Feb. 25, 1958 A. B. HANSE ET AL 2,824,704

STRIPPER BAR MOUNTING FOR ROCK BREAKER

Original Filed Dec. 18, 1950 3 Sheets-Sheet 1

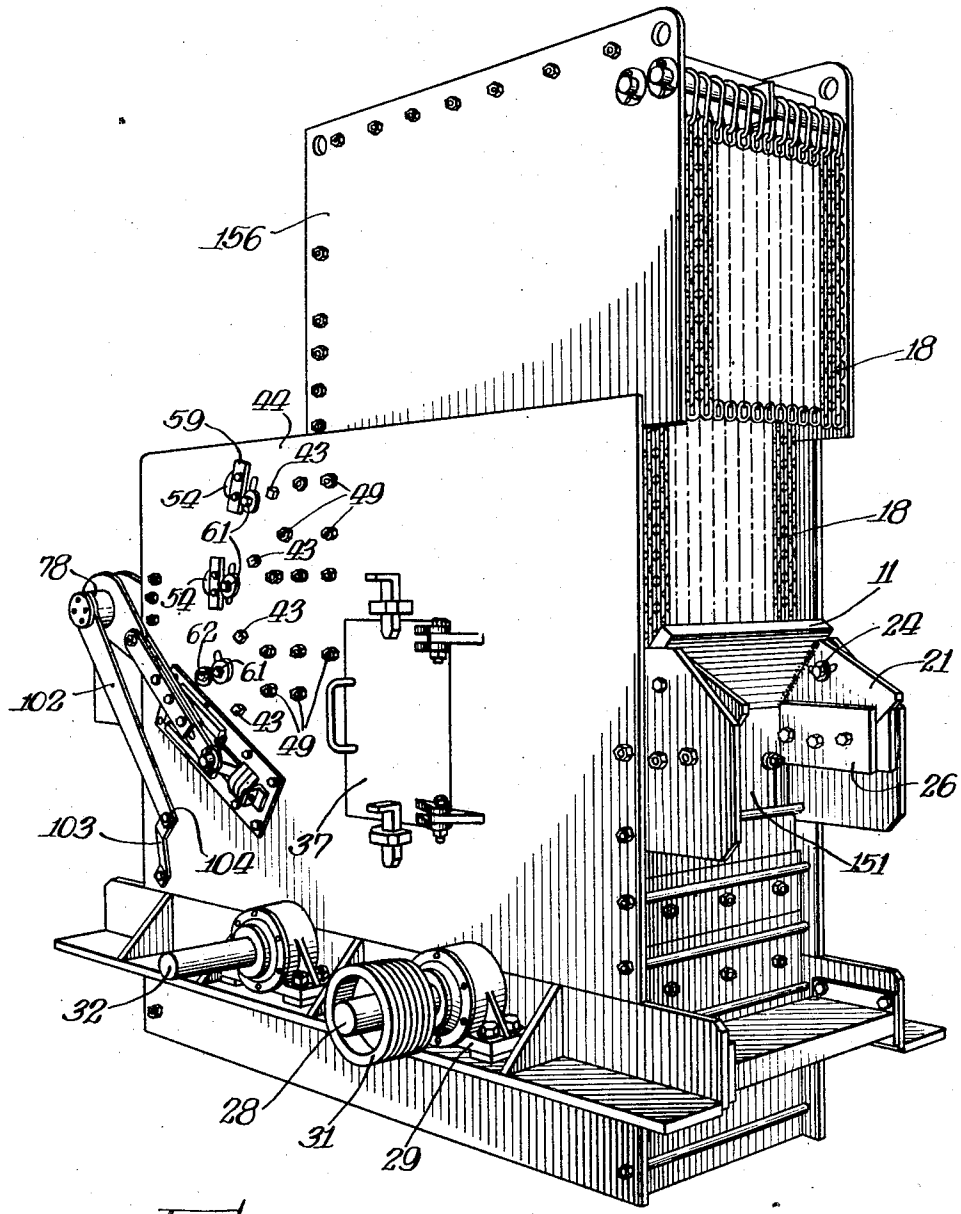

Fig. 1.

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Fig. 2.

