Sept. 15, 1964 J. R. SIBLEY 3,148,918

MINING APPARATUS HAVING ADJUSTABLE BORING HEAD

Filed May 18, 1961 5 Sheets-Sheet 1

FIG. 1.

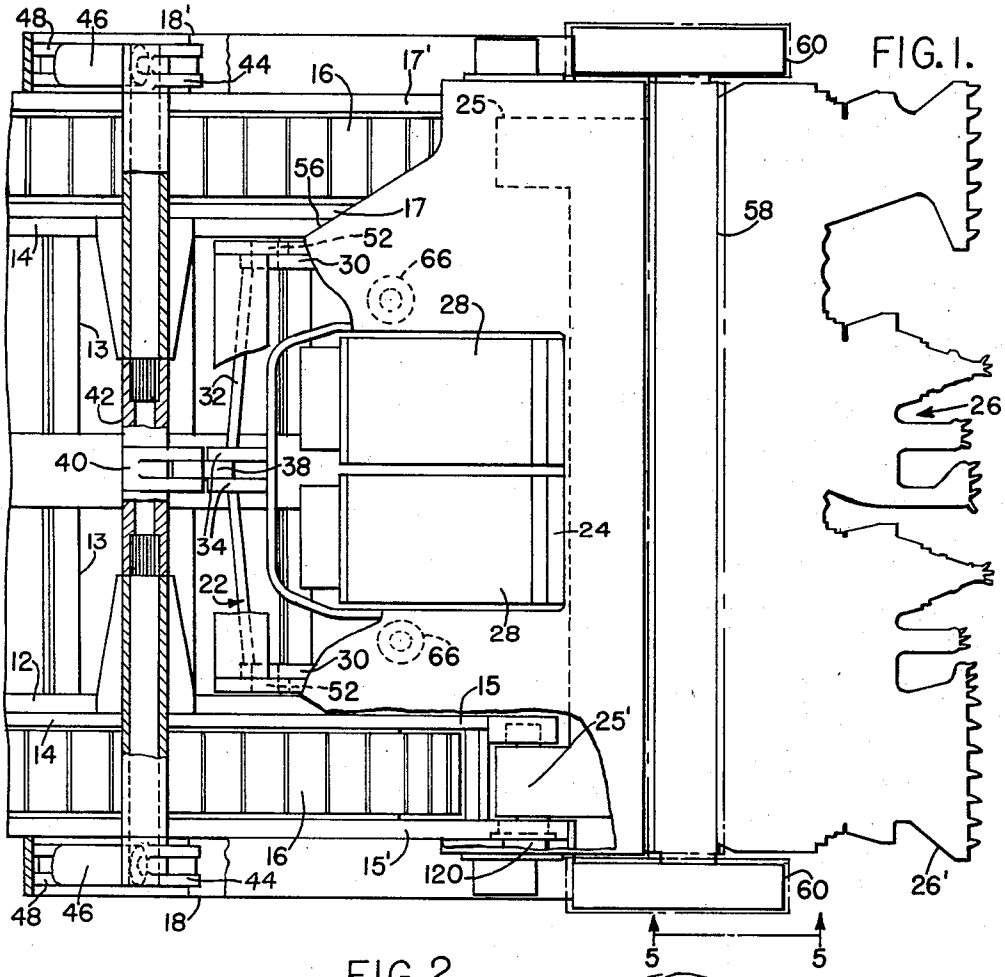
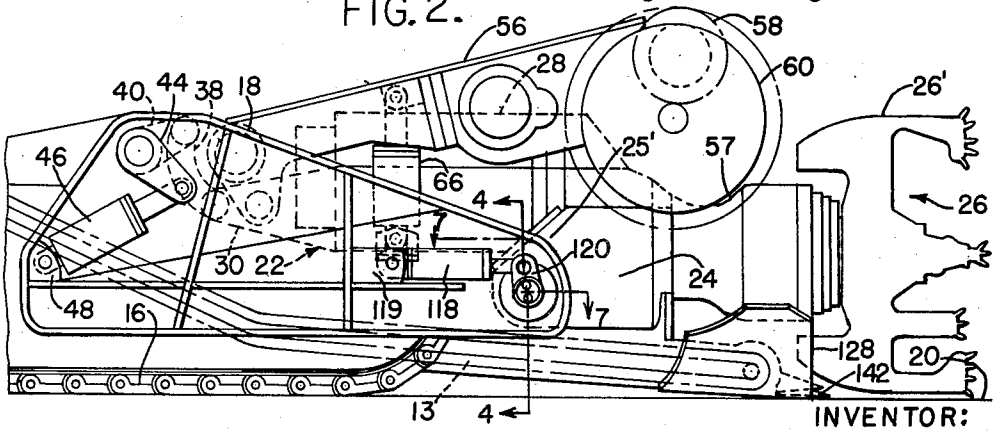


FIG. 2.



