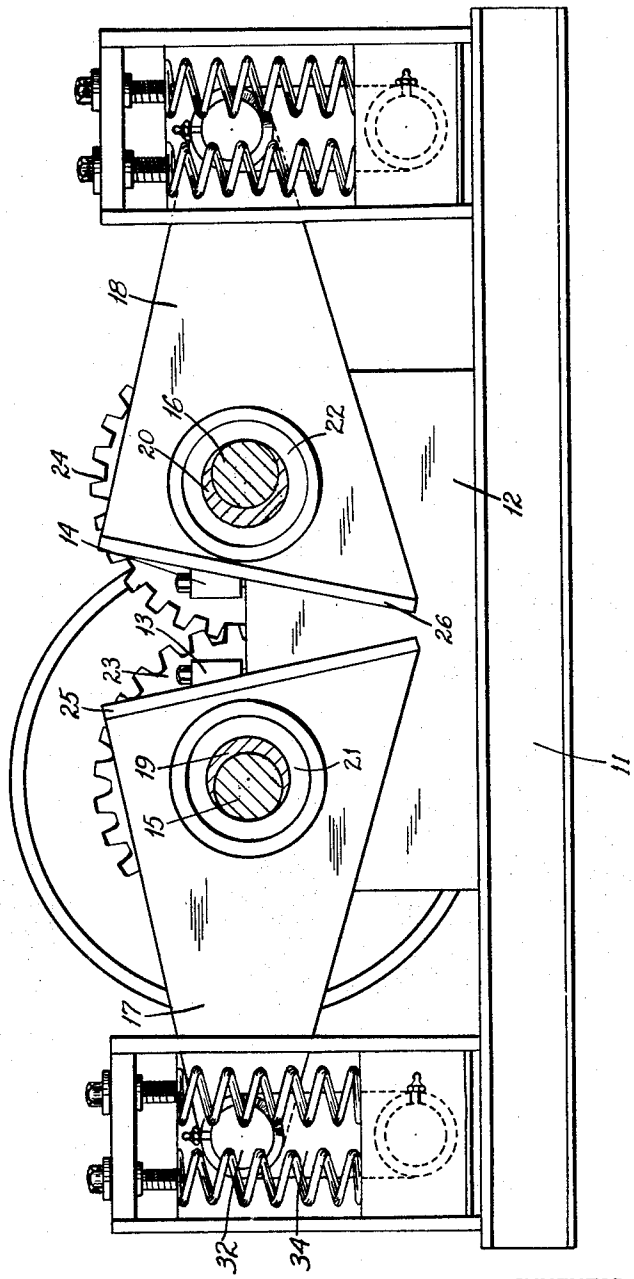
Jan. 19, 1965 H. TURNER, JR 3,166,258

ROCK CRUSHING MACHINES

Original Filed Aug. 17, 1960 3 Sheets-Sheet 1

FIG. 1



INVENTOR.
HERBERT TURNER JR.
BY Corey & Corey
attys.

