

June 2, 1931.

R. M. FLEMING

1,808,649

MINING MACHINE

Filed June 3, 1927

8 Sheets-Sheet 1

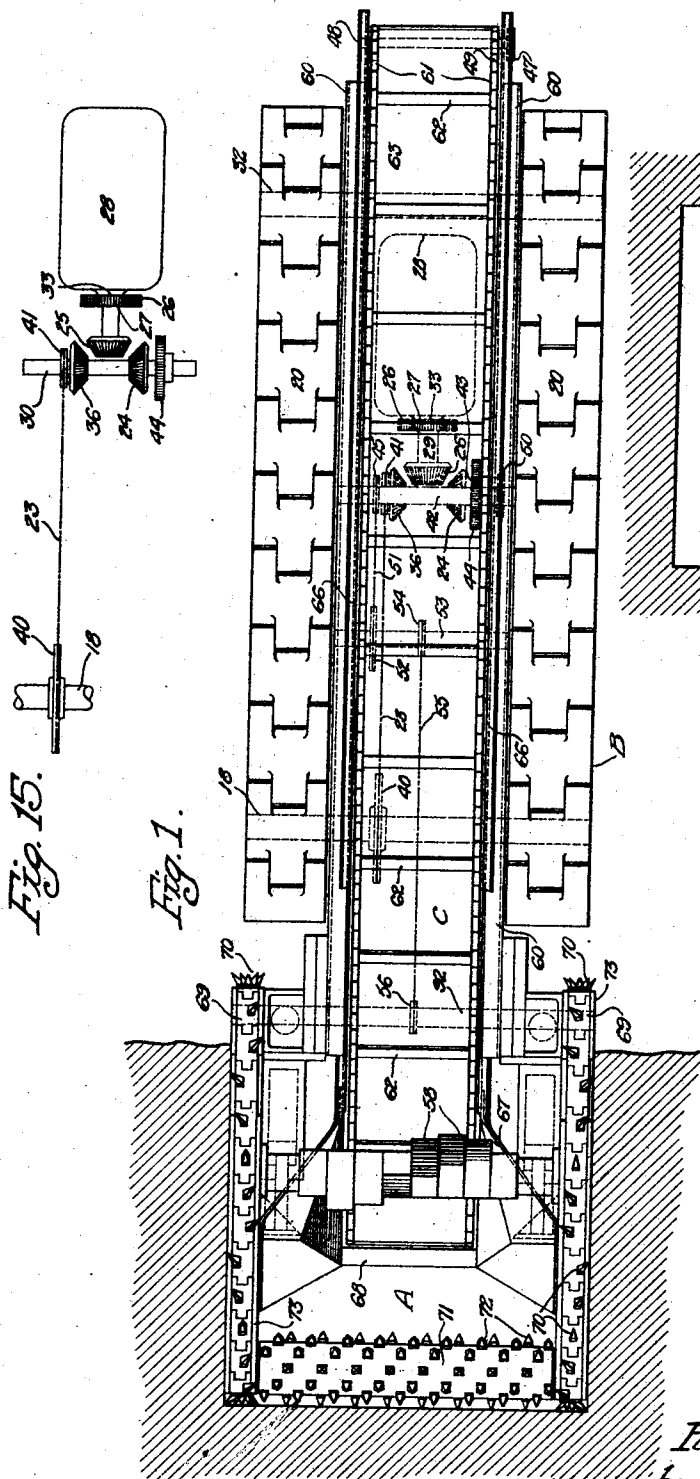


Fig. 15.

Fig. 1.

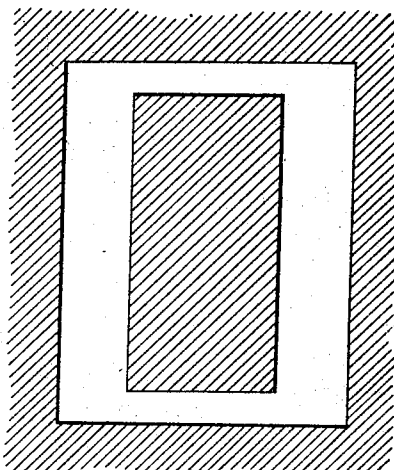


Fig. 21.

Inventor.-
Robert M. Fleming.
by his Attorneys.-
Hawson & Hawson

June 2, 1931.