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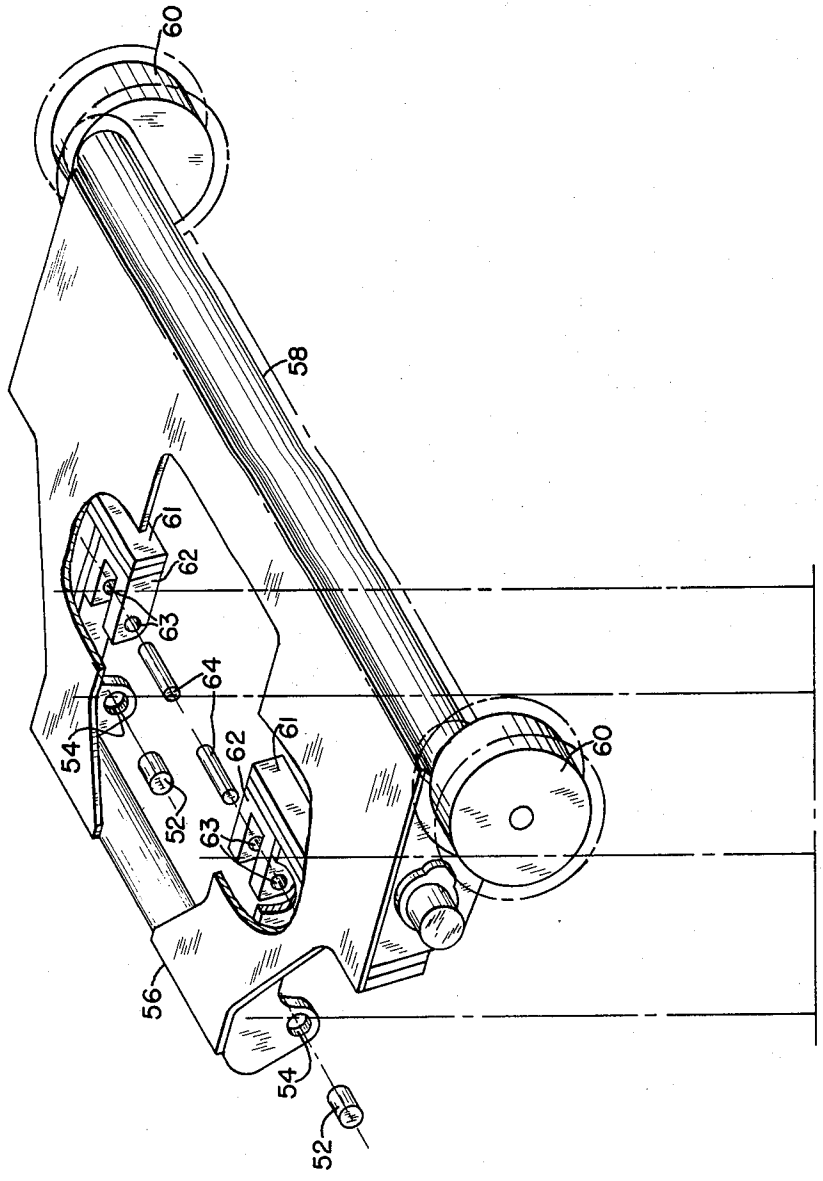
Sept. 15, 1964 J. R. SIBLEY 3,148,918

MINING APPARATUS HAVING ADJUSTABLE BORING HEAD

Filed May 18, 1961 5 Sheets-Sheet 2

FIG. 3a



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Sept. 15, 1964 J. R. SIBLEY 3,148,918

