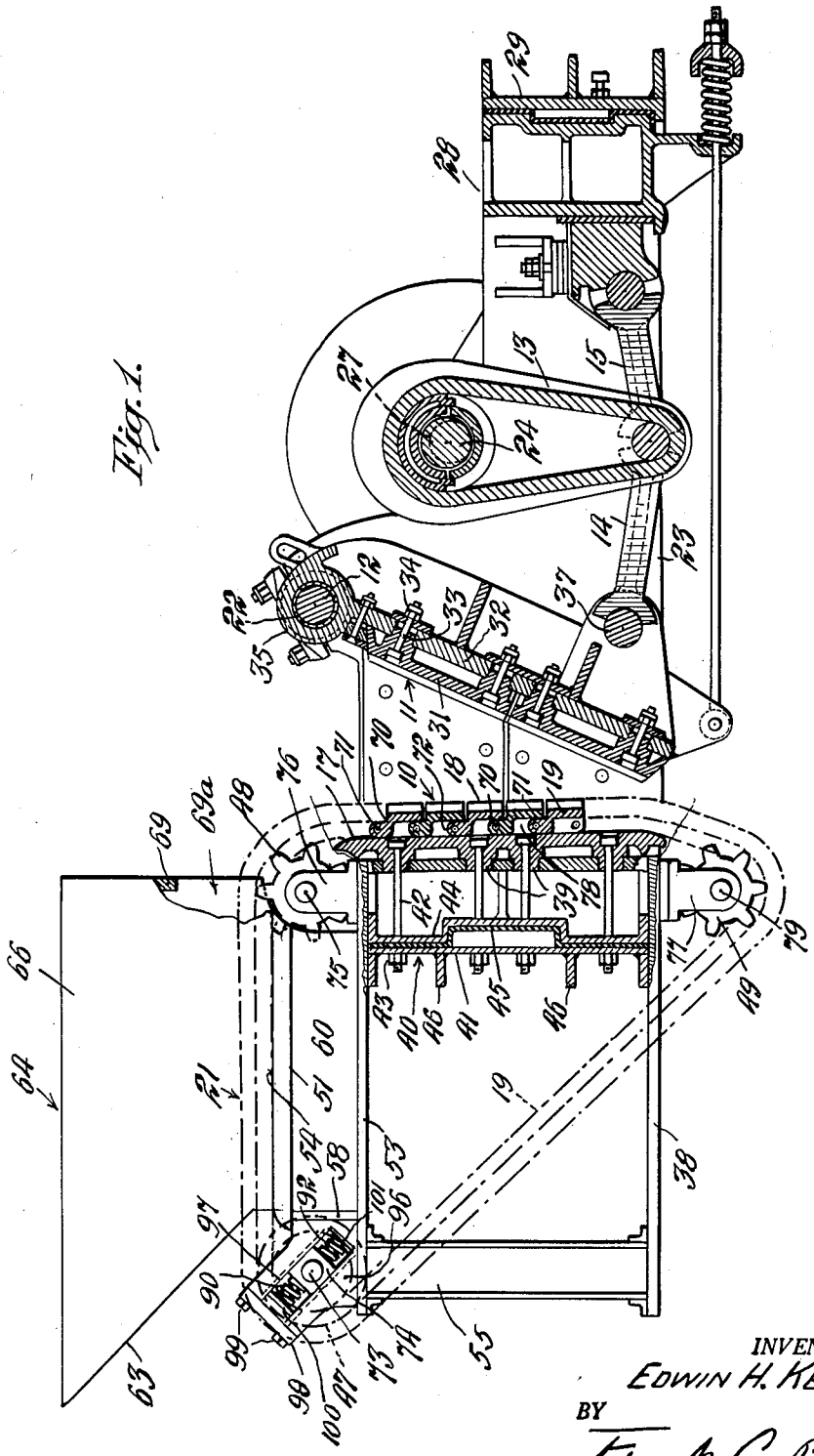
Feb. 28, 1956 E. H. KEIPER 2,736,503

JAW CRUSHER WITH MATERIAL FEEDING AND TURNING BELT MOVING OVER THE STATIONARY CRUSHING PLATE

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Fig. 1.



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Fig. 3.

