Nov. 4, 1924.

1,513,855

P. PHELPS

CRUSHER

Filed Jan. 13, 1923

2 Sheets-Sheet 1

FIG. 1

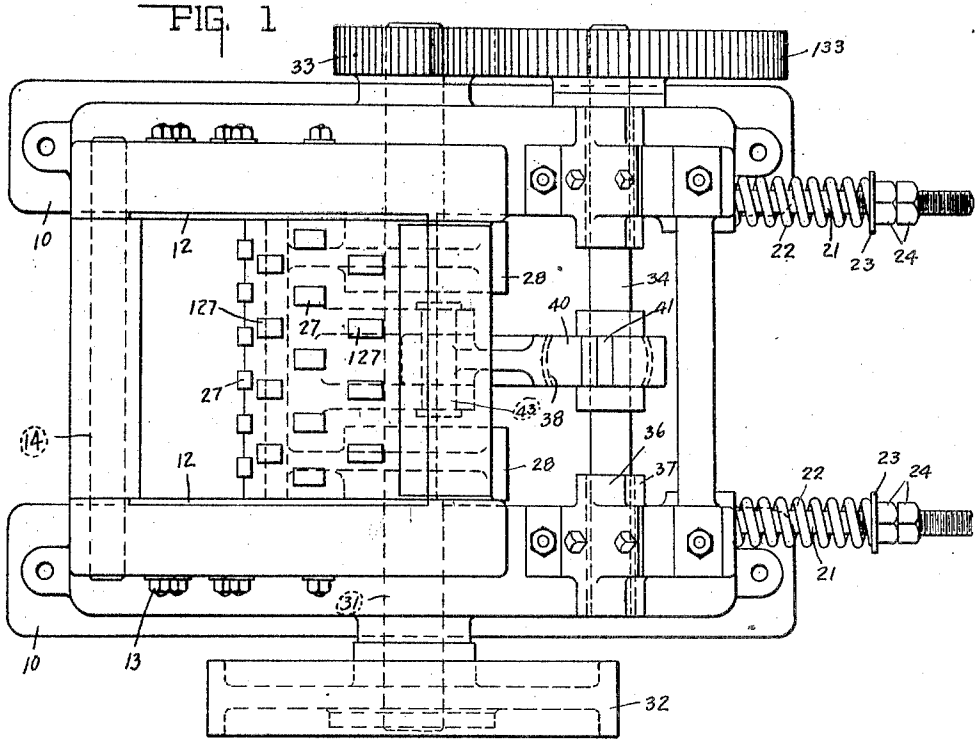
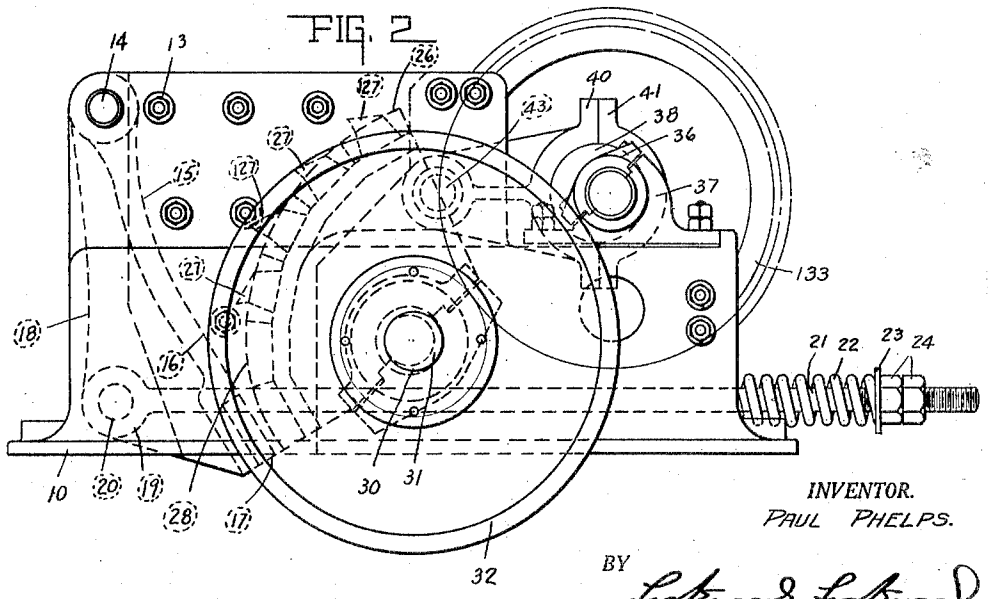


