

No. 811,671.

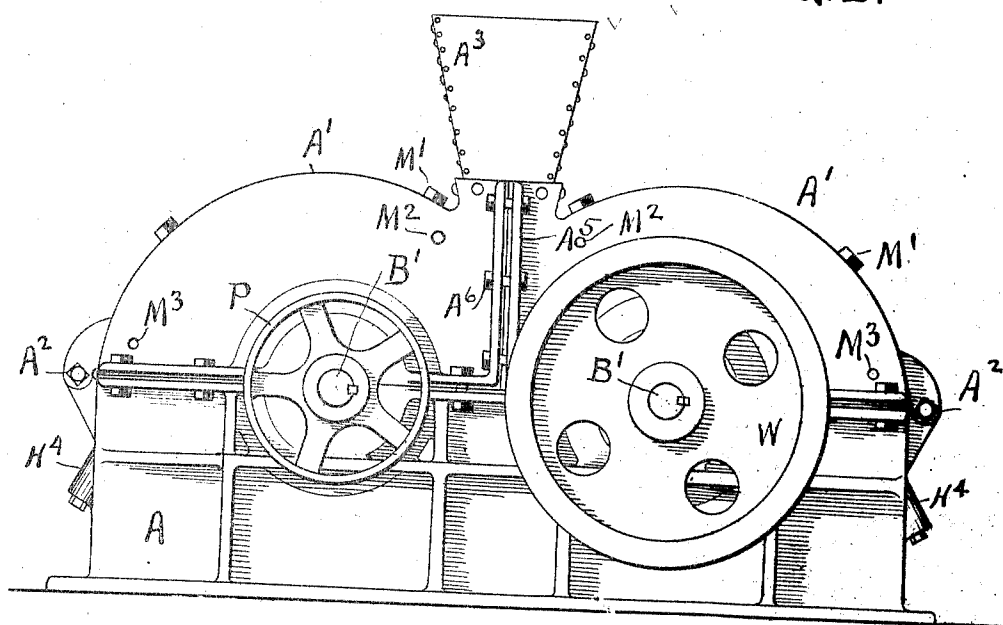
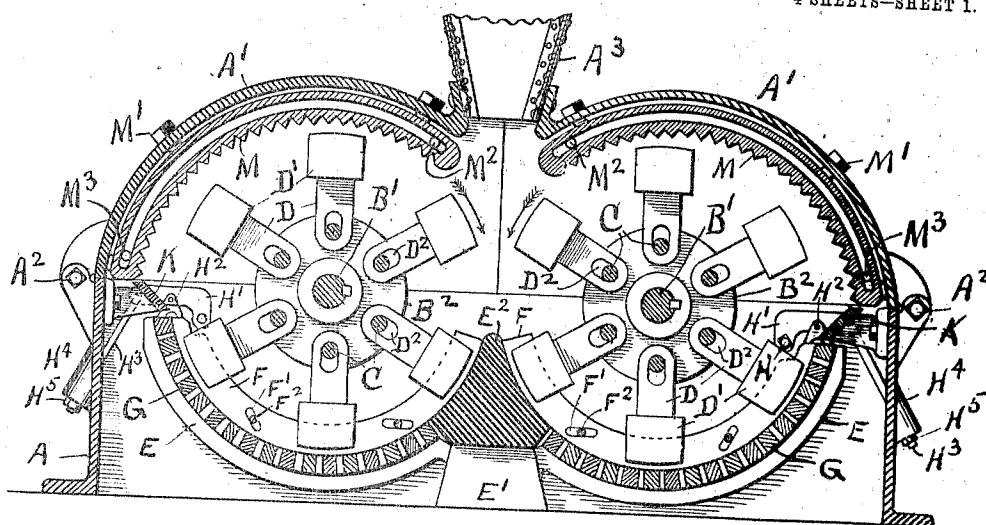
PATENTED FEB. 6, 1906.

P. L. SIMPSON.

CRUSHER.

APPLICATION FILED FEB. 26, 1902.

4 SHEETS—SHEET 1.



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4 SHEETS—SHEET 2.

