Nov. 1, 1949. L. H. KESSLER 2,486,421

DOUBLE IMPELLER IMPACT BREAKER

Filed July 1, 1943 3 Sheets-Sheet 1

Fig. 1.

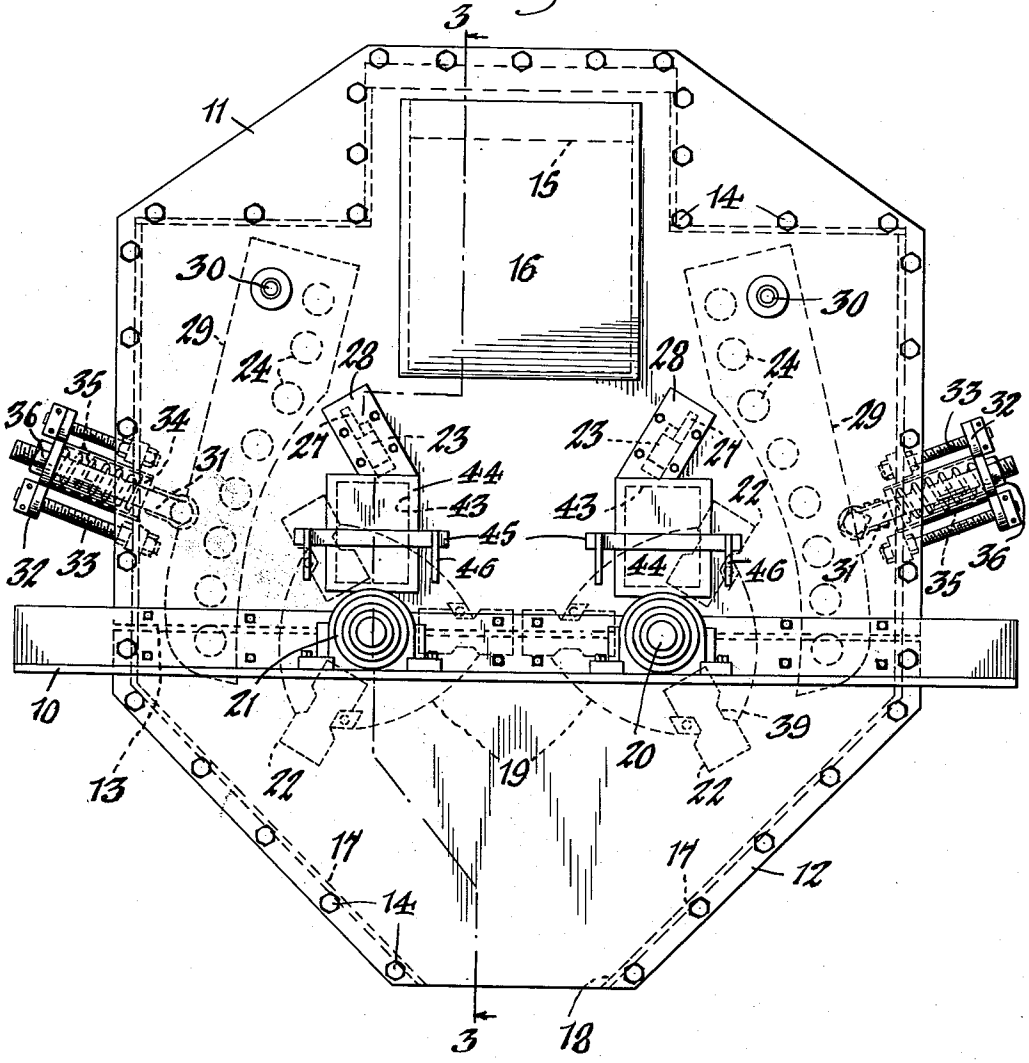
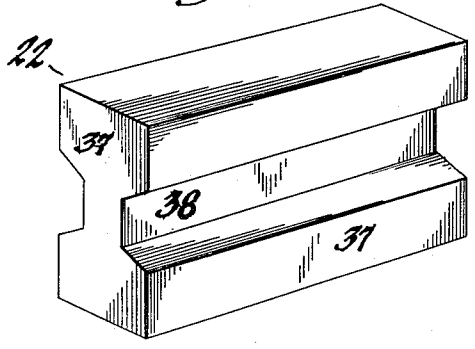


Fig. 6.



