

Aug. 11, 1942.

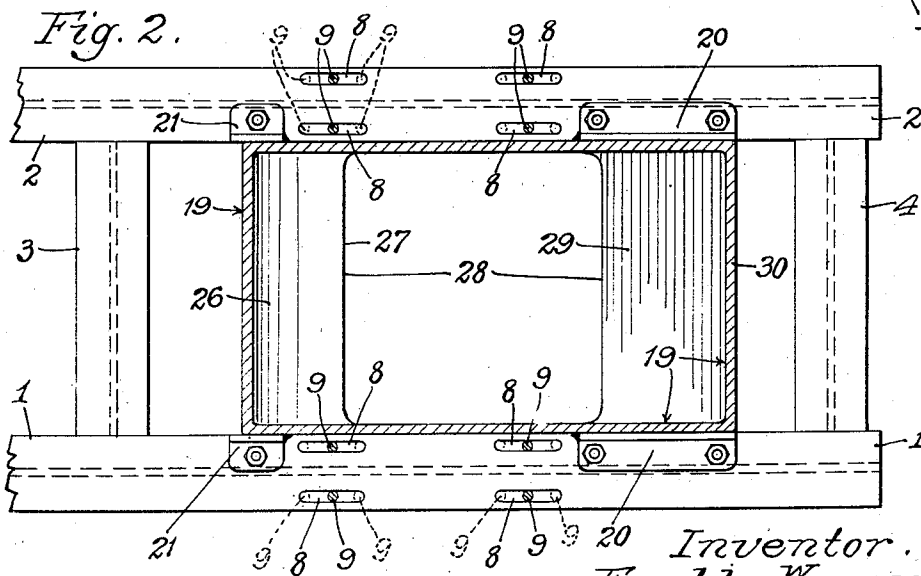
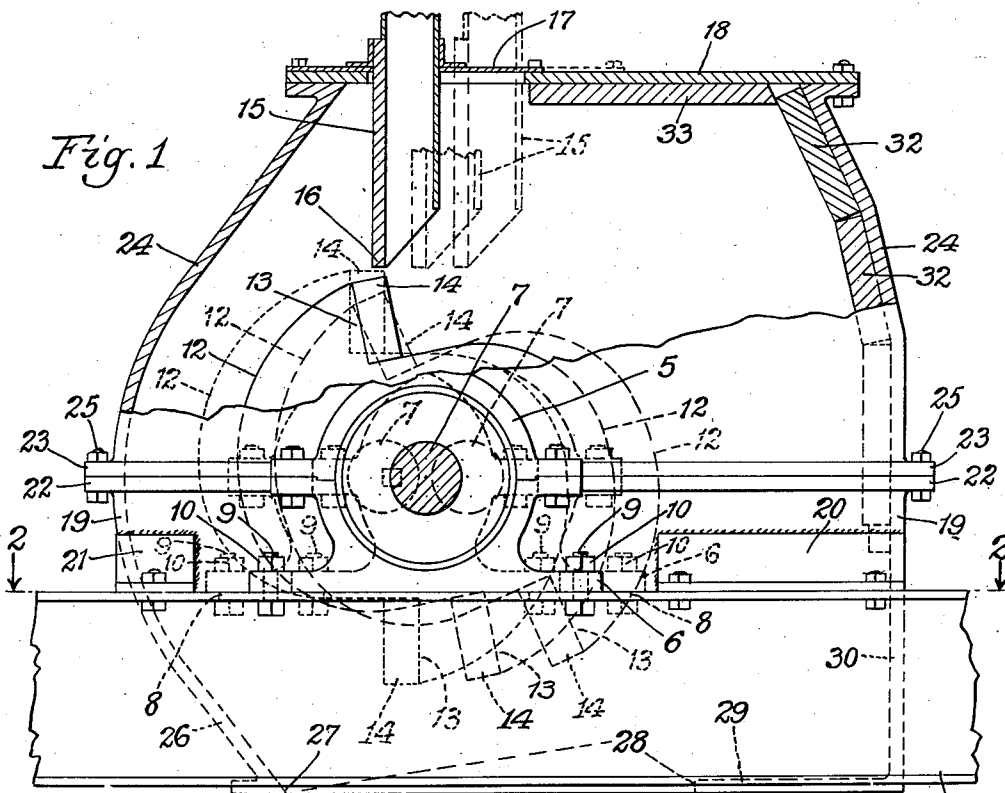
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2,292,852

