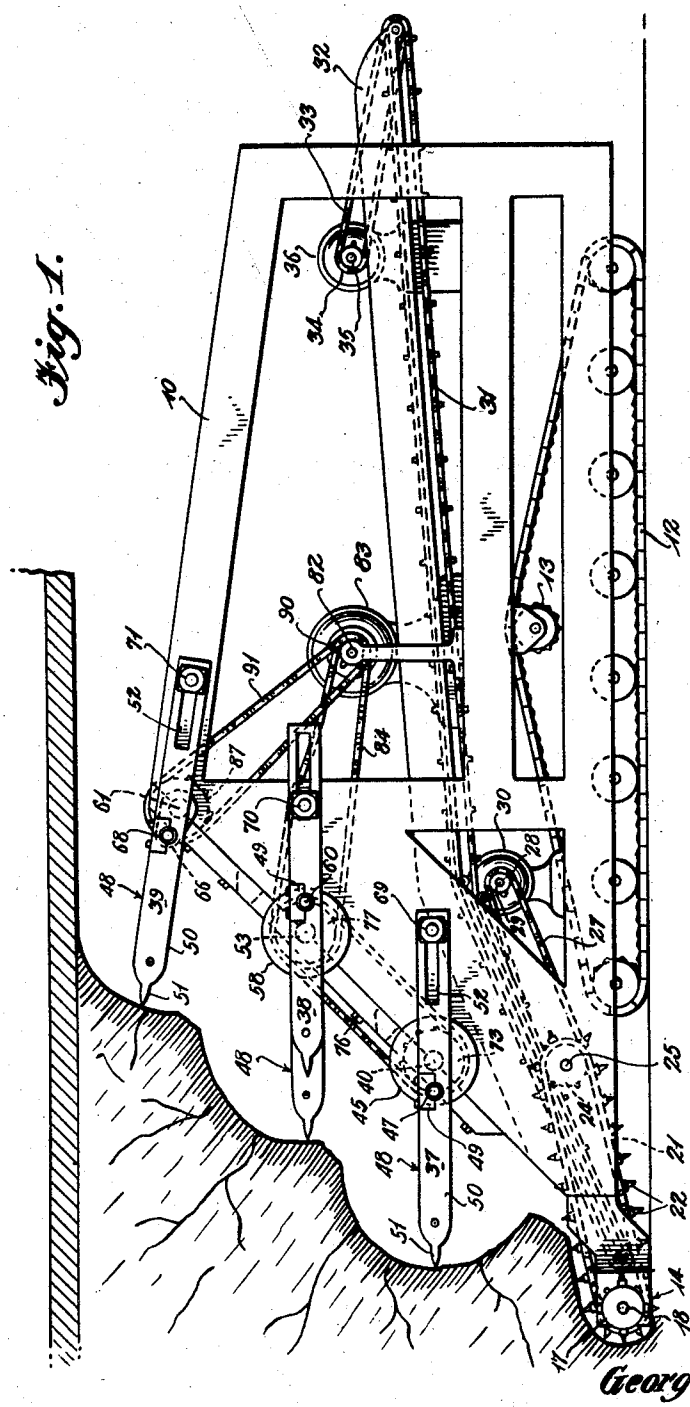
July 15, 1947. G. A. MERCHANT 2,424,180

APPARATUS FOR MINING COAL OR SIMILAR MINERAL

Filed July 11, 1944 5 Sheets-Sheet 1

Fig. 1.



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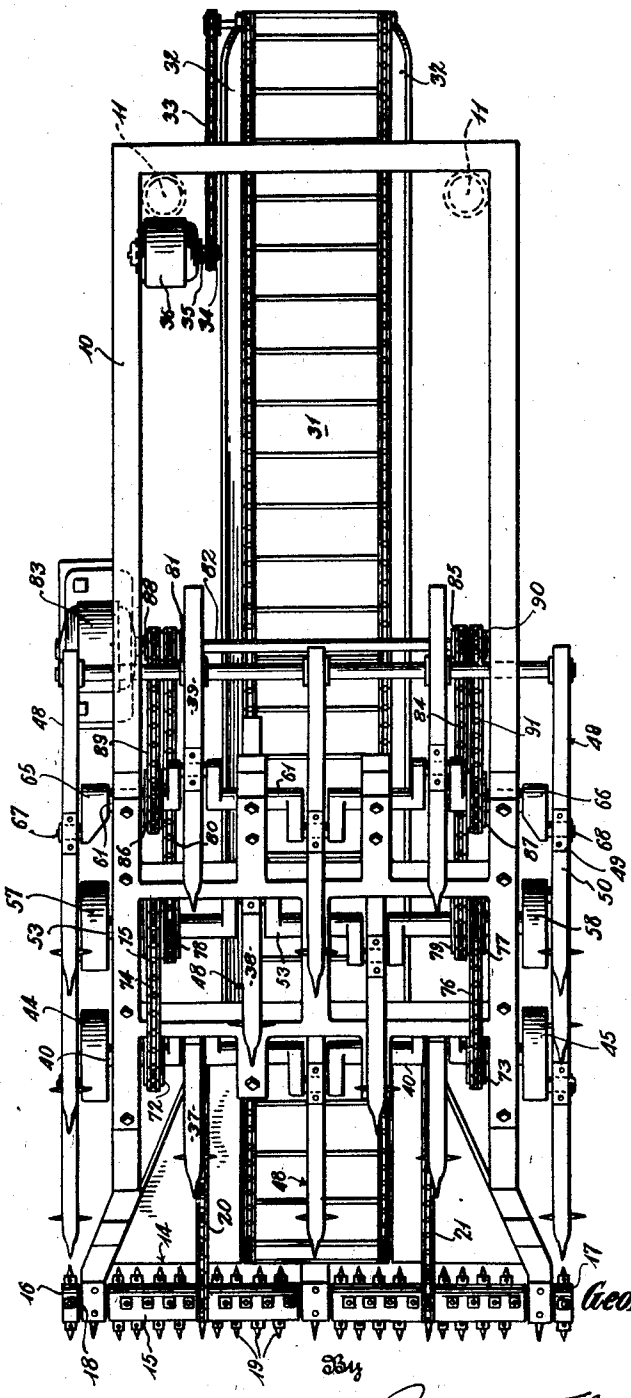
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APPARATUS FOR MINING COAL OR SIMILAR MINERAL