Inventor;
Lee H. Kessler,
by Coulter P. Geyer
Attorney.

Nov. 1, 1949. L. H. KESSLER 2,486,421

DOUBLE IMPELLER IMPACT BREAKER

Filed July 1, 1943

3 Sheets-Sheet 2

Fig. 2.

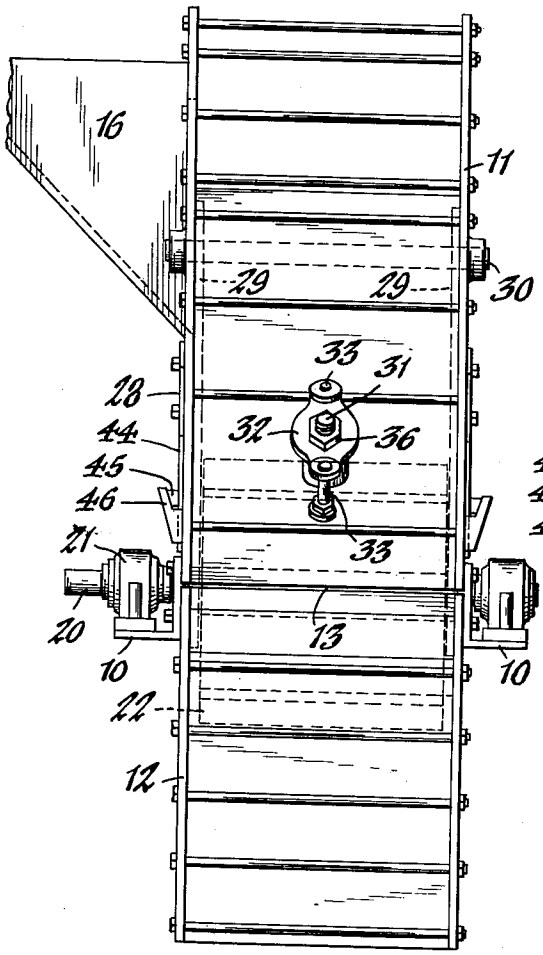


Fig. 3.

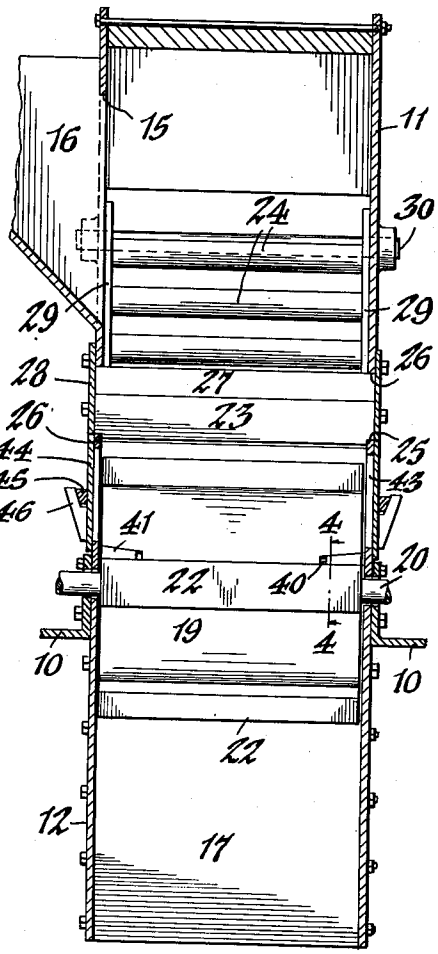


Fig. 5.

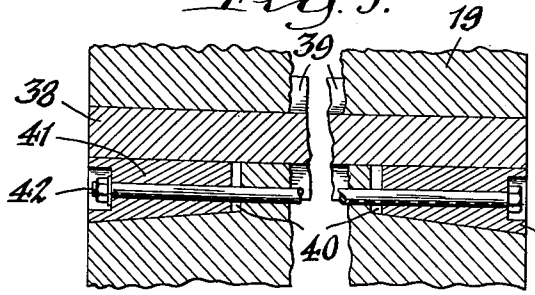
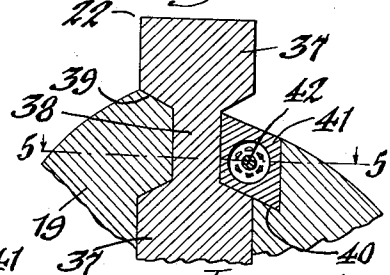


Fig. 4.



