F. OGDEN.

ADJUSTABLE GRINDER.

APPLICATION FILED NOV. 5, 1913.

1,103,219.

Patented July 14, 1914.

3 SHEETS—SHEET 1.

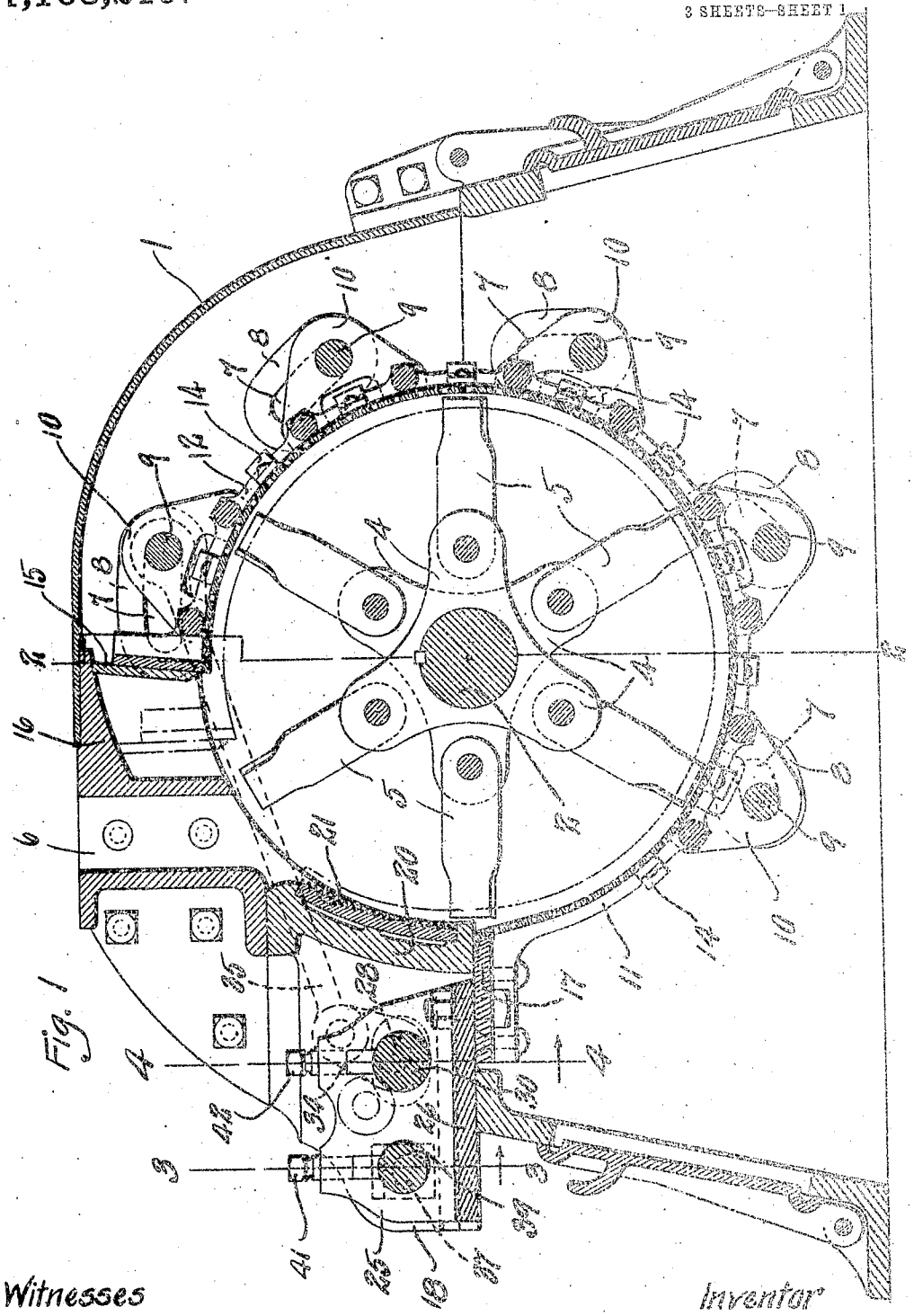


Fig. 1

Witnesses

Wm. Jarvis

C. A. Burton.

Inventor

Ferris Ogden

By E. K. Bonnell & Co. Atty

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3 SHEETS—SHEET 2.