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Fig. 2.



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APPARATUS FOR MINING COAL OR SIMILAR MINERAL

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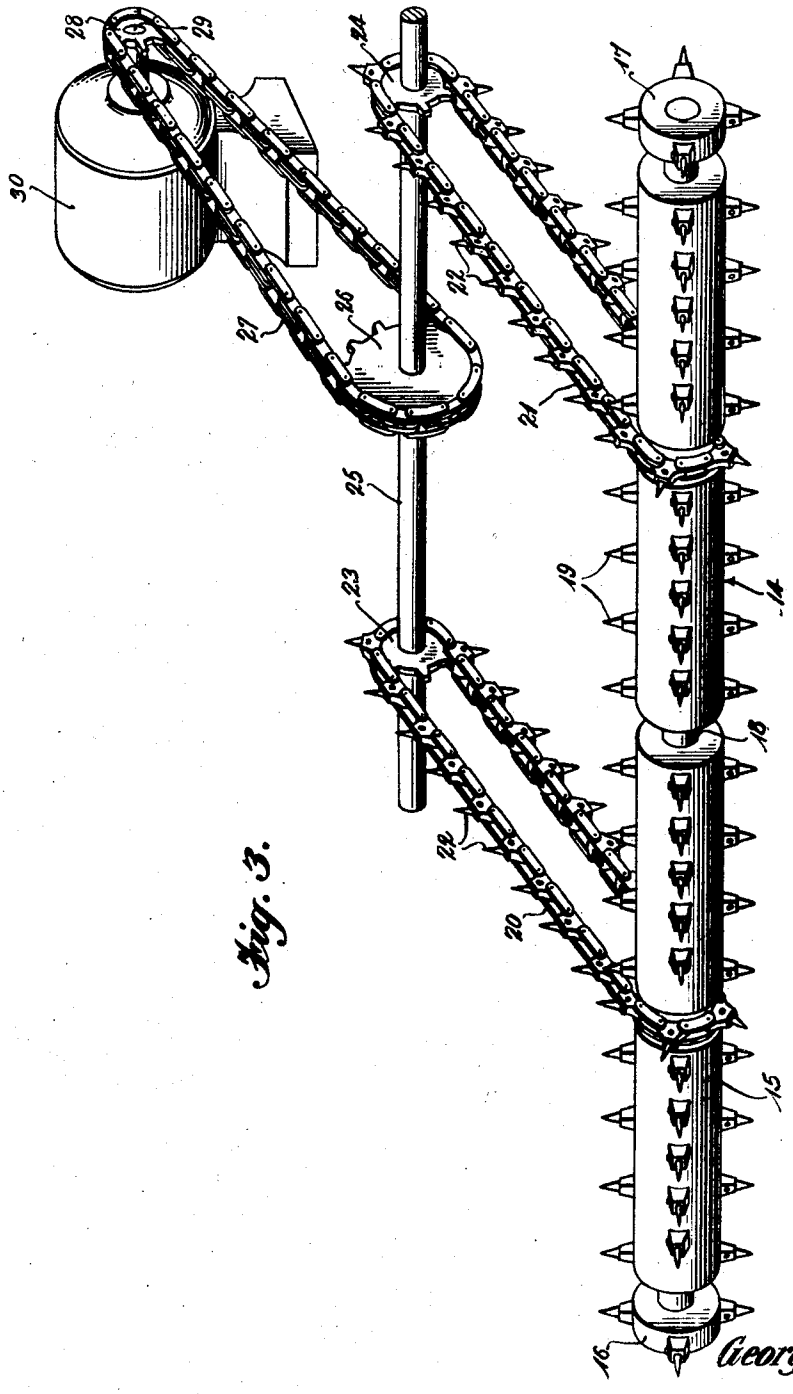


Fig. 3.

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APPARATUS FOR MINING COAL OR SIMILAR MINERAL

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Fig. 4.