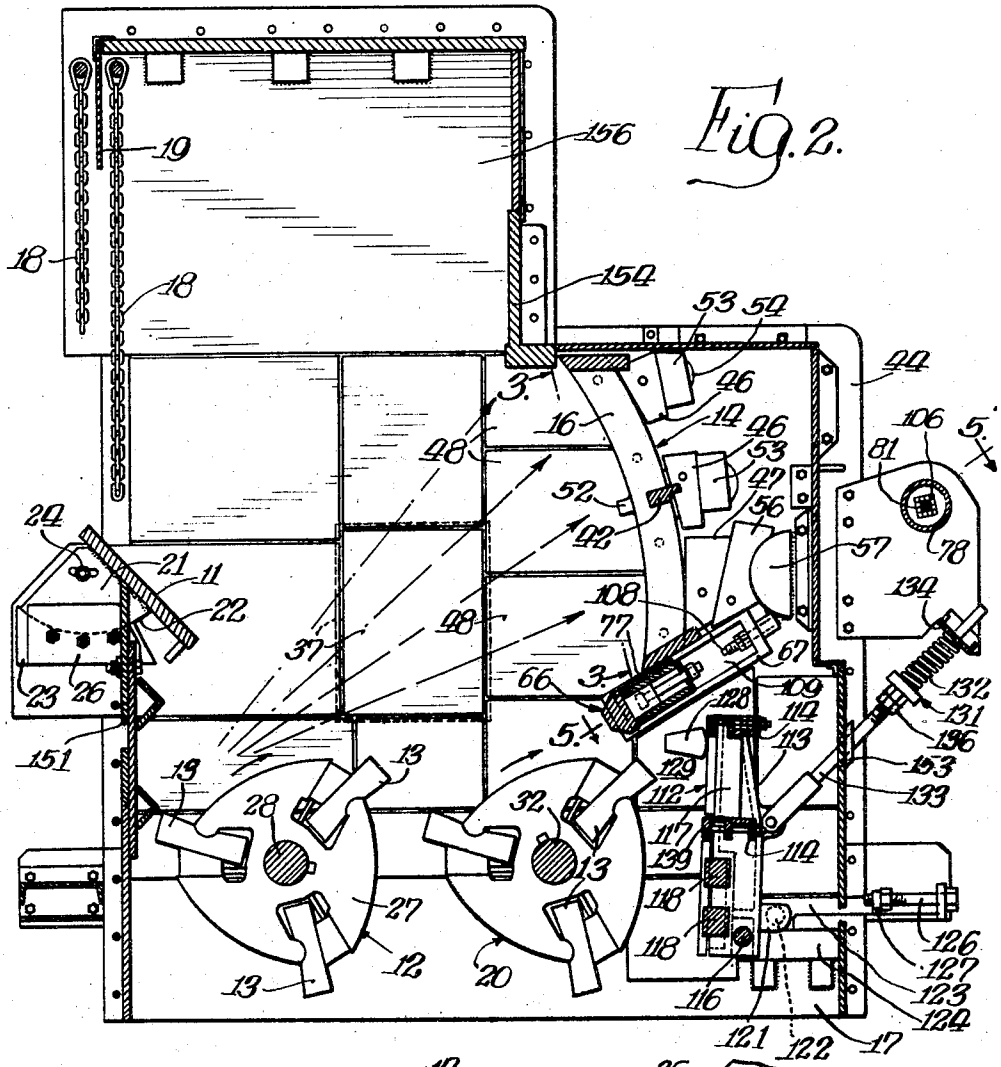

Fig. 3.

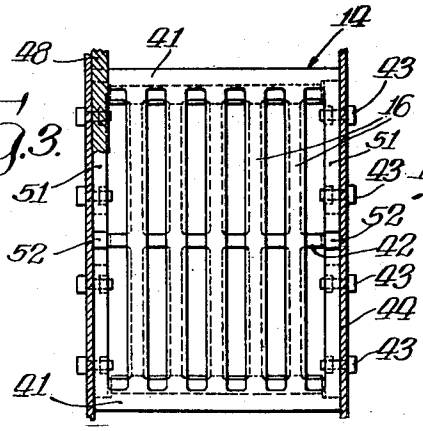

Fig. 4.