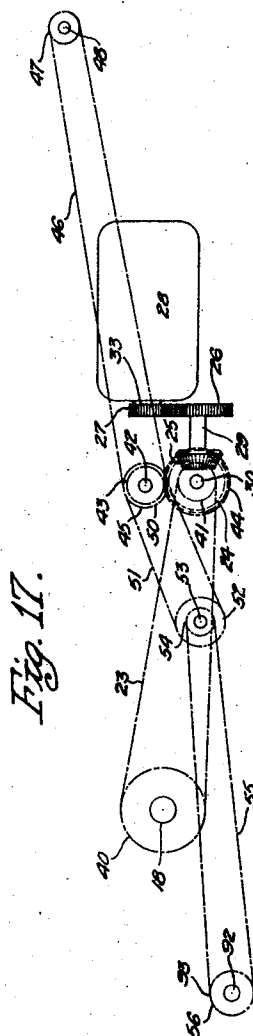
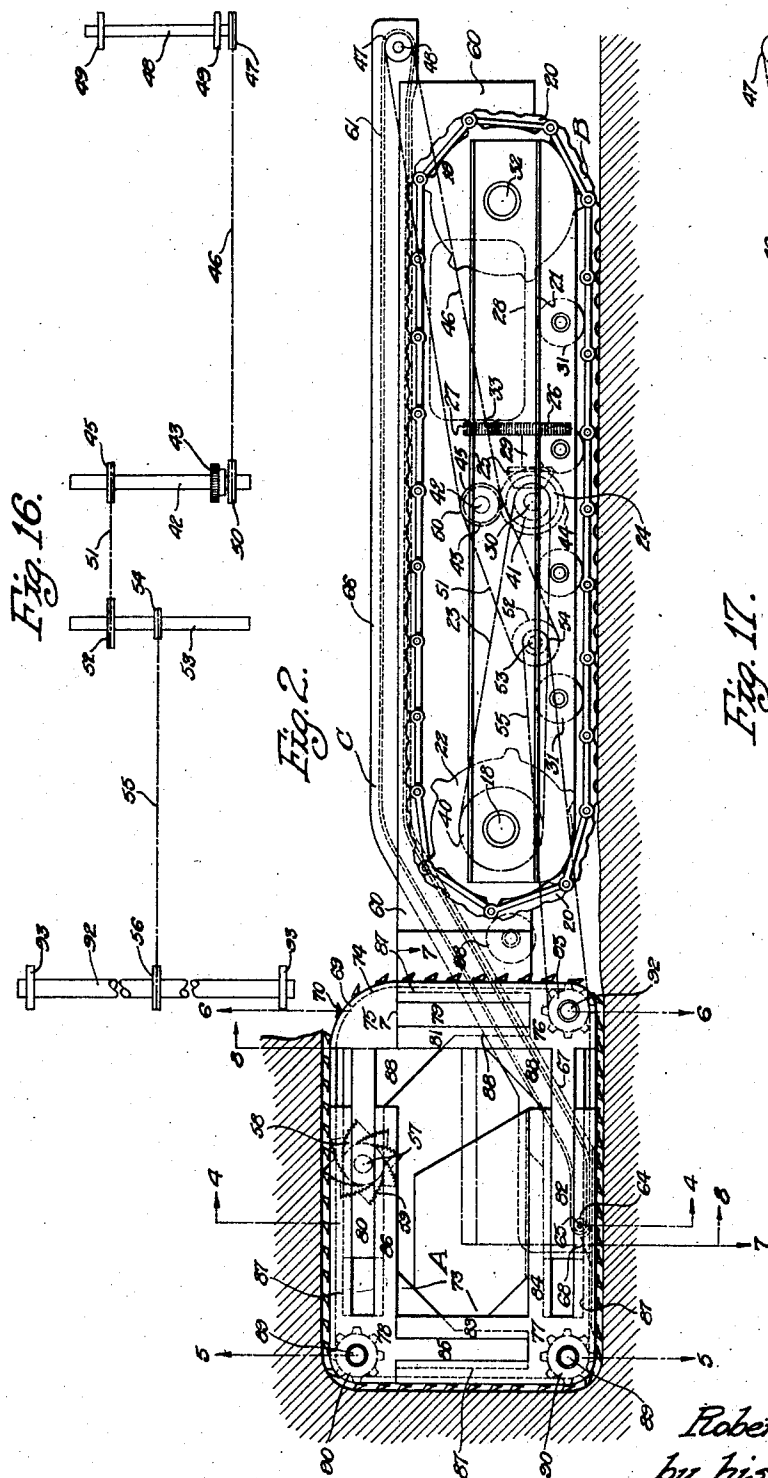
R. M. FLEMING

1,808,649

MINING MACHINE

Filed June 3, 1927

8 Sheets-Sheet 2



Inventor:-
Robert M. Fleming.
by his Attorneys:-
Harrison & Harrison

June 2, 1931.

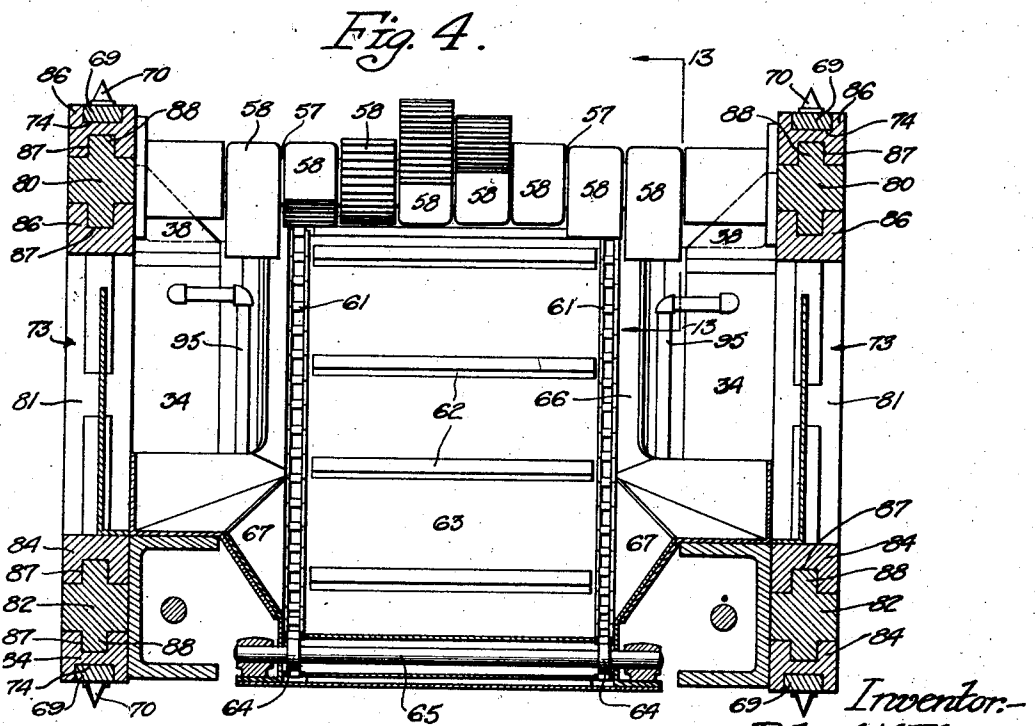
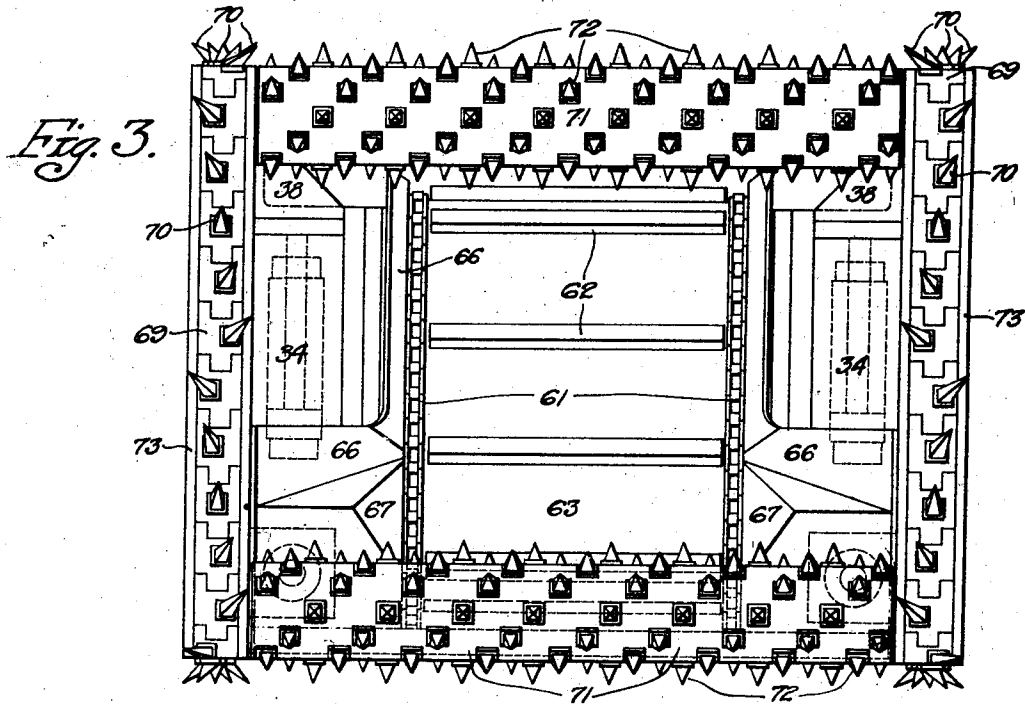
R. M. FLEMING