MINING APPARATUS HAVING ADJUSTABLE BORING HEAD

Filed May 18, 1961 5 Sheets-Sheet 3

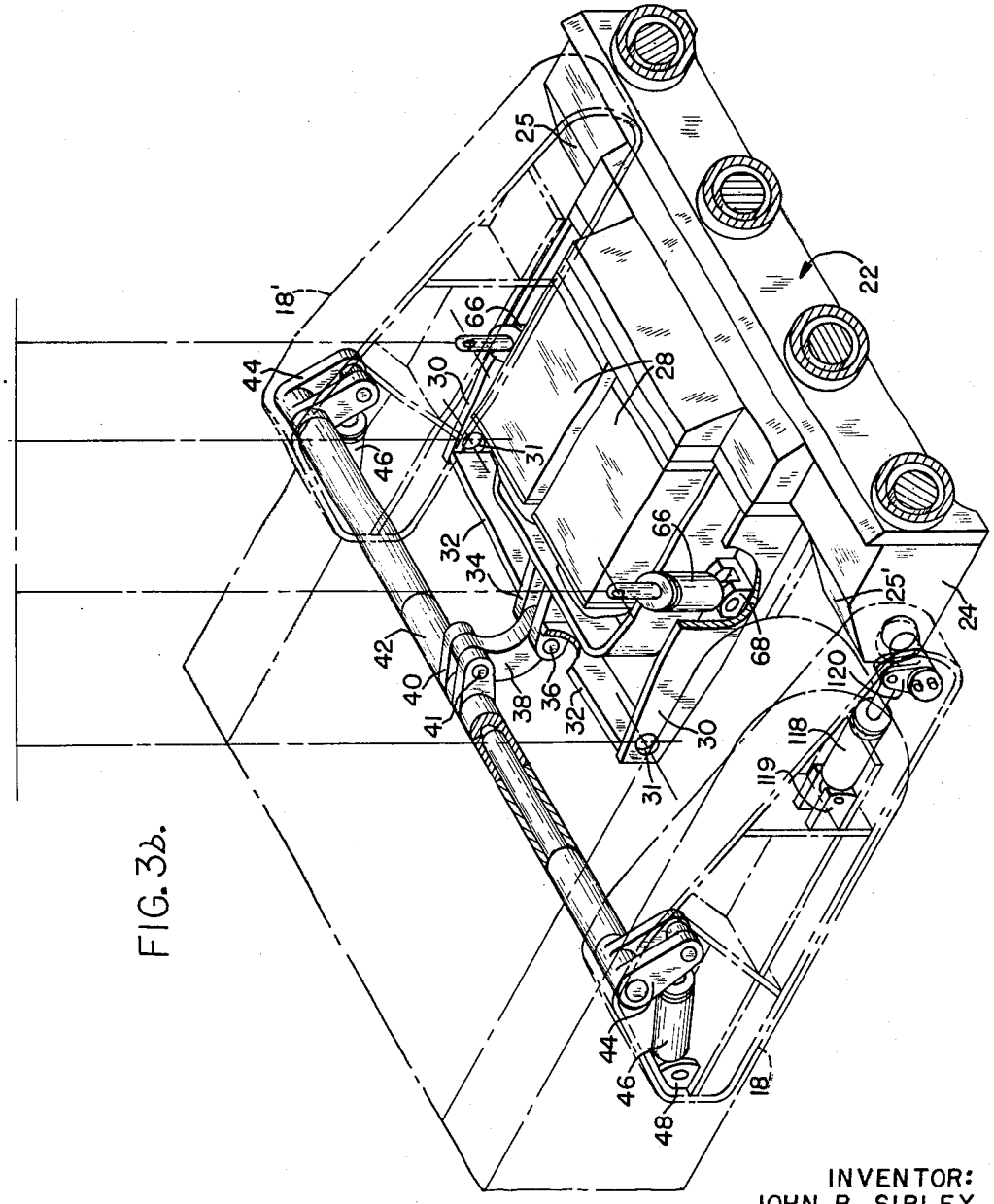

FIG. 3b.

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Sept. 15, 1964 J. R. SIBLEY 3,148,918

MINING APPARATUS HAVING ADJUSTABLE BORING HEAD

Filed May 18, 1961 5 Sheets-Sheet 4

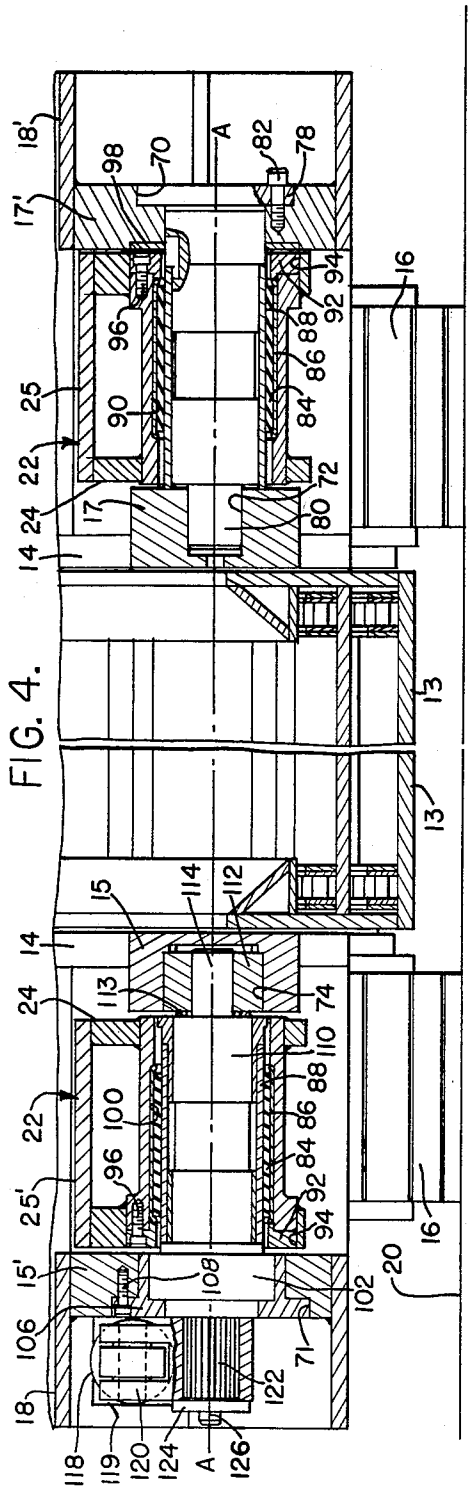

FIG. 4.

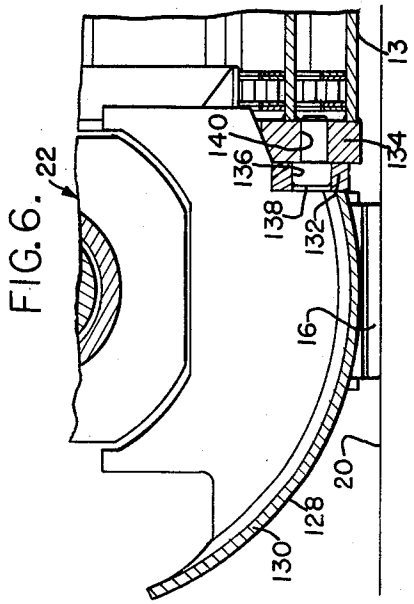

FIG. 6.

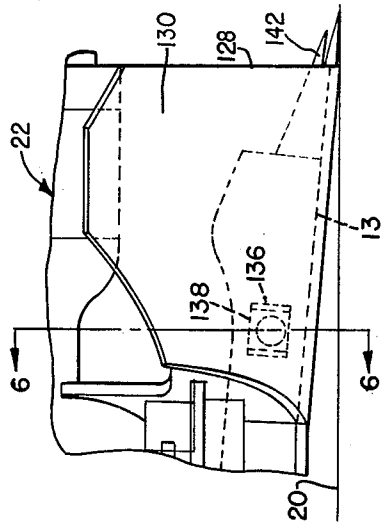

FIG. 5.

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Sept. 15, 1964 J. R. SIBLEY 3,148,918

MINING APPARATUS HAVING ADJUSTABLE BORING HEAD

Filed May 18, 1961 5 Sheets-Sheet 5

FIG. 7.