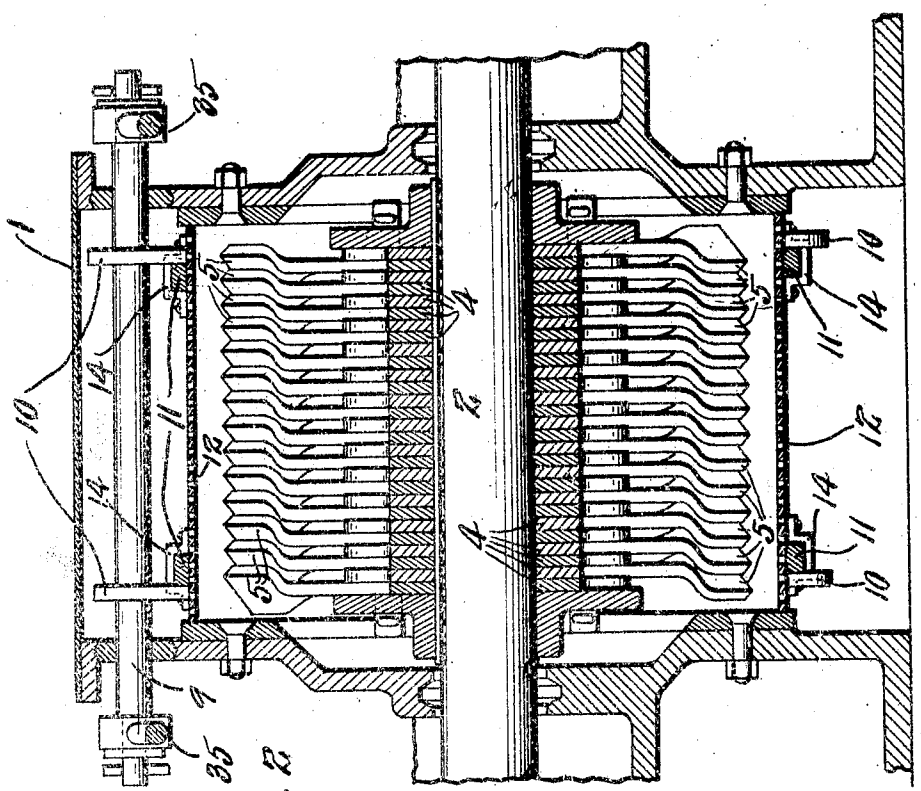


Fig. 2

Witnesses

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3 SHEETS—SHEET 3.