FIG. 2



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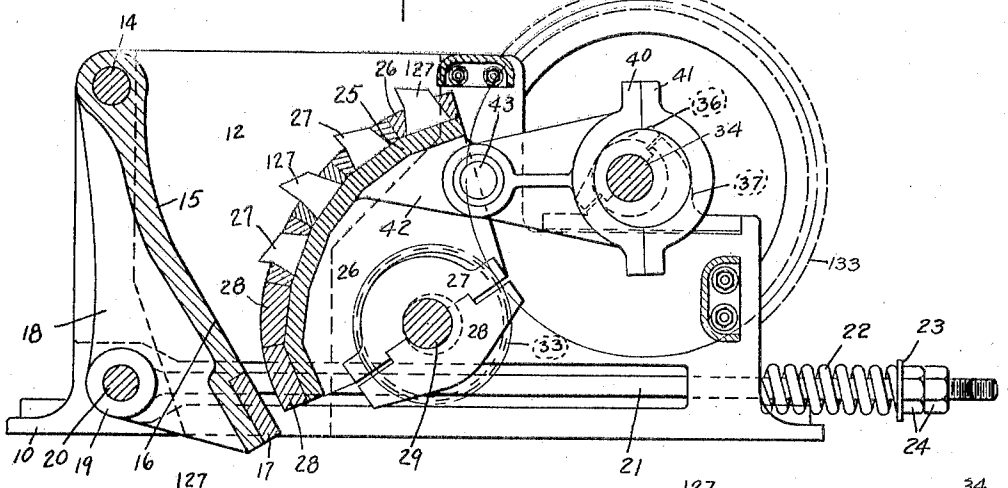
P. PHELPS