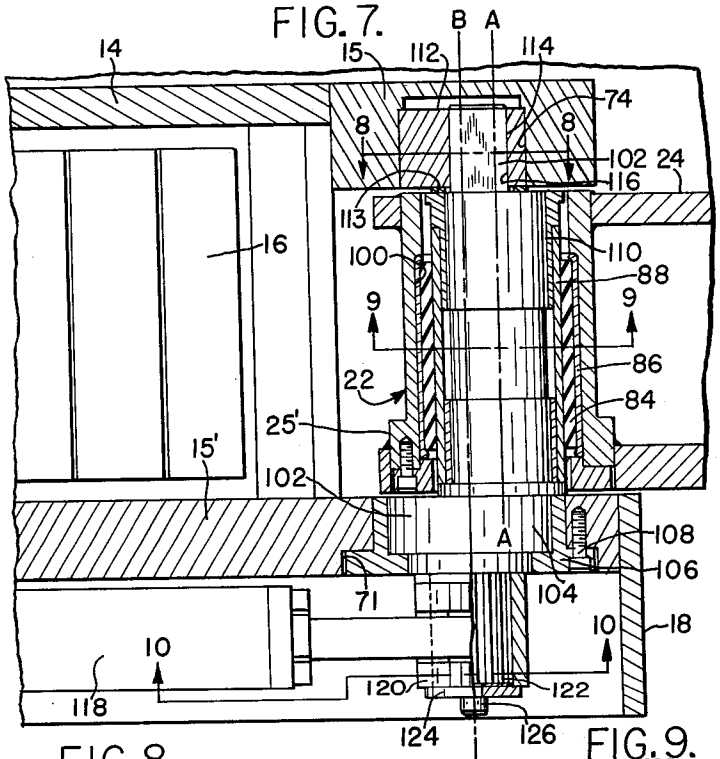


FIG. 8.

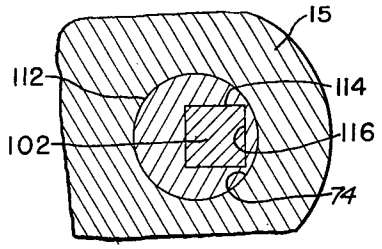


FIG. 9.

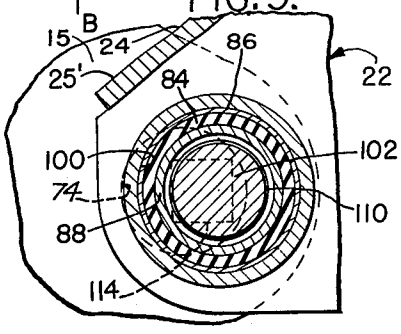
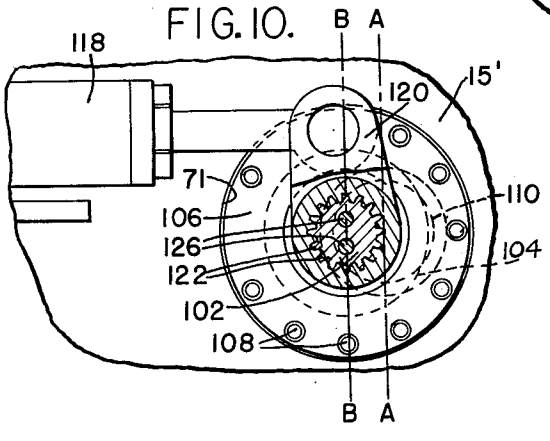


FIG. 10.



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United States Patent Office 3,148,918 Patented Sept. 15, 1964

3,148,918

MINING APPARATUS HAVING ADJUSTABLE BORING HEAD

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Filed May 18, 1961, Ser. No. 110,912
5 Claims. (Cl. 299—59)

This invention relates to mining apparatus and more particularly to a boring type miner having a plurality of laterally disposed rotary boring means and constructed to follow the variations of a mineral vein.

Those concerned with developing a continuous mining machine realize the advantages of a mining machine which is constructed to follow the variations of a mineral vein. Mining machines of the boring type have been constructed to accommodate such variations of the mineral vein by hydraulically or mechanically controlled variation of the relationship between a main frame and a pair of crawler frames which comprise a traction frame. Since the main frame of such machine comprises a large proportion of the total weight of the machine, this type of accommodation to the variations in the mineral vein involves the support and movement of large masses of machinery. The present invention provides means by which the boring machine can follow the variations of the mineral vein through adjustments of a cutting portion of the machine without changing the relationship of the traction frame and the main frame of the machine. In addition the mounting pivot of the cutting portion of the machine of this invention is located below the center line of the rotary boring means so that the thrust forces resulting from the boring action will partially counterbalance the weight of the forward projecting rotary boring means. The tilting adjustment of a cutting portion of the machine of this invention, in order to follow a longitudinal variation in the mineral vein such as a roll, is accomplished from a three point suspension to minimize deflecting torsional loads on the gear case which drives, and the frame which supports, the rotary boring arms. Adjustment of the machine to accommodate variations in the transverse angle of the mineral vein are accomplished by partial rotation of an eccentric shaft, with deflection at the pivot accommodated by deflection of a resilient mounting. A top cutter portion of the machine is mounted as part of the entire cutting portion of the machine but adjustable in relationship to the boring means to accommodate variations in the thickness of the mineral vein. An adjustable connection between the rotary boring means and a floor control unit, or footshaft plow, provides for adjustable relationship between the rotary boring means and the footshaft plow and also provides for common adjustment for both transverse and longitudinal angular variations of the mineral vein.