Fig. 3

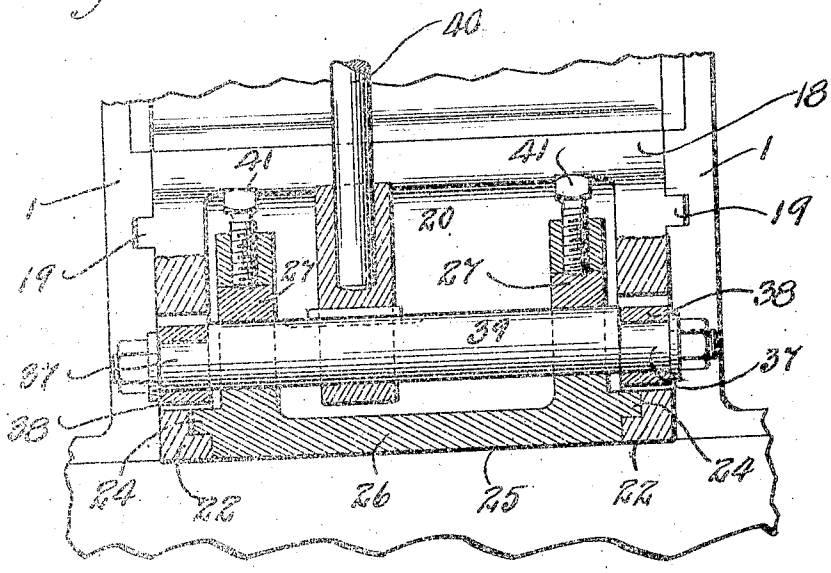
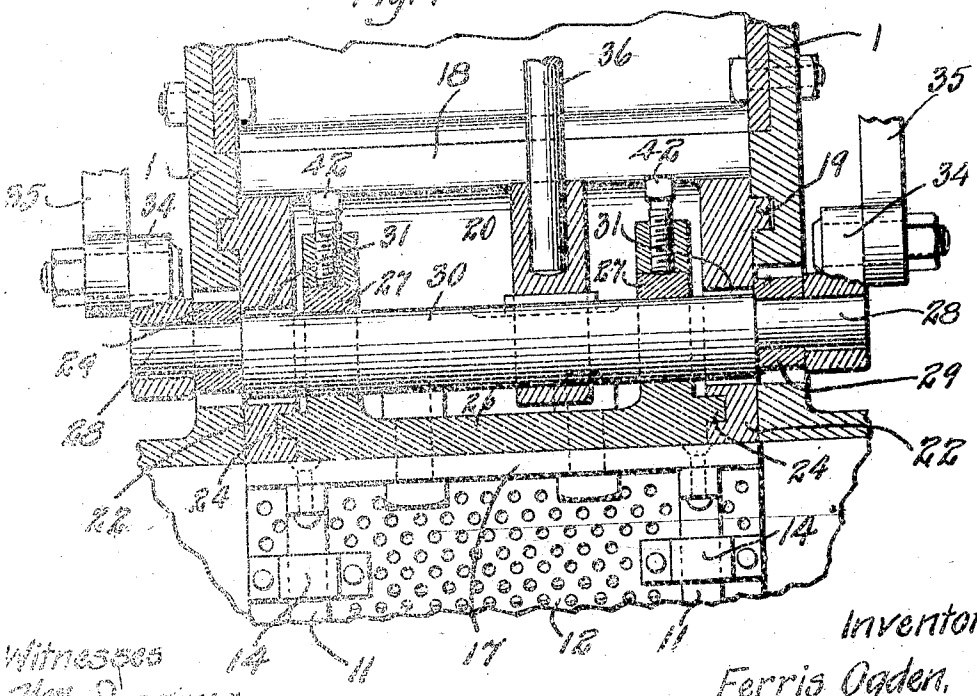


Fig. 4



Witnesses
Wm. Dawson
C. Bowen

Inventor
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UNITED STATES PATENT OFFICE.

FERRIS OGDEN, OF ST. LOUIS, MISSOURI, ASSIGNOR TO WILLIAMS PATENT CRUSHER AND PULVERIZER COMPANY, OF ST. LOUIS, MISSOURI, A CORPORATION OF MISSOURI.

ADJUSTABLE GRINDER.

1,103,219. Specification of Letters Patent. Patented July 14, 1914.

Application filed November 5, 1913. Serial No. 799,329.

To all whom it may concern:

Be it known that I, FERRIS OGDEN, a citizen of the United States, residing at city of St. Louis, State of Missouri, have invented a certain new and useful Improvement in Adjustable Grinders, 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 a vertical section taken longitudinally of my improved grinder. Fig. 2 is a vertical section taken transversely of my improved grinder on the line 2—2 of Fig. 1. Fig. 3 is a detail section on line 3—3 of Fig. 1. Fig. 4 is a detail section on line 4—4 of Fig. 1.

My invention relates broadly to crushing and pulverizing and more specifically to that form of crushing and pulverizing machinery wherein is employed a rotating element carrying beaters, the outer ends of which cooperate with a stationary member in the nature of a grinding cage or concave.

The purpose of my invention is to provide an improved form of grinder particularly adapted for fine grinding or desiccating, but also adapted for shredding, pulverizing and otherwise reducing material.

The principal object of my invention is to provide an improved form of adjustable grinder wherein the grinding cage is adapted to be concentrically contracted and expanded relative to the shaft upon which the beaters are carried.

Another object of my invention is to provide such a device wherein the concentric adjustment of the entire grinding cage takes place at the same time.

Another object of my invention is to provide a machine of the class described wherein there may be a simultaneous and equal adjustment of the grinding cage and the breaker plate.

A further object of my invention is to provide a machine of the class described wherein there may be independent adjustment as well as simultaneous adjustment of the breaker plate and grinding cage relative to the shaft.

