Dec. 16, 1930. G. W. BORTON 1,784,983

COAL BREAKER

Filed Aug. 31, 1929 3 Sheets-Sheet 1

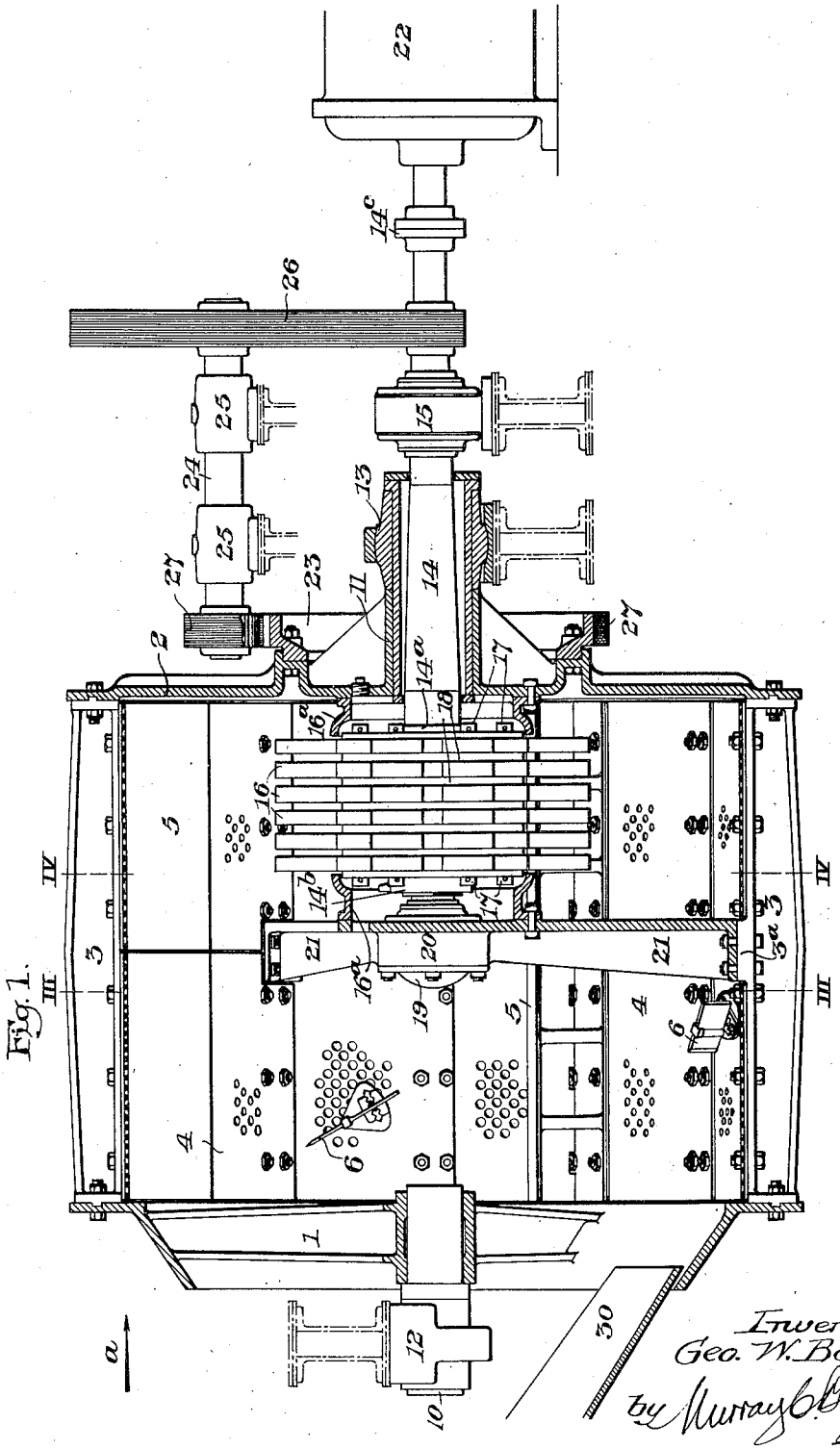


Fig. 1.

Inventor:
Geo. W. Borton
by Murray B. Boyer
Atty.