Inventor;
Lee H. Kessler,
by Walter P. Geyer
Attorney

Nov. 1, 1949. L. H. KESSLER 2,486,421

DOUBLE IMPELLER IMPACT BREAKER

Filed July 1, 1943

3 Sheets-Sheet 3

Fig. 8.

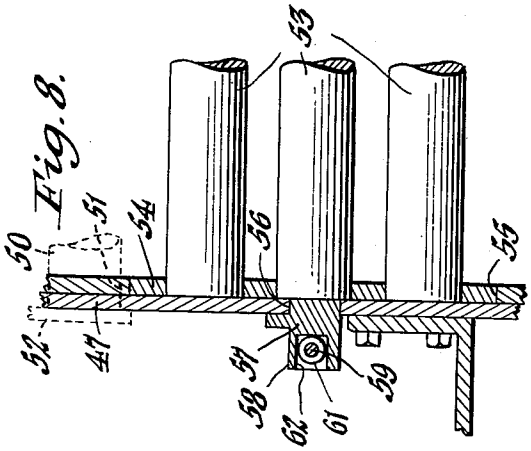


Fig. 9.

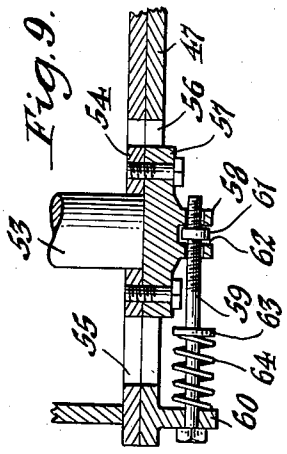
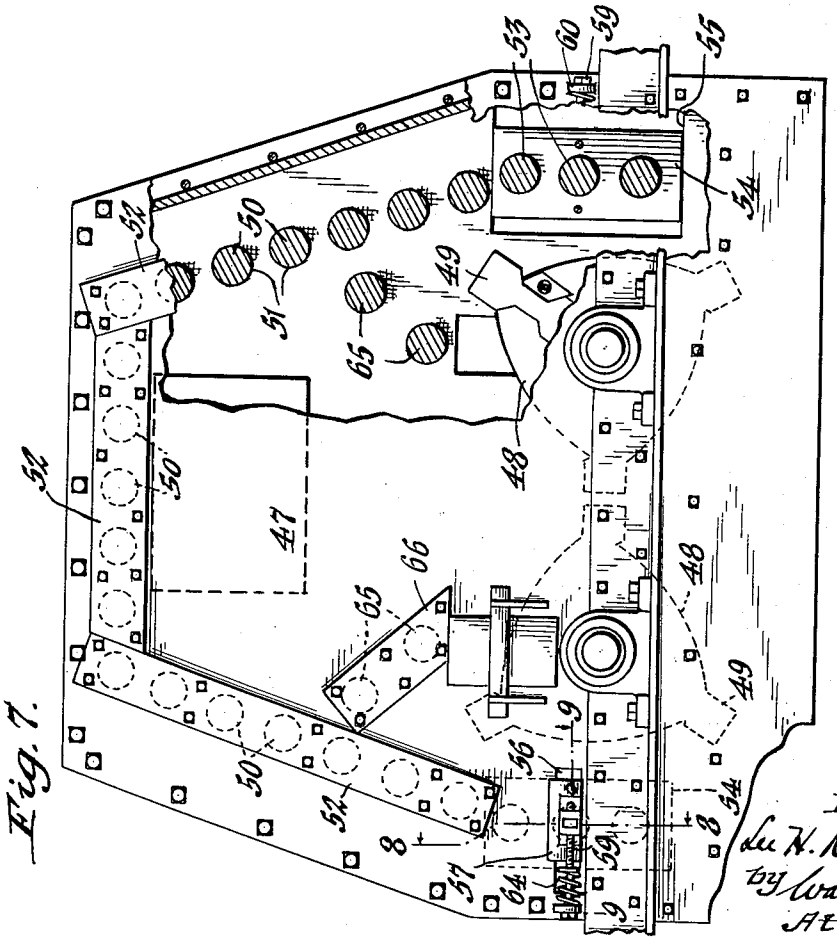


Fig. 7.