CRUSHER

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2 Sheets-Sheet 2

FIG. 3



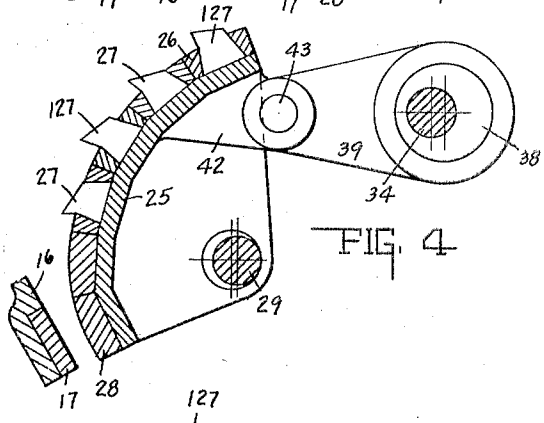


FIG. 4

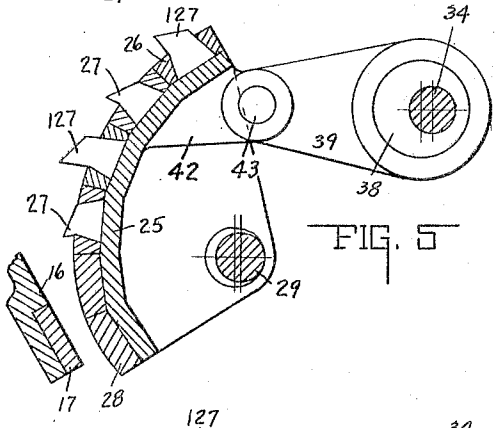


FIG. 5

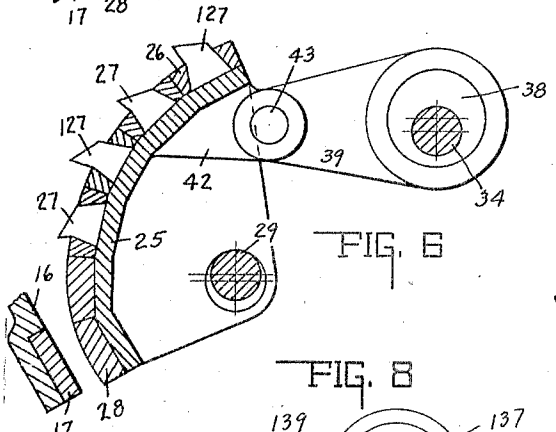


FIG. 6

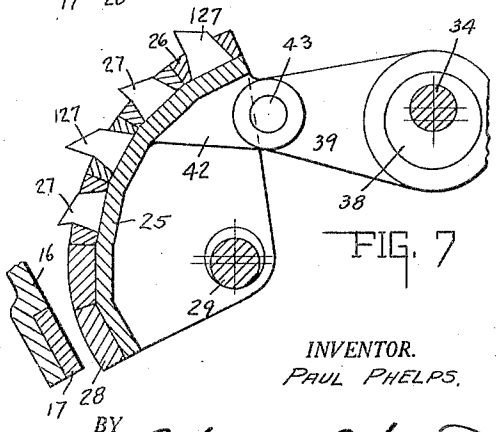
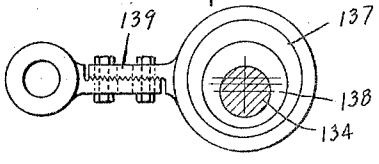


FIG. 7

FIG. 8



INVENTOR.
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BY

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Patented Nov. 4, 1924. 1,513,855

UNITED STATES PATENT OFFICE.

PAUL PHELPS, OF LOUISVILLE, KENTUCKY, ASSIGNOR TO VOGT BROTHERS MFG. CO., OF LOUISVILLE, KENTUCKY.

CRUSHER.

Application filed January 18, 1923. Serial No. 612,384.

To all whom it may concern:

Be it known that I, PAUL PHELPS, a citizen of the United States, and a resident of Louisville, county of Jefferson, and State of Kentucky, have invented a certain new and useful Crusher; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, in which like numerals refer to like parts.

This invention relates to improvements in crushing machinery, and in particular is directed to a single unit crusher for reducing large masses of large size material to a smaller size. The crusher is particularly adapted to work upon coal and reduce large sizes thereof to a smaller and suitable size for use in a furnace equipped with power or hand operable stoking machinery.

The chief object of the invention is to construct a crusher of the general character described which will reduce large sizes of coal and similar material to the desired sizing thereof, with increased capacity or discharge.

Another object of the invention is to construct a crusher in such a manner that by replacing external and detachable parts, the crushing action may be modified to the various materials upon which the crusher is to work, thus insuring stability and ruggedness in the crusher construction while permitting the same to have a wide range of adaptability.

One feature of the invention consists in pivotally mounting a curved crusher plate upon an eccentric mounting and oscillating it thereon to cooperate with a relatively stationary breaker plate so as to give said crusher plate a combined oscillatory and circular movement for crushing or reducing the material acted upon in an improved manner such as will secure relief of pressure and result in greater speed or capacity and uniformity in sizing.

Another feature of the invention is the association of an eccentrically operable reciprocatory means for oscillating or rocking the eccentrically and pivotally mounted curved crusher plate and operating both from a common source of power, and so connecting both operating means with the source of power and each other that the relative movement between the two may be varied within a relatively wide range to permit a differential movement between the lower or discharge end of the crusher plate with respect to the breaker plate for effecting the desired action of the crushing, sizing and relief portions of the crusher plate for accomplishing the results above mentioned.

Still a further feature of the invention consists in the arrangement of the curved crushing surface of the crusher plate with respect to the position of the eccentric mounting upon which it is pivotally supported, whereby the desired crunching, chewing and discharge action may be obtained.