1,808,649

MINING MACHINE

Filed June 3, 1927

8 Sheets-Sheet 3



69  Inventor:
Robert M Fleming
by his Attorneys:
Hawson & Hawson

June 2, 1931.

R. M. FLEMING

1,808,649

MINING MACHINE

Filed June 3, 1927

8 Sheets-Sheet 4

Fig. 5.

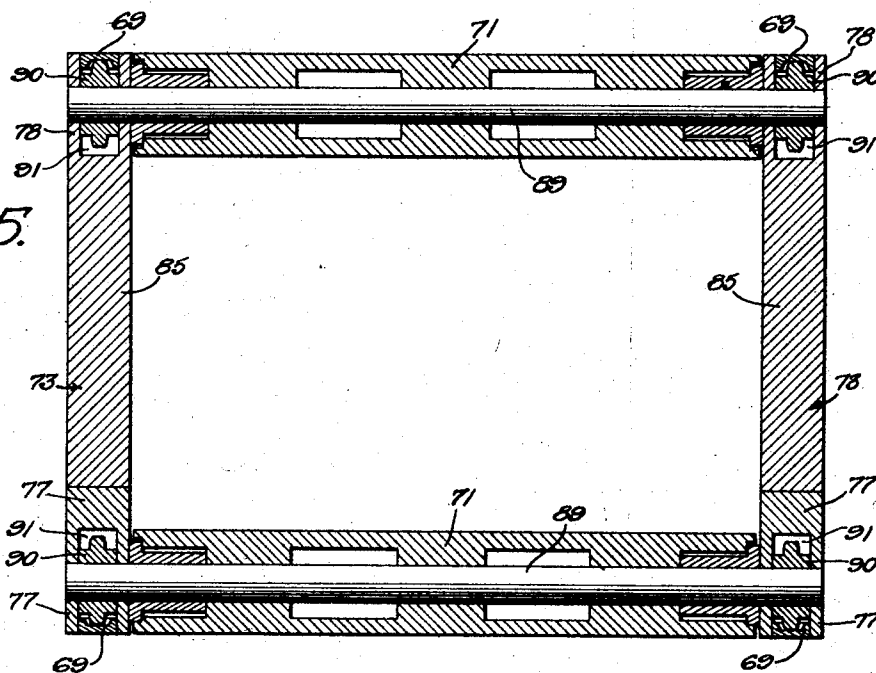
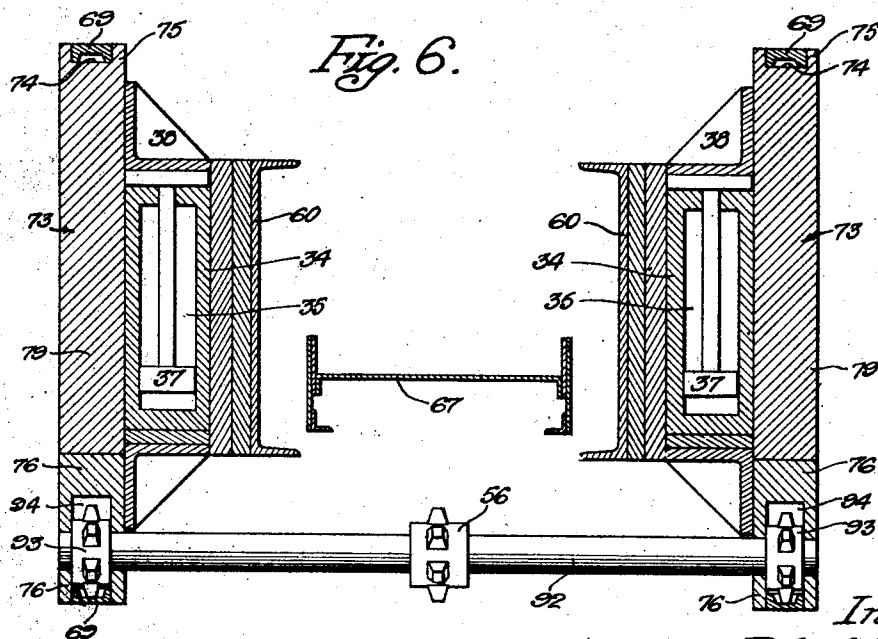


Fig. 6.



Inventor:
Robert M. Fleming
by his Attorneys:
Hewson & Hewson

June 2, 1931.

R. M. FLEMING

1,808,649

MINING MACHINE

Filed June 3, 1927

8 Sheets-Sheet 5

Fig. 7.