IMPACT CRUSHERS

Filed July 17, 1940

2 Sheets-Sheet 1



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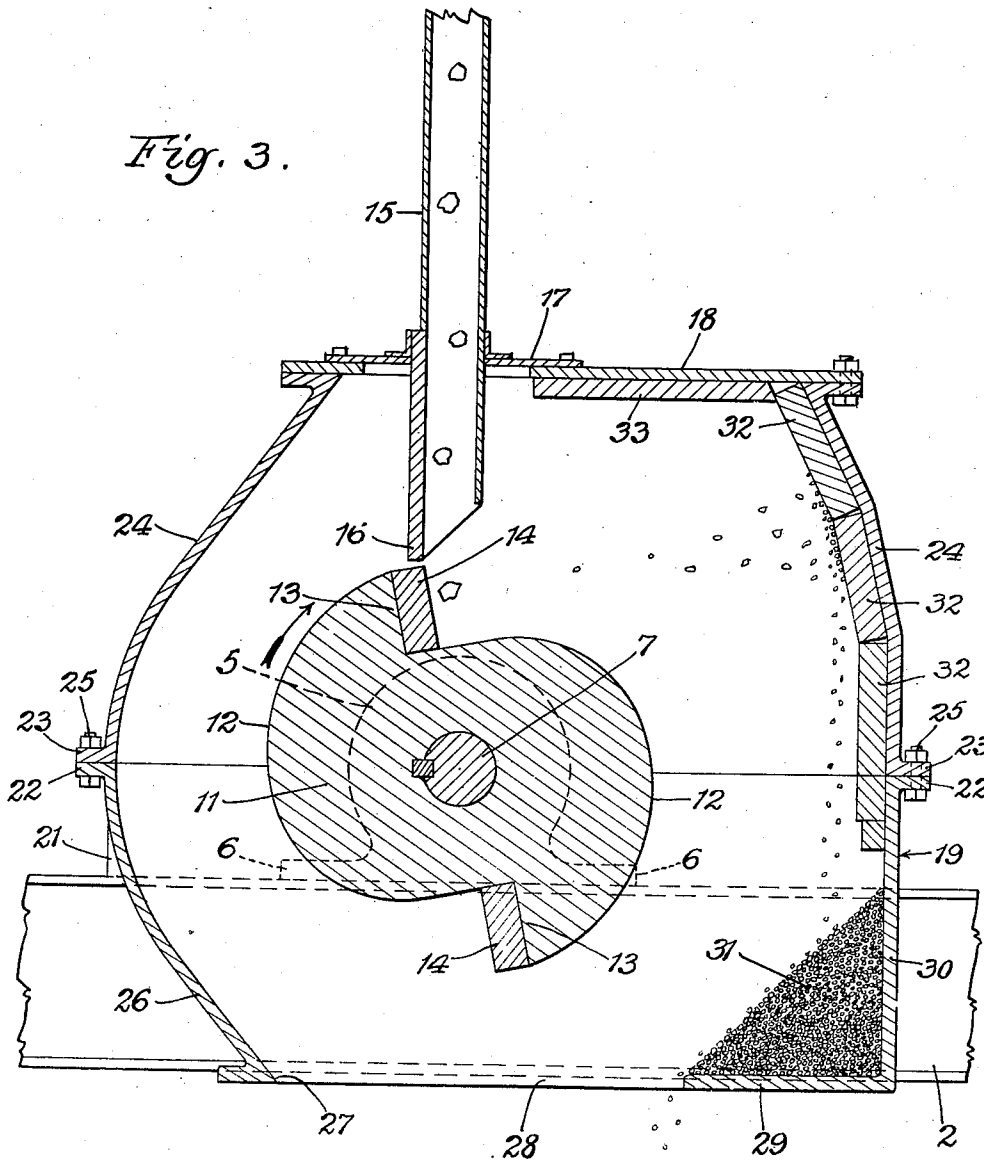
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Fig. 3.



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## UNITED STATES PATENT OFFICE

2,292,852

## IMPACT CRUSHER

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Application July 17, 1940, Serial No. 345,910

2 Claims. (Cl. 83—11)

My invention relates to an improvement in impact crushers and impact crushing methods.

One purpose is the provision of a novel impact crusher in which an impeller may be rotated at high speed with a minimum of abrasion of the impact faces of the impeller and a maximum effect on the material impacted.