Inventor,
Lee H. Kessler,
by Walter P. Geyer
Attorney.

Patented Nov. 1, 1949

2,486,421

UNITED STATES PATENT OFFICE

2,486,421

DOUBLE IMPELLER IMPACT BREAKER

Lee H. Kessler, Springville, N. Y., assignor of one-fourth to Harriet F. Derrick, one-fourth to Norman H. Kessler, and one-fourth to Nellie H. Kessler, all of Springville, N. Y.

Application July 1, 1943, Serial No. 492,980

8 Claims. (Cl. 241—86)

1

This invention relates generally to crushing equipment but more particularly to certain new and useful improvements in a double impeller impact breaker apparatus for stone and like material.

It has for one of its objects to provide an apparatus of this character which is so designed to effect the crushing of the stone while in suspension by impact with itself as well as with rotatable and stationary impact members disposed in a predetermined fashion in the crusher-casing.

Another object of the invention is to provide a double impeller impact crusher having oppositely rotating stone-impacting rotors which are so disposed in the breaker chamber of the crusher as to provide a head space thereover and which serve to intercept the introduced stone and transmit multiple breaking or crushing blows thereto while in suspension in such head space and direct it upwardly and outwardly toward the top and opposite ends of the chamber, such ends of the chamber and those portions immediately over the rotors having impact bars against which the rotor-trajected stone is impinged to further break it down and between certain of which bars the reduced and properly sized stone passes for discharge from the machine.

A further object is to provide an impact breaker whose impact elements are so designed and arranged as to be readily adjustable and replaceable as conditions warrant, and which as a whole is manifestly simple and rugged in construction, which has a high capacity for reducing large stones in a minimum period of time to the size desired, and which requires a minimum of power to operate it.

Other features of the invention reside in the construction and arrangement of parts hereinafter described and particularly pointed out in the appended claims.

In the accompanying drawings:

Figure 1 is a side elevation of my improved breaker. Figure 2 is an end view of the same. Figure 3 is a transverse vertical section thereof taken on line 3—3, Figure 1. Figure 4 is a fragmentary vertical section taken on line 4—4, Figure 3, showing the rotor impact blade mounting. Figure 5 is a fragmentary horizontal section taken substantially in the plane of line 5—5, Figure 4. Figure 6 is a perspective view of one of the rotor impact blades. Figure 7 is a sectional side elevation of a modification of my invention. Figure 8 is an enlarged fragmentary vertical section taken on line 8—8, Figure 7. Figure 9 is an enlarged

2

fragmentary horizontal section taken on line 9—9, Figure 7.

Similar characters of reference indicate corresponding parts throughout the several views.

Referring now to the drawings, 10 indicates a pair of spaced, horizontal angle bars or rails between which the breaker-housing is mounted, the latter including an upper section 11 into which the stone to be crushed is introduced and a lower section 12 from which the crushed stone is discharged. Above and below the joint line 13, the respective sections are bolted, as indicated at 14, or otherwise detachably secured to the supporting bars 10. At its upper end the housing-section 11 has an inlet or feed opening 15 with which a feed hopper 16 communicates for delivering the stone to be crushed by gravity into the housing. The lower housing-section 12 is inclined at its opposite ends to provide chutes 17 down which the crushed stone is guided to a central discharge opening 18 provided at the bottom of the housing. With the exception of the inlet and discharge openings, this housing or casing is completely walled in to provide a breaking or crushing chamber.

Arranged within the crushing chamber and substantially at the joint plane of its upper and lower sections 11, 12 and at opposite sides of the vertical center thereof are movable impact members which are preferably in the form of rotors 19 fixed on corresponding drive shafts 20 extending transversely through the housing from one side thereof to the other and journaled at their ends in bearings 21 mounted on the supporting bars 10. These rotors are adapted to be driven at a high rate of speed in opposite directions with their opposing faces turning upwardly and may be driven from a common source of power by a chain or belt drive or by individual electric motors. Each rotor is of a solid construction to withstand the pressure imposed upon it and projecting from its periphery are a plurality of radial impact blades or members 22 which are adapted to intercept any stone contained in or as it is introduced into the housing, the blades successively transmitting crushing blows to the introduced stone and at the same time tending to maintain the stone in suspension in the crushing chamber and directing it by centrifugal force into impacting and crushing engagement with stationary impact bars 23, 24 disposed transversely of the housing and in predetermined fashion about the top and adjoining outside portion of the respective rotors in substantially the manner shown in Figure 1. The rotors 19 are so spaced horizontally that when