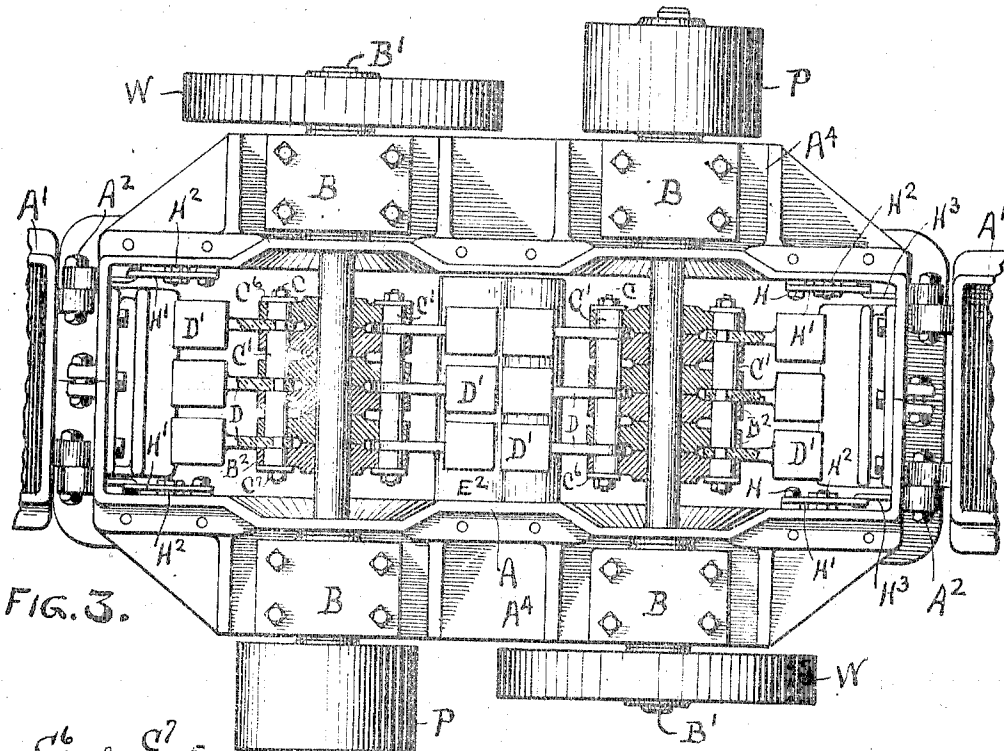


FIG. 3.

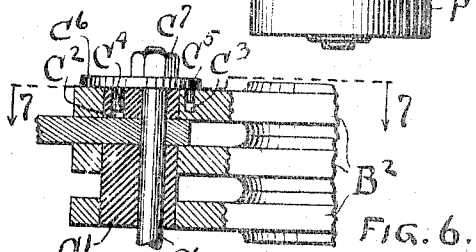


FIG. 6.

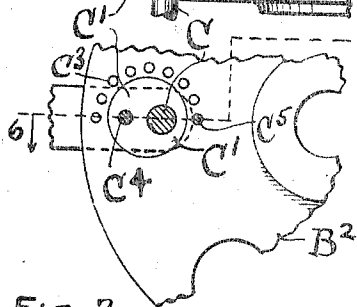


FIG. 7.

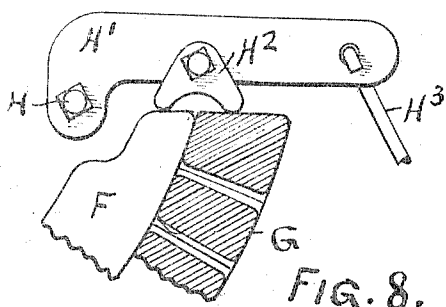


FIG. 8.

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4 SHEETS—SHEET 3.

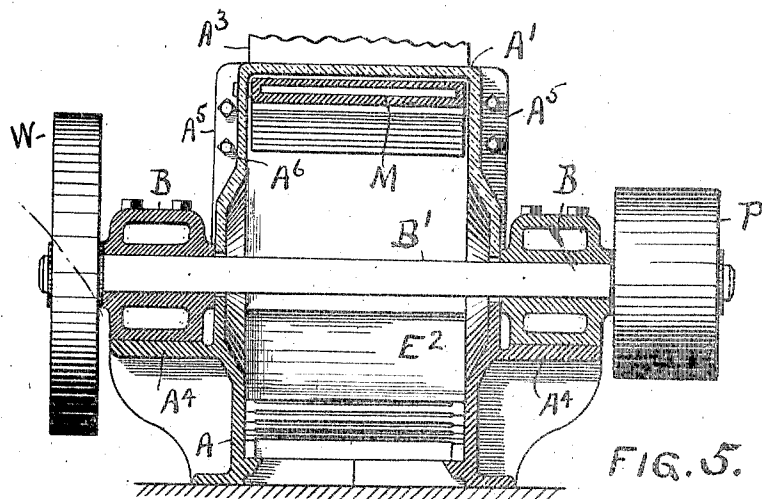


FIG. 5.