Dec. 16, 1930. G. W. BORTON 1,784,983

COAL BREAKER

Filed Aug. 31, 1929 3 Sheets-Sheet 2

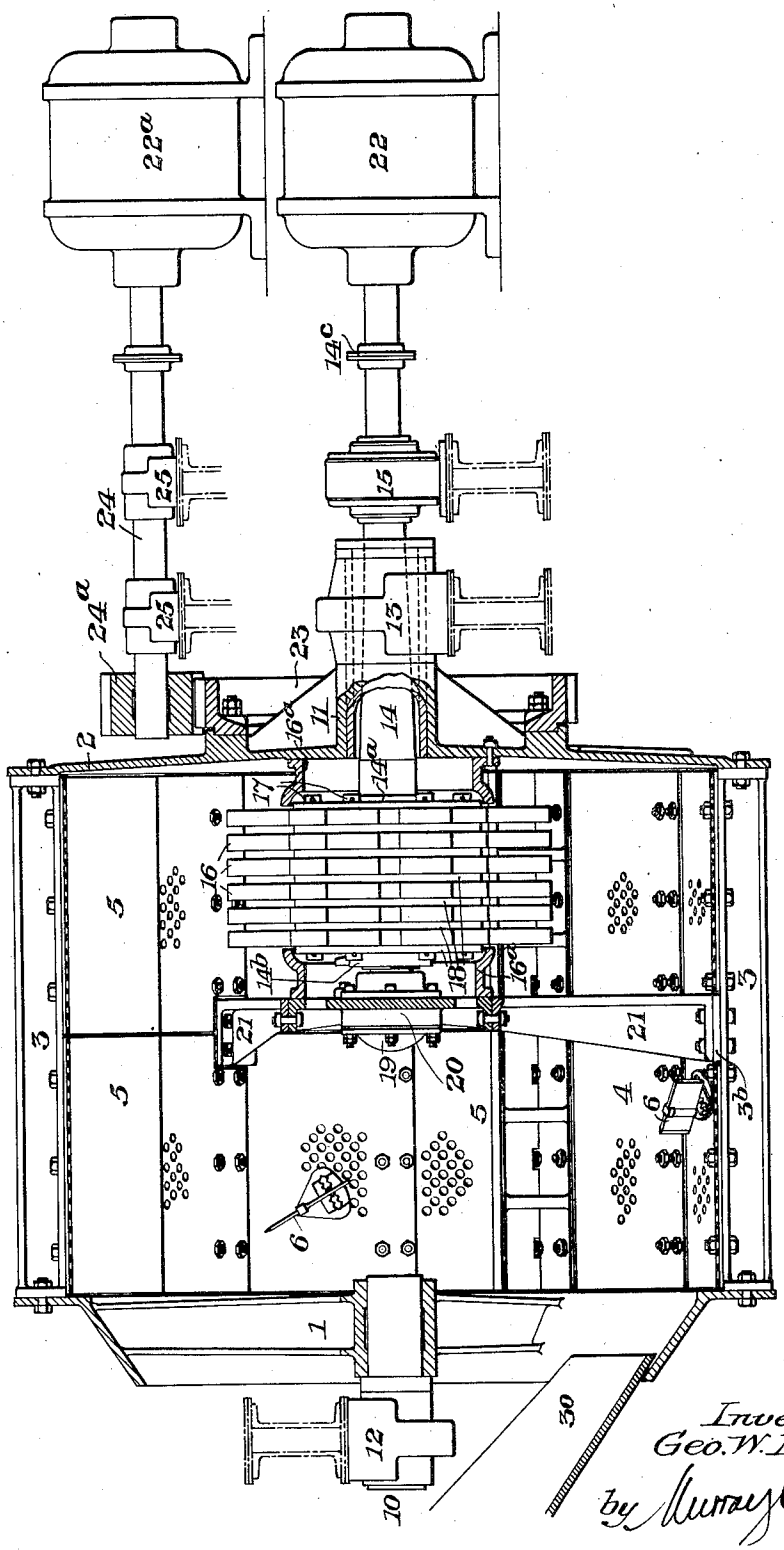


Fig. 2.

Inventor:
Geo. W. Borton,
by Murray & Boyer
Atty.

Dec. 16, 1930. G. W. BORTON 1,784,983

COAL BREAKER

Filed Aug. 31, 1929 3 Sheets-Sheet 3

Fig. 4.