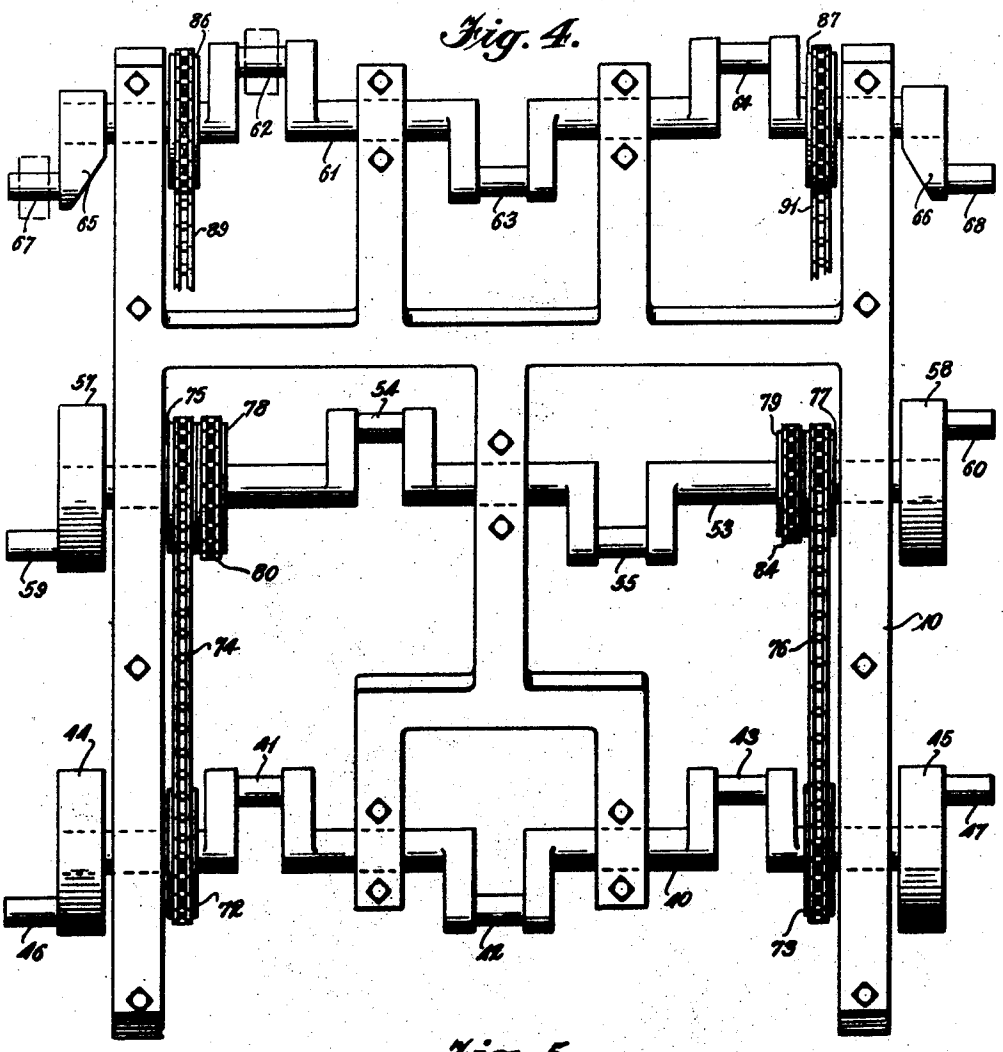
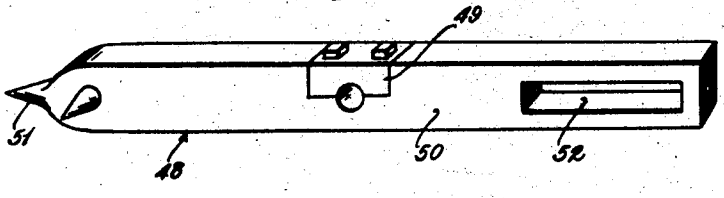


Fig. 5.



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APPARATUS FOR MINING COAL OR SIMILAR MINERAL

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Fig. 6.

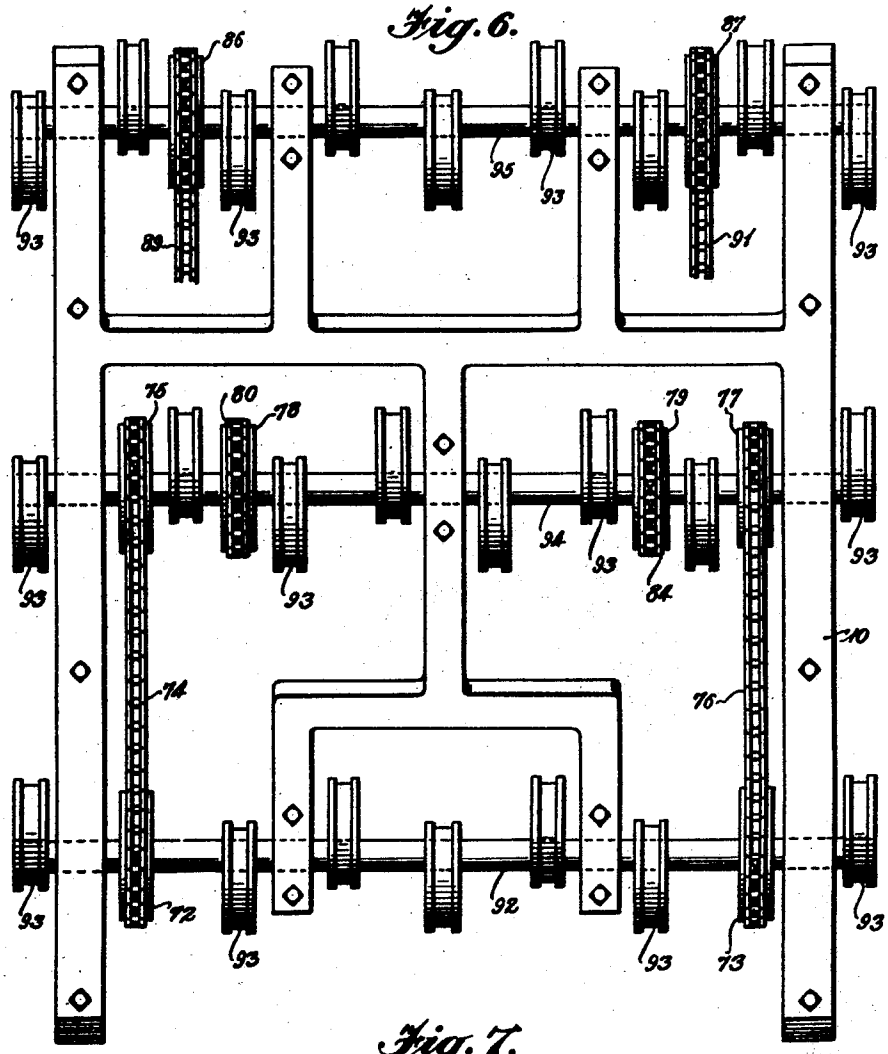
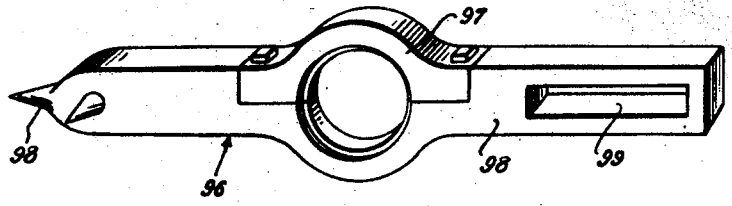