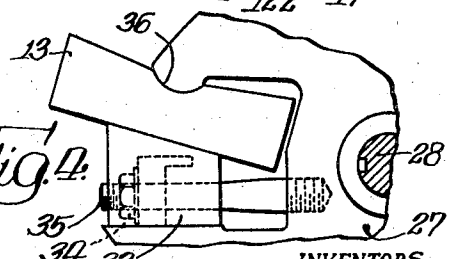

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Fig. 5.

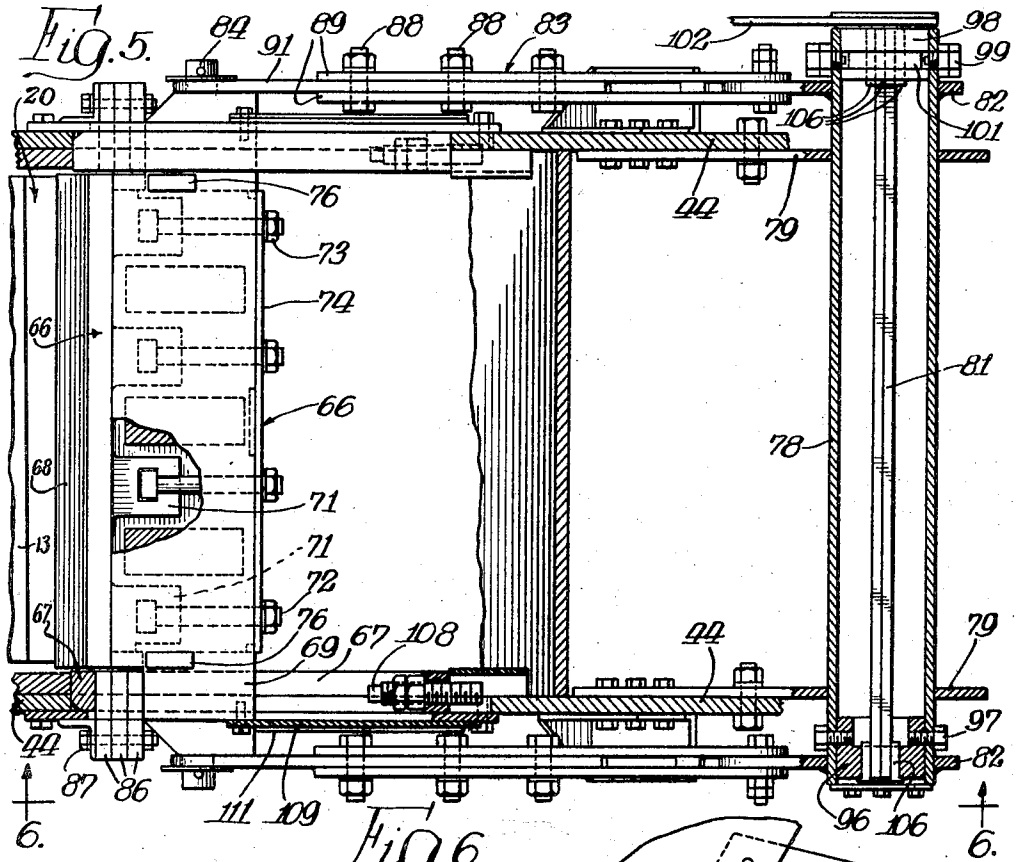
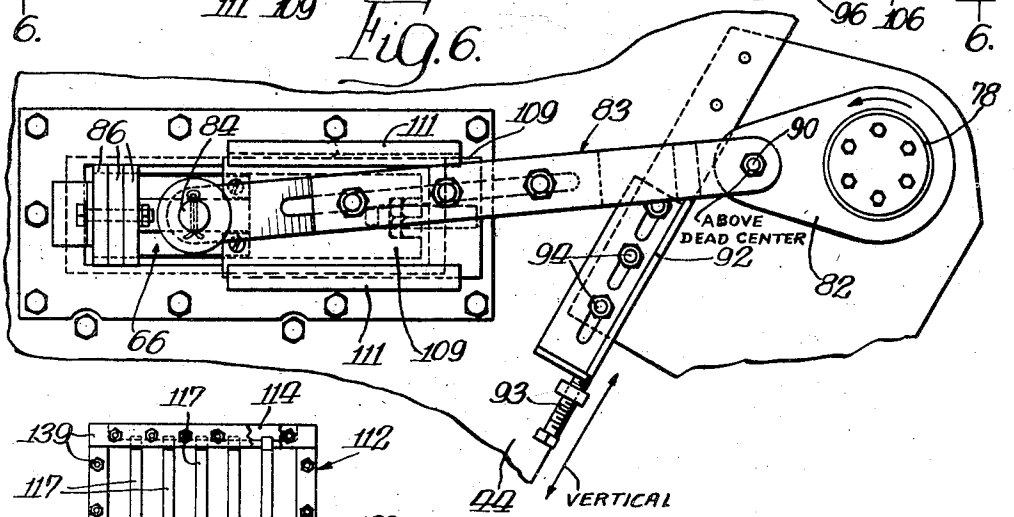