their companion blades 22 reach an opposing, alined position they just clear each other and thereby jointly form, because of the speed of the rotors, a closure to intercept and prevent any small-sized stone dropping down between the rotors to the lower section 12 of the housing before passing through the crushing zone in the upper housing-section 11. The rotors are sufficiently spaced from the side walls of the crushing chamber to permit certain of the impact bars 24 to extend transversely therebetween and allow the crushed stone to drop onto the inclined walls 17 of the housing and thence be discharged through the opening 18.

The impact bars 23 are disposed in the lower portion of the chamber at opposite sides of the vertical plane between the rotors and substantially axially over the companion rotors outwardly of the tip ends of the rotor-blades 22 and function, in addition to their breaking the stone when it is directed thereagainst by the rotor-blades, to keep the larger stones in suspension while they are battered against each other and broken by impact. These bars are preferably arranged so that they are inclined slightly, to the vertical, being notched at their opposite lower edges, as indicated at 25, to rest upon the opposing bottom edges of companion openings 26 formed in the front and rear walls of the housing-section 11. Cleats 27 extend through these wall-openings and engage the top faces of the impact bars to retain them in place. The housing-openings 26 are normally closed by cover-plates 28, bolted or otherwise secured in place, which serve to retain the impact bars against endwise displacement and which are readily removable endwise through such openings when it is desired to replace the impact bars 23.

After being battered about in the mid-portion of the housing and partially reduced, the stones are trajected by one another and by the force of the rotor blades 22 upwardly and outwardly toward the stationary impact bars 24, where they are further reduced or broken up from the resulting impact. These impact bars, which may be round in cross-section as shown, are disposed in a substantially upright row at opposite sides of the housing in the space between the adjoining walls thereof and the companion rotors 19 and extend upwardly to a point adjacent the top of the housing. Each row of impact bars 24 is mounted as a unit in a pendant, adjustable frame consisting of side arms 29 pivoted at their upper ends on a pivot rod 30 secured at its ends in the front and rear walls of the housing and with the impact bars supported at their ends in said arms and in predetermined spaced relation to function as a screen to size the stone before it is discharged from the machine. This frame is supported in a set position of adjustment by a connecting rod 31 extending through an opening provided in the adjoining end wall of the housing and pivotally joined at its inner end to said frame and connected at its outer end to a tie plate 32 adjustably connected to the frame by bolts 33, whereby the impact bar frame may be readily adjusted and set in the position desired in the space between the rotor and adjoining end wall of the housing. Applied to the connecting rod and bearing at one end against the tie plate 32 and at its opposite end against a collar 34 on such rod is a strong spring 35 which yieldingly permits the impact bar frame to be displaced outwardly, as when some hard, foreign, non-crushable object becomes wedged between such frame and the

rotor-blades, and enables the release of such objects from the machine without damage thereto. At its outer or free end the connecting rod 31 has a nut 36 thereon which bears against the tie plate 32 and by which the spring 35 may be adjusted to the tension desired.

The rotor blades 22 are so mounted in the rotor that they can be readily replaced or renewed when necessary with a minimum of effort and without disturbing the rest of the machine. To this end, each blade is shaped as shown in Figure 4 of the drawings to provide two impact heads 37 and a connecting web 38 and is removably seated in a groove or recess 39 formed in the periphery of the rotor and extending parallel to its axis. This groove is undercut and of a cross section simulating that of one of the rotor blade heads and its connecting web whereby the blade is effectually held against radial displacement with one of its heads projecting from the rotor for impacting engagement with the stone. At one side of its web-receiving portion and at opposite ends thereof, the blade-receiving groove 39 has laterally-extending recesses or channels 40 which open at the opposite ends of the rotor and in which clamping jaws or cleats 41 are seated and detachably held in place by a companion bolt 42 to effectually wedge and retain the rotor-blade against endwise displacement in the rotor. The upper section 11 of the crusher housing is provided in its opposite side walls and in a plane intersecting the respective rotor-axes with sets of alining openings 43 of a size to permit the insertion and removal of one or another of the rotor-blades to and from the rotors when it is necessary to replace or reverse their positions. Normally these openings are closed by cover-plates 44 detachably secured in place by latching bars 45 wedged at their ends in suitable brackets 46 applied to the housing-section 11 at opposite sides of such openings, as shown in Figure 1.