Another purpose is the provision of an improved relationship between the impeller of an impact crusher and means for feeding material in an unconsolidated stream to the impeller.

Another purpose is the provision of an improved impeller in which the impact faces of the impeller are radial or substantially radial.

Another purpose is the provision of an impact crusher in which the impeller, or the material feeding means, or both are transversely adjustable.

Other purposes will appear from time to time in the course of the specification and claims.

I illustrate my invention more or less diagrammatically in the accompanying drawings wherein:

Fig. 1 is a side elevation, with parts in section, at right angles to the axis of rotation of the impeller;

Fig. 2 is a section on the line 2—2 of Fig. 1, on a reduced scale; and

Fig. 3 is a vertical section illustrating the impeller structure.

Like parts are indicated by like symbols throughout the specification and drawings.

Referring to the drawings, the impeller may be mounted for example upon a pair of parallel base frame members 1, 2, which may if desired be in the form of I-beams. They may be connected by any suitable transverse connections, angle irons, or the like, as indicated at 3, 4. Positioned upon the I-beams are anti-friction impeller bearing blocks 5, having bottom webs or flanges 6, conforming to the upper surfaces of the I-beams 1, 2. The bearing blocks, the details of which do not form part of the present invention, carry an impeller shaft 7.

It will be understood that any suitable pulley or other driving means may be employed whereby the shaft 7, and with it the impeller, is rotated at a high rate of speed. The bearing blocks and the impeller may be adjusted along the I-beams 1, 2. I illustrate, for example, elongated slots 8 in the upper I-beam webs, through which pass any suitable securing bolts 9, with nuts 10.

As shown in greater detail in Fig. 3, the impeller includes a hub portion 11, having general-

ly spirally outlined extensions 12, terminating in general radial faces 13, and adapted to receive impact blocks or plates 14. It will be observed that the forward faces of the impact plates are generally radial in relation to the axis of rotation of the impeller. The means for securing them in place do not form part of the present invention and are not illustrated in detail.

15 indicates a generally vertical feed spout, the lower end of which 16 terminates a short distance above the path of movement of the impeller. The feed spout may be of any suitable height, for example on the order of from six to ten feet in an impeller the diameter of which is, say, three feet. The dimensions, however, may be widely varied. The feed spout is mounted on any suitable supporting plate or plates 17, which rest upon and are adjustable in relation to the top housing portion 18. Preferably the spout is so adjusted that the path of material dropped by gravity therealong is somewhat to the left of the center of rotation of the impeller, referring to the position of the parts in which they are shown in full line in Fig. 1.

In order to house the structure so formed, I may provide any suitable housing means. I illustrate, for example, a bottom housing portion generally indicated at 19, supported on the frame members 1 and 2 by the angle irons 20 and 21, and having an upper outwardly extending flange 22, adapted to receive and be secured to the corresponding flange 23 of an upper housing portion generally indicated as 24. Any suitable bolts 25 may be employed to bolt them together. It will be observed that the bottom portion of the housing at the left of Fig. 1 is curved generally arcuately inwardly, as at 26, and terminates in a discharge lip 27, which bounds one end of the discharge aperture 28. The opposite end is bounded by a bottom plate or flange 29, in an angle member the vertical portion 30 of which forms part of the bottom housing portion 19.

It will be understood that some of the material discharged from the impeller may bank up on the shelf formed by the member 29, as at 31. The receiving portion of the housing is provided with liner plates 32, arranged in generally arcuate position and preferably generally perpendicular to the path of delivery of the impacted particles from the impeller. At the top, a side wear plate 33 may also be employed.

It will be realized that, whereas I have described and illustrated a practical and operative device, nevertheless many changes may be made in the size, shape, number and disposition of

parts without departing from the spirit of my invention. I therefore wish my description and drawings to be taken as in a broad sense illustrative or diagrammatic, rather than as limiting me to my precise showing.

For example, it will be understood that, whereas I have illustrated the front face of the impact plate 14 as being generally radial, it may be either somewhat forwardly or somewhat rearwardly inclined from the radial, and the adjustment of the axis of rotation of the impeller, and also the adjustment provided for the feed spout 15, make it possible to vary the position of the feed spout in relation to the inclination of the impact plates, or to vary the angle of the plates 14 in relation to the path of delivery of the material from the feed spout.