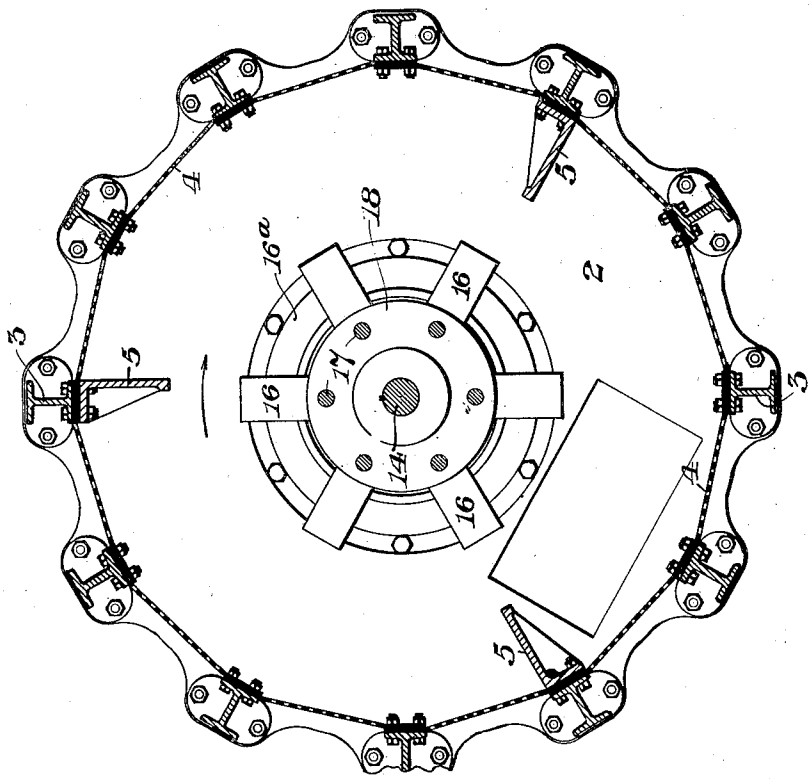
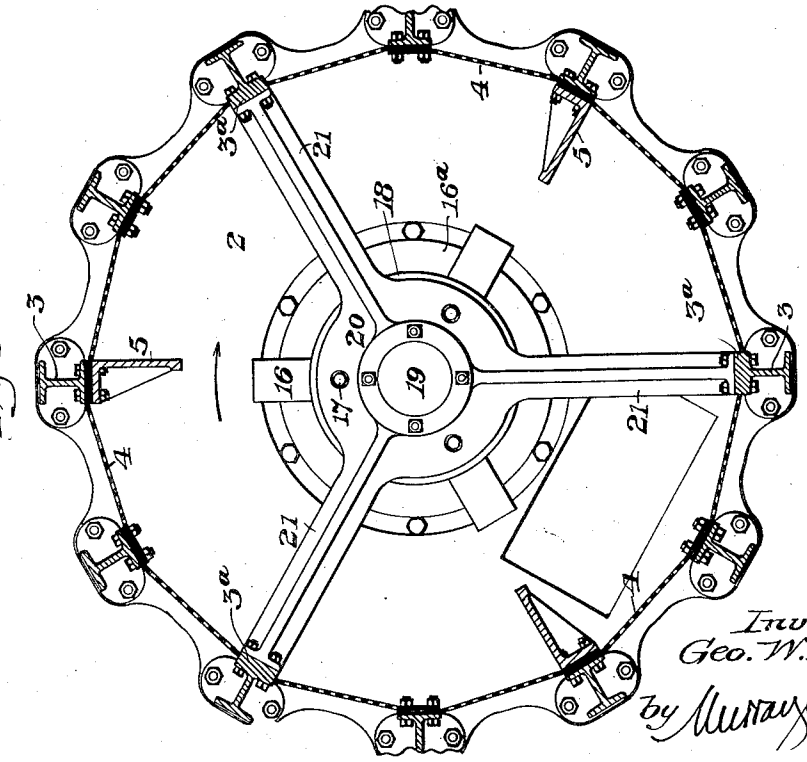


Fig. 3.



Inventor:
Geo. W. Borton,
by Murray & Boyle
Atty.

Patented Dec. 16, 1930 1,784,983

UNITED STATES PATENT OFFICE

GEORGE W. BORTON, OF NEW LISBON, NEW JERSEY, ASSIGNOR TO PENNSYLVANIA CRUSHER COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK

COAL BREAKER

Application filed August 31, 1929. Serial No. 389,771.