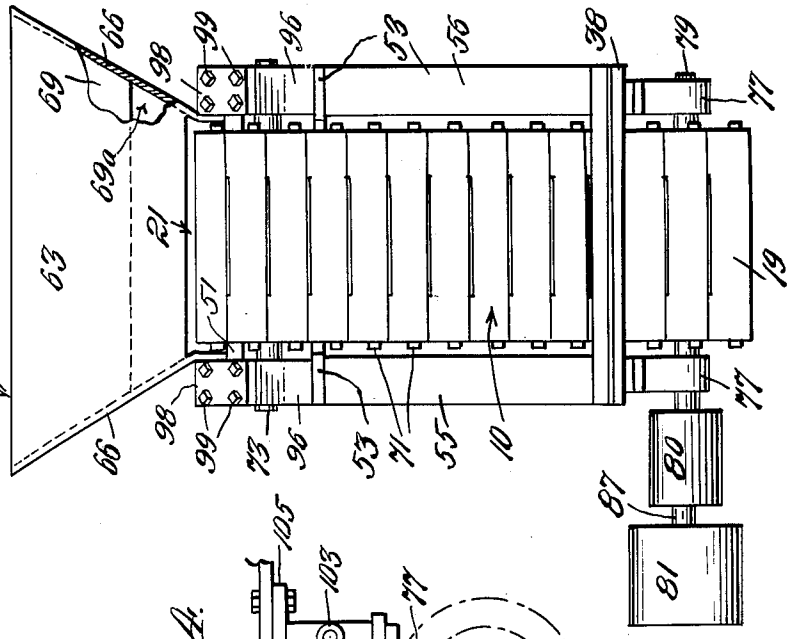


Fig. 4.

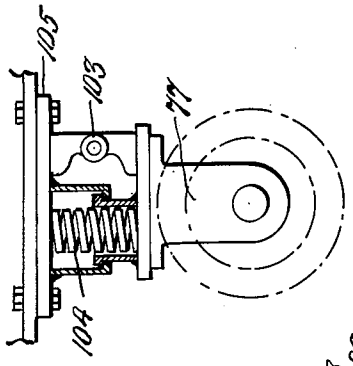
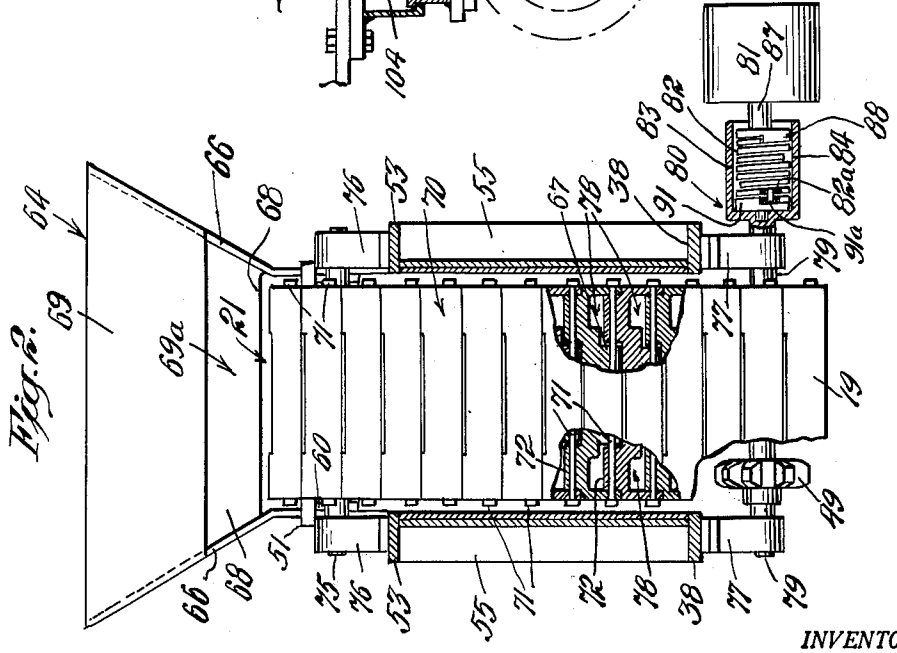


Fig. 2.



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JAW CRUSHER WITH MATERIAL FEEDING AND TURNING BELT MOVING OVER THE STATIONARY CRUSHING PLATE

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7 Claims. (Cl. 241—200)

This invention relates to jaw crushers and more particularly to the crushing action of the jaws on the material being crushed and the feeding of the material to the crusher.