Other and further objects of my invention will be obvious or hereinafter pointed out.

My invention has to do with that form of grinding or pulverizing machinery wherein the material to be reduced is presented to the action of revolving beaters operating within a substantially cylindrical grinding cage with which the operating ends of the beaters coöperate to reduce the material. In the operation of this sort of machine, the degree of fineness to which the material will be reduced is determined by the spacial relationship of the operating ends of the beaters to the concave surface of the grinding cage, and by the size of the perforations in the grinding cage. A close coöperation between the outer ends of the beaters and the grinding cage will produce finer grinding than if these elements are separated by a greater space. The efficiency of the machine is also increased by having the parts adjusted so that the ends of the beaters operate in intimate relationship to the grinding cage. With respect to the relative adjustability of the grinding cage and the operating ends of the beaters or hammers, as they are commonly called, this feature is of further importance for the reason that these parts are subject to wear, which tends to increase the space between them, and it is desirable to take up this space either by extending the hammers toward the grinding cage or contracting the grinding cage toward the hammers.

Heretofore it has been the custom to change the pivotal points or points of attachment of the hammers radially of the shaft, change the curvature of sectional cages by spacing the various bars or sections thereof closer together or farther apart or to remove the grinding cage, then substitute others of greater or less diameter according as the intention is to position the cage farther from or closer to the operating ends of the hammers. In my present invention, I do away with the necessity of changing the pivotal points of the hammers and of removing the grinding cage for the substitution of another, and at the same time maintain the openings through the cage of the proper size.

As illustrated in the drawings, my device contemplates the use of a casing 1 which acts as an inclosure for the operating portions of the machine and for the retention of the ground material. Suitably mounted in the casing 1 is a shaft 2, upon which are carried hammer mounts 4, to which are at-

tached the hammers or beaters 5. The beaters are preferably pivotally mounted on the supports 4, and the rapid rotation of shaft 2 causes hammers 5 to stand out radially under the influence of centrifugal force. A suitable feed or hopper opening 6 is provided which communicates with the interior of the casing 1. In the sides of the casing 1 are provided arcuate slots 7 directed spirally toward the shaft 2. These slots may be machined directly in the casing sides or they may be machined in plates 8 set into the sides of the casing. In the slots 7 are mounted transversely extending rods 9, the arrangement being such that as the rods are moved longitudinally of the slots they are caused to spirally approach the shaft 2.

At either side of the machine, as is best illustrated in Fig. 2, hangers 10 are mounted on the rods 9, which hangers support open flexible rings 11. These rings are preferably of elastic steel and are capable of considerable flexing. The substantially cylindrical screen or grinding cage 12 is hung on the rings 11, attachment being by means of stirrups 14 attached to the screen 12 and embracing the rings 11. The connection is such that a certain sliding movement is permitted between rings 11 and the screen 12 when the diameter of the rings is changed. The upper ends of the rings are attached to a suitable facer 15 which coöperates with a concave arcuate portion 16 of the casing, having close contact therewith. The other ends of the rings are attached to a suitable tie strip 17 which is capable of being moved toward and from the shaft 2 by means now to be described.

The rear of the casing 1 just below the feed opening 6 is formed with an aperture 1^a (see Figs. 3 and 4) having substantially vertical sides and substantially horizontal top and bottom sides. A breaker plate mounting in the form of an adjustable member 18 is slidably mounted in the aperture, having tongue and groove engagement 19 with the casing. This adjustable member has an inner wall 20 which is adapted to support the breaker plate 21. It also has side walls 22, but no bottom wall. Slidably mounted on the adjustable member 18, by means of tongue and groove members 24, is a sliding member 25 which has a bottom wall 26 and side walls 27. An adjusting shaft 28 is journaled in sliding blocks 29 which are mounted in the casing 1 so as to be slidable vertically therein. Adjusting shaft 28 has an eccentric portion 30 which passes through enlarged openings 31 in the side walls 22 and coöperates with suitable journals or bearings in sliding member 25. Adjusting shaft 28 carries at its extremities crank arms 34, at the outer ends of which are attached adjusting links 35. Adjusting shaft 28 may be rotated by a suitable handle 36, such rotation operating to move slidable member 25 inwardly or outwardly of casing 1, due to the eccentric portion of shaft 28 coöperating with sliding member 25.

