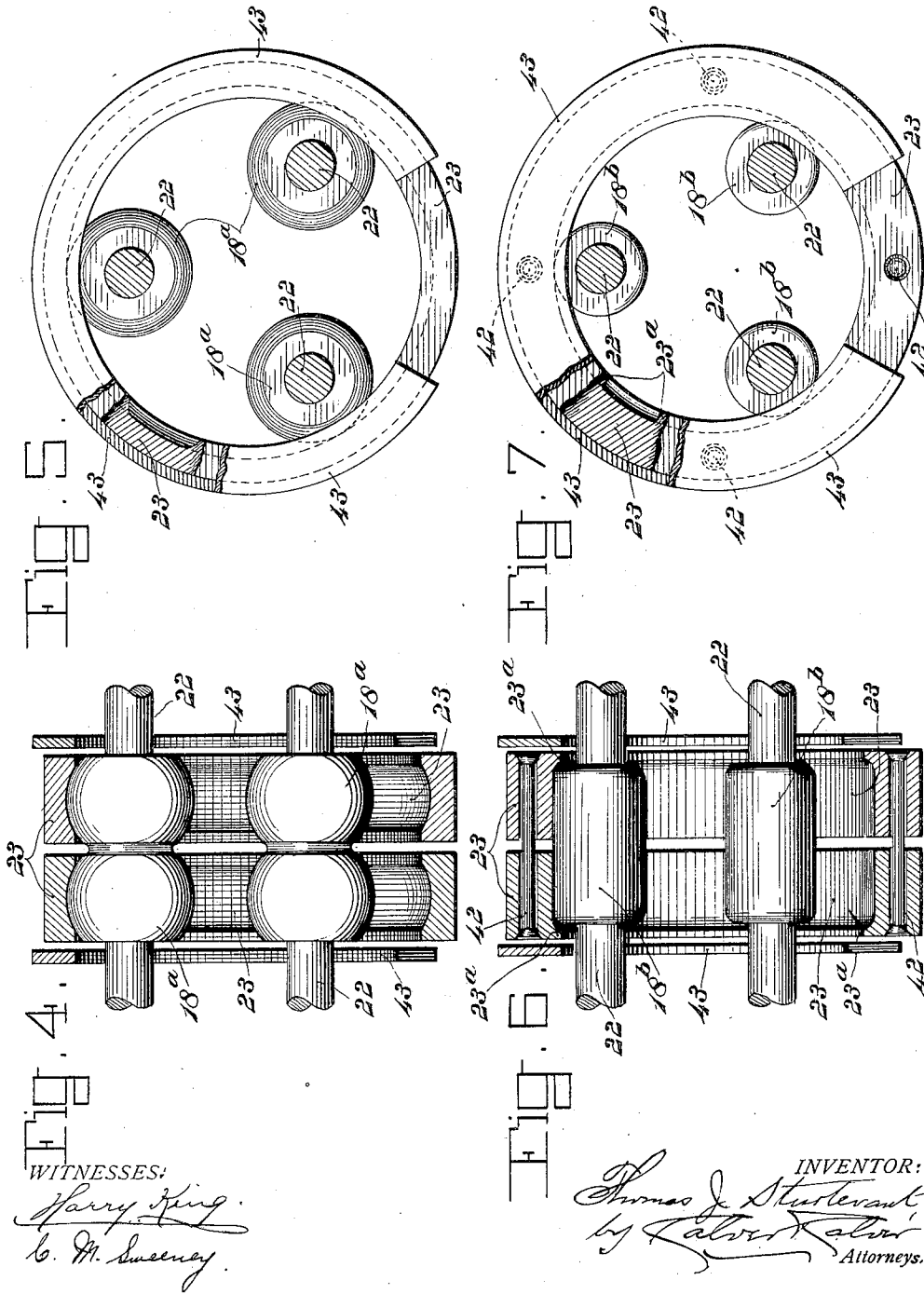
WITNESSES:
Harry King.
C. M. Lucey.

INVENTOR:
Thomas J. Sturtevant.
by *Robert Kellogg*
Attorneys.

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WITNESSES:

Harry King.
C. M. Sweeney.

INVENTOR:

Thomas J. Sturtevant
by Walter K. Kator
Attorneys.

UNITED STATES PATENT OFFICE.

THOMAS JOSEPH STURTEVANT, OF WELLESLEY, MASSACHUSETTS, ASSIGNOR TO
STURTEVANT MILL COMPANY, A CORPORATION OF MAINE.