The full nature of the invention will be understood from the accompanying drawings and the following description and claims:

In the drawings, Figure 1 is a top plan view of a crusher embodying the features of the invention. Fig. 2 is a side elevational view of the same, the cooperating crusher members being shown in dotted lines. Fig. 3 is a longitudinal sectional view of the crushing parts with the operating mechanism in one position. Figs. 4, 5, 6 and 7 are sectional views of the curved crusher plate, the driving mechanism and a portion of the breaker plate associated therewith, each of said views showing said driving mechanism in different positions. Fig. 8 is a modified form showing an adjustable type of link and eccentric driving mechanism for imparting the oscillatory movement to the crusher plate.

In the drawings there is illustrated a crusher which is of substantial and simple construction and the same includes a pair of side frames 10 and 11 complementarily formed and suitably connected together at the ends. A hopper is formed by two parallel plates 12 secured to the side frames by suitable means such as the bolts and nuts 13. The other two sides of the hopper are closed by the crushing plates.

Herein the relatively stationary breaker plate is pivotally supported at its upper end by a pin 14, and said plate has a curved portion 15 and a relatively flat or plain portion 16 which terminates in a detachable flat plate 17. The plate 17 is detachable to permit replacement when the same becomes worn. The hingedly supported relatively stationary plate is provided at each end with side walls or webbing 18

which terminate in bearings 19 that receive a pin 20. The pin 20 adjacent each end supports a rod 21 which extends longitudinally through the side framing of the machine and terminates beyond the same. Upon each rod 21 is positioned a coiled spring 22 which bears at one end upon the side frame and at the other end upon a washer 23 retained in adjusted position by a pair of lock nuts 24. All of the foregoing is either identical or substantially similar to that shown in the co-pending application, Serial No. 495,048. The crusher plate in this invention is constructed in substantially the same manner as that described and illustrated in the co-pending application hereinbefore mentioned, and said crusher plate comprises a curved base plate 25 having the side walls 26 which terminate in a bearing portion 27. The bearing cap 28 associated with each bearing 27 completes the bearing support for the curved base 25. Upon the curved base plate 25 is suitably secured a plurality of facing plates 26, and said facing plates 26, which are detachable, detachably support a plurality of differently sized crushing and cutting teeth 27 and 127. The lowermost portion of the curved base 25 is faced with a pair of detachable plate members 28. Said plate members 28 form an arcuate surface having a center corresponding with that of the shaft 29. The shaft 29 thus pivotally supports the arcuate as well as the curved crusher plate construction. Herein, see Figs. 2 and 3, the side frame is shown provided with a bearing 30 adapted to receive the non-eccentric shaft or supporting portions 31 of the shaft 29. The supporting portions 31 of the shaft 29 are larger in diameter than the shaft 29. In this manner the pivot or shaft 29 may be readily removed from the machine through the bearing openings in the side frames. As shown clearly in the several views the shaft 29 is eccentric to its bearing portions 31, and thus when the bearing portions 31 are rotated in fixed bearings, the eccentric shaft provides an eccentric pivot for the concentric and curved crusher plate. The shaft 31 is extended upon opposite ends and one end carries a pulley wheel 32 by which power is applied to the machine. The other end of the shaft 31 carries a gear 33 which is adapted to mesh with another gear 133 upon a shaft 34. The shaft 34 is rotatably supported in the bearing blocks 36 and 37 suitably secured to each other and to the framework of the machine.

Positioned midway between the bearing blocks 36 and 37 and upon the shaft 34 is a circular eccentric 38. The eccentric 38 is rigid with the shaft and rotates therewith. Adjacent the eccentric 38 is a link 39 which terminates in a bearing portion 40 associated with which is another bearing portion or cap 41 to surround the eccentric circular member 38. The base member 25 intermediate its ends is provided with a pair of ears 42 which pivotally support a pin 43, and said pin supports the other end of the link 39 between said ears. Thus rotational movement of the shaft 34 is transformed into reciprocatory movement of the pin 43 through the eccentric construction.