Fig. 7.



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UNITED STATES PATENT OFFICE

2,424,180

APPARATUS FOR MINING COAL OR SIMILAR MINERAL

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Application July 11, 1944, Serial No. 544,426

14 Claims. (Cl. 262—9)

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This invention relates to an apparatus for mining coal or similar mineral. More particularly it has to do with the mining of coal or similar mineral which is found in strata or veins of such nature as to permit it to be mined by either of the conventional methods of mining known as entry, long-wall, short-wall, room systems of mining. In all of such systems the floor of the strata or vein from which coal or similar mineral is to be mined is substantially flat, and entry to such strata or veins is made through an opening at the rear thereof.

The mining of coal or similar mineral from strata or veins in which the floor is substantially flat, as commonly practiced, consists in forming an undercut at the juncture point of the breast and the floor of the vein to sever or fracture the cleavage between the bed rock of the floor and the coal or mineral to be mined by means of an undercutter chain or like means, drilling a plurality of holes at suitably spaced points in the face of the breast, filling each hole with a charge of explosives, and setting off such charges.

In the mining of coal or similar mineral employing explosives, it is not possible to dislodge the coal or mineral from the entire area of the breast or face by blasting without causing some damage to the roof and the lateral ribs. Thus it is continually necessary to reinforce the roof by means of upright timbers and collars so as to protect the workmen from injury or fatality due to the falling pieces or sections of the roof.

Accordingly, an object of the present invention is to provide an apparatus for room and like systems of mining whereby the coal or similar mineral is mined without blasting.

Another object of the present invention is to provide an apparatus for room and like systems of mining which is capable of performing all of the operations incident to such mining without the use of explosives.

A further object of the present invention is to provide an apparatus for room and like systems of mining whereby the coal or similar mineral is mined in a simple and commercially feasible manner without the use of explosives.

Other objects and advantages will be apparent as the invention is described in greater detail in connection with the accompanying drawings wherein:

Figure 1 is a side elevational view of the apparatus according to the present invention in operative position in a coal or mineral vein of the type suitable for room or like systems of mining.

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Figure 2 is a plan view of the apparatus shown in Figure 1.

Figure 3 is an enlarged perspective view of the burr undercutter and the operating mechanism therefor.

Figure 4 is an enlarged plan view of the crank shafts, with the picks removed, and the operating mechanism therefor.

Figure 5 is an enlarged perspective view of a pick of the type shown in the apparatus of Figure 1.

Figure 6 is an enlarged plan view of a modification of the crank shafts of Figure 4, such view showing shafts having cams thereon, with the picks removed, and the operating mechanism therefor.

Figure 7 is an enlarged perspective view of a modification of the pick shown in Figure 5, such view showing a pick of the type employed with the shafts having cams thereon as shown in Figure 6.

Referring to Figures 1 and 2 of the drawings, the numeral 10 designates a frame which is mounted upon hydraulic jacks 11 carried by a caterpillar tread tractor 12, said tractor being propelled by a reversible motor, not shown, through the medium of side prockets 13. As the tractor forms no part of the invention, detailed description thereof is not necessary. The jacks 11 are so positioned on the tractor 12 that each of the four corners of the frame 10 is supported on a single jack. Although four of such jacks are employed, only two are shown in Figure 2. The frame as clearly shown in Figure 1 is of the type such that it sides are positioned outside the caterpillar tread of the tractor and extend downwardly to a point slightly above the surface engaging portion of said treads.

Protruding from the front end of the frame 10 is an undercutter in the form of a burr cutter 14 which is rotatable about a horizontal axis. Such burr cutter, Figure 3, comprises a cylindrical member or tube 15 mounted in bearings 16, 17, and 18. Disposed at suitably spaced points about the outer peripheral surface of the tube 15 and detachably supported thereon are bits 19. Projecting from the front portion of the peripheral surface of each of the bearings 16, 17, and 18, which are stationary, at suitably spaced points, are also bits 19, such bits being likewise detachably supported thereon. Journaled on the tube 15 is a sprocket chain 20 and a sprocket chain 21, each of said chains being provided with cutter bits 22. Chain 20 is in engagement with a sprocket 23 while chain 21 is in engage-

ment with a sprocket 24, both of said sprockets being carried by a shaft 25. Fixed on the shaft 25 intermediate the sprockets 23 and 24, is a sprocket 26 which is in engagement with a sprocket chain 27, said chain being driven by a sprocket 28 carried by the shaft 29 of a motor 30.