Jan. 19, 1965 H. TURNER, JR 3,166,258

ROCK CRUSHING MACHINES

Original Filed Aug. 17, 1960 3 Sheets-Sheet 2

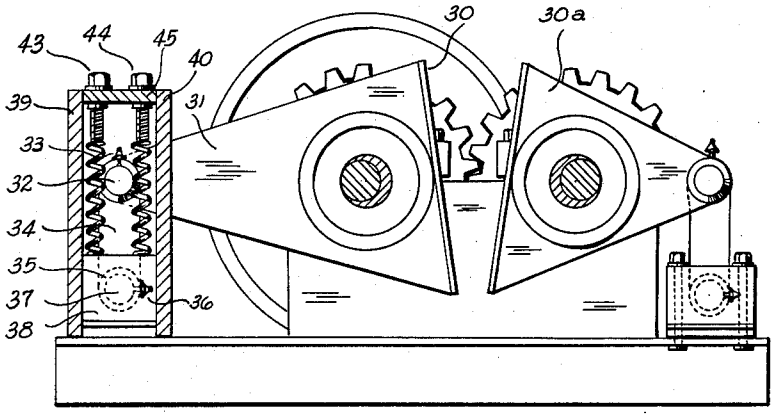


FIG. 2

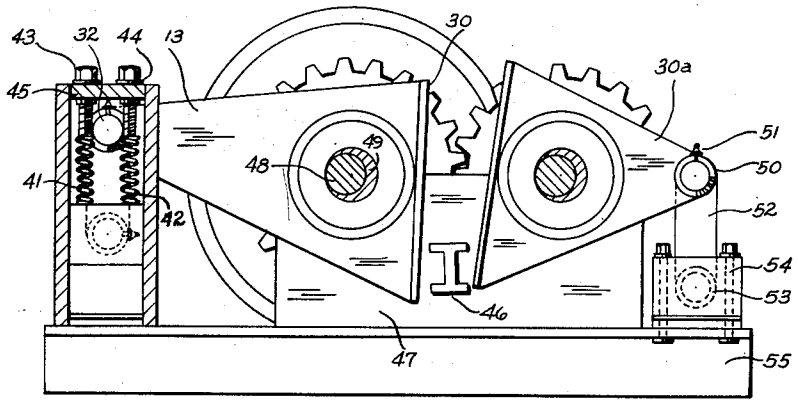


FIG. 3

INVENTOR.
HERBERT TURNER JR.
BY Corey & Corey
attys.