CRUSHING-MILL.

1,092,185.

Specification of Letters Patent.

Patented Apr. 7, 1914.

Application filed December 13, 1911. Serial No. 665,488.

To all whom it may concern:

Be it known that I, THOMAS J. STURTEVANT, a citizen of the United States, residing at Wellesley, in the county of Norfolk and State of Massachusetts, have invented or discovered certain new and useful Improvements in Crushing-Mills, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to that class of crushing mills for reducing rocks, ores, etc., in which the material is crushed between the inner face of a rotating ring or rings and the outer face or faces of a cooperating crushing roll or rolls within said ring, and by which the said ring is elastically supported.

The present invention has for its object to provide a crushing mill, of the class referred to, which will have a greatly increased crushing capacity as compared with previous mills of this class.

In crushing mills of the class under consideration the width of the anvil rings has heretofore been limited, and this of course limits the output. This limitation is due to the fact that if the anvil rings be made too wide the material fed to the rings will, in the crushing process, adhere and bank onto the interior crushing faces of the rings, and thus prevent effective crushing operation. In accordance with the present invention a plurality of relatively narrow elastically supported anvil rings are provided, these anvil rings preferably cooperating with a plurality of sets of relatively narrow crushing rolls, although, within the present invention, a plurality of elastically mounted anvil rings may cooperate with a single set of relatively wide crushing rolls each of which will extend across the face of the several rings. In either case the relatively narrow rings will be spaced apart from each other, or be so loosely mounted that the material to be reduced may be discharged between them, thus permitting a discharge of the crushed material from both sides of each of the several rings in the same manner that the crushed material is discharged from both sides of a single relatively narrow crushing ring in machines of this class as heretofore constructed.

The present invention is shown as being embodied in a crushing mill similar to that shown and described in my application No.

639,456, filed July 19, 1911, but it will be understood that the invention may be embodied in other forms of crushing mills of the general class above referred to.

In the accompanying drawings Figure 1 is a side elevation, partly in vertical section, of a crushing mill embodying the present invention. Fig. 2 is an end view thereof looking from the right of Fig. 1. Fig. 3 is a vertical cross section through one of the stands by which the bearings for the shafts carrying the crushing rolls are supported. Figs. 4, 5, 6 and 7 illustrate different forms of the invention. Fig. 8 is a detail view of one of the flanged bearings.

Referring to the drawings, 12 denotes the base of the mill to which is bolted a stand 13. Slidingly supported on the base 12 is a bed 14 to which is bolted a stand 15. The mill casing consists of fixed and movable parts 16 and 17, the fixed part 16 being bolted to or formed rigid with the stand 13, and the movable part 17 being bolted to or formed rigid with the stand 15.

In the form of mill herein shown and employing two crushing rings 23 and three sets of crushing rolls 18 cooperating therewith, the stands 13 and 15 are each provided with three yielding bearings 19, 20 and 21, for the shafts 22 to which said rolls are attached. The upper shaft 22 carrying the upper rolls 18 is supported by bearings 19 within yokes 24 attached to bolts 25 encircled by springs 26 interposed between the tops of the stands 13 and 15 and washers 27 encircling said bolts and held in place by nuts 28 threaded on said bolts. The springs 26 have a pulling action on the bearings 19. The upper shaft 22, supported in the bearings 19, is, in the present instance, the driving shaft, and is provided with a pulley 29 to which power may be applied for positively driving the upper crushing rolls 18 which thus serve to rotate the crushing rings 23 elastically supported by said rolls. The lower bearings 20 and 21 for the two lower crushing rolls, are pushed outward toward the inner face of the rotating crushing ring 23 by springs 30 confined in suitable pockets in the stands 13 and 15. Each of the lower bearings 20 is provided with a forked or looped rod 31 having a head portion 32 against which a spring 30 bears, and each of the lower bearings 21 is provided with a single rod 33 extending through the forked

or looped part of the rod 31 and likewise having a head or flange 32 against which a spring 30 bears; this arrangement of parts affording a compact construction and enabling the pressure of the springs 30 to be evenly applied to the yielding bearings 20 and 21.

The movable bed 14 is provided on its under side with racks 34 meshing with pinions 35 on a cross shaft 36 which is preferably provided with squared ends to which a crank may be applied for the purpose of rotating said shaft and thereby sliding the said bed 14, carrying the stand 15 and the movable casing part 17, toward and from the stand 13 carrying the fixed casing part 16. When the casing parts are in juxtaposition, as shown in Fig. 1, and the casing is closed, said parts may be secured together by bolts 37 passing through ears 38 with which the said casing parts may be provided.