Mounted adjacent the rotatable burr cutter 14, Figures 1 and 2, is a conveyor 31 for the removal of the coal or mineral, said conveyor being of the drag chain type and extending rearwardly and upwardly to a point beyond the back end of the frame 10. On each side of the conveyor 31 are side plates 32 for the retention of the mined coal or mineral thereon, said conveyor being driven by a chain 33 by means of a sprocket 34 carried by the shaft 35 of a motor 36.

Disposed at the forward end of the frame 10, Figures 1 and 2, is a breaking down mechanism embodying three series of picks, each series being arranged in a horizontal plane spaced from each other above and to the rear of the rotatable burr cutter 14. The lowest series of picks is designated by the numeral 37, the middle series of picks, by the numeral 38, and the highest series of picks, by the numeral 39. It is to be noted that the mounting of these series of picks is such that the highest series is farthest removed and the lowest series nearest removed from the burr cutter, while the middle series is closer than the highest series but farther than the lowest series removed from the burr cutter 14.

The lowest series 37, Figures 2, 4, and 5, comprise a rotatable crank shaft 40 mounted in the front portion of the frame 10 at a point spaced above and slightly to the rear of the burr cutter 14, said shaft intermediate the sides of the frame 10 having crank portions 41, 42, and 43. Mounted on each end of the shaft 40 at a point without the sides of the frame 10 are flywheels 44 and 45, both of such flywheels being provided with pins 46 and 47 respectively. Rotatably mounted on the pin 46 of the flywheel 44 and the pin 47 of the flywheel 45, and on each of the crank portions 41, 42, and 43, is a pick 48, Figure 5, such mounting being effected through the medium of a split bearing 49 in the body portion 50 of the pick 48. As clearly shown in Figure 5, the bearing 49 is positioned at a point adjacent the center of the body portion 50 of the pick, and protruding from the front end of said body portion is cutter point 51, the cutter point being of the type such that extends from the front and side. The body portion 50 is also provided with an elongated slot 52 which extends forwardly from the end opposite the cutter point 51.

The middle series 38, Figures 4 and 5, comprise a rotatable crank shaft 53 mounted on the front portion of the frame 10, Figures 1 and 2, at a point spaced above and slightly to the rear of the crank shaft 40 of the lowest series 37, said shaft intermediate the sides of the frame 10 having crank portions 54 and 55. Mounted on each end of the shaft 53 at a point without the sides of the frame 10 are flywheels 57 and 58, both of said flywheels being provided with pins 59 and 60 respectively. Rotatably mounted on each of the pins 59 and 60 of the flywheels 57 and 58, and on each of the crank portions 54 and 55 is a pick 48 as previously described in connection with the lowest series 37.

The highest series 39, Figures 4 and 5, comprise a rotatable crank shaft 61 mounted on the front portion of the frame 10, Figures 1 and 2, at a point spaced above and slightly to the rear

of the crank shaft 53 of the middle series 38, said shaft intermediate the sides of the frame 10 having crank portions 62, 63, and 64. Journaled on each end of the shaft 61 at a point without the sides of the frame 10 are cranks 65 and 66. Rotatably mounted on the crank pin 67 of the crank 65 and on the crank pin 68 of the crank 66, and on each of the crank portions 62, 63, and 64, is a pick 48 as previously described in connection with the lowest series 37.

The mounting of the picks on the flywheels 44 and 45 of the lowest series 37 and on the flywheels 57 and 58 of the middle series 38 is for the purpose of insuring smooth operation, while the mounting of the picks on the crank pins 67 and 68 of the cranks 65 and 66, respectively, permits sufficient head room for movement of the apparatus when the cranks 65 and 66 are in horizontal position.

Positioned contiguous to the crank shaft 40, of the lowest series 37, Figure 1, is a fixed countershaft 69 which extends through the slot 52 of each of the picks 48 carried by said shaft 40. Disposed adjacent to the crank shaft 53 of the middle series 38, and to the crank shaft 61 of the highest series 39, and extending through the slot 52 of each of the picks 48 carried by said shafts 53 and 61 are fixed countershafts 70 and 71, respectively.

Rotatably mounted on the crank shaft 40, Figures 1, 2, and 4, at a point adjacent each of the sides of the frame 10 are sprockets 72 and 73. Sprocket 72 is in engagement with a sprocket chain 74, said chain being driven by a sprocket 75 carried by the crank shaft 53. The sprocket 73 is in engagement with a sprocket chain 76 which is driven by a sprocket 77 also carried by crank shaft 53. Journaled on the crank shaft 53 at a point adjacent to each of the sprockets 75 and 77 are sprockets 78 and 79, respectively. Sprocket 78 is in engagement with a sprocket chain 80 which is driven by a sprocket 81 carried by a shaft 82 of a motor 83. The sprocket 79 is in engagement with a sprocket chain 84, said chain being driven by a sprocket 85 carried by the motor shaft 82 of the motor 83. The crank shaft 61 also carries sprockets 86 and 87, the sprocket 86 being driven by a sprocket 88 carried by the motor shaft 82 through the medium of a sprocket chain 89. The sprocket 87 is likewise driven by a corresponding sprocket 90 carried by the motor shaft 82, through the medium of a sprocket chain 91.

