This invention relates generally to improvements in mining machines of the McKinlay type having a pair of boring arms arranged to cut overlapping contiguous bores in a seam of coal or the like, and more particularly to an improved construction for mounting the idler sprockets which cooperate with the chain cutting the cores left by the action of the overlapping boring arms, so that a substantially rectangular shaped cross section is cut in the seam or vein by the combined action of the boring arms and the cutter chain.

One of the principal objects of the invention is to provide an improved construction for a McKinlay type miner, whereby the corner sprockets mounted at the guides for the upper and lower chain runs may be selectively retracted.

Other objects and important features of the invention will be apparent from a study of the following specification taken in conjunction with the drawings which together show a preferred embodiment of the invention, and what is now considered to be the best mode of practicing the principles thereof. Other embodiments of the invention may be suggested to those having the benefit of the teachings herein, and it is therefore intended that the scope of the invention not be limited by the precise embodiment hereinafter shown, such other embodiments being intended to be reserved particularly as they fall within the scope and purview of the subjoined claims.

In the drawings:
Fig. 1 is a side view of a continuous miner of the McKinlay type having the improvements according to the present invention embodied therein;
Fig. 2 is an enlarged detailed front elevation view taken generally on the line 2--2 of Fig. 1, and looking in the direction of the arrows, showing the upper and lower guides for the cutter chains, end sprockets which are movable with respect to the chain guides, and the means for moving the end sprockets selectively as desired;
Fig. 3 is a partial front elevation view similar to Fig. 2, to a somewhat larger scale, showing the cutter chain guides, and the idler sprockets mounted thereon in retracted position; and
Fig. 4 is a plan view of one of the corner sprockets showing the details of the mechanism for retracting the same, taken generally on the line 4--4 of Fig. 2.

Referring now particularly to Fig. 1 of the drawings, there is shown a mining machine of the McKinlay type which bores a pair of overlapping contiguous bores in a seam of coal or the like. Such a machine includes a main frame 10 mounted on a pair of crawler treads 11 for propelling the machine along a mine floor. An auxiliary frame 13 is mounted on the front end of the main frame 10 and is arranged to be raised or lowered by a pair of lifting jacks 14 on opposite sides of a gear casing 15. The auxiliary frame 13 may also be tilted in a forward or rearward direction by means of a pair of tilting jacks 16.

The gear casing 15 has extending in a forward direction therefrom a pair of laterally spaced power shafts 17 which support boring members 18 arranged to rotate in timed relationship to each other. In Fig. 2 there is shown a pair of one of the boring members 18 and a divided tooth 19a, see Fig. 2, to the rear of the machine. The general arrangement of parts thus far described is substantially as described in our co-pending application, Serial No. 410,348, filed February 15, 1954, now Patent No. 2,711,890, dated June 28, 1955, for Improvements in Adjustable Corner Sprocket Linkage for Multiple Boring Mining Machine, and so such a machine need not be more fully described herein excepting as to the features forming part of the present invention.

Referring now particularly to Fig. 2, an endless cutter chain 20 is trained in the usual fashion along the front of upper and lower cutter chain guides 21 and 22 which are disposed in a position to remove the upper and lower cores left by the boring action of the two boring arms 19. A pair of laterally spaced hydraulic cylinders 23 are fixed on the gear housing 15 and have piston rods 24 which are fixed in spaced relationship to the underside of the upper cutter chain guide for adjusting the position of the latter vertically. A similar pair of hydraulic cylinders 25, 26 mounted on the gear housing 15 and provided with piston rods 27 are provided for adjusting the lower cutter chain guide 22 vertically.

The endless cutter chain 20 is suitably driven by a sprocket 27 on a shaft 28 extending from the front of the gear casing 15. The cutter chain 20 is guarded over idler sprockets 30 and 31 on the left and right ends respectively of the upper cutter chain guide 21. The idler sprocket 30, 31 is shown in Figs. 2 and 3. From the left idler sprocket 30 the endless cutter chain 20 is trained over a tensioning idler 32, thence over a guide roller 34 on the gear housing 15, and thence over an idler sprocket 35 at the left end of the lower chain guide 22. After being guided over and past the lower chain guide 22 in the usual fashion over and past the lower chain guide 22, the idler sprocket 30 is trained over an idler sprocket 36 at the right end of the lower cutter chain guide 22, thence beneath a guide roller 37 similar to the previous guide roller 34, and thence to the drive sprocket 27.

Means are also provided for swinging each of the aforesaid idler sprockets individually and selectively with respect to the aforesaid cutter chain guides 21 and 22, so that the operator can readily inspect the condition obtaining at the working face, and can also clear some impediment to operation of the boring arms 18 and the cutter chain 20.