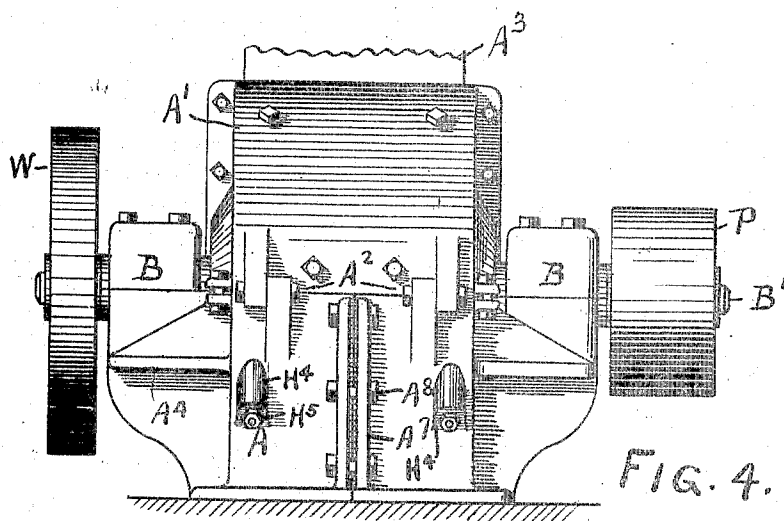


FIG. 4.

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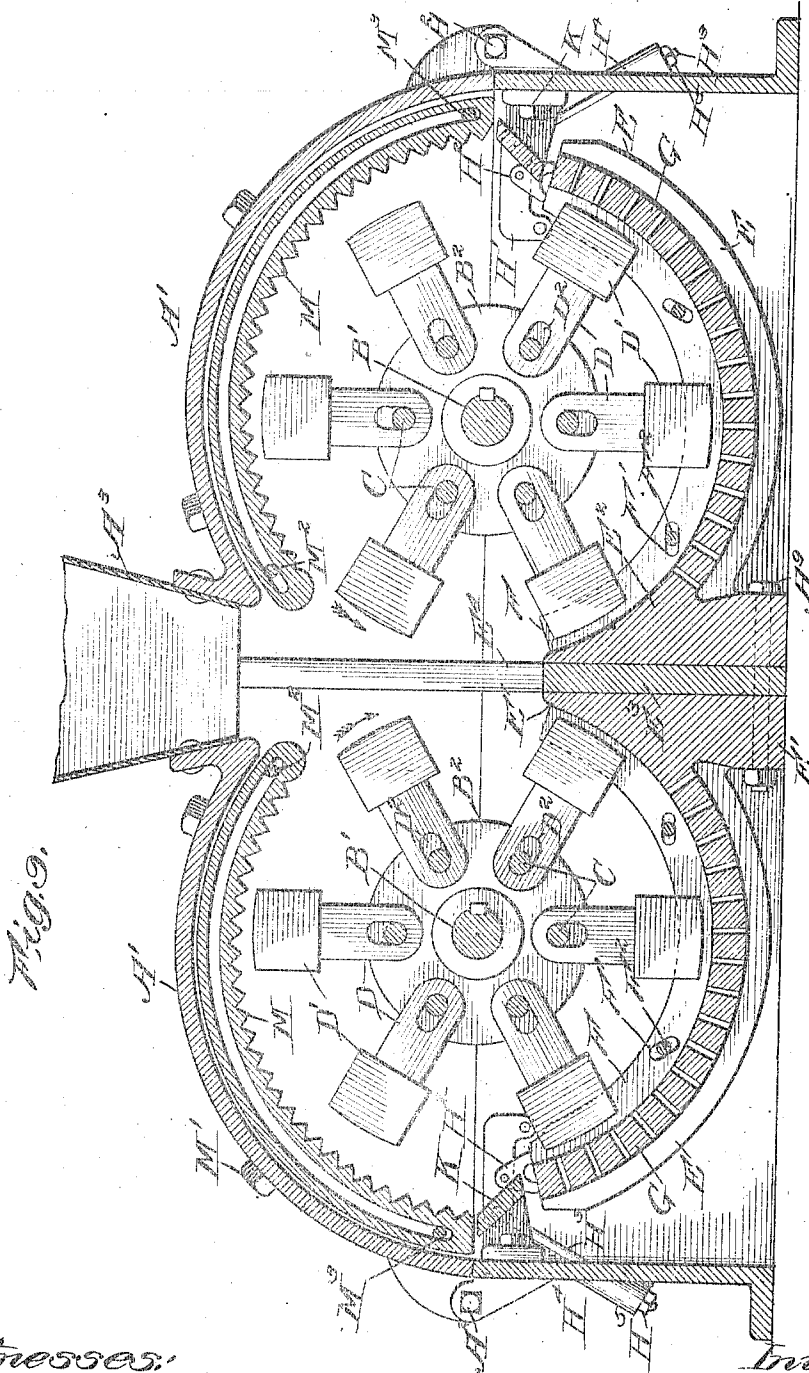
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4 SHEETS—SHEET 4.