A shifting shaft 37 is journaled in sliding blocks 38 mounted to slide vertically in the side walls 22 of adjusting member 18. This shaft also has an eccentric portion 39 operating in suitable journals or bearings in sliding member 25. This shaft may be rotated by a handle 40, and when so rotated operates to shift adjustable member 18 inwardly or outwardly upon sliding member 25. During such movement of adjustable member 18, sliding member 25 is held stationary by shaft 28.

Tie strip 17 is attached to the bottom wall of sliding member 25, and upon inward movement of sliding member 25 is moved toward shaft 2, thereby bringing the lower extremity of screen 12 closer to the operating extremities of hammers 5. This inward movement of tie strip 17 also exerts compression stresses upon rings 11, which stresses are communicated to rods 9, tending to move them in slots 7 spirally toward shaft 2. It will be remembered that this inward movement of tie strip 17 is accomplished by rotation of adjusting shaft 28, and this rotation of adjusting shaft 28 also swings crank arms 34. The links 35, which are attached to crank arms 34, extend on either side of the casing 1 to the uppermost rod 9, to which are attached the hangers 10 nearest the upper extremity of the screen 12.

The swinging of crank arms 34 draws upon links 35 which tends to pull the uppermost rod 9 in its slots 7 spirally toward the shaft 2, and transmits tension stresses to rings 11, which tension stresses operate in the same direction as do the compression stresses occasioned by inward adjustment of tie strap 17. The result is that the extremities of rings 11 are brought closer together and the diameter of the rings decreased. This movement of rings 11 causes a similar contraction of the screen 12, relative circumferential movement of rings 11 and screen 12 being permitted by stirrups 14 as above described. The position and inclination of various slots 7 is such that during this contracting movement of rings 11 and screen 12, they are maintained concentric with shaft 2. This insures all points on the grinding surface of screen 12 being adjusted to the same extent radially of the shaft, and thereby insures uniform coöperation between the ends of the hammers and the grinding cage. Coincident with these movements of rings 11, adjustable member 18 will also be moved toward shaft 2 to an equal extent by virtue of the engagement between adjustable member 18 and sliding

member 25 through shaft 37. However, breaker plate 21 may be adjusted independently of movement of adjusting shaft 28 by operation of shaft 37 as above described which moves adjustable member 18 relative to sliding member 25 while sliding member 25 is held stationary in the frame.

Suitable space is afforded between the facing plate 15 and the casing of the feed opening 6 to allow for the contraction of rings 11, and the engagement of facing plate 15 with the arcuate portion 16 of the casing prevents material from being thrown out of the grinding cage if the adjustment is made while the machine is in operation. When the parts are adjusted to proper positions, they may be secured therein by the screws 41 and 42 which lock shafts 37 and 28 against rotation.

By virtue of this construction, it will be obvious that as the grinding cage is adjusted its diameter and its degree of curvature is changed. Thereby the cage is always maintained concentric with the shaft, and this insures a uniform coöperation between the hammers and the cage throughout the extent of the cage.

I am aware that various changes, alterations and modifications in the device herein illustrated and described may be made, and I intend that my invention as claimed be construed to comprehend all such changes, alterations and modifications.

What I claim is:

1. In a reducing machine the combination of a shaft, beaters mounted thereon, an integral grinding cage coöperating with said beaters, and means for contracting and expanding said cage concentrically relative to said shaft.

2. In a reducing machine the combination of a revoluble shaft, beaters carried thereon, a unitary grinding cage coöperating with said beaters, and means for flexing said cage to vary its radial distance from said shaft equally on all sides.

3. In a reducing machine the combination of a rotary shaft, beaters carried thereby, a substantially cylindrical cage coöperating with said beaters, and means for varying the diameter of said cage equally at all points.

4. In a reducing machine the combination of a shaft, beaters carried thereby, a grinding cage coöperating with said beaters, means for varying the diameter of said cage, and means for guiding said cage to maintain all points thereon concentric of said shaft during such adjustment.

5. In a reducing mill the combination of a shaft, beaters carried thereon, an integral concave member coöperating with said beaters, and means for moving the extremities of said member toward said shaft and toward each other.