In the modified form of the invention shown in Figures 7–9, inclusive, 47 indicates the crusher-housing lined with hardened steel plates and having openings therein for the introduction of the stone to be crushed and for the discharge of the crushed stone, 48 the rotors with the radial impact blades 49 projecting radially therefrom as in the first-described construction, and 50 a plurality of stationary impact bars extending transversely in spaced relation along the top and opposite end walls of the housing in the manner shown in Figure 7 to form the crushing chamber. These bars are adapted to be readily replaced when desired and for this purpose extend through slots 51 in the side walls of the housing and are supported in companion plates 52 bolted or otherwise detachably secured to the outer side of the housing and serving as cover plates for such slots. These impact bars are round in cross section and are so supported in the plates as to be free to turn on their axis as they become worn from the impact of the stone there against. As the bars become worn, say at one side, their center of gravity changes and they are caused to turn in the plate-supports and thus present a different surface to the trajected stone as it is thrown by the rotor-blades. The material to be crushed is introduced into the upper portion of the housing 47 where it is intercepted and directed by the rotor impact blades 49 against the impact bars 50 and while in suspension is broken up and crushed and thence passes through the spaces between such bars and downwardly between the same and the opposing end walls of

the housing to the discharge provided in the lower end thereof.

As shown in Figure 7, the end or substantially upright rows of impact bars 50 terminate approximately at the top sides of the rotors 48 and disposed in the clearance space between the latter and the adjoining housing-walls and forming a continuation of such bars are laterally-adjustable rows or groups of similarly spaced impact bars 53 against which the stone is trajected while in suspension and between which the crushed material passes for discharge. Each group of bars 53 at either end of the housing is mounted as a unit in an adjustably suspended frame consisting of side plates 54 which are guided in suitable ways 55 applied to the opposite side walls of the housing and which are adapted for movement toward and from the companion rotor to locate such bars where desired. Attached to each frame-plate and extending through a corresponding slot 56 in the side wall of the housing is a block 57 having an outwardly facing boss 58 thereon through which one end of an adjusting screw 59 extends. The other or outer end of this screw is supported in a lug 60 projecting from the adjoining side wall of the housing and a nut 61 engages the screw and is seated against axial movement in a recess 62 formed in the block-boss. By turning the adjusting screws in one direction or the other the companion bar-carrying plates 54 are accordingly moved toward or from the rotors 48. Applied to each screw 59 and interposed between a flange 63 thereon and the lug 60 is a coil spring 64 which yieldingly permits the impact bar plates to be displaced outwardly, as when some hard, non-crushable object is encountered and enables the release of such objects from the machine without damage thereto. These adjustable impact bars 53 are free to rotate in their supporting plates and are self-responsive, as they become worn, to present the best impact surface to the action of the suspended stone.

A third set of impact bars 65 may be provided which are disposed above the axis of each rotor and extend at a divergent angle relative thereto in the manner shown in Figure 7, and against which the stones are impacted while in suspension. These bars are supported at their ends in plates 66 bolted to the side walls of the housing and are likewise replaceable when necessary.

The provision of the round impact bars not only afford their self-adjustability for wear purposes but they always assure a direct impact of the stone thereagainst to effectually cause its breakage or reduction and eliminate any glancing off or slippage action of the stone relative thereto.

I claim as my invention:

1. A stone breaker of the character described, comprising a casing defining a breaker chamber having upper and lower openings for the introduction of the stone to be reduced and for the discharge of the reduced stone, multiple rotors having impact blades thereon disposed in side by side relation in the lower portion of the chamber and with the rotor-peripheries closely spaced with but operating clearance between them to provide a free space thereover for the suspension of the stone and for closing the direct fall of stone to the discharge opening and intercepting and transmitting crushing blows to the introduced stone, the rotors being spaced from the end walls of the casing, impact bars located immediately over the rotors at opposite sides of the central lower portion of the breaking chamber in operating clearance relation to the rotor-blades for deflecting larger pieces of the stone upwardly into such chamber, and a series of spaced impact bars extending vertically in spaced relation along the end walls of the casing and substantially to the top thereof as well as vertically opposite the rotor overlying bars and the rotors.