In place of the breaking down mechanism embodying three series of picks having the picks mounted on crank shafts as above described, the picks of the respective series may be mounted on cams carried by each of three straight shafts as shown in Figure 6. In this modification the lowest series 37 comprise a rotatable shaft 92 on which are mounted intermediate the sides of the frame 10 several cams, suitably spaced from each other and all designated by the same numeral 93. The middle series 38 and the highest series 39 include rotatable shafts 94 and 95 respectively, on each of which are mounted a number of cams designated by the numeral 93. As shown in Figure 6, there are five of such cams on shaft 92, six on shaft 94, and seven on shaft 95. Mounted on both ends of each of the shafts 92, 94, and 95, at a point without the sides of the frame are also cams 93. On each of the cams 93 is mounted a pick 96, Figure 7, the mounting being effected through the medium of a split bearing 97 in the body portion 98 of the pick 96. As will be ap-

parent from Figure 7, the bearing is of a shape such as to conform with that of the cam **93** and is positioned substantially in the center of the body portion **98** of the pick. Protruding from the front end of the body portion is a cutter point **98** of the same type as that of the pick shown in Figure 5, the body portion being provided with an elongated slot **99** which is substantially the same as that of the slot in the pick shown in the latter named figure. The respective shafts **92**, **94**, and **95** are driven by the same chain and sprocket mechanism above described in connection with the crank shafts of the form shown in Figure 4. For a full understanding of the driving mechanism of these cam carrying shafts no explanation other than the application of the same reference numerals to the sprocket and chain mechanism shown in Figure 6, as used in designating such mechanism in Figure 4, is necessary.

In operation of the apparatus according to the present invention, the operator actuates the reversible motor of the caterpillar tread tractor **12** so as to drive the tractor forwardly toward the face of the breast of coal or mineral. Upon actuation of such motor the tractor is caused to move forward through the medium of sprockets **13**. As the apparatus travels forwardly toward the breast, the operator actuates the motor **36**, thus driving the drag conveyor **31** through the medium of the chain **33**, sprocket **34**, and shaft **35**.

When the apparatus has travelled to a point such that the burr cutter **14** is about to contact the face of the breast, the operator then actuates the motor **30**. The actuation of the motor **30** causes the burr cutter **14** to rotate in a clockwise direction. The rotation of the burr cutter causes such cutter to attack the coal or mineral in the face of the breast adjacent the juncture point of the breast and the floor of the room. As the apparatus moves forward the burr cutter likewise advances into the breast until an undercut is formed in the base of the breast. The cuttings of the coal or mineral resulting from the action of the burr cutter are deposited upon the drag conveyor **31**, and are carried by such conveyor to a point in the rear of the apparatus where the coal or mineral is discharged therefrom into a car not shown.

As soon as the burr cutter **14** has advanced into the face of the breast to a point such that the picks in the lowest series **37** are about to contact the face of the breast in a horizontal plane spaced above the thus formed undercut, the operator actuates the motor **83**. The actuation of the motor **83** causes the crank shafts **40**, **53**, and **61** of the three series of picks **37**, **38**, and **39**, respectively to rotate. The rotation of the crank shafts imparts a rotary crank drive movement to the picks **48**, thereby causing the front ends of the picks to travel forwardly and downwardly in an elliptical path in contact with the face of the breast of the coal or mineral and then backwardly and upwardly in an elliptical path away from the face of the breast. It will be apparent that the picks are arranged in spaced and aligned relation, and that as several of the picks of each series travel forwardly and downwardly in an elliptical path into contact with the face of the breast the other picks of each series are travelling backwardly and upwardly in an elliptical path away from the face of the breast. This contacting of the face of the breast with the picks of the lowest series **37** results in the breaking down of the coal

or mineral intermediate the undercut and the horizontal plane at which the picks of said series contact the face of the breast. This breaking down of the coal or mineral by the picks of the lowest series **37** continues until the apparatus has advanced into the breast where the picks of the middle series **38** begin to contact the face of the breast, whereupon the picks of the latter series break away and dislodge the coal or mineral below the horizontal plane at which the picks of the middle series contact the face of the breast. This continues until the picks of the highest series **39** contact the face of the breast and break away the coal or mineral below their horizontal plane of contact. The coal or mineral thus mined falls down and collects upon the drag conveyor **31**, and is conveyed by such conveyor to the rear of the apparatus and discharged therefrom.

For coal or mineral to be mined having characteristics such as to require that the picks of three series be spaced closer together, then the picks of said series should be mounted on the cams carried by the shafts **92**, **94**, and **95** as shown in Figure 6. In the latter case, the rotation of the shafts **92**, **94**, and **95** imparts a rotary eccentric drive movement to the picks **96**, thereby causing the front ends of the picks to travel forwardly and downwardly in an elliptical path in contact with the face of the breast of coal or mineral and then backwardly and upwardly in an elliptical path away from the face of the breast. This rotary eccentric drive movement causes the picks to travel into and out of contact with the face of the breast in the same manner as hereinabove described in connection with the rotary crank drive movement.