The construction thus far described, excepting as to the duplication of the crushing rings and rolls, requiring heavier springs, is essentially the same as in the machine shown and described in my said application No. 639,456. When access to the chamber of the mill is desired the movable bed 14 and the stand 15 and movable casing part mounted thereon may be moved away from the fixed stand 13 by turning the shaft 36, thus uncovering the crushing members, as will be understood.

In the form of the invention shown in Fig. 1 each of the yieldingly mounted shafts 22 is provided with two crushing rolls 18 suitably secured to said shafts and cooperating with two crushing rings 23 which are separated from each other so as to permit the material which is being crushed to be discharged from both sides of said rings. The material to be reduced is supplied to the crushing rings from hoppers 39 through feed spouts 40, a hopper and feed spout being preferably provided for each of the crushing rings, although the material might be supplied to both rings from a single hopper through suitable feed spouts.

As the material being reduced may vary in amount on the different rings it is important that the yieldingly mounted bearings, at or near the opposite ends of the shafts 22 and supported by the stands 13 and 15, should be capable of yielding independently of each other, and to this end the said bearings 19, 20 and 21 in the two stands are formed entirely separate from each other, or are not yoked together from one stand to the other. The said bearings 19, 20 and 21 are provided with flanges 41, as more clearly shown in Fig. 8, and which flanges loosely overlap the sides of the stands so as to permit of slightly rocking independent movements of the bearings in the two stands, to accommodate different positions of the rolls due to varying

quantities of materials on the crushing rings, without endangering the binding of the shafts 22, which carry the crushing rolls, in their bearings.

Instead of providing crushing rolls which are separate from each other, as shown in Fig. 1, for cooperating with a plurality of crushing rings, the said rolls may be formed double, as the rolls 18^a, more clearly shown in Fig. 4, each of these double rolls being adapted to cooperate with two independent crushing rings 23 which are properly separated from each other and which, owing to the convex surfaces of said rolls cooperating with the concave inner crushing surfaces on said rings, will be loosely but reliably retained in operative positions. The disposition of the several double rolls shown in Fig. 4, relative to the crushing rings, is illustrated in side view in Fig. 5. Or instead of the double crushing rolls, just above referred to, cooperating with a plurality of crushing rings, independent single wide crushing rolls, as 18^b, more clearly shown in Fig. 6, and illustrated in end view in Fig. 7, may be provided. These rolls 18^b are shown as being provided with flat faces excepting at their ends which are slightly rounded off, and the rings 23 are preferably provided at their outer sides with inwardly extending flanges 23^a which overlap the ends of the rolls. These independent rings 23, as shown in Fig. 6, are loosely held together by headed bolts 42 which permit of slight wobbling or independent movements of the rings, although the inwardly extending flanges 23^a on the said rings, and cooperating with the rolls 18^b, will tend to keep said rings separated from each other so that crushed material will be discharged between them as well as from their outer edges.

Interposed between the mill casing and the crushing rings are shields 43 serving to protect the mill casing and to confine the material being crushed, the said shields being suitably supported on the casing parts 16 and 17. In some instances it may be desirable, in connection with the separated rings and the crushing rolls cooperating therewith, to provide a shield, as 44, between said rings; and in such case said shield will be detachably secured to the movable casing part 17, as shown in Fig. 1. These shields 43 and 44, may be either in the forms of disks, with proper openings for the shafts carrying the crushing rolls, as indicated in Fig. 1, or they may be made of annular form, as shown in Figs. 4, 5, 6 and 7. In either instance the said shields will be open at their bottom portions, as more clearly shown in Figs. 5 and 7, to permit of the free downward discharge of the reduced material.

The invention is not to be understood as being limited to the details of construction

herein shown, or to any particular number of loosely mounted crushing rings, as it will be apparent that a plurality of separated crushing rings greater than two may be employed, in coopération with yieldingly mounted driving and crushing rolls, without departing from the essence of the invention.

Having thus described my invention I claim and desire to secure by Letters Patent:

1. In a crushing mill, the combination with elastically mounted crushing rolls, of a plurality of loose crushing rings driven and yieldingly supported by said rolls and spaced apart from each other, and also having clearances at their outer sides so that crushed material may be discharged from both sides of all of said rings.