2. A stone breaker of the character described, comprising a casing defining a breaking chamber having upper and lower openings for the introduction of the stone to be reduced and for the discharge of the reduced stone, multiple rotors having impact blades thereon disposed in side by side relation in the lower portion of the chamber and with the rotor peripheries closely spaced with but operating clearance between the ends of the impact blades to provide a free space thereover for the suspension of the introduced stone and for closing the direct path of fall of stone to the discharge opening and intercepting and transmitting crushing blows to the introduced stone, the rotors being spaced from the end walls of the casing to provide passages for the flow of the reduced stone to the discharge opening, impact bars disposed in the lower portion of the free space at opposite sides of the vertical plane between the rotors and vertically spaced from the rotors to clear the circular path of rotation of the rotor-blades, an upwardly extending series of spaced impact bars disposed in a plane spaced from said first-named impact bars and the companion end walls of the casing and extending generally vertically substantially from a point opposite the rotor overlying impact bars to the top of the casing, and means adjustably mounted on said casing adjacent the end walls thereof for movement horizontally toward and from the companion rotors and having spaced impact bars thereon disposed in the spaces between the rotors and the end walls of the casing and constituting a continuation of said series of impact bars.

3. In a stone breaker, a casing forming an enclosed breaking chamber having an upper opening in one of the walls thereof for the introduction of the stone to be reduced and open at its lower end for the discharge of the reduced stone, a pair of rotors disposed in a horizontal plane across the lower discharge end of said chamber in spaced relation to the companion end walls of the casing and adapted to rotate in opposite directions so that the path of motion is upward between the rotor-axes, means for rotating the rotors in such directions, said rotors having impact blades thereon for intercepting and transmitting crushing blows to the introduced stone to direct it upwardly and outwardly from a vertical plane passing between said rotor and with the rotor-peripheries closely spaced with but operating clearance between the ends of the blades to substantially close the direct fall of stone therebetween to the lower discharge end of the chamber, an upwardly extending series of spaced, substantially round impact bars disposed along the end walls of the casing in spaced relation thereto with some of them disposed in the spaces between the rotors and such end walls, and like-shaped impact bars disposed in that portion of the chamber immediately over the rotors and in spaced relation to the adjoining bars of said series of impact bars and the circular plane of rotation of the rotor-blades to subtend the spaces over the downward turning sides of the rotors between the vertical axes thereof and the bars along said casing end walls.

4. A breaker for reducing stone or the like to fragments of predetermined size comprising a casing forming an enclosed chamber having a feed opening in its upper portion and a discharge opening at its bottom, a pair of rotors symmetrically disposed on opposite sides of the chamber with their axes in a horizontal plane substantially below the feed opening and rotatable in opposite directions with their adjacent parts moving upward, means for rotating the rotors in such directions, impact blades projecting from the rotors with their circular paths in close proximity, a series of closely spaced impact bars outside each rotor arranged parallel to the axes of the rotors and extending substantially above the plane of the rotors, and a plurality of closely spaced impact bars over part of each rotor in operating clearance relation to the rotor-blades, each plurality of impact bars disposed in an inclined plane extending from the vicinity of the top of the circular path of the respective impact blades upwards to the vicinity of the nearer series of impact bars.

5. In a stone breaker, an enclosed casing having a feed opening in its upper portion and a discharge opening in its bottom, vertically-spaced impact bars substantially paralleling the end walls of the casing in spaced relation thereto for the passage of the reduced stone a pair of bladed rotors disposed in the casing a substantial distance below the casing top wall to define therewith and the impact bars a breaking chamber into which the stone is introduced and suspended therein by impact of the rotor blades during its reduction, the rotor-peripheries being closely spaced to each other and to the lowermost adjoining impact bars with but operating clearance for the ends of the blades, and means for rotating said rotors in opposite directions with their adjoining faces moving upwardly.