My invention relates to coal breakers of the Bradford type, and one object of my invention is to provide apparatus of this character of materially reduced dimensions, both longitudinally and laterally, and to provide means whereby the material undergoing treatment, coal for instance, may be broken to a size that will permit continuous and complete discharge through the foraminous wall of the cylinder.

A further object of my invention is to provide a coal breaker of the Bradford type with crushing mechanism of the hammer type disposed at one end of the rotating cylinder or drum toward which the material undergoing treatment is advanced. Suitable means, for instance, deflectors such as those disclosed in the patent of J. A. Plimpton, No. 1,700,687, may be employed to advance the coal; such deflectors being alternated with shelves extending longitudinally of the cylinder or drum forming the breaker structure, whereby the coal may be successively lifted and dropped for the purpose of breakage and at the same time fed longitudinally of the breaker chamber.

A further object of my invention is to provide at the end of the chamber remote from the inlet, a rotor structure carrying suitable hammers rotating at a speed greater than that of the cylinder, whereby the coal which reaches said end of the chamber may be subjected to impact by the hammers in addition to the breakage which will be occasioned by the coal falling from the shelves and striking the lower part of the rotating structure. As the hammers are in constant motion this action will be carried on continuously in order that all of the coal may be reduced to a size that will pass through the apertures in the walls of the cylinder; coal unbroken by initial hammer impact being carried up by the shelves for further discharge into the path of the hammers until reduced to the desired size.

These and other features of my invention are more fully described hereinafter; reference being had to the accompanying drawings, in which:

Figure 1 is a sectional elevation of coal breaker apparatus embodying my present improvements.

Fig. 2 is a similar view illustrating modified driving means, and

Figs. 3 and 4 are cross sectional elevations of the lines III—III and IV—IV, respectively, Fig. 1; looking in the direction of the arrow *a*.

The coal breaker forming the subject of my present invention is of substantially the same type as that illustrated in the patent of Borton and Hiller, No. 1,086,129, Feb. 3, 1914. My improved breaker comprises a suitable cylinder or drum mounted for rotation and made up of a frame having a foraminous wall. In the present instance this wall is made up of two sections or sets of apertured plates set circumferentially, which plates may be provided with edge flanges disposed in lapped relation when assembled to form the cylinder of the breaker structure. It will be understood, of course, that while such plates are preferred, I do not wish to be limited to the use of plates of the type illustrated in constructing the breaker cylinder of the present structure.

As illustrated in the accompanying drawings, the cylinder may comprise a frame or spider 1 at one end, and a closed frame or wall 2 at the opposite end; such parts being connected by I-beams 3, which may be of rail type if desired, and between which the foraminous plates 4, which make up what may be termed the screen portion of the breaker, are confined; said plates being preferably lapped at their point of engagement with the beams and bolted or otherwise secured thereto. The beams 3 may be of the type illustrated in Fig. 1 with arched centers, or they may be straight as indicated in Fig. 2.

Internally of the drum or cylinder, lifting shelves, indicated at 5, are provided, which shelves may extend throughout the length of the same. In practice these shelves are preferably disposed opposite certain of the beams extending longitudinally of the structure and may be secured to the latter by the fastening means employed for holding the plates thereto. The inner surface of the cylinder wall may be provided with deflec-

tors 6, of the type illustrated in the Plimpton patent referred to, set at a suitable angle, so that material fed into one end of the cylinder, in the present instance at the left, will be moved toward the right as the cylinder rotates.

Coal breakers of this type are mounted upon trunnions; those in the present instance being indicated at 10 and 11. The trunnion 10 may be carried by the frame or spider 1, while the trunnion 11, which may be hollow, is carried by the wall 2 at the opposite end of the cylinder. These trunnions are supported by suitable bearings 12 and 13 and are rotatably mounted with respect to the same.

The right hand end of the cylinder in the present instance is closed by the wall 2, and in a space at such end of the structure I provide a rotor structure carrying hammers of the type employed in rotary beaters or hammer crushers. This rotor structure may comprise a shaft 14 having one end journaled within the drum or cylinder, while the opposite end passes through the hollow trunnion 11 and may be supported by a suitable bearing 15, which may be of the self-aligning type, disposed externally of the machine. The rotor structure includes a series of hammers 16 of the type common to hammer crushers; such hammers being mounted upon rods 17, supported by disks 18, mounted upon the shaft 14. These disks may be of the spacing type, or have spacing means between them, and they are preferably confined between a shoulder 14^a of the shaft and a removable nut 14^b mounted thereon. Annular guards 16^a may be carried by the end wall 2 and the spider supporting the bearing 19, and serve to prevent material undergoing breakage falling directly upon the rotor shaft. The wall 2 may be provided with a door to gain access to the cylinder for the purpose of removing uncrushable material which does not pass the screen plates.