Jan. 19, 1965 H. TURNER, JR 3,166,258

ROCK CRUSHING MACHINES

Original Filed Aug. 17, 1960 3 Sheets-Sheet 3

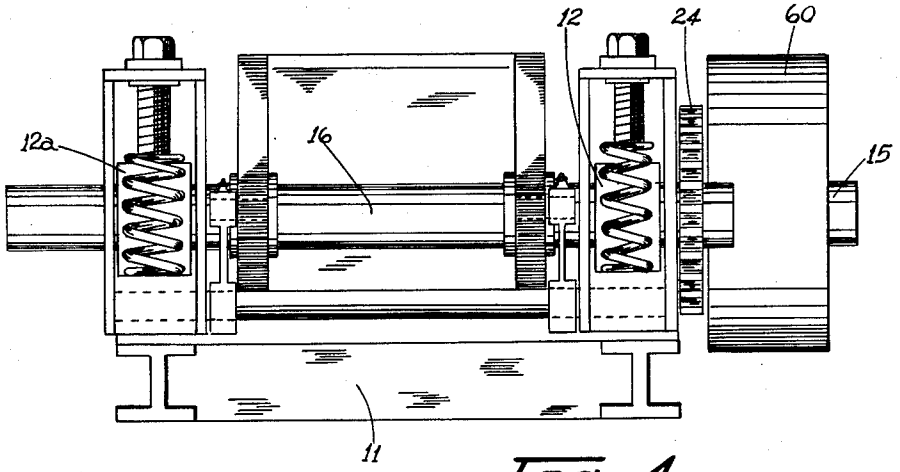


FIG. 4

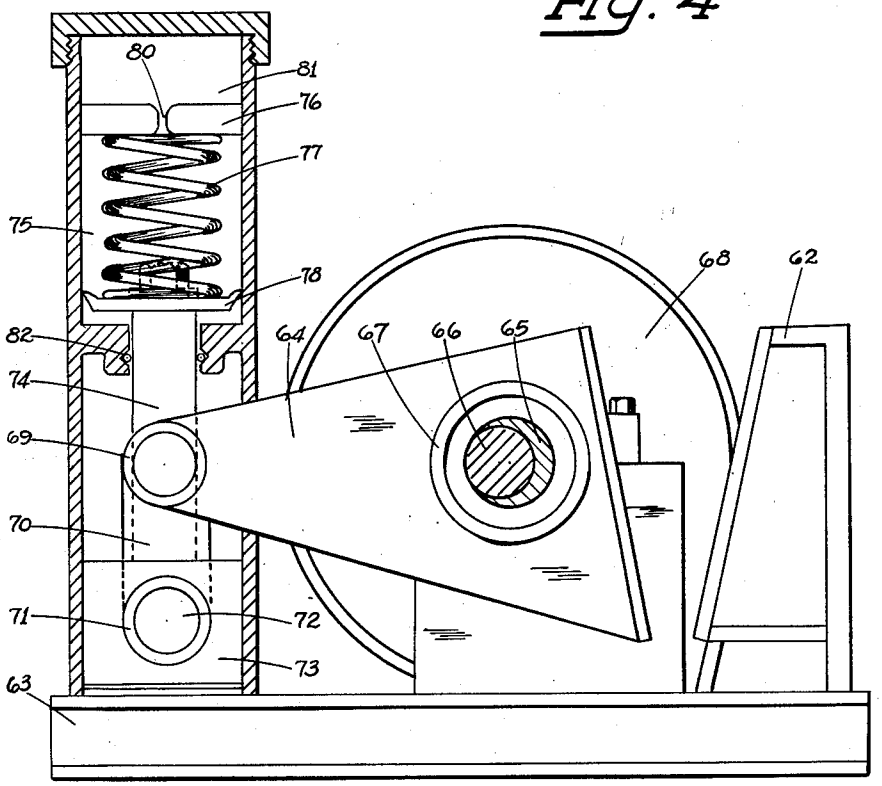


FIG. 5

INVENTOR.
HERBERT TURNER JR.
BY Corey & Corey
attys.

United States Patent Office 3,166,258 Patented Jan. 19, 1965

3,166,258

ROCK CRUSHING MACHINES

Herbert Turner, Jr., Boscobel, Wis.

Continuation of application Ser. No. 50,189, Aug. 17, 1960. This application Mar. 1, 1963, Ser. No. 266,126
5 Claims. (Cl. 241—218)

This is a continuation of my application Serial No. 50,189, filed August 17, 1960, now abandoned.

This invention concerns a rock crushing machine and more particularly one in which the impact forces are applied in a downward direction to permit the rapid flow of material through the jaws of the crusher.

One of the major objectives of my invention is to provide a rock crusher in which the crushing jaws may be driven at a high rate of speed in a range of 800 to 900 revolutions per minute, and thereby process a substantially larger quantity of rock and stone than are now possible with commercial machines in use.

It has been my experience, in commercial processing of rock, that crushers now available are effective up to a range of 400 revolutions per minute, but when they are driven at higher rates of speed they do not appear to increase the capacity or to produce a greater flow of material proportionate to the higher speed. By observation it appears that the movement of the jaws in crushers now available seems to throw rock upwardly and impede the flow when the speed is increased.

It is therefore a primary object of my invention to provide a device in which the opposed crushing jaws rotate in an opposite direction to closely approach each other as the adjacent faces move downwardly with the material between the jaws, and in that manner not only crush the rock, but apply a positive downward force to move the material rapidly through the operative area.

It is another major object of my invention to provide a device in which the jaws relieve themselves automatically of objects which cannot be crushed, such as tramp, iron and the like.

It is a further object of my invention to provide a device in which the intrusion of tramp actuates the movement of the crusher jaws pivotally outwardly to avoid damage.

It is a still further object of my invention to provide a device in which a given point around which the jaws operate can be positioned at a substantial distance from the zone in which the rock is crushed to further prevent undue wear of the pivotal structure.

It is yet another object of my invention to provide a device in which biasing means, having a predetermined load point, may be employed to permit the jaws to open wide to make a path for non-crushable objects.

Other and further features and objects of the invention will be more apparent to those skilled in the art upon a consideration of the accompanying drawings and following specifications, wherein are disclosed several exemplary embodiments of the invention, with the understanding, however that such changes may be made therein as fall within the scope of the appended claims, without departing from the spirit of the invention.