Fig. 6.



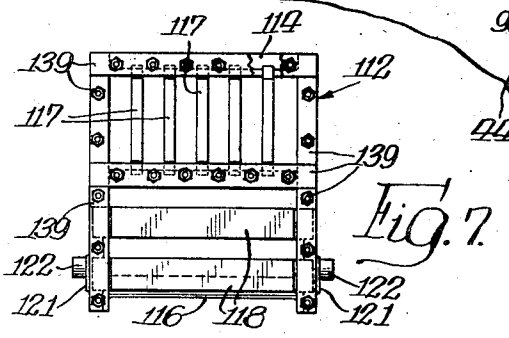


Fig. 7.

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STRIPPER BAR MOUNTING FOR ROCK BREAKER

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Original application December 18, 1950, Serial No. 201,364, now Patent No. 2,767,928, dated October 23, 1956. Divided and this application December 1, 1955, Serial No. 550,439

6 Claims. (Cl. 241—286)

In breaking up large rocks, it has long been recognized that one of the most efficient methods of breaking the rocks comprises impact breaking. Typically, the large rock is dropped into the path of a rotating hammer, which strikes the rock with sufficient speed to shatter it. A number of different impact breakers have been provided. Nevertheless, impact breakers have not, prior to the present invention, reached the potential attainable with this invention. Our invention, first disclosed in our application Ser. No. 201,364, filed December 18, 1950 (now Patent 2,767,928 of October 23, 1956), provides various improvements for increasing the efficiency and effectiveness of impact breakers and in some respects, is suitable for use with other breakers as well.

One important feature of the invention, which is particularly the subject of this divisional application, relates to the mounting of the stripper bar. This is a bar which is normally stationary and is positioned fairly close to the circle of movement of the hammers so as to prevent the passage of oversized pieces through the machine. It is desirable that such stripper bars be yieldable, in order to prevent expensive breakage of the machine in case a large piece of tramp iron or other excessively tough material should be fed to the machine with the rock.

Heretofore, many of the stripper or breaker bars which have been yieldably mounted have been mounted in such a way that they would yield more readily when struck near the ends than when struck near their center. This made optimum adjustment difficult, because an adjustment of yieldability such that the stripper bar would yield to center-striking objects with safety was likely to cause it to yield undesirably readily to objects striking the ends of the stripper bar. Any adjustment would be likely either to fail to fully protect the machine, or to permit passage of large pieces of rock which should have been retained until broken. Furthermore, stripper bars of the past were in some instances likely to shear off parts when they were forced out by tramp iron, with necessity for delay while the parts were replaced, even if they were shear pins or the like which could be replaced relatively inexpensively and quickly. According to the present invention, a uniform resistance to movement is provided throughout the length of the stripper bar and, after yielding, it is instantly and automatically restored to its original position without danger that parts will be broken. An important part of the mounting comprises spaced pairs of toggle levers, of which one member of each pair is coupled to a rotatable sleeve so that the two pairs must act in unison, thereby restricting the movement of the stripper bar to one in which both ends move uniformly. The toggle linkage also facilitates the desired degree of firmness in the stripper bar while letting it move relatively freely, once its movement has begun. In addition, an improved spring system has been devised for loading the toggle linkage to provide the desired resistance of movement to the stripper bar.

Additional objects an advantages will be apparent from the following description and from the drawings.

DESIGNATION OF FIGURES

Figure 1 is a perspective view of a rock breaker built in accordance with the present invention and which has been chosen for illustration thereof.

Figure 2 is a longitudinal, vertical, cross-sectional view taken, for the most part, approximately through the middle of the structure of Figure 1.

