Aug. 8, 1944. G. W. BORTON 2,355,050

CRUSHING MACHINERY

Filed Dec. 28, 1942

Fig. 1.

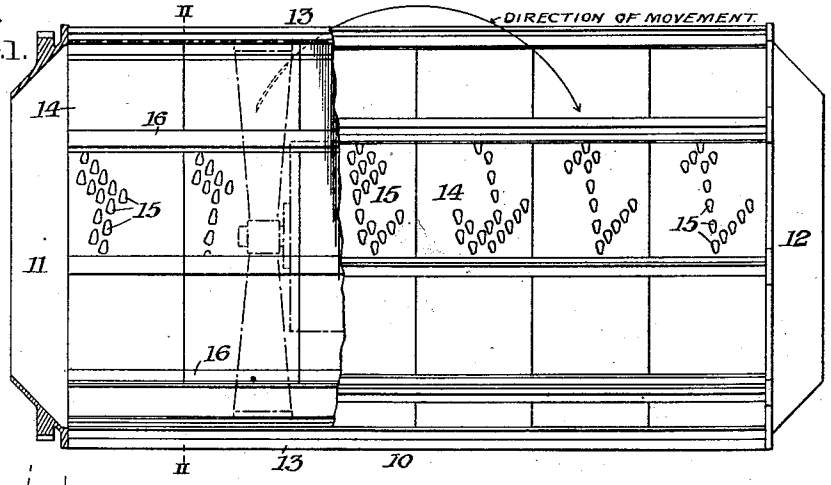


Fig. 2.

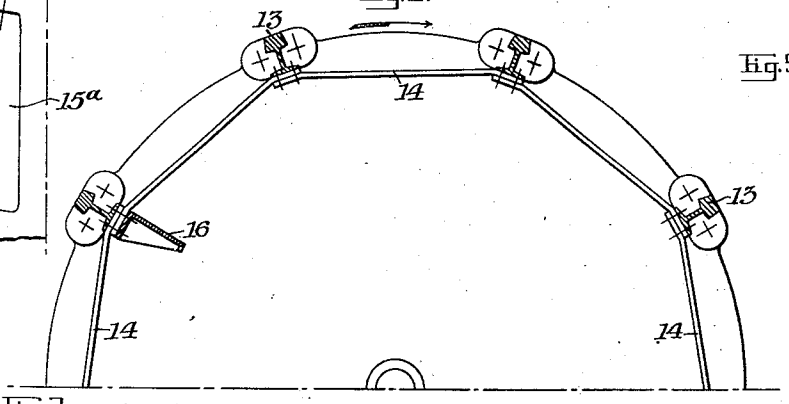


Fig. 7.

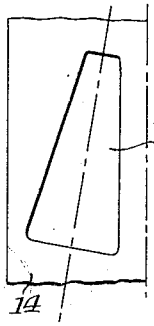


Fig. 5.

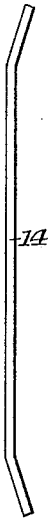


Fig. 3.

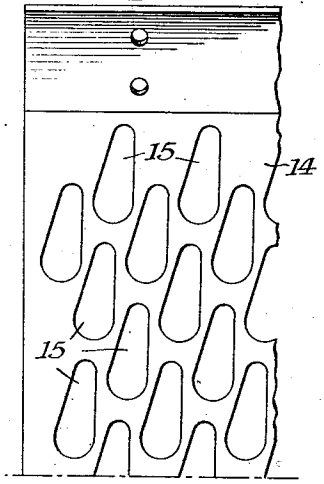


Fig. 4.

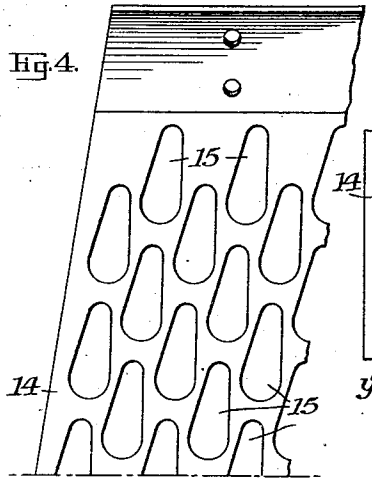
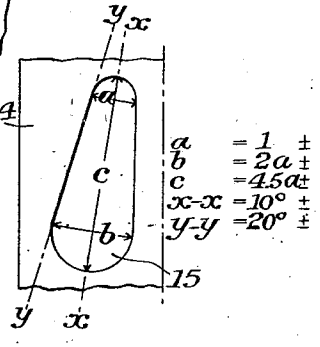


Fig. 6.