In said drawings:

FIGURE 1 is an end view of a device constructed according to my invention, showing a pair of jaw members including spring-loaded relief members, the eccentric drive portion thereof being shown in cross section.

FIGURE 2 is an end view of the device constructed according to another embodiment of my invention, in which only one of the parallel jaws is equipped with a spring-loaded device to permit the relief of that jaw if a foreign object is encountered.

FIGURE 3 is another view of the device shown in FIGURE 2, the spring-loaded jaw being shown in the position it assumes when a foreign object is inserted between the jaws.

FIGURE 4 is a side view of the device shown in FIGURE 1, and

FIGURE 5 is an end view of another embodiment of my invention in which one jaw is stationary and the opposite jaw being provided with a hydraulic relief member.

Referring now to the drawings, and more particularly to FIGURE 1, the structure therein shown comprises a main frame or base 11 having upright supports 12 and 12*a*. On the upper face of the support 12 are bearing caps 13 and 14. The bearing supports, of which there are two, 12 and 12*a* as shown in FIGURE 4, carry two parallel shafts 15 and 16. Mounted on these two shafts are jaw assemblies 17 and 18.

The shafts 15 and 16 are provided with eccentrics 19 and 20. The two jaws 17 and 18 are provided with a plurality of bearings such as 21 and 22 which are positioned on the eccentrics 19 and 20. It will be noted that these eccentrics are so positioned on the shafts 15 and 16 that as they rotate, they move first toward each other and then away from each other, thus causing the jaws to rotate towards each other and then away from each other. The outer ends of the jaws are supported and guided by a link assembly comprising a bearing 32 and a link 34 which is attached to the base 11 in a manner which will be described in detail hereinafter. By reason of this mounting, the two jaws in movement describe two opposite circles, one jaw moving clockwise and the other jaw counter-clockwise. The two opposed jaws move toward each other, then downwardly together, then at the bottom of the arc, draw apart. They then move upwardly together at their greatest spaced distance from each other, then towards each other at the top to their arc.

It will be apparent that this action is such that as the jaws move together at the top of their circular rotation, they tend to crush the rock between them and, at the same time, move it downwardly, increasing the pressure forces; then when they are opposing each other on a horizontal line, they are applying the greatest pressure. They then move away from each other at the bottom of their arc, discharging the crushed rock downwardly with a throwing action, tending to move the rock downwardly away from the jaws. In this manner, maximum movement of the rock is attained, and the greater the speed the more downward thrust is applied to moving increasing quantities of material through the jaws.

It will also be noted that the faces 25 and 26 of the two opposed jaws are positioned each at an outward angle in relation to the vertical. This angular relationship is provided to permit staggered reduction of rock as it moves downwardly between the jaws, thus reducing rock by stages to increasingly smaller pieces. It is to be noted that throughout the several embodiments shown, the functions of the various structures remain identical and that the action is similar whether it is applied to one or both jaws. I will now describe the structure provided to prevent damage.

Referring now to FIGURES 2 and 3, the embodiment shown therein has the relief structure on one jaw only. In all embodiments of the device, jaw members comprise the face, such as 30 of FIGURES 2 and 3, and a triangular plate member 31 extending rearwardly from the jaw face. At the outer end of this triangular plate is a bearing 32. It will be noted that this bearing and the structure associated therewith is at a considerable distance from the area in which the rock is crushed. These bearings therefore are away from the dust and debris of the crushing action and may be shielded or sealed and lubricated through appropriate fittings, such as 33.

Extending downwardly from this bearing 32 is a linking

member 34 which, at its lower end, is connected to a bearing 35 which is similar to the upper bearing 32, and which also may be lubricated through means of a fitting 36. This lower bearing is mounted on a shaft 37 which in turn is positioned to extend outwardly from a block member 38. This block member is held between two upright slide members 39 and 40 and is adapted to move vertically between them.