Figure 3 is a fragmentary, approximately vertical, sectional view, taken near the line 3—3 of Figure 2 and showing particularly the face of the main deflector screen grate.

Figure 4 is a fragmentary view on a larger scale, showing the wedging features for holding a hammer in place.

Figure 5 is a sectional view taken approximately on the line 5—5 of Figure 2, showing particularly the construction and mounting of the stripper bar and its tensioning means.

Figure 6 is a fragmentary side view of the structure shown in Figure 5, being taken approximately on the line 6—6 of Figure 5, the parts being shown slightly tilted in a clockwise direction, so that the parts may be positioned as projections of like parts in Figure 5, for greater clarity.

Figure 7 is a face view of the lower grating.

Although the law requires setting forth the preferred form of the invention and the inclusion of a full and exact description of at least one form of the invention, such as that which follows, it is, of course, the purpose of a patent to cover each new inventive concept therein no matter how it may later be disguised by variations in form or additions of further improvements; and the appended claims are intended to accomplish this purpose by particularly pointing out the parts, improvements, or combinations in which the inventive concepts are found.

GENERAL OPERATION

The form of the invention chosen for illustration is seen generally in Fig. 1. The internal structure is seen generally in Fig. 2. Large rocks are fed to inclined slide **11** and slide from this slide into the circle of rotation of a rotary hammer assembly **12**. Here the rock is struck by one of the hammers **13**, which shatters or fractures the rock and throws the pieces toward grid **14**, composed mainly of spaced bars **16** in vertical planes. Most of the pieces which are small enough pass through the grid **14** and fall through the discharge area **17**. Usually a conveyor is provided below the illustrated apparatus to receive the broken rock and carry it to a vibratory screen. The larger pieces of fractured rock will strike the bars **16** and usually be deflected upwardly and inwardly to drop clear of grid **14** and be struck by the hammers, sometimes being broken by this impact. The bars **16** preferably have faces flat transversely and curved longitudinaly, as shown, about a point a little above the zone of impact of fresh rock with rotary hammer. Accordingly, many of the rock fragments will ricochet upwardly and rearwardly, so that they will drop back into one of the hammer circles of hammers **13** and **20** at a sufficient speed so that many fragments will be struck by the faces of hammers **13** instead of their corners. Particles are blocked from flying out of the breaker by curtains formed of chains **18**. Flying dust may be reduced by one or more curtains **19**, which may be formed of reinforced rubber, such as conveyor belting. If desired, laterally overlapping strips of belting, each hung from the top in the manner of chains **18**, may be used in place of chains. Some of the rock which does not pass through grid **14** will fall onto a second rotary hammer **20**, which will again shatter it, most of the pieces flying against or through grid **14**.

Stripper bar

A stripper bar **66** (an assembly of parts) is positioned

as seen best in Fig. 1 to lie close to the hammer circle of the rotary hammer **20**. This stripper bar is carried in a stripper bar guide **67**, which forms an opening through the side plates **44**. The stripper bar assembly, at both ends, extends through the side plates. It is shiftable in guides **67** to move toward or away from the hammer circle, the position control being described under the next heading. The form of stripper bar illustrated is best understood from Fig. 5. From this, it is seen that the stripper bar comprises two main parts, namely, a head **68** and a carrier **69**, which latter extends through the guides **67** and side walls **44**. The head **68** is provided with tongues **71**, into which draw bolts **72** are dropped through an open-sided slot. The head and bolt assembly is then slipped into carrier **69** and drawn tight by nuts **73**, which may rest on washers or an apertured plate **74**. A carrier **69** may have guide lugs **76** welded thereto. A wear plate **77** (Fig. 2) may be applied to the exposed face of the carrier **69**, having been omitted from Fig. 5, partly for clarity and partly because it is not deemed necessary, at least unless the rock is very abrasive.