The inner end of the shaft 14 upon which the rotor structure is mounted may be journaled in a suitable bearing 19, which may also be of the self-aligning type and may be supported by a spider disposed intermediate the ends of the cylinder; said spider having a hub 20 receiving said bearing 19 and to which the latter is secured, and radially projecting arms 21 which are secured to longitudinal beams of the cylinder. These beams are preferably provided with pads 3^a upon which the ends of the arms 21 rest and to which they may be secured. If desired, these pads may be separate pieces interposed between the beams 3 and the arms 21 of the spiders, as indicated at 3^b, Fig. 2. The position of the spider arms, which may be mounted upon the pads 3^a or 3^b, is such that upon removal of the securing means therefor, such spider may be moved lengthwise of the cylinder (to the left as indicated in the drawings) for the purpose of adding to or removing any of the disks or hammers carried by the rotor shaft, or for effecting repairs in any part of the hammer mechanism.

The shaft 14 may be operatively connected to a motor 22, (a coupling 14^c being indicated for the purpose) whereby the rotor structure may be driven, preferably at a high speed. In order that the cylinder may be rotated, the wall 2 at one end of the same is provided with a spur gear 23, to which motion may be imparted. In the arrangement illustrated in Fig. 1, a counter shaft 24 is provided, mounted in suitable bearings 25 and driven by chain gearing indicated at 26; the spur gear of the cylinder being operatively connected by similar gearing 27 to said counter shaft. In the arrangement illustrated in Fig. 2 I have illustrated a separate motor 22^a for driving the counter shaft 24 which latter carries a pinion 24^a meshing with the spur gear 23. It will be understood, of course, that the speed of the rotor structure carrying the hammers is greatly in excess of the speed of the cylinder, and that they are preferably driven in the same direction.

In operation, coal to be broken is fed into the cylinder by means of a chute 30 at the left hand end of the same, and is subjected to such breakage or fracture within the limits of the first set of plates and a portion of the second, as may be occasioned by dropping from the shelves into the lower portion of the revolving cylinder in the usual manner. The deflectors mounted upon the inner surface of the cylinder wall move the coal forward during the alternate lifting and dropping actions toward the end wall 2 of the cylinder and into the zone of the hammers. The shelves extend throughout the length of the cylinder and into the zone of the hammers so that coal is being constantly raised during its rotation. Any coal dropping from these shelves in the zone of the hammers is broken thereby by impact, and if of proper size will pass from the chamber of the cylinder through the apertures of its wall whose size regulates the size of the fragments discharged and insures that no oversize pieces of coal will be delivered by the breaker structure.

It will be understood that most of the fines accompanying the coal introduced into the breaker cylinder will be discharged through the apertures in the first set of plates and that the larger pieces of coal unbroken by impact upon the screen walls when dropped from the shelves will be subjected to the action of the hammers in the crushing zone.

The construction herein described and shown in the accompanying drawings is highly efficient in use in that it establishes a maximum diameter of product which is very desirable for stoker feed.

While I have referred especially to the breaking of coal, it will be understood that other materials of a friable nature may be subjected to the action of my improved machine and broken in a similar manner for discharge through the foraminous wall.

I claim:

1. In a crushing structure, the combination of a rotating cylinder having a foraminous wall, means for rotating said cylinder, lifting means extending longitudinally of said cylinder internally of the same whereby material introduced therein may be lifted for gravitational discharge to the lower portion of the cylinder for fracture and subsequent discharge through the foraminous wall, means for carrying such material forward in the cylinder, and independently operated hammer mechanism disposed at one end of the chamber.

2. In a crushing structure, the combination of a rotating cylinder having a wall made up of aperture plates, means for rotating said cylinder, a series of shelves extending longitudinally of said cylinder internally of the same whereby material introduced into said cylinder may be lifted for gravitational discharge to the lower portion of the same for fracture and subsequent discharge through the apertured plates of the wall, means for carrying such material forward in the cylinder, and independently operated hammer mechanism disposed at the end of the chamber toward which the material is moved during rotation of the cylinder.