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CRUSHER.

No. 811,671.

Specification of Letters Patent.

Patented Feb. 6, 1906.

Application filed February 26, 1902. Serial No. 95,656

To all whom it may concern:

Be it known that I, PETER L. SIMPSON, a citizen of the United States of America, and a resident of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Crushers, of which the following is a specification.

My invention relates to crushers, and has for its object the construction of an improved machine for breaking rock or other hard material.

In the accompanying drawings, Figure 1 is a side elevation. Fig. 2 is a longitudinal section. Fig. 3 is a plan with the covers turned back so as to show the interior. Fig. 4 is an end elevation. Fig. 5 is a transverse section on the line of one of the shafts. Fig. 6 is a section on line 6 6 of Fig. 7. Fig. 7 is a section on line 7 7 of Fig. 6. Fig. 8 is a detail showing the means for clamping the grate-bars in position, and Fig. 9 is a detail showing the method of separating the two parts of the machine when it is desirable to do so.

In the said drawings, A is a frame made up of two halves, which are secured together by bolts A⁸, running through the flanges A⁷. Pivoted at A² on the frame A are two covers A¹, which meet at the central portion of the machine and provide at the upper portion a hopper A³ for inserting material into the machine. On the sides of the frame A are brackets A⁴, upon which are carried the boxes B. Supported in boxes B are shafts B¹, provided with pulleys P and fly-wheels W. Also on a shaft B¹ are a series of washers B², provided with openings, through which shafts may be inserted. A shaft for this purpose consists of a rod C, upon which are mounted a series of eccentrics C¹. Around an opening through which the shaft is inserted is a series of holes C², and in the outside eccentric is a hole C³. A washer C⁴ is provided with an opening for the rod C and also with pins C⁴ and C⁵. The pin C⁴ is adapted to be inserted in one of the holes C², and the pin C⁵ is adapted to be inserted in the hole C³ of the outer eccentric C¹. By means of this washer and this series of holes the eccentric C¹ may be held in any desired position. The result of this construction is that the eccentrics lie centrally with the openings in the washers B², and the rod C may be adjusted by the movement of these eccentrics and held in any desired position by the pins C⁴ and C⁵, the consequence of which is that the rod C is

moved to or from the shaft B¹ according to what hole C³ the pin C⁵ is inserted in.