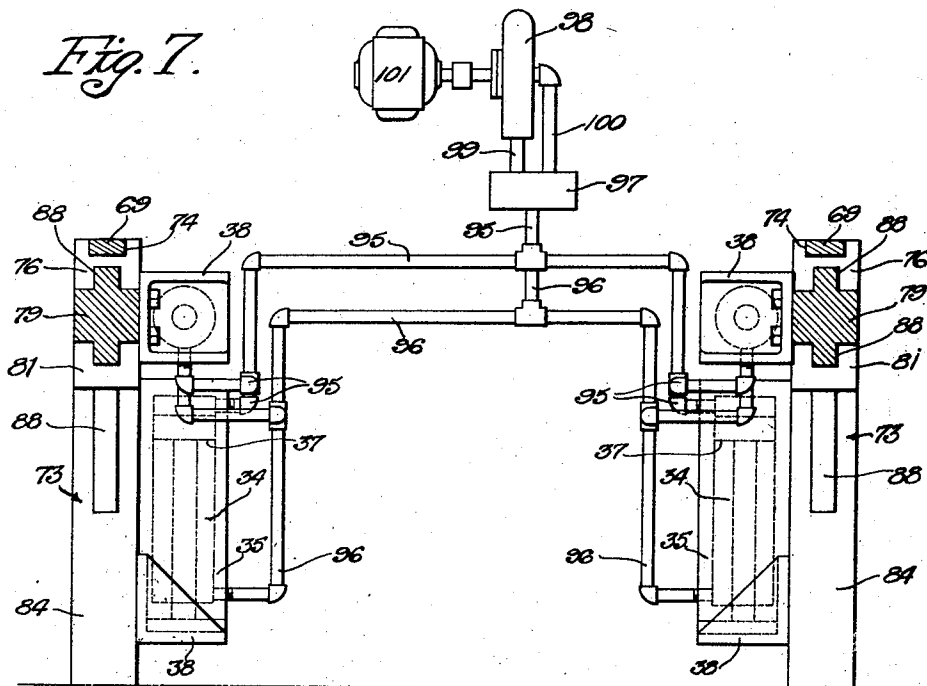
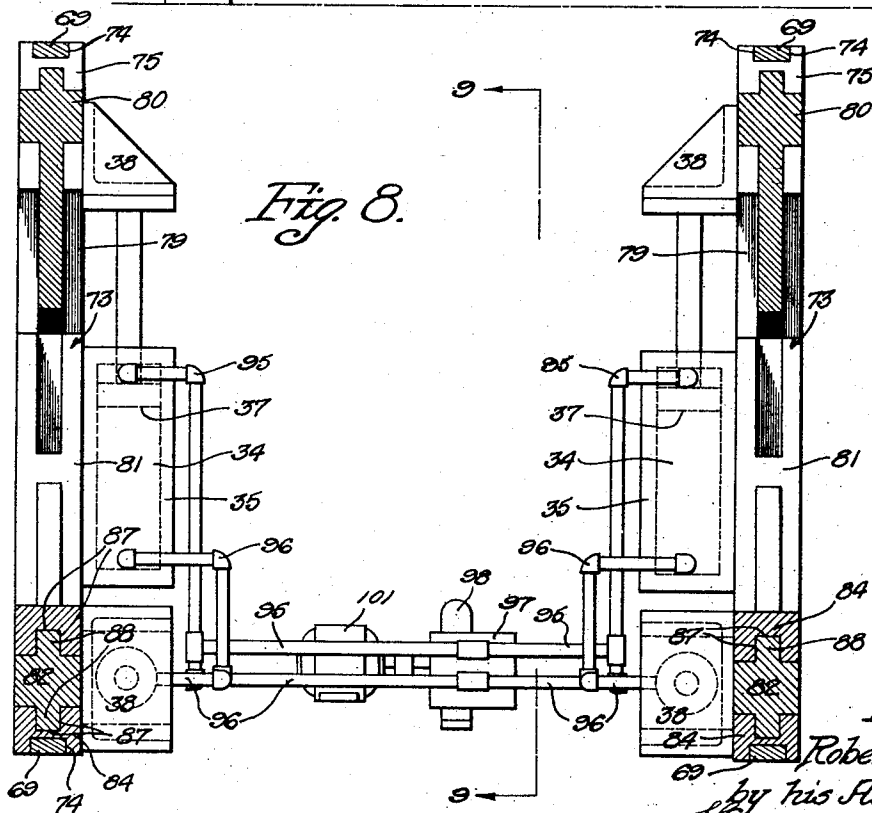


Fig. 8.



Inventor:
Robert M. Fleming
by his Attorneys.
Harrison & Harrison

June 2, 1931.

R. M. FLEMING

1,808,649

MINING MACHINE

Filed June 3, 1927

8 Sheets-Sheet 6

Fig. 9.

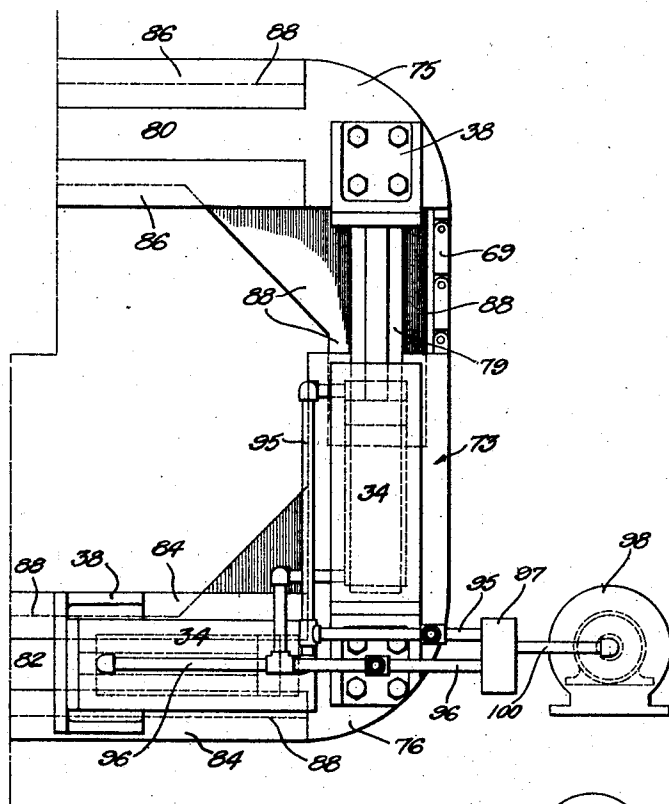


Fig. 14.

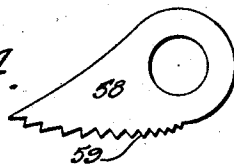
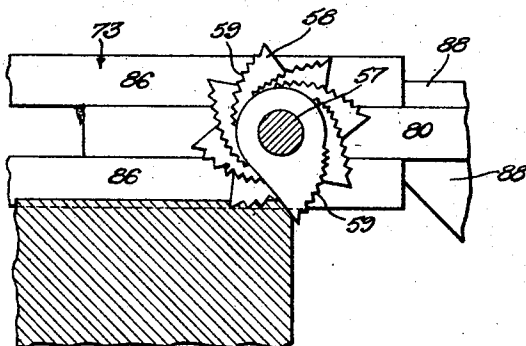


Fig. 13.



Inventor.-
Robert M. Fleming
by his Attorneys.-
Lawson & Lawson

June 2, 1931.

R. M. FLEMING

1,808,649

MINING MACHINE

Filed June 3, 1927

8 Sheets-Sheet 7

Fig. 10.