Accordingly one object of this invention is to provide a new and improved mining apparatus having rotary boring means constructed to follow the variations of a mineral vein.

It is a further object of this invention to provide a new and improved mining apparatus having rotary boring means pivotably mounted to follow the variations in a mineral vein.

It is an additional object of this invention to provide new and improved mining apparatus having rotary boring means supported in resilient mounts for control of vibration and accommodation of adjustment.

A still further object of this invention is to provide a new and improved mining apparatus having a cutting portion of the machine adjustably supported on a suspension to minimize the deflectional torsional loads on frame and gear cases which support and drive mineral cutting means.

It is a more specific object of this invention to provide a new and improved mining apparatus having rotary boring means adjustable to accommodate transverse angular variations in the mineral vein by deflection of a resilient mounting accomplished by partial rotation of an eccentric shaft.

Another specific object of this invention is to provide a new and improved mining apparatus having rotary boring means and roof forming means adjustable in relation to each other for variations in the thickness of the mineral vein but also provided with a common adjustment for longitudinal and transverse angular variations in a mineral vein.

It is another specific object of this invention to provide a new and improved mining apparatus having a cutting portion of the machine controllably pivotable about a transverse axis to accommodate variations in the longitudinal inclination of a mineral vein.

These and other objects of this invention will become more apparent when taken in conjunction with the following detailed description and drawings, in which:

FIG. 1 is a top plan view of a portion of a mining apparatus constructed in accordance with the principles of this invention,

FIG. 2 is a side elevational view of the mining apparatus as shown in FIG. 1.

FIGS. 3A and 3B when taken in conjunction form an exploded perspective view of a central portion of the apparatus shown in FIG. 1,

FIG. 4 is an enlarged sectional view taken substantially on line 4—4 of FIG. 2,

FIG. 5 is an enlarged elevational view of a portion of the apparatus of FIG. 1 taken substantially on line 5—5 of FIG. 1,

FIG. 6 is a sectional view taken on the line 6—6 of FIG. 5,

FIG. 7 is an enlarged sectional view taken on the line 7—7 of FIG. 2,

FIG. 8 is a sectional view taken substantially on the line 8—8 of FIG. 7,

FIG. 9 is a sectional view taken substantially on the line 9—9 of FIG. 7,

FIG. 10 is a sectional view taken substantially on line 10—10 of FIG. 7.

Referring to FIGS. 1 and 2 there is shown a forward portion of a mining apparatus constructed according to the principles of this invention so oriented that the foremost portion of the machine is shown at the right hand side of the FIGS. 1 and 2 with central and rearward portions of the machine (not shown) being located to the left of FIGS. 1 and 2. Applying the directions hereinabove cited it will be seen that FIG. 2 is a right side elevation of this portion of the machine. A line 20 at the bottom of FIG. 2 represents the ground line or other supporting surface on which the machine is operating. A direction normal to the ground line 20 extending upwardly in FIG. 2 is taken as the upward direction on the machine. It is to be noted that the directions rearwardly, forwardly, upwardly, downwardly, right hand and left hand are used in this description purely for purpose of simplification and should not be applied as limiting this invention. In FIG. 1 there is shown a forward portion of a suitable elongated main frame 12 having conventional tread frames 14 suitably rigidly secured to the laterally opposed sides thereof. Endless tread means 16 are trained about the tread frames 14, respectively, and power means (not shown) are provided for circulating the endless tread means 16 about the tread frames 14 in a manner well known in the art to propel the apparatus along the supporting surface 20. The main

frame 12 has a central, longitudinally extended trough shaped portion to accommodate two elongated, laterally adjacent, flight conveyors 13 adapted to circulate about the main frame 12 and being driven by suitable power means (not shown). The conveyors 13 are substantially longitudinally coextensive with the main frame 12 but are forwardly extended beyond the forward portion of the main frame 12, the forward extending portions of the conveyors 13 being pivotably connected to the main frame 12. Formed hollow front frame supports 18 and 18', being right hand and left hand respectively, are suitably rigidly secured to the outer sides of the tread frames 14 and extend forwardly of the tread frames 14 and the tread means 16 to pivotably support an elongated, laterally extended front frame 22 in a manner hereinafter described. The front frame 22 has a suitable transmission 24 rotatably supporting and driving a plurality of suitable boring means generally designated as 26, extending forwardly of the front frame 22. For further detailed description of the boring means 26, reference is made to the copending application Serial No. 107,576 filed May 3, 1961 which application is assigned to the same assignee as the assignee of this application. The transmission 24 suitably supports and is driven by one or more suitable electric motors 28 suitably connected by means not shown to a suitable source of electric power.

The front frame 22 (see FIG. 3*b*) has formed rearwardly extending laterally spaced side members 30 which are rigidly connected at their rearward portions by a formed transversely extending cross member 32. Rigidly secured in the central portion of the cross member 32 is a formed rearwardly extended two member actuating bracket 34 having axially aligned transverse bores through the two members to rigidly secure a suitable pin 36 which in turn universally pivotably secures one end of a formed connecting link 38 by means of a suitable bore and a suitable spherical bushing of a type well known in the art. In like manner the other end of the link 38 is universally pivotably secured to a second two member actuating bracket 40 by means of a suitable pin 41. The bracket 40 is suitably rigidly secured in the central portion of an elongated tubular transversely extending cross shaft 42 which is in turn pivotably received by axially aligned bores in upwardly extended rearward portions of the front frame supports 18 and 18' respectively. Rigidly mounted at each end of the cross shaft 42 are radially extending double levers 44 pivotably secured to the rod end of suitable hydraulic cylinders 46 the head ends of which are suitably pivotably connected to the rearward portion of the front frame supports 18 and 18' by suitable jack brackets 48. The cylinders 46 are so connected that when pressure fluid from a suitable source such as a hydraulic pump is admitted to the cylinders the levers 44 are rotated about the axis of the cross shaft 42, in a counterclockwise direction as viewed in FIG. 2, which is itself rotated, thereby revolving the bracket 40 in the same direction to raise the rearward end of the front frame 22 pivoting it about its connection with the forward end of the frame supports 18 and 18'.