3. In a crushing structure, the combination of a rotating cylinder having a foraminous wall, means for rotating said cylinder, lifting means extending longitudinally of said cylinder internally of the same whereby coal introduced therein may be lifted for gravitational discharge to the lower portion of the cylinder for fracture, means for carrying unbroken coal forward in the cylinder, independently operated hammer mechanism disposed at one end of the chamber, means for driving said cylinder, and means for driving said hammer mechanism at a higher speed than the cylinder.

4. In a crushing structure, the combination of a rotating cylinder having a wall made up of apertured plates, means for rotating said cylinder, a series of shelves extending longitudinally of said cylinder internally of the same whereby coal introduced into said cylinder may be lifted for gravitational discharge to the lower portion of the same for fracture, means for carrying unbroken coal forward in the cylinder, independently operated hammer mechanism disposed at the end of the chamber toward which the coal is moved during rotation of the cylinder, means for driving said cylinder, and means for driving said hammer mechanism at a higher speed than the cylinder.

5. In a coal breaker, the combination of a cylinder comprising end frames and a foraminous wall, longitudinal beams connected to said end frames and supporting said wall, shelves within the cylinder for lifting coal introduced therein for gravitational fracture, a rotor structure carrying hammers located at one end of said cylinder, means within the chamber for supporting one end of the shaft of the rotor structure, trunnions carried by the end frames for supporting the cylinder; one of said trunnions being in the form of a sleeve for the passage of the rotor shaft to an external support, and means for driving the cylinder and the rotor structure at different speeds.

6. In a coal breaker, the combination of a cylinder comprising end frames and a foraminous wall; one of said end frames being closed, longitudinal beams connected to said end frames and supporting said wall, shelves within the cylinder for lifting coal introduced therein for gravitational fracture, means for moving the coal longitudinally of the cylinder, a rotor structure carrying hammers located at one end of said cylinder adjacent the closed end frame, a spider disposed intermediate the ends of the chamber for supporting the shaft of the rotor structure, trunnions carried by the end frames for supporting the cylinder; one of said trunnions being in the form of a sleeve for the passage of the rotor shaft, means for driving the cylinder at a relatively slow speed, and means for imparting high speed to the rotor structure.

7. In a coal breaker, the combination of a cylinder comprising end frames one of which is closed and a foraminous wall disposed between the same, longitudinal beams supporting said foraminous wall, shelves within the cylinder for lifting coal introduced therein for gravitational fracture, hammer mechanism located adjacent the closed end of said cylinder, a shaft therefor, a support for one end of said shaft disposed within the cylinder, trunnions carried by the end frames for supporting the cylinder; one of said trunnions being in the form of a sleeve for the passage of the shaft carrying the hammer mechanism, an external support for the outer end of said shaft, means for driving the cylinder at relatively slow speed, and independent means for imparting high speed to the hammer mechanism.

8. In a coal breaker, the combination of a cylinder comprising end frames and a foraminous wall composed of annularly arranged apertured plates disposed between the same, longitudinal beams supporting the plates forming said wall, shelves within the cylinder for lifting coal introduced therein for gravitational fracture, hammer mechanism located at one end of said cylinder, a shaft therefor, a support for one end of said shaft disposed within the cylinder, trunnions car-

ried by the end frames for supporting the cylinder; one of said trunnions being in the form of a sleeve for the passage of the shaft carrying the hammer mechanism, means for imparting high speed to the hammer mechanism, and means operatively connected to the main driving shaft for moving the cylinder at a slower speed than the hammer mechanism.

9. In a crushing structure, the combination of a rotating cylinder having a foraminous wall, means for rotating said cylinder, means for effecting longitudinal movement of material introduced into said cylinder, independently operated hammer mechanism disposed at one end of the cylinder and including a rotor shaft, a bearing for the inner end of said shaft, and a spider for supporting said bearing; said spider being displaceable lengthwise of the cylinder to gain access to the shaft and the hammer mechanism carried thereby.

10. In a structure such as set forth in claim 9, longitudinal beams for supporting the foraminous wall, and pads carried by said beams upon which the arms of the spider are mounted.

In witness whereof I have signed this specification.

GEORGE W. BORTON.