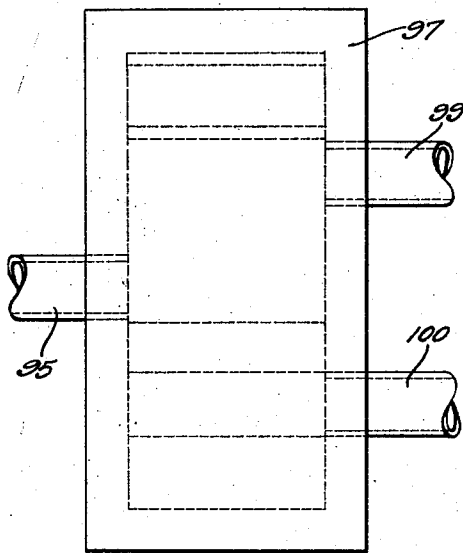


Fig. 11.

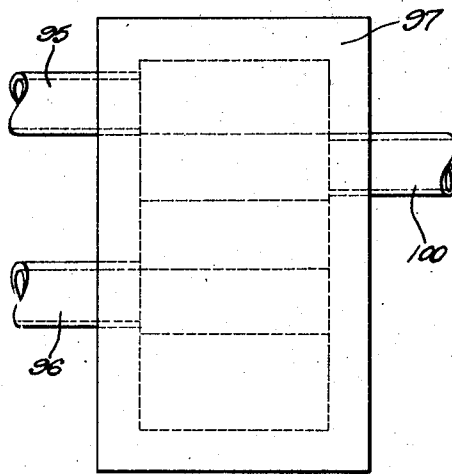
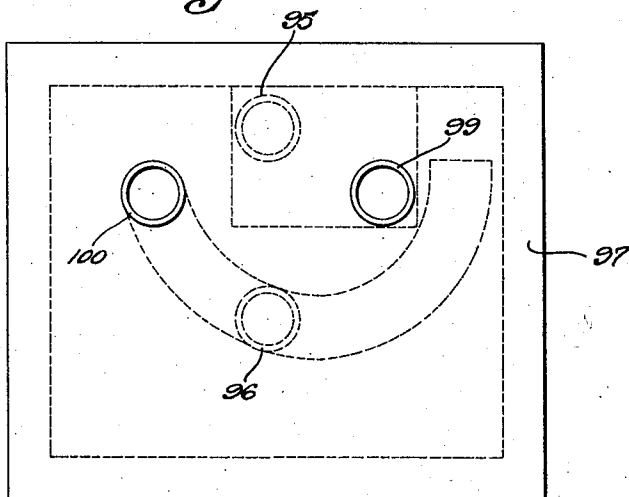


Fig. 12.



Inventor.-
Robert M. Fleming-
by his Attorneys-
Houson & Houson

June 2, 1931.

R. M. FLEMING

1,808,649

MINING MACHINE

Filed June 3, 1927

8 Sheets-Sheet 8

Fig. 18.

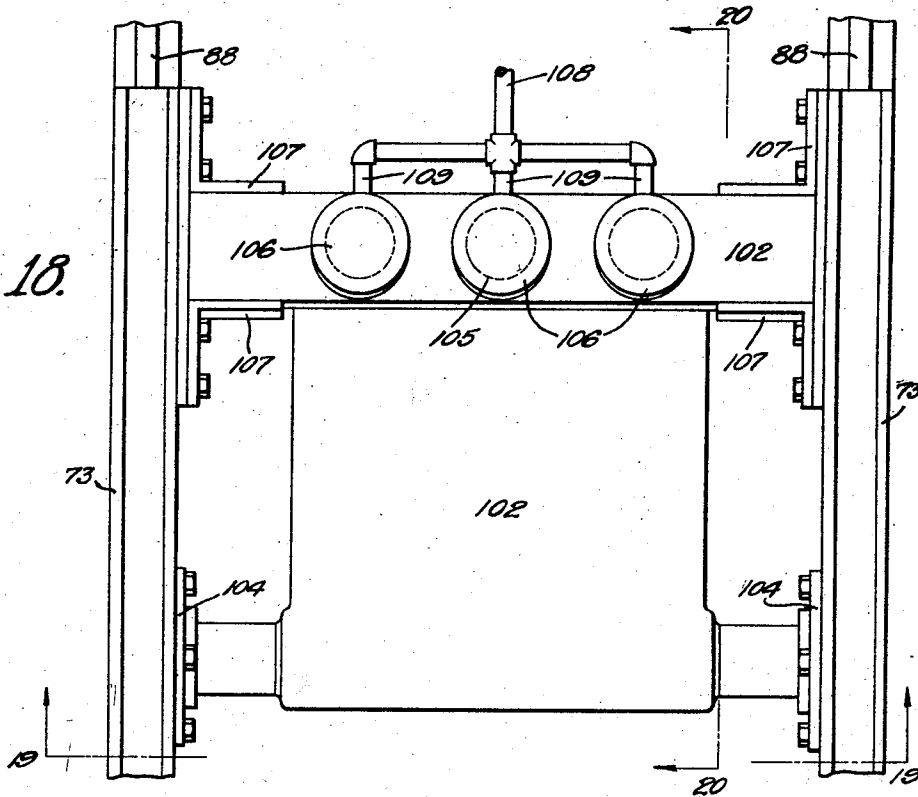


Fig. 19.

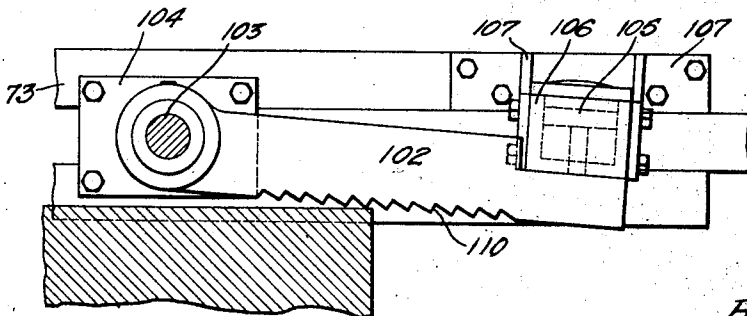
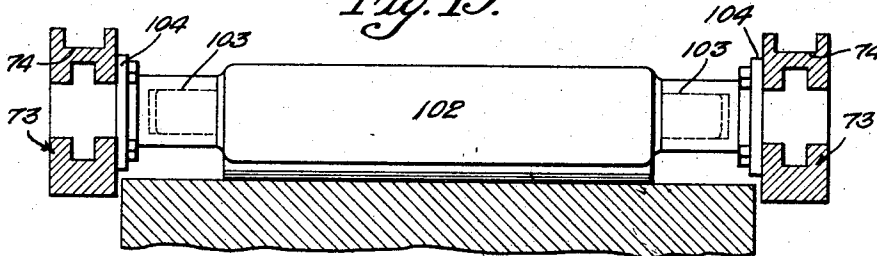


Fig. 20.