The object of the invention is to crush large pieces of rock into smaller pieces of substantially uniform size.

Another object of the invention is to feed the material to be crushed between the crusher jaws at substantially uniform rate in accordance with the ability of the crusher to reduce the material to the desired size.

A further object is to crush the material into pieces of a generally spherical or cubical shape.

Other and further objects and advantages will be apparent from the following description taken in connection with the accompanying drawings, in which—

Fig. 1 is a side view of the crusher with a fragmentary sectional view of the crushing portion.

Fig. 2 is a front view of the jaw with the moving surface showing the link belt.

Fig. 3 is a rear view of the structure supporting the link belt; and

Fig. 4 is a fragmentary view of the mounting of the lower sprockets when they are idlers.

The jaw crusher comprises a moving surface jaw **10** and an oscillatory jaw **11** moving to and from the jaw **10** about the supporting shaft **12**. The jaw **11** is operated by a pitman **13** through the toggles **14**, **15** in a conventional manner. The moving surface jaw **10** comprises a stationary supporting plate **17** and a moving crushing surface **18** formed by the endless link belt **19** moving across the plate **17**. The link belt **19** receives the material to be crushed along the horizontal portion **21** and carries it to the edge of the jaw **10** and drops it into the crushing zone. The jaw **11** oscillates crushing the material against the jaw **10**. As the material moves down between the jaws the endless link belt tumbles and turns the material during the stroke of the jaw **11** rearranging the various pieces to provide a more advantageous crushing. At the bottom the crushed material drops out through the space between the lower ends of the jaw.

The shaft **12** of the oscillatory jaw **11** is journaled in bearings **22** supporting the oscillatory jaw on the sides **23** of the casing. The shaft **24** supporting the pitman **13** is similarly supported by the sides **23**. The eccentric **27** actuates the pitman **13** and opens and closes the jaws through the toggles **14** and **15**. The toggles **14** press against the lower free end of the jaw **11** and the toggles **15** press against the stationary head **28** secured to the sides **23**. The semicircularly shaped end plate **29** has its ends abutting the sides **23** and is welded thereto to form a permanent rigid structure. The crushing plate **31** on the jaw **11** is replaceably secured by the bolts **33** and nuts **34** to the backing plate **32**. The backing plate **32** is welded to the journal **35** at its upper end and connected at its lower end to the toggles **14** through the shaft **37**.

The opposing moving belt **19** is supported or backed by the stationary plate **17**. The plate **17** receives the

crushing force of the jaw **11** and transmits it to the fixed head **40**. The head **40** is connected to the other ends of the sides **23** from head **28**. The end plate **41** is semicircular in shape and extends the full height of the head. The ends of the plate abut the ends of the walls **23** and are welded thereto. The plate **17** is detachably secured to the head **40** by the bolts **42** and nuts **43**. The head **40** is built in a conventional manner with an inner supporting member **44** of the same shape as the end plate **41** and fitting inside of the end plate **41**. An interlining **45** is positioned between the adjacent surfaces of the plate **41** and the member **44**. Flanges **46** are welded to the outer surface of end plates to give strength and rigidity to the head **40**. The head rests on the flat beams **38**, **38***a*. The bolts **42** extend through the head **40** with the heads of the bolts recessed below the surface of the plate **17**. The bolts pull the plate in tightly against the head **40** with the plugs **39** of the plate **17** fitting into openings in the plate **41** of the head and held tightly in position.

The belt **19** is of a link type with an armored crushing surface **18**. In the embodiment shown in Fig. 1 the links **70** are pivotally interconnected by pins **71** extending through hinge portions **72** of the preceding link with the central hinge portion **67** of the succeeding link. Recesses **78** are formed in the hinge portion. The teeth of the sprocket **49** fit into the recesses and engage the hinge portion pulling the belt **19**. The armored surface of the succeeding link overlaps the hinges of the preceding link protecting them from the material.

The belt **19** runs on two pairs of idlers **47** and **48** and one pair of sprockets **49** and is pulled by the driving sprocket **49** across the slide plate **51** of table **54** and the backing plate **19**. The idlers **48** and sprocket **49** are mounted on beams **53** supported at one end by the head **40** and at the other end by the posts **55** respectively. A lateral beam **58** extends across the ends of beams **53** and the end of table **54** to support the idlers **47**.