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Patented Aug. 8, 1944 2,355,050

UNITED STATES PATENT OFFICE

2,355,050

CRUSHING MACHINERY

George W. Borton, Philadelphia, Pa., assignor to Pennsylvania Crusher Company, New York, N. Y., a corporation of New York

Application December 28, 1942, Serial No. 470,348

4 Claims. (Cl. 83—9)

My invention relates to crushing machinery, more particularly coal crushers of the "Bradford Breaker" type (Patent No. 143,745, Oct. 21, 1873), which comprise a rotating cylindrical screen or drum made up of plates having apertures for the discharge of the crushed material.

The usual practice in the construction of these cylindrical screens or drums is to make them up of a frame carrying a series of foraminous elements—plates with circular apertures—which apertures may be of different size depending upon the size of the crushed material desired to be discharged. In such structures it has been the practice to provide, in addition to the shelves for lifting the material undergoing crushing, deflectors mounted on the inner wall of the drum for the purpose of imparting longitudinal movement to the material undergoing crushing from the inlet to the discharge end of the drum as the latter is rotated. Such deflectors were adjustable so that the feed could be regulated or adjusted with respect to various factors connected with the crushing operation, which will include the degree of hardness of the material undergoing crushing; the size desired of the crushed material discharged through the perforated walls of the drum, and the speed of rotation.

With a view of improving the efficiency of crushing apparatus of this type, I have devised a special type or form of perforation which, in addition to permitting passage of the crushed material, will have the effect of imparting longitudinal movement to the uncrushed material; thereby obviating the use of special deflectors mounted on the wall of the crushing chamber, and providing a self-feeding structure. Furthermore, by omitting all or the greater part of the special deflecting means, the effective screening area is materially increased.

A further object of my invention is to associate this special type or form of aperture with screen plates of the character illustrated in the patent of John H. Doerres, No. 1,563,173, dated November 24, 1925.

These and other features of my invention are more particularly pointed out hereinafter; reference being had to the accompanying drawing, more or less diagrammatic in character, in which:

Figure 1 is an elevation on a greatly reduced scale and partly in section, of a crushing screen or drum of the "Bradford Breaker" type.

Fig. 2 is a cross sectional view of a portion of the drum on a slightly larger scale, taken on the line II—II, Fig. 1.

Figs. 3 and 4 are fragmentary plan views illustrating forms of screen plates provided with the special type or form of perforations which I employ to effect simultaneous discharge and movement of the material undergoing crushing.

Fig. 5 is an end view of a plate of the preferred type.

Fig. 6 is a diagrammatic view of one of the special perforations which I employ, and

Fig. 7 is a view similar to Fig. 6, illustrating a modified form of aperture within the scope of my invention.

In Fig. 1 of the drawing I have shown diagrammatically a form of crushing structure involving a drum 10, having end sections 11 and 12; such drum being formed of a frame which includes longitudinal members 13 connected to said end members, and perforated walls made up of plates 14 secured to the longitudinal members 13. The longitudinal members may be in the form of rails of the usual T-head type, and the screen plates are of the type illustrated in the Doerres patent before referred to; overlapping at their points of connection with the longitudinal members 13 and being secured in such overlapping relation by suitable bolts (not shown). The crushing structure may include as a part of its equipment a rotary hammer structure of the type illustrated in many of my prior patents, for instance, that shown in my Patent No. 2,108,793, and others.

The plates of the Doerres patent are provided with circular apertures. In developing my present invention the apertures in the screening plates, indicated at 15, are substantially of "pear" shape; that is to say, they are elongated, and they may have curved ends of different radii, more particularly shown in Fig. 6. While the dimensions of these apertures may vary, they may be approximately two and one-half times the length of the greatest dimension of their larger ends, and the radius of the smaller end may be approximately one-half the radius of the larger end. While apertures of such dimensions will efficiently perform the function desired, I do not wish to be limited to the proportions given; nor to the size of the perforations, nor to their exact shape. For instance, I may eliminate the full curves at the ends and provide walls substantially at right angles to the longitudinal axis of the perforations with rounded corners of suitable curvature—more or less as the case may be—as illustrated at 15a, Fig. 7.

These perforations, formed in the plates making up the drum of the breaking or crushing structure are disposed diagonally with respect to the longitudinal axis of the same and, depending in some measure upon the character of the material to be crushed, the angle of the longitudinal axis of the perforations may lie between five and twenty degrees to the normal—more or less.

The perforated plates are mounted in the drum frame in such position that when the drum is rotated, to the right for instance, the larger

ends of the perforations may be the following ends. Fragments of the material undergoing crushing will pass through the larger ends and, of course, to a certain extent, other fragments will pass through the smaller portions of the perforations since the crushing operation always produces a certain amount of "fines" that will pass very small openings. Under some conditions it may be desirable to have the apertures arranged in the reverse position with respect to the rotation of the drum.