The side members 30 of the front frame 22 have transverse axially aligned bores 31 in their rearward portions to pivotably receive a pair of suitable hinge pins 52 (see FIG. 3*b*) which are in turn rigidly secured in a downwardly extended rearward portion of an elongated transversely extended top cutter frame 56 (see FIG. 3*a*) to provide for pivoting the top cutter frame 56 in relation to the front frame 22 to vary the vertical relationship between the boring means 26 mounted on the transmission 24 and a roof cutter 58 and a pair of slot cutters 60 rotatably mounted on the top cutter frame 56. For further details of the roof cutter 58 the slot cutters 60 and suitable driving means therefor (not shown) reference is made to the above identified copending application.

Rigidly secured to a downwardly extended intermediate portion 61 of the top cutter frame 56 is a pair of transversely aligned jack brackets 62 having transverse axially aligned bores 63 therethrough to rigidly secure a pair of suitable jack pins 64. The pins 64 are pivotably received by the rod end of a pair of suitable fluid operated extensible cylinders 66 which are pivotably secured at their lower ends to a pair of suitable brackets 68 rigidly mounted in an intermediate portion of the side members 30 of the front frame 22. The cylinders 66 are connected so that pressure fluid supplied to the head ends will increase the length of the cylinders 66 and by pivoting the top cutter frame 56 about the axis of the pins 52 will increase the height of the roof cutter 58 and the slot cutters relative to the boring means 26. A concave channel 57 extends transversely on the upper portion of frame 22 rearwardly adjacent boring means 26 for the purpose of accommodating cutter frame 56 in the retracted position thereof.

Referring now to FIG. 4 there is shown an axis A—A laterally extending across the forward portion of the machine through the forwardly extending portions of the front frame supports 18 and 18', respectively, being substantially lower than the longitudinal axes of the boring means 26 and lying in a plane parallel to the plane of the longitudinal axes. The front frame 22 is pivoted about the axis A—A through rearwardly extended portions 25 and 25' of the transmission 24 (see FIGS. 1 and 2) by action of the hydraulic cylinders 46 to obtain vertical adjustment of the boring means. FIG. 4 also shows sectional views of forward portions of the tread frames 14 having inner side members 15 and 17 of the right hand and left hand frames 14, respectively, and outer side members 15' and 17' in the same order. Axially aligned stepped bores 70 and 71 in forward extending portions of the side members 17' and 15', respectively, and bores 72 and 74 in forward extending portions of the side members 17 and 15, respectively, have axes coinciding with the axis A—A, as viewed in FIG. 4, however, in FIG. 7 it will be seen that the axis B—B of bores 71 and 74 in the side members 15' and 15, respectively, is rearwardly displaced from axis A—A being parallel thereto in the illustrated position. An elongated cylindrical shaft 76 having a radially extended head 78 and a reduced cylindrical end portion 80 is slidably received by the aligned bores 70 and 72 and secured therein by suitable retaining means such as cap screws 82. A suitable cylindrical resilient bushing element 84 is confined between and suitably bonded to an outer cylindrical bushing element 86 and an inner cylindrical bushing element 88, the inner bushing element 88 rigidly securing an intermediate portion of the shaft 76 being suitably keyed thereto. The outer bushing element 86 is received within a transverse bore 90 in the rearward extending portion 25 on the left hand portion of the gear case 24. The outer bushing 86 being retained and keyed in position by suitable retaining means such as a ring 92 secured in a counter bore 94 coaxial with the bore 90 by a plurality of threaded elements such as cap screws 96. Rotation of the front frame 22 with respect to the tread frame 14 about the axis A—A as hereinabove cited is accommodated by the resilient bushing 84 which also allows a desirable misalignment produced in a manner hereinafter described. A suitable metallic thrust washer 98 maintains clearance between the rearward extending portion 25 of the transmission 24 on the front frame 22 and the forward extending portion of the side member 17'.

The rearward extending portion 25' of the transmission 24 on the right hand side of the machine extends rearwardly between the side members 15 and 15' of the right hand tread frame 14 and is provided with a bore 100 coaxial with and axially spaced from the bore 90 of the left hand portion 25 of the transmission 24. The bore 100 is similarly provided with a metallic inner bushing 88 and a metallic outer bushing 86 with a resilient bushing 84 therebetween and bonded thereto. The outer bushing 86 is received by the bore 100 and rigidly secured therein by another retaining and keying means 92 secured by a

plurality of cap screws 96. A formed elongated eccentric shaft 102, aligned on axis B—B (see FIG. 7), having a stepped radially extending head portion 104 is pivotably received by a hollow cylindrical bushing and retaining means 106 received by the stepped bore 71 in the side member 15' and secured by a plurality of threaded elements such as cap screws 108. An intermediate cylindrical portion 110 of the shaft 102 on the axis A—A parallel to the above mentioned axis B—B but forwardly displaced therefrom, is pivotably received by the inner metallic bushing 88 to provide for rotation of an eccentric shaft 102 to accomplish vertical adjustment of the right hand end of the front frame 22. A cylindrical member 112 having an off centered square hole 115 therethrough (see FIG. 8) is pivotably received by the bore 74 in the side member 15 and in turn non-pivotably receives a square end portion 114 of the eccentric shaft 102. The axially aligned bores 71 and 74 on axis B—B in the forward portions of the side members 15' and 15, respectively, allow for pivoting the eccentric shaft 102 between the side members 15 and 15'. Controlled partial rotation of the eccentric shaft 102 is accomplished in a conventional manner by the use of a hydraulic cylinder 118 pivotably secured by a suitable mounting 119 within and to the right hand front frame support 18 and pivotably connected at its rod end to an internally splined lever 120 rigidly secured on an externally splined end portion 122 of the eccentric shaft 102 by a cap 124 and a plurality of threaded means 126 such as cap screws in a manner well known in the art.