6. In a stone breaker, an enclosed casing having a feed opening in its upper portion and a discharge opening in its bottom, relatively-spaced impact bars substantially paralleling the end walls of the casing in spaced relation thereto for the passage of the reduced stone and defining with the top wall of the casing a breaker chamber for the suspension and circulation of the introduced stone, a pair of rotors having impact blades thereon disposed in side by side relation in the lower portion of said casing with but operating clearance for the ends of the blades to define the lower wall of said chamber, close the direct fall of stone to the discharge opening and intercept and transmit crushing blows to the introduced stone upwardly into said chamber, means for rotating said rotors in opposite directions with their adjoining faces moving upwardly, and other impact bars disposed in the lower portion of said chamber adjacent the opposite ends thereof and immediately over the downwardly turning faces of the rotors and clear of the circular plane of rotation of their impact blades to intercept and deflect larger stones back in the chamber.

7. A stone breaker of the character described, comprising an enclosed casing having an intake opening adjacent its upper end for the introduction of the stone to be broken and a discharge opening at its lower end for the broken stone, oppositely rotating bladed rotors disposed on horizontal axes in the lower portion of said casing across the discharge opening with but operating clearance between them and the end walls of the casing to substantially close the direct path of fall of stone and providing a substantial head space thereover constituting a breaking zone for the circulation and suspension of the stone during breakage, means for rotating said rotors with their adjacent parts turning upwardly for directing the stone upwardly and outwardly in a trajectory-like path in the breaking zone toward the top and adjacent ends of the casing, and spaced impact bars of substantially round cross section disposed in a horizontal row along the top and in a substantially vertical row along and paralleling the end walls of the casing in vertically-spaced relation and against which the suspended and rotor-trajected stone is adapted to impinge, the impact bars along the end walls of said casing being spaced therefrom to provide a clearance space for the gravity flow of the broken and sized stone to the discharge opening.

8. A stone breaker, comprising a casing forming an enclosed breaking chamber having upper and lower openings therein for the introduction of the stone to be broken and for the discharge of the broken stone, a pair of rotors disposed side by side with but operating clearance therebetween and in a horizontal plane between said openings and in spaced relation to the end walls of the casing to provide for the passage of the broken stone and spaced substantially below the top wall thereof to provide a free breaking and suspension space thereover for the introduced stone, impact members mounted on said rotors for intercepting and transmitting crushing blows to the introduced stone, impact bar-carrying members suspended in said chamber and having vertically spaced impact bars mounted thereon paralleling the end walls of the casing in spaced relation thereto and extending between the rotors and the casing end walls and against which the rotor-trajected stone is adapted to impinge and between which bars the reduced stone passes to the discharge opening, means for adjusting said bar-carrying members transversely toward and from the companion rotors, and impact bars disposed in the lower portion of the free breaking space of said chamber at opposite sides of the vertical plane extending between the opposing rotors and substantially axially over the companion rotors in vertically-spaced relation thereto to clear the circular plane of rotation of their impact members and to intercept the larger stones and keep them in suspension in the breaking space while they are battered against one another by the rotor impact members.

LEE H. KESSLER.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
197,484	Mead	Nov. 27, 1877
211,576	Lawton et al.	Jan. 21, 1879
399,518	Good	Mar. 12, 1889
430,646	Hickey	June 24, 1890
455,531	Good et al.	July 7, 1891
675,751	Moustier	June 4, 1901
759,856	Borton	May 17, 1904
836,162	Williams	Nov. 20, 1906
1,035,313	Buchanan	Aug. 13, 1912
1,331,969	Tomlinson	Feb. 24, 1920
1,439,581	Sedberry	Dec. 19, 1922
1,491,418	Plaisted	Apr. 22, 1924

(Other references on following page)

UNITED STATES PATENTS

Number	Country	Date
1,621,256	Jones	Mar. 15, 1927
1,909,623	Mc Dowell	May 16, 1933
2,086,383	Gruender	July 6, 1937
2,122,965	Swenson	July 5, 1938
2,152,791	Dahlstrom	Apr. 4, 1939
2,170,407	Hartshorn	Aug. 22, 1939
2,287,799	Hartshorn	June 30, 1942

Number	Name	Date
2,324,382	Goodwin	July 13, 1943
2,325,605	Gruender	Aug. 3, 1943
2,373,691	Kessler	Apr. 17, 1945

FOREIGN PATENTS

Number	Country	Date
2,930	Great Britain	1885
456,445	Great Britain	Nov. 9, 1936