The apparatus thus described embodies a self-contained unit which undercuts, breaks down and loads the coal while moving slowly into the face of the breast of coal or mineral. Also, all of the mining and conveying elements of the apparatus are mounted on a steel frame having its top sloping backwardly with each series of picks breaking away and dislodging the coal or mineral which has been undercut by either the burr cutter or the preceding series of picks. As the mining apparatus in its entirety is mounted on hydraulic jacks positioned at four points in the caterpillar tread tractor it may be raised, lowered, leveled or tilted as conditions warrant.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. Apparatus for mining coal or similar mineral comprising an undercutter embodying a burr cutter rotatable about a horizontal axis for forming an undercut in the base of the breast, and a break down mechanism including a plurality of picks arranged in spaced series substantially parallel to said undercutter, said series being disposed consecutively rearwardly of and above said undercutter, and said picks being mounted for individual movement so that some of said picks travel forwardly and downwardly in an elliptical path into contact with the face of the breast of coal or mineral as other of said picks travel backwardly and upwardly in an elliptical path away from the face of the breast to thereby break away and dislodge the coal or mineral from the face of the breast in a manner such that the material falls freely from the face of the breast.

2. Apparatus for mining coal or similar mineral comprising an undercutter embodying a burr cutter rotatable about a horizontal axis for forming

an undercut in the base of the breast, and a break down mechanism including a plurality of series of picks arranged in different horizontal planes above said undercutter, each of said series comprising a plurality of picks arranged in spaced and aligned relation and mounted for movement so that some of said picks travel forwardly and downwardly in an elliptical path into contact with the face of the breast of coal or mineral as other of said picks travel backwardly and upwardly in an elliptical path away from the face of the breast to thereby break away and dislodge the coal or mineral from the face of the breast in the area surrounding and below the horizontal plane at which said picks are arranged.

3. Apparatus for mining coal or similar mineral comprising a break down mechanism including a plurality of series of picks arranged in different horizontal planes above and spaced from each other, each of said series comprising a plurality of picks arranged in spaced and aligned relation and mounted for movement so that some of said picks travel forwardly and downwardly in an elliptical path into contact with the face of the breast of coal or mineral as other of said picks travel backwardly and upwardly in an elliptical path away from the face of the breast to thereby break away and dislodge the coal or mineral from the face of the breast in the area surrounding and below the horizontal plane at which said picks of each series are arranged.

4. Apparatus for mining coal or similar mineral comprising a break down mechanism including a plurality of rotatable crankshafts arranged in different horizontal planes above and spaced from each other, a pick mounted on the crank portion of each of said shafts, and means for simultaneously rotating all of said shafts to thereby cause some of the picks on each shaft to travel forwardly and downwardly in an elliptical path into contact with the face of the breast of coal or mineral as other of said picks on each of said shafts travel backwardly and upwardly in an elliptical path away from the face of the breast.

5. Apparatus for mining coal or similar mineral comprising a break down mechanism including a plurality of rotatable shafts arranged in different horizontal planes above and spaced from each other, each shaft having a plurality of cams mounted thereon in angularly spaced relation, a pick mounted on the cam of each of said shafts, and means for simultaneously rotating all of said shafts to thereby cause some of the picks on each shaft to travel forwardly and downwardly in an elliptical path into contact with the face of the breast of coal or mineral as other of said picks on each of said shafts travel backwardly and upwardly in an elliptical path away from the face of the breast.

6. Apparatus for mining coal or similar mineral comprising an undercutter embodying a cylindrical member rotatable about a horizontal axis, cutter bits arranged in spaced and aligned relation about the outer peripheral surface of said member and protruding therefrom, means for rotating said member to thereby cause the cylindrical member to form an undercut in the breast at the juncture point of the floor of the vein and the breast, a break down mechanism in association with said undercutter including a series of picks arranged in different horizontal planes above and to the rear of said undercutter and spaced from each other, each of said series

comprising a plurality of picks arranged in spaced and aligned relation and mounted for movement so that some of said picks travel forwardly and downwardly in an elliptical path into contact with the face of the breast of coal or mineral as other of said picks travel backwardly and upwardly in an elliptical path away from the face of the breast to thereby break away and dislodge the coal or mineral from the face of the breast in the area surrounding and below the horizontal plane at which said picks of each series are arranged.

7. Apparatus for mining coal or similar mineral comprising an undercutter embodying a cylindrical member rotatable about a horizontal axis, cutter bits arranged in spaced and aligned relation about the outer peripheral surface of said member and protruding therefrom, means for rotating said member to thereby cause the cylindrical member to form an undercut in the breast at the juncture point of the floor of the vein and the breast, a break down mechanism in association with said undercutter including a plurality of rotatable crankshafts arranged in different horizontal planes above and to the rear of said undercutter and spaced from each other, a pick mounted on the crank portion of each of said shafts, and means for simultaneously rotating all of said shafts to thereby cause some of the picks on each shaft to travel forwardly and downwardly in an elliptical path into contact with the face of the breast of coal or mineral as other of said picks on each of said shafts travel backwardly and upwardly in an elliptical path away from the face of the breast.

8. Apparatus for mining coal or similar mineral comprising an undercutter embodying a cylindrical member rotatable about a horizontal axis, cutter bits arranged in spaced and aligned relation about the outer peripheral surface of said member and protruding therefrom, means for rotating said member to thereby cause the cylindrical member to form an undercut in the breast at the juncture point of the floor of the vein and the breast, a break down mechanism in association with said undercutter including a plurality of rotatable shafts arranged in different horizontal planes above and to the rear of said undercutter and spaced from each other, each shaft having a plurality of cams mounted thereon in spaced relation, a pick mounted on the cam of each of said shafts, and means for simultaneously rotating all of said shafts to thereby cause some of the picks on each shaft to travel forwardly and downwardly in an elliptical path into contact with the face of the breast of coal or mineral as other of said picks on each of said shafts travel backwardly and upwardly in an elliptical path away from the face of the breast.