Stripper positioning and control

The position of the stripper bar assembly **66** is determined with reference to a torque tube **78**, which is pivotally carried by plates **79** secured to side plates **44**. The torque tube is urged by spring bars **81** in the direction of the arrow shown in Fig. 6 to turn plates **82** thereon in a direction to thrust stripper bar **66** forwardly, namely, to the left, as seen in Figs. 5 and 6. The plates **82** are welded to torque tube **78** and comprise links of a pair of toggle link systems. Thus each plate or link **82** engages a link assembly **83**, which engages a pin **84** extending outwardly from the end of carrier **69**. It is apparent from Fig. 6 that as the plate **82** is turned counterclockwise toward its illustrated position, the toggle linkage comprising link **83** and plate **82** approaches alignment and the stripper bar **66** is thrust forwardly. The stripper bar is preferably placed firmly against a stop, such as shims **86**, which may be inserted or removed in accordance with the desired position of the stripper bar **66**. The shims **86** may be of T-shape, with the legs fitting into the slot formed by guide **67** and with the heads provided with an aperture through which a bolt **87** may pass to hold the shims in place.

The length of the toggle link **83** is preferably adjustable. This adjustment may be accomplished by wedges, but in the illustrated form it is accomplished by bolts **88**. When these bolts are tightened, they clamp link plates **89** against link plate **91**. Link plate **91** engages a pin **84**, while link plate **89** engages plate or link **82**, being pivoted thereto by a bolt **90**.

The length of link **83** is adjusted to keep the toggle linkage slightly out of dead center alignment when the stripper bar **66** is thrust home. As a further safeguard to prevent the toggle linkage from swinging into alignment, an adjustable stop **92** is provided. This stop may be mounted on side plates **44** and adjusted by a screw **93**, bolts **94** being tightened when it is properly positioned.

The spring bars **81** are anchored at one end to a torque ring **96** which may be secured to tube **78** by bolts **97**. At their other ends, the spring bars **81** are anchored in a torque ring **98**, which is held within tube **78** by bolts **99**. In this instance, however, the bolts **99** ride in an annular groove **101** in torque ring **98**, so that it may turn with respect to tube **78**. As seen best in Fig. 1, a tensioning lever **102** is secured to torque ring **98** so as to turn this torque ring and twist the spring rods **81**. The tensioning lever **102** is held in its tensioned position by a link **103** secured to the side plate **44**. In making any adjustment, the bolt **104** securing lever **102** to link **103** is first removed and the lever **102** eased to its natural position to relieve the tension on the parts.

The tension can be varied by changing the number of spring bars **81**. These are anchored to the torque rings **96** and **98**, as seen in the cross section of ring **96** in Fig. 5. The center aperture in ring **96** is squared in cross section. In the illustrated form, it is large enough to hold 16 of the bars **81** arranged in four rows of four each. It may be assumed, however, that only four of bars **81** are illustrated, the space of the remaining twelve being occupied by filler pieces **106**.

The force required for a piece of tramp iron or the like to press the stripper bar **66** outwardly depends on the number of spring bars **81** used and also on the proximity of the toggle links **82** and **83** to alignment. Hence, minor variations in the seating force applied to stripper bar **66** may be made by adjusting the length of composite links **83**, the position of stop **92** preferably being changed accordingly. It is usual, however, for the stop **92** to be slightly spaced below the toggle link **83** so as to ensure firm seating of the stripper bar **66** on the shims **86**.

As the toggle linkage collapses, its mechanical advantage decreases rapidly, more than offsetting the increasing spring tension, at least in the initial part of the stroke which is all that usually occurs. It is desirable for the stripper bar to move back relatively easily once it has started, and it is especially desirable for it not to increase its opposition to movement, as this would necessitate setting the initial tension lower than the optimum or would fail to give the degree of protection desired.

To limit the outward movement of the stripper bar, one or more stops **108** may be provided, these stops preferably being adjustable to permit as much movement as is safe. They should protect spring bars **81** against being twisted far enough to acquire a set.

A seal plate **109** is preferably provided in conjunction with the stripper bar to seal the opening in guide **67** against the passage of flying dust therethrough. The plate **109** may be secured to the stripper bar carrier **69** and may slide in guideways **111**.

The discharge passage behind grid **14**, stripper bar **66** and grating **112** is preferably wide and unobstructed, as shown. The various demarcations shown therein in Fig. 2 are all as shallow as the thickness of liner plates **48**, so that even clay is not likely to accumulate and clog.

As stripper head **68** wears, it may be turned over for longer life.

Other features of the invention are fully described in the parent application Ser. No. 201,364, and the disclosure thereof whereby incorporated herein by reference.