On the upper face of the block member are a pair of springs 41 and 42. These spring members are attached at their upper ends to bolts 43 and 44 which are in turn mounted in a horizontal plate 45 which connects the two vertical slide member 39 and 40. It will be understood that the bolts 43 and 44 are adjustable in vertical position and permit varying tension adjustment of the springs 41 and 42.

Referring now to FIGURES 2 and 3 in which the device is shown in two different positions; FIGURE 3 shows the structure when a piece of scrap iron, indicated at 46, is caught between the two jaw members 30 and 30*a*. At this instant the jaw member 30 is unable to move in its prescribed circular path. The "tramp" iron piece 46 applies pressure to the lower portion of the jaw face at 47. This pressure is transmitted by the triangular plate 13 to the bearing 32, then downwardly to the bearing 35 and thence upwardly against the springs 41 and 42. The springs contract and the entire assembly moves radially around the shaft 48 and eccentric lobe 49, thus enlarging the space between the lower faces of the two jaw members 30 and 38 and permitting the "tramp" iron 46 to pass between the jaws without damaging them.

In reference to FIGURES 2 and 3, it will be noted that the opposite jaw 30*a* is also provided with an upper bearing 50 which is lubricated through a fitting 51 and is further interconnected by a link 52 to a lower bearing 53. However this lower bearing is firmly fixed in position by the block assembly 54 which is bolted to the main frame 55 of the crusher, the main frame being substantially the same structure as is shown in FIGURE 1.

Referring to FIGURE 4, it will be seen that the shaft 16 extends the full length of the device and carries the back gear 24. The opposite shaft 15 carries a drive pulley 60 and also the gear 23 which drives the back gear 24. This structure is provided to drive the crusher jaws, the drive pulley being connected to any suitable source of power.

FIGURE 5 shows another embodiment of my invention in which one jaw 62 is a fixed member positioned on the main frame 63. The movable jaw, indicated generally at 64, moves on the eccentric lobe 65 which in turn is positioned on shaft 66. The bearing 67 carries the jaw member, indicated at 64, and is positioned on the eccentric lobe 65. A drive pulley 68 rotates the shaft 66. Again the jaw member includes a triangular plate, the outer end thereof having a bearing member 69, a downwardly extending link 70, a lower bearing 71, which in turn is pivoted on a shaft 72 which is extended outwardly from the block member 73. Extending upwardly from the block member is a shaft 74 which extends into a cylindrical cavity 75. This cavity has a partition 76 therein, and a spring member 77 extends between the partition 76 and the upper portion of the shaft 74. Also mounted on this shaft is an oil cup 78.

Again the structure is provided to permit the jaw member 64 to be forced outwardly away from the jaw 62 when something which cannot be crushed moves between these two jaws. The cavity 75 is ordinarily filled with oil or any other suitable fluid. The partition 76 has a restricted orifice 80 centered in the partition which permits the movement of oil from the cavity 75 into an upper cavity 81. This action occurs whenever a foreign object appears between the jaw faces, but since the large volume of oil cannot move through the orifice too rapidly, the action is correspondingly slowed down. Once the foreign object has been discharged from between the jaws, the spring 77 applies a downward pressure to return the jaw to its operative position. Since the cavity is sealed by the cup 78 and an O ring 82, the oil is sucked back into the chamber 75 and the device re-cycled for subsequent relief action should it be required.

Referring to FIGS. 1 and 2 it will be apparent that each jaw face will be given a compound movement, from its uppermost position: toward, downwardly, and away from the opposite jaw, said movement comprising:

(*a*) a rotary movement toward, downwardly and away from the opposite jaw, imparted by the eccentric, plus
(*b*) a rocking movement around said eccentric adding downwardly to said downward rotary movement.