9. Apparatus for mining coal or similar mineral comprising a rotatable undercutter mounted on a horizontal axis in the lower forward end portion of the apparatus for forming an undercut in the breast of coal, and a break-down mechanism above and rearwardly of said undercutter, said break-down mechanism comprising a crank shaft rotatably mounted in a substantially horizontal plane and in substantial parallelism with the axis of said undercutter, a fixed shaft to the rear of and in the same plane with said crankshaft and in substantial parallelism therewith, a pick member slidingly and pivotally mounted on said fixed shaft transversely thereof and extending forwardly therefrom across said crankshaft

with a journal mounting on a crank portion of said crankshaft, said pick member having a pick functioning end portion forwardly of said crankshaft, and means for rotating said crankshaft, whereby rotation of said crankshaft causes said pick end of said pick member to travel in an elliptical path in a substantially vertical plane forwardly and downwardly from a point above to a point below said horizontal plane in which said crankshaft and said fixed shaft are mounted for operation of said pick end of said pick member on the face of the breast of coal in said portion of said path of travel of said pick end and then backwardly and upwardly in said path away from the face of the breast of coal to said first mentioned point of travel of said pick end of said pick member in recurring cycles to thereby break away or dislodge the coal from the face of the breast in the area above, at the level of, and below said horizontal plane.

10. Apparatus for mining coal or similar mineral comprising a break-down mechanism including a rotatable crankshaft, a fixed shaft spaced rearwardly from and in parallelism with said crankshaft, a plurality of pick members journal mounted on separate crank portions of said crankshaft and extending rearwardly therefrom into pivotal and sliding engagement with said fixed shaft transversely thereof, each of said pick members also extending forwardly from said crank shaft to a pick functioning end portion, and means for rotating said crank shaft, whereby rotation of said crank shaft causes each of said pick ends of each of said pick members to travel in an elliptical path in a plane transverse to said crank shaft and said fixed shaft and from a point on one side to a point on the opposite side of the plane passing through said shafts for operation of said pick ends of said pick members on the face of the breast of coal throughout said portion of said elliptical path of travel of said pick end.

11. An apparatus as defined in claim 10 and further characterized by adjacent pick members being arranged in angularly spaced relation on said crank shaft whereby rotation of said crank shaft causes the pick end of one of said pick members to travel in said portion of its said elliptical path in operative engagement with the breast of coal while the pick end of the adjacent pick member is travelling in said portion of its said elliptical path out of pick functioning contact with the face of the breast of coal.

12. Apparatus for mining coal or similar mineral comprising a break-down mechanism including a rotatable shaft having a plurality of cams arranged in spaced relation thereon, a fixed shaft parallel to and spaced rearwardly from said cam shaft, a pick member journal mounted on each of said cams and extending rearwardly therefrom into pivotal and sliding engagement with said fixed shaft transversely thereof, each of said pick members also extending forwardly of said cam shaft to a pick functioning end portion, and means for rotating said cam shaft to thereby cause the said pick end of each of said pick members to travel in an elliptical path in a plane transverse to said shafts and from a point on one side to a point on the opposite side of the plane passing through said shafts for operation of said pick ends of said pick members on the face of the breast of coal throughout said portion of said elliptical paths of travel of said pick members and then travel of each of said pick members out of contact with the face of the breast of coal to said first mentioned point in the path of travel of said pick ends of said pick members, to thereby break away or dislodge the coal from the face of the breast in the area of said operation of said pick ends on the face of the breast of coal.

13. An apparatus as defined in claim 11 and further characterized by adjacent cams being arranged in angularly spaced relation on said cam shaft whereby rotation of said cam shaft causes the pick end of one of said pick members to travel in said portion of its said elliptical path in operative engagement with the breast of coal while the pick end of the adjacent pick member is travelling in said portion of its said elliptical path out of contact with the face of the breast of coal.

14. Apparatus for mining coal or similar mineral comprising a break-down mechanism including a plurality of movable elongated pick members each having a pick-functioning forward end portion, mounting and operating means for said plurality of pick members disposing them in spaced and aligned arrangement and in a substantially horizontal plane in one position of their movements, said means being operable to produce individual oscillating and sliding movements of each of said pick members bodily on a fixed axis in said horizontal plane causing its said pick end to travel in an elliptical path in a substantially vertical plane forwardly and downwardly from a point above to a point below said horizontal plane for operation of said pick end of said pick member on the face of the breast of coal in said portion of said path and then backwardly and upwardly in said path away from the face of the breast of coal to said first-mentioned point of travel of said pick end of said pick member in recurring cycles, to thereby break away or dislodge the coal or other similar mineral from the face of the breast of coal in areas above and below and at the level of said horizontal plane, said mounting and operating means being also such as to dispose the pick ends of adjacent pick members in angular relation in their said cycles of movement whereby as the pick end of one of said pick members travels forwardly and downwardly for operation on the face of the breast of coal the pick end of an adjacent pick member travels backwardly and upwardly away from the face of the breast of coal.

GEORGE A. MERCHANT.

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117,778	Germany	Feb. 18, 1901
616,779	Germany	Aug. 8, 1935
614,452	Germany	June 8, 1935
267,381	Great Britain	Mar. 17, 1927