Since the shaft 31, which is an extension of the eccentric shaft 29, and shaft 34 are geared together, there is a speed relation between the reciprocatory movement imparted to the curved crusher plate and the eccentric movement, due to its eccentric pivot. By the use of a hunting tooth in one of the gears 33 or 133, a non-repeating speed relation can be obtained if desired. This construction will reduce wear on the gear teeth. It will be apparent that by changing the gear ratio, there will be a change in the relationship of the pivotal movement about the eccentric mounting and the movement of the eccentric center. By this arrangement, the machine is adapted to crush material of different kinds to substantially the same size, since the throw of the eccentric rod or link 39 is the same in all cases for all gear changes. Thus a material which requires repeated hammering, rolling, or crushing before rupture, will be crushed by the machine when the rate of reciprocation of the link 39 is relatively high. If the material is relatively soft or easily reduced, the rate of reciprocation of the link 39 may be very low compared with the movement of the eccentric pivotal mounting.

In Fig. 8 there is illustrated an extension and modified form of the particular means for oscillating the crusher plate upon its eccentric mountings. In this modification the link 139 is adjustable in length and in addition the amount of said adjustment may be varied by interposing an eccentric collar 137 between the eccentric 138 and the shaft 134. By shifting the position of the collar 137 relative to the shaft 134 various amounts of eccentricity can be obtained. This last variation can be obtained by other equivalent means, not shown, and the aforesaid variation varies the amount of oscillatory movement of the plate 25. The first mentioned adjustment merely determines the initial and final positions of the plate 25 upon the pivotal support. A combination of both adjustments will provide for considerable variation in the oscillatory movement of the plate 25 independent of any gear ratio change as heretofore explained.

The movement and speed ratio of the eccentric pivotal mounting with respect to the

oscillatory driving means, as well as the relative position of the eccentric mounting to the curved crushing surface of the crusher plate, provides for the relief of pressure at the throat or discharge end of the hopper, which gives the machine increased capacity without any substantial variation in the sizing of the material.

While the invention has been described in considerable detail in the foregoing, it is to be understood that such detailed description is to be considered as illustrative and not restrictive in character, reference being had to the appended claims.

The invention claimed is:

1. A crusher having a crusher plate, and a plurality of actuating means connected and associated with said plate for creating a plurality of relief of pressure movements at one portion thereof during the crushing operation at the other portion thereof.

2. In a crusher, a crusher plate having an arcuate crushing surface, means for oscillating said plate, and means positioned inwardly from the ends of the crushing surface for imparting an independent movement for securing relief of pressure.

3. In a crusher, the combination of an eccentric mounting, an oscillatory crusher plate having an arcuate crushing surface, said plate being mounted inwardly of the ends of said crushing surface on said mounting, means for oscillating said plate upon said mounting, and means for actuating said eccentric mounting for effecting a relief of pressure.

4. In a crusher, a hopper having one side movable relative to the other, and means for causing one side of the hopper at its more restricted portion to move toward and away from the opposite side at a rate more rapid than the other portion.

5. In a crusher, a breaker plate, a crusher plate to cooperate therewith, one end of said crusher plate being disposed nearer the breaker plate than the other end, means for moving said crusher plate relative to the breaker plate, and means for moving the said nearer end of said crusher plate toward and away from said breaker plate at a more rapid rate than the opposite end of said crusher plate is so moved.

6. In a crusher, the combination of an eccentric mounting, an oscillatory crusher plate mounted thereon, means for oscillating said plate upon said mounting, and means for actuating said eccentric mounting, the eccentric mounting being driven at such speed with respect to said oscillating means, that it effects a greater number of relief strokes by the lower portion of the crusher plate than pressure strokes by the upper portion thereof.

7. In a crusher, a crusher plate having an arcuate crushing surface, means for oscillating said plate, an eccentric mounting for said plate, and means for actuating said eccentric mounting simultaneously with said oscillatory means for imparting a combined and simultaneous downwardly and opening discharge movement to the lower portion of said crushing surface.

8. A hopper having a breaker plate and an oscillatory crusher plate positioned with respect thereto, providing a discharge throat, means for oscillating said crusher plate to impart a crushing action, and means for actuating one of said plates in timed relation to said oscillating means for effecting a plurality of opening and closing movements of said throat during a single cycle of movement of said crusher plate.

In witness whereof, I have hereunto affixed my signature.

PAUL PHELPS.