In FIGS. 5 and 6 there is shown a right hand lower front corner portion of the apparatus immediately rearwardly adjacent a right hand outboard rotary boring means 26' (the right hand and left hand portions of the machine being identical in respect to the following description, only the righthand side will be described). An arcuate shroud 128 having an inner radius substantially equal to the radius of the boring means 26' and being coaxial therewith is rigidly secured on a lower forward portion of the front frame 22. The shroud 128 is so shaped and so positioned as to aid the boring means 126 to direct a flow of fragmented mineral onto the centrally placed rearwardly extending conveyors 13. The shroud 128 also has an arcuate portion 130 and a vertically disposed flat plate anchor portion 132 having a rectangular opening 136 therethrough to slidably receive a square head portion of an otherwise cylindrical pin 138. The cylindrical portion of the square head pin 138 is suitably received and suitably secured in a transverse bore 140 through a side plate 134 of the conveyor 13. It is to be noted that the square head of the cylindrical pin 138 is off centered with respect to the cylindrical portion of the pin 138 so that removal and partial rotation of the pin 138 will upon re-insertion of this pin vary the vertical relationship between the shroud 128, with its attached front frame 22, and the forward portion of the conveyor 13, with attached plow elements 142. It is to be further noted that since the front frame 22 carries the rotary boring means 26, the above described connection, through the pin 138, provides means by which the height of the plows 142 and the boring means 26, in relation to the tread means 16, may be varied as a unit. For further description of the above mentioned arcuate shroud 128, the plow elements 142, and the rotary boring means 26, reference may be made to the hereinbefore cited copending application.

One mode of operation of this invention may be described as follows: Action of the tread means 16 under control of an operator causes the mining apparatus to move in a forward direction until the rotary boring means 26 are in contact with a vein of mineral to be mined. The action of a plurality of rotary boring means, suitably fragmenting a portion of the mineral, develops a boring pattern within the mineral vein which consists of a laterally aligned series of overlapping bores having unmined portions partially extending therebetween known as cusps which are located as well known in the art of mining. As the mining apparatus advances, the plow elements 142, suitably positioned, come in contact with, and remove, the cusps developed in the lower portion of the boring pattern. The mineral removed from the vein in the form of fragments of various size is moved by cooperation of the plows 142, the boring means 26, and the shroud 128 onto one or the other of the rearwardly extending conveyors 13 which, operating in a normal fashion, convey the mineral back through the central portion of the mining apparatus in a manner well known in the art. The cooperating action of the plows 142 and the rotary boring means 26 develops a floor surface 20, desirably at the bottom of the mineral vein, upon which surface 20 the tread means 16 will be supported in further forward motion of the mining apparatus.

Upon further forward motion of the mining apparatus the slot cutters 60 come in contact with an unmined portion of the mineral laterally adjacent to the boring pattern and by milling action produces kerfs therein. Still further forward motion of the mining apparatus brings the roof cutter 58 in contact with the unmined portion of the boring pattern consisting at least partially of the cusps left between the upper portions of the contiguous bores. The cooperative action of the slot cutters 60 and the roof cutter 58 produces a flat upper surface in the upper portion of the mineral vein hereinafter referred to as the roof of the mined portion of the mineral vein, slot cutters 60 and roof cutter 58 being referred to as roof forming elements. If the floor 20 is observed to be tending upwardly, in relation to the bottom of the mineral vein, pressure fluid is admitted to the head end of the cylinder 46 to rotate the levers 44 and 40 in a counterclockwise direction as viewed in FIG. 2 which levers 40 and 44 cooperating with the link 36 (see FIG. 3*b*) raise the rearward portion of the front frame 22 pivoting it about the axis A—A and causing a lowering of the entire cutting means in relation to the tread means 16. Pressurization of the rod end of the cylinder 46 will alternatively raise the cutting means in relation to the tread means 16 and thus by suitable operation of the cylinder 46 it is possible to adjust the machine to follow variations in the angle of the mineral vein longitudinally with the travel of the machine, such variation being designated as roll.

It is to be noted that action of the cylinder 46 is applied not alone to the rotary boring means 26 but also to the plow elements 142 and the roof forming elements 58 and 60 to give a unitary adjustment in following the roll of a mineral vein. Should it be desired to vary the height of the cut, as measured from the surface 20 to the top of the roof cutter 58, suitably controlled action of the cylinder 65 will raise or lower the roof forming elements 58 and 60 in relation to the boring means 26 and the floor line 20.