Inventor:
Robert M. Fleming
by his Attorneys:
Hewson & Hewson

UNITED STATES PATENT OFFICE

ROBERT M. FLEMING, OF COLVER, PENNSYLVANIA, ASSIGNOR TO EBENSBURG COAL COMPANY, OF COLVER, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA

MINING MACHINE

Application filed June 3, 1927. Serial No. 196,344.

This invention relates to machines of the type adapted for use in mining or extracting, breaking down and loading, coal or other mined products from a solid state, without the use of blasting or other preparation.

An object of the invention is to provide a mining machine that will attack solid coal as it occurs in the seam, cut a rectangular block of coal, break the block of coal down, shovel or scoop up the broken coal and carry it to the rear of the apparatus.

Another object is to provide a mining machine for cutting out a rectangular block of mineral, such as coal, with means for adjusting the cutting elements so as to cut coal seams of varying thicknesses.

Another object is to provide a mining machine with means for simultaneously producing a plurality of kerfs interconnected in the form of a rectangle, together with means for simultaneously wedging against the material below the upper horizontal kerf and breaking the material down.

Another object is to provide a coal mining machine with a moving wedge for breaking down blocks of coal.

Another object is to produce an efficient, strong and durable mining machine which may be economically constructed and operated.

Other objects and advantages will hereinafter appear.

The views of the drawings are:—

Figure 1 is a plan of the machine, showing one form of means for breaking down the mineral, the machine being shown in an operative position in a mine;

Fig. 2 is a side elevation of the structure shown in Fig. 1;

Fig. 3 is an elevation of the front of the machine;

Fig. 4 is a vertical transverse section as seen from the line 4—4 of Fig. 2;

Fig. 5 is a similar view taken on the line 5—5 of Fig. 2;

Fig. 6 is a vertical transverse section as seen from the line 6—6 of Fig. 2; parts being

omitted for clearness;

Fig. 7 is a detail horizontal section as seen from the line 7—7 of Fig. 2;

Fig. 8 is a detail vertical section taken on the line 8—8 of Fig. 2;

Fig. 9 is a detail longitudinal section as seen from the line 9—9 of Fig. 8;

Figs. 10, 11 and 12 are detail views of the control valve for the cutter head frame adjusting means;

Fig. 13 is a detail vertical section taken on the line 13—13 of Fig. 4;

Fig. 14 is a detail view of one of the parts of the breaker shown in Figs. 1, 2, 4 and 13;

Fig. 15 is a diagrammatic plan of the driving mechanism for the tractor;

Fig. 16 is a diagrammatic plan of the driving mechanism for the mining section of the machine;

Fig. 17 is a diagrammatic side elevation of the structure shown in Figs. 15 and 16;

Fig. 18 is a plan of a portion of the forward end of the machine, showing a modified form of breaker;

Fig. 19 is a vertical section as seen from the line 19—19 of Fig. 18;

Fig. 20 is a vertical section taken on the line 20—20 of Fig. 18; and

Fig. 21 is a front view of a portion of a seam of coal illustrating the shape of the cut made by the machine.

Referring to the drawings, the machine comprises three sections, including a mining section A, a tractor B, and a conveyor C.

The mining section A of the machine is provided with a plurality of cutting elements, which are carried on a frame in such a manner as to produce interconnected kerfs of rectangular form in a seam of coal.

Should the block of coal between the kerfs fail to break down under its own weight, then means, in the form of a moving wedge also carried by the frame of the machine, may be used for breaking down the coal.

The frame of the machine includes sides, which may be telescoped so as to increase or decrease the height of the cutting elements of the machine according to the thickness of the seam of coal being worked.

The machine is adapted to be operated in

any place in which hand mining can be done.

The machine is carried into the working place on the tractor B, and it is placed so that the front of its cutting elements are directly in contact with the solid face of coal.

Motion is then imparted to the cutting elements. As the coal is cut away, the tractor pushes the entire machine forwardly into the coal at slow speeds.

When the cutters have penetrated to a sufficient depth, a rectangular block of coal, free on five faces, is broken down.

The coal thus freed from the seam falls on the front of the conveyor C, which carries the broken coal rearwardly where it is discharged into a car or another conveyor.

In the following detail description, first the tractor, then the conveyor, and then the mining section of the machine will be described.

The tractor

The tractor B is designed and intended to support the mining section A and the conveyor C, and to transport them wherever desired.

The tractor comprises a skeleton frame 21, which may be constructed in any suitable manner.

The frame 21 has a pair of shafts 18 and 32 journaled therein.

Mounted on the shafts 18 and 32 are sprockets 19 and 22, there being a pair of such sprockets at each end of the tractor.

Endless belt treads 20 encircle each pair of sprockets. Rollers 31, carried by the frame 21, bear against the treads 20, beneath the frame, for the purpose of retaining the treads in contact with the ground.

The treads 20 are driven either in a forward direction or in a rearward direction by the sprockets 22.

For this purpose, the shaft 18 carries intermediate its length, another sprocket 40.

The sprocket 40 is connected to a sprocket 41 on a drive shaft 30 by means of a chain 23.

The drive shaft 30 is carried in the frame 21 and parallels the shafts 18 and 32.

Slidably mounted on the shaft 30 are bevel gears 24 and 36. These gears are adapted to mesh with a bevel gear 25 on the end of a shaft 29.

The shaft 29 is disposed longitudinally of the tractor and may be mounted in the frame in any suitable manner.

The end of the shaft 29 opposite to the gear 25 has fixed thereon a gear 26 which meshes with a pinion 27 on the end of a shaft 33 of an electric motor 28.

Power is transmitted from the motor pinion 27 through the gear 26 to the shaft 29.

By means of a suitable gear shifting mechanism (not shown), either of the gears 24 or 36 can be engaged with the gear 25.

When the gears 24 and 25 are engaged, and

the motor 28 rotated clockwise, a forward motion will be imparted to the tractor treads from the shaft 30 by the sprocket 41, chain 23, sprocket 40, shaft 18 and sprockets 22.

When the gears 36 and 25 are engaged, the motion imparted to the tractor treads will be reversed, as will be readily understood.

As shown in Fig. 1, the gears 24 and 36 are illustrated in a neutral position, with respect to the gear 25.

Mounted in the frame 21 directly above the shaft 30 is another shaft 42.