The table **54** sets on the beams **53** and comprises two longitudinally extending beams **60** supporting the horizontally positioned slide plate **51**. The slide plate is between the idlers **47**, **48** with the link chain belt **19** in contact with and bearing on the upper surface. The belt slides along the top of this plate with the material to be crushed dropping from the chute **63** on to the belt.

A guide **64** with sides **66** welded to the upper surface of the slide plate on opposite sides of the belt holds the material on the belt. The sides **66** extend upwardly and diverge outwardly and form trough shaped space to hold the material. The sides extend along the slide plate **51** and beyond it projecting over the pair of idlers **48**. End plates **68**, **69** extend across the front and rear respectively of the guide sides **66**. The plate **68** has its lower edge **67** adjacent the upper surface of the belt and closes the back to retain the pieces of rock on the belt. The material fed to the crushing zone passes through the exit opening **69***a* and drops between the jaws. The lower edge of plate **69** or other suitable means may be used to limit the amount of material.

The pair of idlers **47** are mounted on a shaft **73** to engage the spaces **78** in the belt **19**. The shaft may be journaled at each end in bearings **74** resiliently mounted in yokes **96**.

The pair of idlers **48** are mounted on a shaft **75** journaled in bearings **76** mounted on the head **40**. The idlers are positioned adjacent the end of the slide plate and the upper end of the plate **17**. The belt **19** is carried by the idlers from the slide plate **51** around the corner of the head onto the plate **17**. The belt **19** is pulled down and against the face of the plate **17** by the driving pair of sprockets **49** located on the bottom of the head

40 adjacent the lower end of the plate 17. The belt then travels back up to the rear pair of idlers 47.

The material is crushed between the crushing plate of the jaw 11 and the belt 19 of the jaw 10. During the maximum crushing force the belt is forced tightly against the plate 17 and held stationary for an instant. The sprockets 49 and shaft 79 stop but the motor 81 continues to drive.

A conventional disengaging clutch or torque limiting device is used in connecting the motor to the shaft 79 such as shown in Fig. 2. A disengaging clutch 80 is coupled between the motor 81 and shaft 79 of the pair of sprockets 49 and comprises a helical spring 82 enclosed in a cylindrical casing 83 with an inner gripping surface 84. The casing 83 is part of the driven shaft 79 and the spring 82 is keyed to the drive shaft 87 through the collars 88 and to the casing 83 through the collar 91. The collar 88 has a shoulder 89 engaging the end of the spring and expanding the spring into clutch gripping engagement with the inner surface 84 of the casing 83.

With the stopping of the shaft 79 the pin 91A moves in the direction of rotation and engages the wall of the enlarged hole in collar 91. The spring 82 contracts and slides on the surface 84. When shaft 79 is released the pin 91*a* disengages from the wall of the hole in the collar 91 permitting the spring 83 to grip the surface 84 and turn the shaft 79.

The material loaded on the belt 19 from the chute 63 is in large boulder size pieces and is to be reduced to smaller sizes for further crushing by other types of crushers. The material piles up on the belt and is fed to the jaws at a rate to keep the jaws filled. The rate of flow is set by the speed of the belt and the height of the edge 64. The rate is set so that material dropping between the jaws equals the amount crushed. The jaw 11 oscillates crushing the material against the jaw 10. As the belt moves downward the uncrushed boulders and partially crushed boulders are turned by the belt into more advantageous crushing positions. This constant agitation keeps the material shifting. The jaws of the crusher will be crushing each piece at different angles and breaking it down into small and more uniformly sized pieces. The belt 19 tends to grip the pieces and rotate them in a downward direction on the jaw 10 side while the jaw 11 is tending to rotate them in an upward direction due to the angle of jaw 11. This gives a rotational movement to the pieces along with the downward movement of the pieces through the crusher.

The control of the feed maintains a uniform flow of the material to the crusher and keeps the crusher operating at full capacity.

The bearing 74 slides in the slot 97 and is supported between springs 90, 92. The spring 92 presses the shaft 73 outwardly and maintains the belt taut. The slack between the sprockets 49 and idlers 47 is maintained at a minimum. The belt is thus kept tight tending to seal the engaging surfaces against the dust from the crushing operation and reducing the wear on the parts. A spring is provided on each side to properly position the shaft. The springs are held in by the plate 98 bolted to the end of the yoke 96 by the bolt 99. Shims 100 and 101 may be placed in the slot 97 to position the shaft 73 in the proper place.