6. In a reducing machine the combination of a shaft, beaters carried thereon, a cage cooperating therewith, said cage being in the form of an integral concave member, means for moving one of the extremities of said cage toward or from the other, and means for guiding said cage concentrically relative to said shaft during such movement.

7. In a reducing machine the combination of a shaft, beaters carried thereon, a cage coöperating with said beaters, a breaker plate coöperating with said beaters, means for simultaneously adjusting said cage and said breaker plate relative to said shaft, and means for moving said breaker plate back of the work surface of said cage radially of said shaft independently of movement of said cage.

8. In a reducing machine the combination of a shaft, beaters mounted thereon, a cage coöperating with said beaters, and means for moving said cage spirally relative to said shaft.

9. In a reducing machine the combination of a shaft, beaters mounted thereon, movable cage mountings, a cage supported thereon and substantially encircling said shaft and adapted to coöperate with said beaters, and means for moving said mountings to expand or contract said cage equally on all its diameters relative to said shaft for the purpose of adjustment.

10. In a reducing machine the combination of a frame, flexible members mounted for movement on said frame, circumferentially arranged guiding means for said flexible members, a cage supported on said flexible members, and means for flexing said flexible members to adjust the cage.

11. In a reducing machine the combination of a frame, a flexible ring mounted on said frame, a cage mounted on said ring, reducing elements coöperating with said cage, and means for flexing said ring to vary the degree of curvature of said cage for the purpose of adjusting the same relative to the reducing elements.

12. In a reducing machine the combination of a frame, a flexible ring mounted on said frame, a cage carried on said flexible ring, a rotary member coöperating with said cage, and means for flexing said ring to move the various portions of said cage to different operative positions toward or from said rotary member.

13. In a reducing machine the combination of a frame, flexible rings mounted on said frame, a flexible cage mounted on said rings, and means for varying the diameter of the rings to change the operative position of the cage.

14. In a reducing machine the combination of a frame, a shaft operating therein, flexible rings mounted on said frame, a cage carried on said rings, means for varying the

diameter of said rings, and means for guiding said rings relative to said shaft.

15. In a reducing machine the combination of a frame, movable ring members, mountings for said movable ring members, arcuate guides for said mountings, a cage supported by said ring members, and means for moving the said mountings in the said guides.

16. In a reducing machine the combination of a shaft, a cage mounted concentrically thereof, mountings for said cage, means for moving said mountings, and means for guiding said mountings involutely relative to said shaft.

17. In a reducing machine the combination of a frame, movable rings mounted thereon, a cage movably supported on said rings, and means for varying the diameter of said rings to vary the diameter of said cage.

18. In a reducing machine the combination of arcuate cage supporting devices, a cage slidably supported thereon, and means for varying the degree of curvature of said supporting devices for the purpose of adjusting the cage.

19. In a reducing machine the combination of a frame, a slidable member mounted therein, an adjusting shaft mounted in said frame, a cage mounted in said frame and having operative relationship with said sliding member, and means for shifting said sliding member by said shaft to adjust said cage to various operative positions.

20. In a reducing machine a shaft, beaters mounted thereon, a cage coöperating with said beaters, means for moving one of the extremities of said cage radially of said shaft, means for moving the other extremity of said cage circumferentially of said shaft, and means for guiding the said cage intermediate its extremities for maintaining it concentric with said shaft.

21. In a reducing machine the combination of a shaft, beaters mounted thereon, an integral cage substantially encircling said shaft and adapted to coöperate with said beaters, and means for expanding and contracting said cage diametrically relative to said shaft into different operative positions.

22. In a reducing machine the combination of a shaft, beaters operated thereby, an integral foraminous cage coöperating with said beaters, and means operable to flex said cage to change its curvature and to move said cage relative to said shaft into different positions to coöperate with the beaters.

23. In a reducing machine the combination of a shaft, beaters operable thereby, an integral section constituting a concave cooperating with said beaters, and means for varying the degree of curvature of said concave to change its coöperative relationship with the beaters.

In testimony whereof I hereunto affix my signature in the presence of two witnesses, this 11th day of October, 1913.

FERRIS OGDEN.

Witnesses:
WM. MEBU,
DOROTHY FRISINGER.