A gear 44 on shaft 30 is adapted to be engaged with a gear 43 on the shaft 42 by means of suitable mechanism (not shown).

The conveyor is driven from shaft 42.

The frame 21 carries a pair of spaced girders 60, of channel form. These girders are disposed between the treads 20 and project forwardly from the tractor.

The girders 60 support the mining section A, as well as the conveyor C.

The conveyor

The conveyor consists of two parallel chains 61 which are connected at intervals by flights 62.

The flights 62 carry an endless belt 63. The belt has a width slightly less than the distance between the chains 61.

The conveyor chains are passed around a sprocket 64 on a shaft 65 at the loading, or forward end of the machine, and around sprockets 49 on a shaft 48, at the discharge, or rear end of the machine.

The conveyor is confined between a pair of upstanding side walls 66.

The forward end of the conveyor frame is provided with an inclined bottom plate 67 upon which the coal is deposited during the mining operation.

The plate 67 has a nose 68, disposed contiguous to the ground.

The plate 67 and the nose 68 are so constituted as to direct the loose coal towards the forward end of the conveyor.

Between its front end, and the portion thereof which overlies the tractor, the conveyor is inclined. All of the driving mechanism is disposed beneath the elevated portion of the conveyor.

If so desired, the bottom plate 67 may be so constructed as to underlie the conveyor for its entire length. In this way, loose particles of material falling from the conveyor will be prevented from lodging in the driving mechanism.

The shaft 42 has two sprockets 45 and 50 fixed thereon, the sprocket 45 being positioned near one end of the shaft and is adapted to drive the mechanism at the forward end of the machine, while the sprocket 50 is positioned near the other end of the shaft 42, and is connected to a sprocket 47 on shaft 48 by a chain 46. The sprocket 47 is located ad-

jacent to one of the conveyor chain drive sprockets 49.

The mining section

5 The mining section A consists of four cutting devices which are arranged in such a manner as to cut a rectangular block out of a seam of coal (see Fig. 21).

10 The cutting devices include a pair of parallel vertically disposed endless chains 69, having toothed projections 70, and parallel horizontal drums 71 disposed transversely of the machine. The drums 71 have toothed projections 72.

15 The projections 70 and 72 may be of the form illustrated, so as to provide a plurality of staggered cutting elements.

The chains 69 and drums 71 are carried by rectangular frames 73.

20 The rear of the frames 73 are rigidly connected to extensions of the girder 60 (see Figs. 1 and 2).

The frames 73 have grooves 74 formed in their periphery for the chains 69.

25 In order to provide means whereby the sides of the mining section may have their height adjusted to correspond to the thickness of the coal seam being worked, the frames 73 are composed of telescoping sections.

30 The sections of the frames 73 include angular members 75, 76, 77 and 78.

The member 75 has a solid corner portion from which projects two arms 79 and 80.

35 The member 76 has a solid corner portion from which projects two arms 81 and 82, the arm 81 being bifurcated, while the arm 82 is similar in form to the arms 79 and 80.

40 The member 77 has a solid corner portion from which projects two arms 83 and 84, both of which are formed similarly to the bifurcated arm 81 of the member 76.

45 The member 78 has a solid corner portion from which projects two arms 85 and 86, the arm 85 being formed similarly to the arms 79, 80 and 82, while the arm 86 is formed similarly to the arms 81, 83 and 84.

50 Each of the arms 81, 83, 84 and 86 have grooves 87 formed therein, as shown in Fig. 4, while each of the arms 79, 80, 82 and 85 have ribs 88 formed thereon.

The ribs 88 are slidably mounted in the grooves 87.

55 The drums 71 are journaled on shafts 89 carried by the corner portions of the members 77 and 78 of the frames 73.

60 The ends of the shafts 89 have fixed thereon sprockets 90 which are disposed in recesses 91 formed in the corner portions of the members 77 and 78.

The links of the chains 69 engage the teeth of the sprockets 90 and are guided thereby at the front end of the machine, (see Fig. 5).

65 The corner of the member 75 has its sur-

face curved, and the groove 74 extends around this portion of the frame 73.

70 The corner portions of the members 76 have journaled therein a shaft 92. This shaft has fixed thereon sprockets 93. The sprockets 93 are disposed in recesses 94 formed in the corner portions of the members 76.

75 The links of the chains 69 engage the teeth of the sprockets 93.

Intermediate its length, the shaft 92 has fixed thereon a sprocket 56.

80 Mounted in the frame 21, forwardly of the shaft 42, is another shaft 53, on which shaft is mounted sprockets 52 and 54.

A chain 51 connects sprockets 45 and 52, while a chain 55 connects sprockets 54 and 56.

85 When motion is imparted to the conveyor from the shaft 42, motion will also be imparted to the cutting chains 69 and the cutting drums 71 by the series of chains and sprockets just described.

90 The arms 80 of the frame 73 have journaled therein a shaft 57 having fixed thereon, as shown in Figs. 1, 2, 4 and 13, a plurality of dogs 58.

95 Any number of the dogs 58 can be placed on the shaft 57. However, these dogs should preferably be of the form shown in Fig. 14 and they should have serrated arcuate faces 59.

The dogs 58 should be disposed in angular relation to each other on the shaft 57 as shown in Figs. 2 and 13.

100 As the machine cuts its way forward into solid coal, the block of coal thus freed on five faces will catch one or another of the dogs 58.

105 Since the tips of the dogs project below the upper surface of the block of coal, the teeth of the dogs will be forced into the coal when the machine moves forwardly. This action will force the block of coal downwardly, and the wedging action of the dogs against the coal will fracture the latter so that it will fall upon the front end of the conveyor.

110 As shown in Fig. 2, the vertical height of the frame 73 is reduced to a minimum, by reason that the arms 79 and 81, and the arms 83 and 85 of the frame members have been telescoped together, while in Fig. 8, the vertical sides of the frame are shown extended.

115 When the vertical arms of the frame are telescoped together as shown in Fig. 2, the horizontal arms 80 and 86, and 82 and 84, will be extended with respect to each other a corresponding distance. This provides for uniform length of the periphery of the frames 73 regardless of the relative position of the telescoped sides thereof.

120 To change the height of the frame 73, the vertical and horizontal arms are slid relatively to each other by means of jacks 34. In the present instance four jacks are used, and such devices are arranged in pairs, dis-

posed at right angles to each other, as shown in Figs. 7 and 8.

The jacks 34, which are similarly formed, comprise a body having a cylinder 35. The body is rigidly attached to the arms 81 and 82 of the frame 73.