Suspended on the rod C between the eccentrics C¹ are a series of hammers D, having heads D¹ and slots D² at the points of connection with the rods C. The washers or disks B² are preferably provided with six openings, as shown in Fig. 2, and as a consequence there are six series of hammers D D¹ on each shaft B¹. When a shaft B¹ is rotated, the hammers D¹ revolve about it, swinging on their pivots on the shafts C. Lying in the bottom part of the frame A are a series of grate-bars G, which are supported by lugs E, secured to the sides of the frame A. These grate-bars are so arranged that they lie in the arc of the circles whose centers are the shafts B¹. The distance between one shaft B¹ and the other is such that the hammers D¹ approach very near each other when the said shafts are revolved in the direction of the arrows shown in Fig. 2. Over the top of the bars G and located against the sides of the frame A are two bars F on each side of the machine, which bars are provided with slots F¹, which work upon pins F² in the frame A. Pivoted at H (see Figs. 2 and 8) is a bar H¹, upon which is pivoted a block H², adapted to engage the bar F and the grate-bar G. Connected to the other end of the bar H¹ is a rod H³, which extends outward through the lug H⁴ on the frame A, and at the other end of this rod H³ is a nut H⁵. By tightening up the nut H⁵ a strain is put upon the bar F and the grate-bars G, which strain operates to press the grate-bars toward a central block E² and also to press the clamping-bar F tightly against the upper surface of the grate-bars G. The central block E² is located at the center of the machine and extends from one side to the other, resting upon a lug E¹ of the frame A. The grate-bars and the block E² form part of cylinders which communicate with each other at the center of the machine.

The upper part of the frame, consisting of the covers A¹, is provided with a corrugated liner M, which is secured to the cover A¹ by bolts M¹. The arcs formed by the corrugated wearing-surfaces of the liner M are supported eccentrically to the shafts B¹, so that the hammer-heads D¹ while passing the corrugated surfaces continually approach nearer thereto. Each liner M has an interior steam-chamber which is provided with an inlet

steam-pipe at M² and an outlet-pipe at M³. The eccentric position of the liner M with respect to the movement of the hammers D' causes the said hammers to force material against the inner face of said liner, where it is liable to stick if slightly moist. The heat supplied by the steam overcomes the sticking tendency. Also secured at each end of the frame is a bracket K, supporting a transverse plate, which extends across the machine between the corrugated liner M and the grate-bars G. This plate K prevents material from dropping down through the space which would otherwise be left open.

The bars H', together with their connections H² and H³, furnish equalizing-bars for clamping the grate-bars in position against the frame and the central block E².

Assuming the shafts to be driven in the direction of the arrows shown in Fig. 2, then if the material be inserted through the hopper A³ such material will fall in the path of the hammers D' and be crushed between the said hammers, which are driven at a very high rate of speed. A hammer on one shaft may be considered as one of a pair of hammers, the other member of which pair is a corresponding hammer on the other shaft. The material dropped through the hopper A³ is therefore crushed between a pair of hammers, and this crushing is accomplished by virtue of a very great velocity given to the hammers. The hammers D are provided with slots D², by means of which they are connected to the rods C. By this means the hammers are permitted when striking large or hard pieces to yield radially with respect to the shaft B' as well as circumferentially with respect to their pivoting-rods C. The crushed material drops downward, being parted by the central block E², so that part of it moves toward one end of the machine and the other part toward the other. That which is fine enough drops through the grate-bars G and through the bottom of the machine into a suitable receptacle, which would be within the foundation upon which the machine was placed. Material too coarse to pass through between the grate-bars is driven around by the hammers and comes into the path of the new material being inserted through the hopper A³. In passing around some portions of this material are broken on the corrugated plate M and some of it is broken only when thrown in the path of the hammers revolving in the adjacent cylindrical chamber. As the hammers wear by use they may be adjusted outward, as explained by the operation of the eccentric C' and the shaft C, upon which the hammers are pivoted.

In cases where it is desired to sometimes crush material so as to leave it coarse I cut the frame in two transversely, and the block E² also, so that the two cylindrical chambers may be moved from each other. The space

left open by moving the parts from each other is filled for the block by a liner E² (shown in Fig. 9) and for the frame by a similar liner E⁴. The two portions are then secured together by bolts A⁹ for the lower portion of the frame and A⁶ in the flanges A⁵ for the covers A⁷.

What I claim is—

1. In a crusher, the combination with hammers, and means for rotating them about adjacent centers so as to crush material between them, of means for inserting material between said hammers so that it will be crushed, a dividing-block located beneath the points of nearest approach of hammers to each other, and grate-bars extending in curves from said block and underneath the axes of said hammers.

2. In a crusher, the combination with a casing, a pair of parallel shafts rotated in opposite directions, and pivoted hammers carried by said shafts, of means by which material may be inserted between the hammers on opposite shafts, a block located beneath the point at which material is crushed between said hammers, and grate-bars extending from said block in concaves under said shafts.