Each of the idler sprockets 30, 31, 35 and 36 is accordingly journaled on the end of a supporting link or rock arm 40 pivoted at its inner end to an extension 41 at the extreme end of the cutter chain guides 21 and 22. When each of the aforesaid sprockets is in a fully extended normal cutting position as seen in Fig. 1, each link 40 extends at an inclined angle to the cutter chain guide 21 or 22, so that the teeth of the corresponding sprockets 30, 31, 35 and 36 are in horizontal alignment with the cutter chain 20 as it passes along the cutter chain guides 21 and 22.

The sprockets 30 and 31 are each arranged to be rocked with respect to the upper chain guide 21 by means of hydraulic cylinders 45, 45. Each of said cylinders has a piston rod 46, and the two piston rods are each pivotally connected as at 48a to the two rock arms 40 at a point intermediate the turning center of the sprockets 30 and
31 and their point of pivotal connection to the aforesaid extension 41 at the extreme end of the cutter bar 21. As seen in Fig. 2, 15, the upward extension 42 which flanks the lifting cylinders 23, each being disposed on the outer side thereof. The downward extensions 42 have extending therefrom a bracket 43 to which the cylinders 45 are each anchored pivotally as at 45a.

The sprockets 35 and 36, which are each hingedly connected to an extension 41 from the lower chain guide 22, are similarly moved from the position shown in Fig. 2 to the position seen in Fig. 3 by means of similar cylinders 45. Cylinder 45 for moving the idler sprocket 35 at the left end of the lower chain guide 22 has a piston rod 46 which is pivotally anchored at 46b at a point intermediate the turning center of the sprocket 35 and the extension 41 of the roller chain guide where the rock arm 49 is hingedly connected. The cylinder 45 for actuating the rock arm 40 for the idler sprocket 35 is anchored hingedly at 45c to a bracket 44 extending from an upward extension 42a from the lower chain guide 22. Similarly, the sprocket 36 is moved on its rock arm 40 by means of a similar cylinder 45 having a piston 46 hingedly connected at 46b to the rock arm 40 for the sprocket 36, the cylinder 45 for the sprocket 36 being connected at 45d to the bracket 44 extending from the upper extension 42a, see also Fig. 3.

The continuous miner disclosed herein is preferably provided with movable deflector means which move into position as the lower sprockets 35 and 36 are moved to the position shown in Fig. 2, so that the material cut by the rotating boring arms 18, 20 may be deflected into the sprocket 19a to the endless flight conveyor 19. Such deflection means forms no part of the present invention but is claimed in an application of Jerome C. Salmon, Ser. No. 408,003, filed February 3, 1934 now Patent No. 2,719,708, dated October 4, 1955 for Improvements in Mining Machines, in view of the other sprockets 35 and 36 at opposite ends of the lower cutter chain guide 22 has two deflector plates 50 and 51 mounted for movement therewith in addition to a pusher plate 52 which is secured to and movable with the lower cutter bar guide 22.

As seen in Figs. 2 and 4, each deflector plate 50 is arranged to swivel at the outer end thereof on the rock arm 40, the center of such swivelling movement corresponding to the center of rotation of sprocket 35 or 36 as the case may be. The deflector plate 50 is mounted to the boring arm 18, 20 so that sprocket 19a extending along the back face thereof. Slot 50a has a T-shaped cross section in which the head of a pin 50b is arranged to slide upon swivelling movement of plate 50. The shank of pin 50b is secured to the front side of the movable pusher plate 52.

As been described, the movable pusher plate 52 overlaps the fixed pusher plate 53, so that as pusher plate 52 moves with respect to fixed pusher plate 53, the swivel plate 50 will also move therewith.

As shown in Fig. 2, the slot 50a is formed on a sinuous curve so as to maintain the deflector plate 50 generally horizontal while the rock arm 40 is being swung to its several positions. The second movable deflector plate 51, which is also movable with the sprockets 35 or 36, has one corner pivotally connected by a pivot 51a to the upper outer corner of its associate plate 50, and has a slot 51b adjacent its opposite end slideable in a vertical slot 51c formed in the fixed pusher plate 53. An L-shaped outer and upper portion 51d of the plate 51 is preferably made of a semi-pliable rubber sheet, such as a piece of rubber conveyor belting, so as to be normally held in the same plane as the main body of said plate, but to be sufficiently flexible so to bend to provide maximum lateral clearance, as for example when it is necessary to pass by an upright mine prop 69 when fully retracted.

The outer edge 53 of the rubber sheet 51d is of generally arcuate shape to correspond with the curved side wall 57 of the plate guide bar 51, so that the lower position for normal cutting, as seen particularly in Fig. 2. It will be understood from the description just had, that the two deflector plates 50 and 51 at each of the machine are extended with the lower sprockets 35 and 36 when the latter are in the normal cutting position, so as to keep the cuttings on the mine floor by the boring members 18 and cutting chain 20 from spreading along opposite sides of the bore, but instead keep the cuttings in position to be swept inwardly by the boring members 18, 19 toward the open throat of the conveyor 19 for removal to the rear of the machine. When the lower cutter bar is raised and the end sprockets 35 and 36 retracted, the plates 50 and 51 are automatically moved into retracted position so as not to interfere with the withdrawal of the cutting devices from the bore.