Slidably mounted in the cylinder 35 of each jack is a piston 37, the rod of which is fixed to a bracket 38.

The brackets 38 are fastened to the arms 79 and 84 of the frames 73.

The jacks 34 may be of any desired type. However, in the present instance, the pistons 37 are adapted to be actuated by suitable fluid, such as oil, which is contained within the cylindrical body of each jack.

The cylinders 35 of each of the jacks have a length greater than the length of the strokes of the piston 37.

Pipe lines 95 and 96 are respectively connected to the forward and rear ends of each of the cylinders 35.

The pipes 95 and 96 are connected to a valve 97.

The valve 97 is connected to a pump 98 by pipes 99 and 100.

The pump 98 may be of any approved type and it can be actuated by means of an electric motor 101 (see Figs. 7 and 8).

When the oil is forced into the jacks 34 through the pipe 96, the pistons will move outwardly thereby spreading the horizontal members of the frame.

However, the arrangement of the jacks is such that as the horizontal sides of the frames 73 are telescoped together, the vertical sides of the frames will be simultaneously extended. In this way, the distance around the periphery of the frame 73 will be the same although the height and length of the frames are changed.

The pump 98 always rotates in the same direction thus causing the direction of flow in pipes 99 and 100 to remain unchanged.

When it is desired to change the height of the frames 73, the direction of flow of the oil in the pipes 95 and 96 is reversed. This is done by means of the valve 97 (see Figs. 10, 11 and 12).

The valve 97 may be an approved type of slide valve so constructed that the flow of oil can be controlled to permit the oil to flow from pipe 99 to either pipe 96 or pipe 95, or from pipe 100 to either pipe 95 or pipe 96, according to the position of the valve, as will be readily understood.

When the machine is positioned against a seam of coal motion can be imparted to the chains 69 and drums 71. As the cutting elements of these members cut away the coal, the tractor treads will push the whole machine forward into the coal at a slow rate of speed.

Fine coal from the cutters, and coal that does not fall directly on to the conveyor is

caught up by the nose 68 at the front of the conveyor and the forward thrust of the tractor will push such coal on to the conveyor. The coal will be discharged from the rear of the conveyor into a car or another conveyor.

In lieu of the means, including the dogs 58, for breaking down the coal, I have, in Figs. 18, 19 and 20, shown an alternative form of coal breaker comprising a heavy jaw 102.

The jaw is provided with a pair of oppositely projecting trunnions 103 which are pivotally mounted in brackets 104 carried by the upper horizontal arms of the frames 73.

The jaw 102 is substantially rectangular in form and the trunnions 103 are disposed near one end thereof.

The edge of the jaw 102 opposite to its pivot is provided with a plurality of pistons 105 which are slidably mounted in cylinders 106.

The cylinders 106 are carried by brackets 107 fixed to the upper horizontal arms of the frames 73.

A pipe 108, leading from the pump 98, (shown in Fig. 9) has branches 109 to each of the cylinders 106.

The bottom of the jaw 102 has serrations 110, which are disposed transversely of the machine.

Oil pressure from the pump 98 will force the pistons 105 downwardly, and as the machine moves forwardly in the mine the serrations 110 will bite into the coal and crush the same.

As shown by Fig. 20, the disposition of the jaw 102 is such that it acts as a moving wedge against the top of the block of coal, as will be readily understood.

The invention set forth herein is, of course, susceptible of various other modifications and adaptations.

The invention claimed is:—

1. The combination in a mining machine, of a mining section; endless chain cutters located at each side of said mining section; and transverse upper and lower cylindrical cutter bars located between the endless chain cutters and between which the operative sections of the endless chain cutters extend substantially vertically.

2. The combination in a mining machine, of a mining section; rotatable transverse upper and lower cutting bars having trunnions; and longitudinally arranged endless chain cutters mounted on the trunnions of the cutter bars and between which the operative sections of the chain cutters extend vertically.

3. The combination in a mining machine, of a mining section having a plurality of endless chains having cutting elements thereon, one of said chains being located at one side of the mining section and the other at the opposite side thereof; a driving shaft at the

rear of said mining section; and transverse upper and lower cylindrical cutter bars rotatably driven from said shaft through said endless chains, the operative sections of said chains extending vertically between the cutters.

4. The combination in a mining machine, of a frame; means for vertically adjusting the frame; means for longitudinally adjusting said frame; an endless chain cutting element at each side of the frame; and upper and lower members having cutting elements extending substantially across the frame between the sides thereof.

5. The combination in a mining machine, of a mining section; a frame, said frame having telescopic sections to allow the frame to be expanded or contracted vertically and longitudinally; endless chain cutting members arranged at each side of the said frame; upper and lower transverse elements having cutting members driven from the said chains; and fluid operated jacks arranged to simultaneously adjust the frame.

6. The combination in a mining section of a mining machine, of a frame, the side members of which are vertically adjustable; two endless chain cutters, one mounted at one side of the frame and the other at the opposite side thereof; means at the rear end of the frame for driving said chains; upper and lower cylindrical members having cutters at the forward end of the frame driven by the chains; and means for vertically adjusting the frame.

7. The combination in a mining section of a mining machine, of cutting elements for producing a rectangular kerf in a seam of coal; and rotatable cam wedging means rotatably actuated by engagement with the body of coal for producing a wedging effect upon such body, said wedging means being located rearwardly of the cutting face of the machine, and operating after the kerf has been produced.

8. The combination in a mining section of a mining machine, consisting of a frame; two endless chain cutters, one located at one side of the frame and the other at the opposite side thereof; a plurality of transverse cutters spaced apart, one of said cutters being above the other and having their axes arranged substantially horizontally; and a rotating wedging device comprising a plurality of relatively staggered wedges arranged side by side on a single shaft, located in the kerf of the upper transverse cutter for producing the wedging effect upon the upper surface of the cut section of coal, to break it down, said wedges each having a toothed cam face for engagement with the coal.

9. In a mining machine having mining and tractor sections, a drive shaft, means for driving said shaft, two endless belt cutting chains, one located on one side of said machine, and

the other on the opposite side thereof and driven from said shaft, upper and lower transverse cutting bars driven from said shaft through said endless chains and having cutting elements combining with the cutting chains to sever the four sides of a horizontal column of coal, an endless belt conveyor extending over and carried by the frame of the tractor section and extending into the lower member of the frame of the mining section, and means between the cutting chains and operating in the kerf formed by the upper transverse cutting bar for breaking the column and causing it to fall upon said conveyor.

ROBERT M. FLEMING.

70

75

80

85

90

95

100

105

110

115

120

125

130