3. The combination with a casing provided with two cylindrical chambers communicating with each other, a rotating shaft located at the axis of each chamber, pivoted hammers supported on each shaft and moved thereby toward the hammers on the opposite shaft, and means by which material to be crushed may be inserted between the hammers on opposite shafts, of a dividing-block located at the junction of the two chambers and closely adjacent to said hammers, and grate-bars extending from said block in opposite directions so as to form the lower concave portion of each chamber.

4. In a crusher, the combination with a casing, a pair of parallel shafts rotated in opposite directions, and pivoted hammers carried by said shafts, of a block located beneath the point at which material is crushed between the hammers of opposite shafts, grate-bars extending in opposite directions from said block and forming concave surfaces under said shafts, and corrugated plates forming concave surfaces over said shafts.

5. The combination with a casing, a pair of parallel shafts, and pivoted hammers carried by said shafts, of a dividing-block located between and slightly below said shafts, concave grate-surfaces extending from said dividing-block underneath each shaft, and corrugated concave surfaces extending over said shafts.

6. The combination with a casing, a pair of parallel shafts, and pivoted hammers carried by said shafts, said casing having an opening located between and slightly above said shafts, of a dividing-block located be-

tween and slightly below said shafts, concave grate-surfaces extending in opposite directions from said block under said shafts, and concave corrugated surfaces extending in a similar manner from said opening over said shafts.

7. In a crusher, a casing consisting of two parts bolted and providing two cylindrical chambers communicating with each other, rotary hammers supported at the axes of said chambers, and liners adapted to be inserted between the parts of the casing whereby the distance between the axes of said chambers may be adjusted to and from each other.

8. In a crusher having two sets of hammers carried by corresponding shafts, a casing inclosing said hammers and providing bearings for said shafts, said casing being divided into two parts at some point between the two shafts, and means whereby the parts of said casing may be adjusted to and from each other so that the hammers on one shaft may be adjusted with respect to the hammers on the other shaft.

9. A rotating shaft, disks carried by said shaft, eccentrics carried by said disks, hammers pivoted upon said eccentrics, and means for adjusting said eccentrics so as to vary the distance of said hammers from the center of said shaft.

10. A series of cylindrical blocks united by an eccentrically-placed rod, bearings for said blocks, hammers supported on said rod between said blocks, and means for securing said blocks at different positions in their bearings.

11. The combination with an eccentric and a bearing therefor, said eccentric being provided with a hole for the reception of a pin and said bearing being provided with a series of similar holes adjacent to said eccentric, of washers provided with two pins one of which is adapted to be inserted in the hole in said eccentric and the other of which is adapted to be inserted in one of the holes in said bearing.

12. A series of grate-bars, a clamping-block

for holding said bars to their seat, and an equalizing-lever adapted to simultaneously press said bars together and to operate said clamping-block.

13. In a crusher, a casing, revolving hammers supported within said casing, a series of grate-bars supported beneath said hammers and arranged concentrically therewith, an eccentrically-placed corrugated liner secured to the inside surface of the casing over said hammers, said liner being provided with an interior chamber, and means for admitting steam to said chamber.

14. A frame providing two interior and communicating chambers having axes parallel to each other, a series of bars forming part of the boundary of each chamber and arranged to be at a uniform distance from their respective axes, a corrugated liner forming the boundary of another part of each chamber, said liners being provided with interior steam-chambers and being so located that different parts lie at different distances from their respective axes, and means for admitting steam to the interior of said liners.

15. The combination with a rotating shaft, crushing devices carried thereby, and a grate-surface beneath said devices arranged to permit crushed material to fall therethrough, of a corrugated crushing-surface disposed eccentrically over said crushing devices, means for heating said corrugated surface.

16. The combination with a rotating shaft, crushing devices carried thereby, a grate-surface beneath said devices, and a casing inclosing said devices and grate-surface, of a corrugated plate secured to the inner surface of said casing over said crushing devices and eccentrically disposed with respect thereto, and means for heating said corrugated plate.

Signed at Chicago, Illinois, this 13th day of January, 1902.

PETER L. SIMPSON.

Witnesses:

WM. A. ROWLAND,
C. L. REDFIELD.