This will be apparent from FIGURE 1 (or from FIG. 2) because, as eccentrics 19 and 20 move the jaw faces 25 and 26 from the positions illustrated: toward each other, then downwardly, then away from each other, the jaw faces will also be given a rocking movement around the eccentrics caused by the outer pivots (such as 32 of FIG. 2) being on the opposite sides of the respective shafts 15, 16 from the respective jaw faces 25, 26. It will also be apparent that this rocking movement will add to the downward movement of the jaw faces, and that it will increase the separation of the bottoms of the jaw faces as the eccentrics pass through their lowermost positions.

Although I have described several specific embodiments of my invention, it is apparent that modifications thereof may be made by those skilled in the art. Such modifications may be made without departing from the spirit and scope of my invention as set forth in the appended claims.

I claim as my invention:

1. A rock crusher comprising:
a base,
first and second downwardly converging crushing jaws supported by said base,
a horizontally disposed shaft mounted for rotation in said base, and means for rotating said shaft,
an eccentric fixed to said shaft,
means for imparting a compound movement to said first jaw toward, downwardly, and away from said second jaw, said movement comprising:
(*a*) a rotary movement toward, downwardly and away from said second jaw, imparted by said eccentric, plus
(*b*) a rocking movement around said eccentric, adding downwardly to the said downward rotary movement,
said means comprising:
a horizontally extending carrier mounting the first jaw on its inner end, said carrier being disposed perpendicularly to said shaft,
a bearing in said carrier abreast said first jaw and at substantial vertical distances respectively from the top and bottom thereof, said bearing being mounted on said eccentric,
a vertical link pivotally attached at one of its ends to the outer end of said carrier, said bearing being between said first jaw and said outer end,
and a bearing block mounted on said base and pivotally attached to said link at the other end of the latter,
said bearing block being mounted on said base for vertical movement relatively thereto,
and spring means urging said block downwardly to a normal position while permitting limited upward movement from said normal position.

2. A rock crusher as defined by claim 1, the second of said jaws being rigidly fixed to said base.

3. A rock crusher as defined by claim 1, comprising fluid buffer means for retarding upward movement of said block.

4. A rock crusher as defined by claim 1 comprising:
a second horizontally disposed shaft, parallel to said first shaft, mounted for rotation in said base, and

means for rotating it in the opposite direction to said first shaft and in timed relationship thereto,

a second eccentric fixed to said second shaft,

a second horizontally extending carrier mounting the second jaw on its inner end, said second carrier being disposed perpendicularly to said second shaft,

a second bearing in said second carrier abreast said second jaw and at substantial vertical distances respectively from the top and bottom thereof, said second bearing being mounted on said second eccentric,

and a second vertical link pivotally attached at one of its ends to the outer end of said second carrier,

said second vertical link being pivotally attached at the other of its ends to said base.

5. A rock crusher as defined by claim 1 comprising:

a second horizontally disposed shaft, parallel to said first shaft, mounted for rotation in said base, and means for rotating it in the opposite direction to said first shaft and in timed relationship thereto,

a second eccentric fixed to said second shaft,

a second horizontally extending carrier mounting the second jaw on its inner end, said second carrier being disposed perpendicularly to said second shaft,

a second bearing in said second carrier abreast said second jaw and at substantially vertical distances respectively from the top and bottom thereof, said second bearing being mounted on said second eccentric,

a second vertical link pivotally attached at one of its ends to the outer end of said second carrier,

a second bearing block pivotally attached to said second link at the other end of the latter,

means mounting said block on said base for vertical movement relative thereto,

and second spring means urging said second block downwardly to a normal position thereof while permitting limited upward movement from said normal position.

References Cited by the Examiner

UNITED STATES PATENTS

2,380,419	7/45	Ebersol	241—218
2,485,718	10/49	Ebersol	241—266
2,921,750	1/60	Picalargce	241—266
2,999,651	9/61	Ault et al.	241—266

FOREIGN PATENTS

26,206	8/09	Great Britain.

ANDREW R. JUHASZ, *Primary Examiner.*

J. SPENCER OVERHOLSER, *Examiner.*