The use and operation of my invention are as follows:

The material to be crushed may be fed in any suitable manner to the top of the spout 15. The spout is of sufficient height so that the material has time to accelerate under gravity. The speed of movement of the material under gravity is related to the speed of rotation of the impact members, and the spacing of the impact members or plates 14 circumferentially about the impeller. The speed of movement of the impeller must be sufficient to strike the falling particles a fully shattering blow.

The particles are then projected centrifugally against the plates 32, where they receive a second impact, and then drop down and are fed by gravity through the outlet aperture 28, without returning to the path of movement of the impeller. Thus all particles are impacted a single time by the impeller, receive a second impact from the fixed plates 32, and thereafter, without returning to the impeller, flow through the discharge aperture.

It is also important that impacted particles fall fully into the path of movement of the plate 14 before they are impacted, as a glancing blow is not desired. The high spout 15 imparts a gravital speed or acceleration sufficient to carry substantially all of the falling particles fully into the path of the impact plates 14. Preferably this line of fall is vertical, so that there is a minimum of deceleration or wear producing friction along the chute 15. The particles then receive a full face impact, which prevents or reduces to a minimum glancing blows against the upper edge of the impact plate 14, and also reduces to a minimum any slippage or abrasion of the face of the plate.

In preventing abrasion the angular relation of the face of the plate to the path of movement of the falling particles is important. I find it desirable to offset the path of movement of the gravital fall of the material from the center of rotation of the impeller, and to provide substantially radial impeller faces. As the path is only slightly offset from the center of rotation, the result of a rapid rotation of the radial faced plates 14 as the impeller rotates is to impart a substantially full face crushing impact to the particles. The particles are thereby centrifugally delivered substantially horizontally, or with a slight upward inclination against the plates 32.

Broadly stated, my method is directed to advancing or moving a stream of material into an impact zone, and there causing a substantially instantaneous stoppage and change of direction of the particles by moving across the stream of the falling or moving material a succession of

impact plates. The angle of the impact plates in relation to the path of the falling stream, and the relation between the speed of movement of the falling particles and the speed of movement and spacing of the impact plates is such as to insure a substantially full face crushing impact of each particle delivered from the chute 17. In effect, successive increments or areas of particles are knocked off the bottom of the falling stream and are thrown against the plates 32 for a second crushing impact.

Since it is important to be able to control accurately the relationship between the axis of rotation of the impeller and the path of movement of the falling particles, I find it desirable to provide the above described adjusting means for adjusting either the impeller or the chute, or both.

I claim:

1. In an impact crusher, a housing, an impeller mounted in said housing for rotation about a generally horizontal axis, a plurality of impact elements normally fixed on said impeller and having generally radial faces, fixed breaker plates in said housing spaced substantially outwardly from the path of movement of said impact elements and extending from a level adjacent the axis of rotation of said impeller to a level substantially above it, a generally upright feed delivery spout mounted on an upper part of the housing and terminating closely adjacent the path of movement of said impact elements and the axis of rotation of said impeller, and displaced from said vertical alignment in a direction opposite to the direction of movement of the impact elements as they pass the lower end of the feed delivery spout, and means for varying the angle of the crushing faces of said impact elements in relation to the path of movement of particles guided downwardly by said feed spout, including means for bodily shifting the delivery spout in relation to the top of the housing, the top of the housing being apertured to permit the penetration therein of the lower end of the feed delivery spout, a closure and adjustment plate through which the lower end of the feed delivery spout passes, and means for adjustably securing said plate in relation to the top of the housing, said plate being adapted to close said aperture in the top of the housing.
2. In an impact crusher, a housing, an impeller mounted in said housing for rotation about a generally horizontal axis, a plurality of impact elements normally fixed on said impeller and having generally radial faces, fixed breaker plates in said housing spaced substantially outwardly from the path of movement of said impact elements and extending from a level adjacent the axis of rotation of said impeller to a level substantially above it, a generally upright feed delivery spout mounted on an upper part of the housing and terminating closely adjacent the path of movement of said impact elements and the axis of rotation of said impeller, and displaced from said vertical alignment in a direction opposite to the direction of movement of the impact elements as they pass the lower end of the feed delivery spout, and means for varying the angle of the crushing faces of said impact elements in relation to the path of movement of particles guided downwardly by said feed spout, including means for providing a bodily lateral relative displacement of the feed delivery spout and the axis of rotation of the impeller.

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