It is believed that it will be apparent from the description foregoing that all of the sprockets 30, 31, 35 and 36 may be retracted as a group or individually and selectively according to the wishes of the operator. Control means, not shown, are provided for each of the cylinders 45, and by the provision of the individual means for such retraction of the sprockets the movement of the operator of the cutter chain guides it is possible to perform any desired inspection at the working face without affecting the position of the upper and lower chain guides 21 and 22. It is obvious, of course, that the movement of the cutter chain guides 21 and 22 to collapsed position may also be attended with the rocking of the rock arms 40 to the collapsed position as seen in Fig. 3.

The provision of the deflector means previously described with reference to sprockets 35 and 36 also makes it possible to move the deflector means with the lower sprockets for clearance of undesired fragments adjacent the boring arms 18.

While the invention has been described in terms of a preferred embodiment thereof, its scope is not intended to be limited by the precise embodiment herein shown nor otherwise than by the terms of the appended claims.

We claim as our invention:

1. In a mining machine, a main frame; an auxiliary frame supporting a pair of laterally spaced boring arms rotatable upon spaced parallel axes for cutting contiguous bores from a solid seam of material; main jack means between said main and auxiliary frames for adjusting the boring level; each of said boring arms having a cutter chain guided in a horizontal direction and having an endless cutter chain guided thereby for cutting a cusp remaining from the action of said boring arms; an arm hinged to an end of said chain guide; a corner guide mounted on said hinged arm and having said endless chain trained therethrough; means for moving said chain guide up and down including auxiliary jack means acting between said auxiliary frame and said chain guide; and means for moving said hinged arm together with its associated corner guide between operative and inoperative positions without moving the chain guide relative to the auxiliary frame comprising a fluid operator mounted for movement with said chain guide relative to said auxiliary frame; said fluid operator having one end thereof disposed at a point inward of the end of said chain guide, anchoring means for said fluid operator comprising a bracket carried by and extending laterally of said chain guide, said fluid operator being pivotally connected to said bracket at a point spaced laterally of said chain guide; said fluid operator extending in a direction toward the end of said chain guide and being pivotally and directly connected to said hinged arm.

2. In a mining machine, a main frame; an auxiliary frame supporting a pair of laterally spaced boring arms rotatable upon spaced parallel axes for cutting contiguous bores from a solid seam of material; main jack means.
between said main and auxiliary frames for adjusting the boring level of said boring arms; a chain guide extending in a horizontal direction and having an endless cutter chain guided thereby for cutting a cusp remaining from the action of said boring arms; an arm hinged to an end of said chain guide; a corner sprocket mounted at the end of said hinged arm and having said endless chain trained therearound; means for moving said chain guide up and down including auxiliary jack means acting between said auxiliary frame and said chain guide; and means for moving said hinged arm together with its associated sprocket between operative and inoperative positions without moving the chain guide relative to the auxiliary frame comprising a fluid operator mounted for movement with said chain guide relative to said auxiliary frame; said fluid operator having one end thereof disposed at a point inward of the end of said chain guide, anchoring means for said fluid operator comprising a bracket carried by and extending laterally of said chain guide, said fluid operator being pivotally connected to said bracket at a point spaced laterally of said chain guide; said fluid operator extending in a direction toward the end of said chain guide and being pivotally and directly connected to said hinged arm.

3. In a mining machine, a main frame; an auxiliary frame supporting a pair of laterally spaced boring arms rotatable upon spaced parallel axes for cutting contiguous bores from a solid seam of material; main jack means between said main and auxiliary frames for adjusting the boring level of said boring arms; a chain guide extending in a horizontal direction and having an endless cutter chain guided thereby for cutting a cusp remaining from the action of said boring arms; an arm hinged to an end of said chain guide; a corner guide mounted on said hinged arm and having said endless chain trained therearound; means for moving said chain guide up and down including auxiliary jack means acting between said auxiliary frame and said chain guide; and means for moving said hinged arm together with its associated corner sprocket between operative and inoperative positions without moving the chain guide relative to the auxiliary frame comprising a piston and cylinder mounted for movement with said chain guide relative to said auxiliary frame; said piston and cylinder having one end thereof disposed at a point inward of the end of said chain guide, anchoring means for said piston and cylinder comprising a bracket carried by and extending laterally of said chain guide, said piston and cylinder having the said one end pivotally connected to said bracket at a point spaced laterally of said chain guide; said piston and cylinder extending in a direction toward the end of said chain guide and having its other end pivotally and directly connected to said hinged arm.

References Cited in the file of this patent

UNITED STATES PATENTS

2,269,781 Osgood ------------ Jan. 13, 1942
2,374,240 Shankman ------------ Apr. 24, 1945
2,564,038 Stephenson ------------ Aug. 14, 1951
2,705,624 Robbins ------------ Apr. 5, 1955