The idlers 47 may be sprockets and drive the belt 19. The sprockets 49 would become idlers and would be mounted on the head 40 as shown in Fig. 4. The bearings 77 are pivotally mounted by hinges 103 at the jaw side and springs 104 at the opposite side where the belt is momentarily held stationary. On full crushing action the pull of sprockets 47 will be absorbed by the spring. In this latter embodiment the bearings 73 would be rigidly fastened to the beams 52. The tension on the belt may be varied by changing the thickness of the block 105 on which the bearing is mounted.

Although preferred embodiments have been described and illustrated various modifications and changes may be made without departing from the scope of the invention.

I claim:

1. In combination with a jaw crusher having a fixed crushing member extending vertically and a movable crushing member spaced from the fixed member and having a crushing surface spaced away from the fixed member at its upper portion to form a crushing chamber, said movable crushing member being pivoted at the material receiving end and oscillating to and from the fixed crushing member with an upward component of movement, an endless chain of links movable continuously downward in a vertical direction across the said surface of said fixed crushing member in the direction of movement of the crushed material through the jaw crusher and forming a crushing surface moving downward along one side of said crushing chamber and opposite the upwardly swinging pivoted member to the vertical component of movement of the oscillating crushing surface so as to rotate the crushed material to successive crushing positions as it passes between the crushing surfaces.

2. A jaw crusher combination as set forth in claim 1 in which there are driving means for the endless chain yieldingly drawing it along said fixed surface so that its movement thereon is retarded by resistance developed by the crushing action on the material being crushed.

3. In combination with a jaw crusher having a fixed crushing member and a pivoted crusher member both extending substantially vertically and spaced to form a generally U-shaped crushing zone therebetween, means for oscillating said pivoted member to and from the fixed crushing member, an endless chain of links movable across the face of said fixed crushing member in the direction of movement of the crushed material through the jaw crusher and movable horizontally from under a feed delivering material to said chain between said crushing members carrying it to said crushing zone, means for continuously moving said chain to deliver material to the crushing zone and through the crushing zone to provide an endless series of links moving continuously through successive crushing actions opposite to said oscillating member and downward in the direction of movement of the crushed material thereby reorienting the crushed material through successive crushing positions.

4. A jaw crusher comprising a fixed crushing member having a vertical face and a pivoted crushing member having a crushing surface opposite to said face to form a crushing zone therebetween with the material entering at the top of said crushing zone, said pivoted crushing member being pivotally mounted at the receiving end of said zone with said crushing surface extending at an angle to the vertical towards said fixed member vertically narrowing the crushing zone towards the lower exit end and swinging toward said fixed member, means to oscillate said pivoted crushing surface to and from said vertical member to crush material between said members, an endless chain with a plurality of plates forming a moving crushing surface slideably movable across said vertical face in a direction opposite to the oscillation of the pivoted crushing surface to form an opposing crushing surface moving downwardly opposite said pivoted crushing member, means for continuously moving said chain downward in the direction of movement of the material through the crushing zone during successive crushing actions to reorientate the crushed material in its downward progress.

5. A crusher as claimed in claim 4 wherein a horizontal loading table with a feed chute above is positioned to the rear of said fixed member, said endless chain moving horizontally on said table to receive material from said chute and carry it over the upper edge and downward into the crushing zone.

6. A jaw crusher as set forth in claim 4 wherein said endless chain is mounted on three sets of sprockets, one of said sets before the crushing zone and a driving set after the crushing zone, said driving set being resiliently mounted to permit the gripping of the chain against the face of the fixed crushing member.

7. A jaw crusher as set forth in claim 6 wherein a motor is provided to drive said driven sprockets, and a slideable clutch interconnecting said motor and said driven set of sprockets to permit the sprockets to turn chain when the chain is momentarily held driving the crushing action.

References Cited in the file of this patent

UNITED STATES PATENTS

475,518	Richard	May 24, 1892
1,165,523	Lyle	Dec. 28, 1915
1,605,181	Frickey	Nov. 2, 1926
2,007,874	Redler	July 9, 1935
2,161,573	Henry	June 6, 1939
2,210,790	Bernhard	Aug. 6, 1940
2,464,774	Keiper	Mar. 15, 1949