When it is found that the inclination of the mineral vein transversely of the direction of travel of the mining apparatus is varying in an upward direction at the right hand side of the machine, admission of pressure fluid from a suitable source such as a hydraulic pump, to the rod end of the cylinder 118 (see FIG. 7) will rotate the lever 120 and the attached eccentric shaft 102 in a counterclockwise direction as viewed in FIG. 10. Such counterclockwise rotation acting through the eccentricity of the shaft 102 will raise the right hand end of the front frame 22 together with the attached boring means 26, roof forming elements 58 and 60, and plow elements 142 so that the right hand side of the floor line 20 and of the roof line (not shown) will be raised in relation to the tread means 16 bringing the mining apparatus once more into alignment with the traverse inclination of the mineral vein. This action is known as left hand spiral adjustment. Pressurization of the head end of the cylinder 118 will reverse the above described action and bring about a spiral adjustment that results in a lowering of the floor

line at the right hand side of the boring pattern resulting in a right hand spiral adjustment.

When it is noted that the mining apparatus as it progresses forwardly is producing an uneven floor line transversely of the machine such a condition can be corrected by raising or lowering the plow elements 142 in relation to the boring means 26 by removal and partial rotation of the pin 138 (see FIG. 6). Upon re-insertion of the pin 138 the vertical relationship between the boring means 26 and the plow elements 142 will be changed, thus making it possible to produce a smooth floor line transversely of the mining apparatus.

Three point suspension of the transmission 24 through its rearwardly extending portions 25 and 25' and the link 38 reduces torsional stresses normally absorbed by a rigidly mounted transmission. It is to be noted that two of these suspension points are provided with resilient bushings 84 which absorb a substantial portion of the shock loading inherent in the cutting operation of a plurality of boring means. The resilient bushings 84 also accommodate the desirable misalignment, of the bores 90 and 100 in the portions 25 and 25', respectively, relative to the shafts 76 and 102, which exists during periods of operation when spiral adjustment is being accomplished.

A further advantage of this design is encompassed by the location of the axis A—A about which the cutting portion of the apparatus is pivoted. The axis A—A, being substantially lower than the axes of the boring means 26, acts as a fulcrum about which the reaction from the forward directed cutting force acts to counterbalance a portion of the weight of the forwardly disposed boring means 26.

Having described a preferred embodiment of this invention in accordance with the patent statutes, it is to be realized that modifications thereof may be made without departing from the broad spirit and scope of the invention.

What is claimed is:

1. A mining apparatus comprising, a longitudinally extending main frame having a transversely extending boring head frame mounted at one end thereof, spaced pivot means aligned with a transversely extending axis being secured to said boring head frame for permitting transverse pivotal movement of said boring head frame relative to said main frame, one of said pivot means having eccentric cylindrical surfaces which are rotatably disposed in said main frame and in said boring head frame respectively, power means connected to said main frame and to said one pivot means for rotating said one pivot means so that said boring head frame is tiltable in a direction normal to such transverse pivotal movement.

2. A mining apparatus comprising, a longitudinally extending main frame having a transversely extending boring head frame mounted at one end thereof, spaced pivot means aligned with a transversely extending axis being secured to said boring head frame for permitting transverse pivotal movement of said boring head frame relative to said main frame, one of said pivot means having eccentric cylindrical surfaces which are rotatably disposed in said main frame and in said boring head frame, power means connected to said main frame and to said one pivot means for rotating said one pivot means so that said boring head frame is tiltable in a direction normal to such transverse pivotal movement, other pivot means located rearwardly and intermediate said spaced pivot means for connecting the rearward portion of said boring head frame to said main frame, and link means being connected to a rotatable transversely extending shaft and to said other pivot means for rotating said other pivot means so that said boring head frame is movable about said axis.

3. A mining apparatus comprising, a main frame having a transversely extending boring head frame mounted at one end thereof, spaced pivot means aligned with a transversely extending axis being secured to said boring head frame for permitting transverse pivotal movement of said boring head frame relative to said main frame, one of said pivot means having eccentric cylindrical surfaces which are rotatably disposed in said main frame and in said boring head frame, power means connected to said main frame and to said one pivot means for rotating said one pivot means so that said boring head frame is tiltable in a direction normal to such transverse pivotal movement, roof cutter means secured to said boring head frame for pivotal movement relative thereto, and other power means connected to said boring head frame and to said cutter means for pivoting said cutter means as aforesaid.

4. A mining apparatus comprising, an elongated main support having axially aligned pivot receiving bores at one end thereof, a boring head support having cooperating pivot means disposed in said bores, said pivot means having resilient bushing mounted thereon which are disposed in said bores, one of the said pivot means being formed by integral eccentric cylindrical portions having power means connected thereto for rotating said one pivot in order to move said boring head support relative to said main support, roof cutting means pivotally mounted on said boring head support and power means for pivoting said roof cutting means relative to said boring head support.

5. A mining apparatus comprising, a longitudinally extending main support having transversely aligned pivot means on the forward end thereof, boring head support means having pivot means thereon cooperable with said transversely aligned pivot means to permit pivotal movement of said boring head support about said pivot means, said boring head support means including a rearwardly extending frame portion having transversely aligned pivot means with the axis thereof located longitudinally rearwardly of said first mentioned pivot means, actuating means cooperably connected to said main support and to said rearwardly extending frame for pivotally moving said boring head support means and said rearwardly extending frame about said first mentioned pivot means, top cutter frame means pivotally connected to said second mentioned pivot means for pivotal movement relative to said main support and said boring head support means, and actuating means operatively connected to said top cutter frame means for pivotally moving said top cutter frame means.

References Cited in the file of this patent

UNITED STATES PATENTS

2,694,562	Snyder et al.	Nov. 16, 1954
2,839,281	Alspaugh et al.	June 17, 1958
2,866,626	Moon	Dec. 30, 1958
2,878,000	Felbeck	Mar. 17, 1959