2. In a crushing mill, the combination with elastically mounted crushing rolls, of a plurality of loose crushing rings driven and yieldingly supported by said rolls and spaced apart from each other, and also having clearances at their outer sides so that crushed material may be discharged from both sides of all of said rings, shafts by which said rolls are carried, and independent, yieldingly-supported bearings at or near the opposite ends of each of said shafts.

3. In a crushing mill, the combination with a plurality of crushing rings separated from each other and also having clearances at their outer sides, so that crushed material may be discharged from both sides of all of said rings, of a crushing roll or rolls, a driving shaft carrying said roll or rolls and provided with means by which it may be driven, and independent yielding bearings for said shaft at or near the opposite ends thereof; whereby said rings are driven and yieldingly supported by said rolls, and whereby also independent yielding movements of the opposite ends of said shaft, without binding, is provided for.

4. In a crushing mill, the combination with a plurality of loose crushing rings spaced apart from each other and also having clearances at their outer sides so that crushed material may be discharged from both sides of all of said rings, of a yieldingly-supported crushing roll or rolls serving to drive and elastically sustain said rings, and other yieldingly mounted crushing rolls cooperating with said first-named roll or rolls and said rings.

5. In a crushing mill, the combination with a plurality of loose crushing rings spaced apart from each other and also having clearances at their outer sides so that crushed material may be discharged from both sides of all of said rings, of a yieldingly-supported crushing roll or rolls serving to drive and elastically sustain said rings, other yieldingly-mounted crushing rolls cooperating with said first-named roll or rolls and said rings, shafts by which said

rolls are carried, and independent, yielding bearings for said shafts at or near their opposite ends.

6. In a crushing mill, the combination with elastically mounted crushing rolls, of a plurality of loose crushing rings driven and yieldingly supported by some of said rolls and spaced apart from each other, and shields at the outer sides of said rings and having open bottom portions to enable the free discharge of the reduced material.

7. In a crushing mill, the combination with elastically mounted crushing rolls, of a plurality of loose crushing rings driven and yieldingly supported by said rolls and spaced apart from each other, and shields at the outer sides of and between said rings and having open bottom portions to enable the free discharge of the reduced material.

8. In a crushing mill, the combination with elastically mounted crushing rolls, of a plurality of loose crushing rings driven and yieldingly supported by some of said rolls and spaced apart from each other, shafts by which said rolls are carried, independent, yieldingly-supported bearings at or near the opposite ends of each of said shafts, and shields at the outer sides of said rings and having open bottom portions to enable the free discharge of the reduced material.

9. In a crushing mill, the combination with elastically mounted crushing rolls, of a plurality of loose crushing rings driven and yieldingly supported by some of said rolls and spaced apart from each other, shafts by which said rolls are carried, independent, yieldingly-supported bearings at or near the opposite ends of each of said shafts, and shields at the outer sides of and between said rings and having open bottom portions to enable the free discharge of the reduced material.

10. In a crushing mill, the combination with elastically mounted crushing rolls, of a plurality of loose crushing rings driven and yieldingly supported by some of said rolls and spaced apart from each other, shafts by which said rolls are carried, independent, yieldingly-supported flanged bearings at or near the opposite ends of said shafts, and stands in which the said bearings are mounted, and which are loosely embraced by the flanges of said bearings so that the said bearings will be free to tilt or rock slightly to prevent said shafts from binding in their bearings when the material being crushed is unequal on the different rings.

11. In a crushing mill, the combination with elastically mounted crushing rolls, of a plurality of loosely held crushing rings driven and yieldingly supported by some of said rolls, all of said rolls being of equal diameter, and said rings being all spaced apart from each other and from the interior of the crushing chamber so that the reduced

material may be discharged from both sides of said rings.

12. In a crushing mill, the combination with crushing rolls, all of which, including 5 the driving rolls, are yieldingly mounted, all of said rolls being of equal diameter, of a plurality of loosely mounted crushing rings driven and elastically supported by some of said rolls, said rings being all 10 spaced apart from each other and from the interior of the crushing chamber so that the reduced material may be discharged from both sides of said rings.

13. In a crushing mill, the combination with crushing rolls, all of which, including 15 the driving rolls, are yieldingly mounted, of a plurality of loosely held crushing rings driven and elastically supported by some of said rolls.

In testimony whereof I affix my signature, 20 in presence of two witnesses.

THOMAS JOSEPH STURTEVANT.

Witnesses:

L. H. STURTEVANT,
HENRY A. TOMLINSON.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."