We claim:

1. A rock breaker including a rotary hammer for breaking rock fed to the hammer, a stripper bar normally stationary close to the circle of movement of the hammer, and means for yieldably holding the stripper bar in that position including means engaging the stripper bar adjacent its ends at opposite sides of the breaker and restricting each end of the stripper bar to movement matched by movement of the other end of the stripper bar, namely, two pairs of toggle links, of which a first link of each pair is attached at one end to the stripper bar and at the other end to the second link of the pair, a rotatably-mounted member to which each of the other links is firmly secured to rotate about a common axis, spring means for urging said rotary member in a direction to thrust the stripper bar to said position by moving the pairs of toggle links toward alignment, and means for restricting the movement of the parts to bring the stripper bar to rest before the toggle links reach alignment.

2. A rock breaker including a rotary hammer for breaking rock fed to the hammer, a stripper bar normally stationary close to the circle of movement of the hammer, and means for yieldably holding the stripper bar in that position including means engaging the stripper bar adjacent its ends at opposite sides of the breaker and restricting each end of the stripper bar to movement matched by movement of the other end of the stripper

bar, namely, two pairs of toggle links, of which a first link of each pair is attached at one end to the stripper bar and at the other end to the second link of the pair, a rotatably-mounted member to which each of the other links is firmly secured to rotate about a common axis, spring means for urging said rotary member in a direction to thrust the stripper bar to said position by moving the pairs of toggle links toward alignment, and means for restricting the movement of the parts to bring the stripper bar to rest before the toggle links reach alignment, including a seat against which said stripper is pressed.

3. A rock breaker including a rotary hammer for breaking rock fed to the hammer, a stripper bar normally stationary close to the circle of movement of the hammer, and means for yieldably holding the stripper bar in that position including means engaging the stripper bar adjacent its ends at opposite sides of the breaker and restricting each end of the stripper bar to movement matched by movement of the other end of the stripper bar, namely, two pairs of toggle links, of which a first link of each pair is attached at one end to the stripper bar and at the other end to the second link of the pair, a rotatably-mounted member to which each of the other links is firmly secured to rotate about a common axis, spring means for urging said rotary member in a direction to thrust the stripper bar to said position by moving the pairs of toggle links toward alignment, and means for restricting the movement of the parts to bring the stripper bar to rest slightly before the toggle links reach alignment.

4. A rock breaker including a rotary hammer for breaking rock fed to the hammer, a stripper bar normally stationary close to the circle of movement of the hammer, and means for yieldably holding the stripper bar in that position including two pairs of toggle links, of which the first links of each pair are attached at one end of each to opposite ends of the stripper bar and at the other end of each to the second link of the pair, a rotatably-mounted tube on which said second links are secured, a plurality of bars of spring steel extending through said tube, and anchored to the tube at one end, a torison plate to which the other ends of the bars are anchored, and means for twisting said torsion plate to load said spring bars.

5. A rock breaker including a driven rock-breaking member, an opposing member against which rock may be crushed by the driven member and means for yieldably holding the opposing member including two pairs of toggle links with the first link of each pair connecting opposite ends of the opposing member to the second links respectively, a rotatably-mounted tube on which said second links are secured, a plurality of bars of spring steel extending through said tube, and anchored to the tube at one end, a torsion plate to which the other ends of the bars are anchored, and means for twisting said torsion plate to load said spring bars.

6. A rock breaker including a driven rock-breaking member, an opposing member against which rock may be crushed by the driven member and means for yieldably holding the opposing member including two pairs of toggle links with the first link of each pair independent of the other first link and these first links connecting opposite ends of the opposing member to the second links respectively, a rotatably-mounted member to which each of the second links is firmly secured to rotate about a common axis, spring means for urging said rotary member in a direction to thrust the opposing member to its normal position by moving the pairs of toggle links toward alignment, and means for restricting the movement of the parts to bring the stripper bar to rest slightly before the toggle links reach alignment.

References Cited in the file of this patent

UNITED STATES PATENTS

198,561	Blake	Dec. 25, 1877
702,889	Steckel	June 17, 1902
740,215	Bartholow	Sept. 29, 1903
1,125,137	Liggett	Jan. 19, 1915
2,375,370	Krider	May 8, 1945
2,597,635	Grisdale	May 20, 1952