During the rotation of the drum, the material which fails to pass through the perforations will be engaged by the lips or walls of the same, and by reason of the fact that these lips or walls are disposed diagonally with respect to a line at right angles to the longitudinal axis of the drum circumferentially of the same, such engagement will have the effect of imparting longitudinal movement to the uncrushed material until crushed, so that constant feed through the drum at a well regulated rate of speed will take place. In practice, with the longitudinal axes of the perforations at approximately ten degrees to the normal, the following lip or wall of the perforation will be approximately twenty degrees to the normal.

In lieu of providing the plates with apertures set diagonally with respect to the edges of the same in staggered relation, as shown in Fig. 3, they may be arranged in staggered relation in lines paralleling the longitudinal edges of the plates and the latter will be in the shape of a rhombus, the angles of which will determine the angles which the perforations will present to a circumferential line at right angles to the longitudinal axis of the drum, as shown in Fig. 4.

In all instances the ends of the plates will be arranged in overlapping relation, and these plates preferably include a substantially flat central area, with flanged ends at a slight angle to the plane of the central area. It is within the scope of my invention, however, to employ plates curved throughout their extent and arranged with their ends in overlapped relation at the points of engagement with the longitudinal members of the drum frame.

I have found in practice that the perforations which I have developed have the effect of properly screening or discharging the crushed material of the desired size that will pass the same, with the added effect of imparting forward movement to the uncrushed material so that crushing or breaking drums equipped with screen plates having the type of perforations which I have designed will be self-feeding; thus obviating the necessity of employing special deflector blades on the inner wall of the drum. The usual lifting shelves will be employed, and in a drum structure having a diameter of approximately twelve feet, at least nine screen plates will be employed circumferentially of the same; the ends of such plates being attached to nine longitudinal members. In such a structure three lifting shelves may be employed, one of which is shown at 16, Fig. 2, and they are preferably attached to the longitudinal members where the perforated plates are attached. These lifting shelves are of substantially standard type and no extended description of the same seems to be necessary. They will be found in many of my prior patents, among which may be mentioned Nos. 1,906,734; 1,948,504; 2,108,793, etc., as well as in the patent of W. A. Battey, No. 1,855,379.

The screen plates forming the subject of my invention may be employed with any type of rotary breaking structure of the "Bradford" design, including those which have a hammer structure located within the same and designed to break by direct impact the coal raised by the lifting shelves and discharged into the body of the drum for further crushing and passage through the perforations of the screen plates as conditions may require.

It has been found in practice that my improved form of perforation is highly efficient; readily and quickly delivering fragments that are of a size to pass the same, and feeding forward the uncrushed material until completely broken.

While I have described with some particularity the character of the perforations which is preferred, and the manner of placing or positioning them in the plates, as well as the type of plates, such description is for illustrative purposes only, hence I do not wish to be limited to the precise construction shown, which is capable of many modifications; all of which is deemed to be within the scope of the appended claims.

(This application includes subject-matter common to my application filed May 27, 1941, Serial No. 395,360.)

I claim:

1. A crushing structure of the rotary type including a drum made up of end sections in spaced relation with longitudinal members connecting the same, in combination with screen plates forming the wall of said drum and having elongated perforations whose width at one end is greater than that at the other in the ratio of approximately two to one; said drum being arranged to rotate in a direction with the smaller end of the perforations in the leading position.

2. A self-feeding crushing structure of the rotary type comprising a screen drum made up of plates with elongated perforations whose width at one end is greater than that at the other in the ratio of approximately two to one; such perforations permitting discharge of the crushed material and by reason of the angular setting of their walls effecting longitudinal displacement of the uncrushed material during rotation of the crushing drum.

3. A self-feeding crushing structure of the rotary type comprising a screen structure made up of plates having a flat central area with flanged ends in overlapping relation; said plates having elongated perforations whose width at one end is greater than that at the other in the ratio of approximately two to one diagonally disposed with respect to the plane of rotation; such perforations permitting discharge of the crushed material and by reason of their angular setting providing lips or walls in camming relation to effect longitudinal displacement of uncrushed material during rotation of the crushing drum.

4. A crushing structure of the rotary type including a drum made up of end sections in spaced relation and longitudinally connected, in combination with screen plates forming the wall of said drum and having elongated perforations whose width at one end is greater than that at the other in the ratio of approximately two to one arranged in staggered relation; said drum being arranged to rotate in a direction with the smaller end of the perforations in the leading position.

GEORGE W. BORTON.