

April 30, 1929.

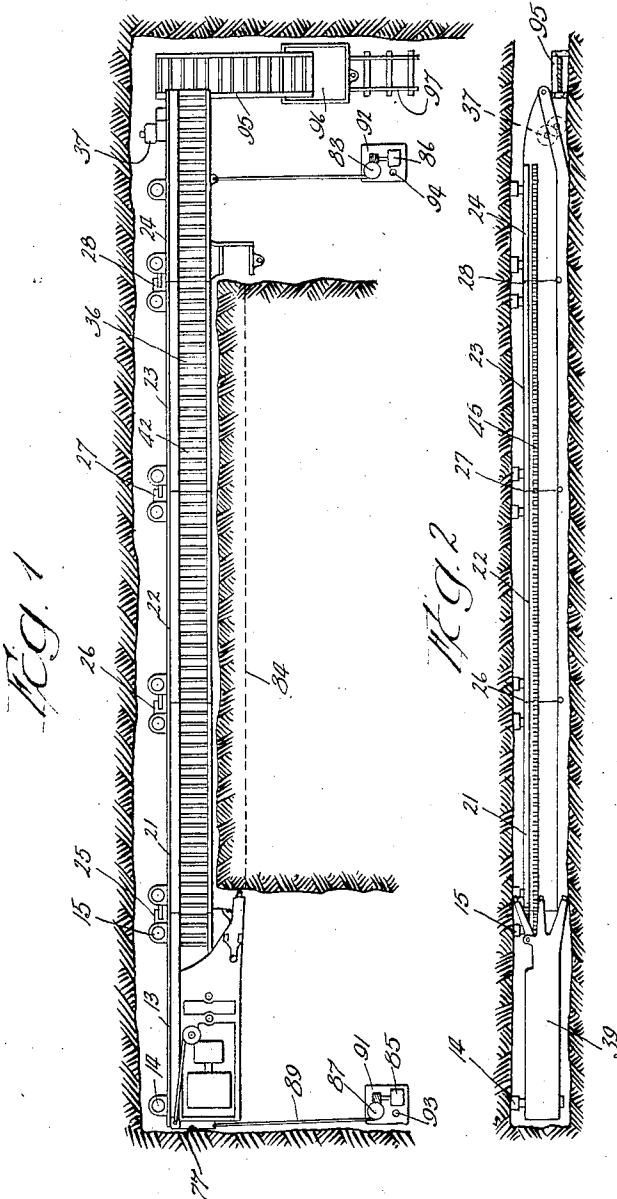
E. C. MORGAN

1,711,280

LONG WALL MINING AND LOADING MACHINE

Filed Sept. 22, 1922

5 Sheets-Sheet 1



Inventor:
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By Nissen & Crane Attys.:-

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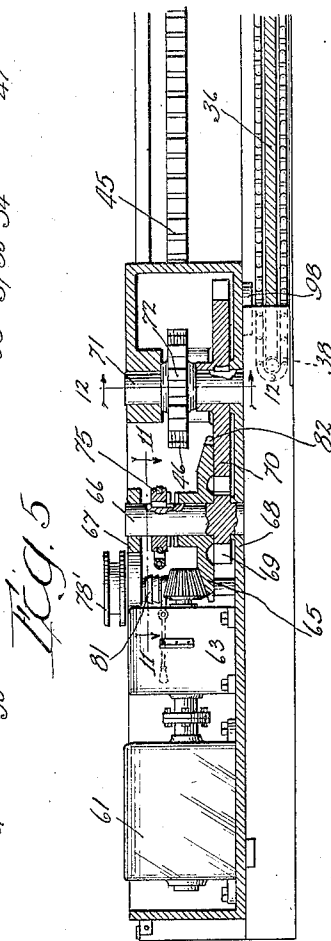
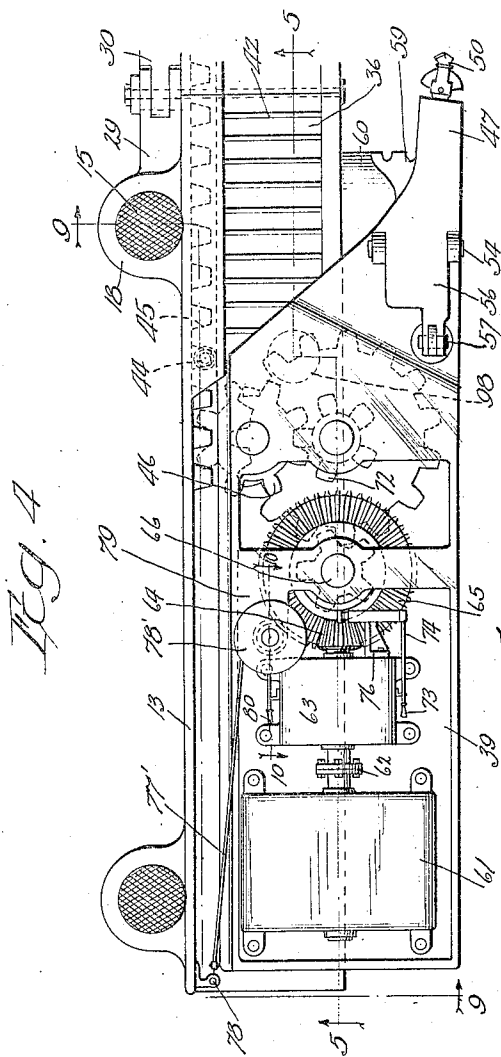
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5 Sheets-Sheet 2



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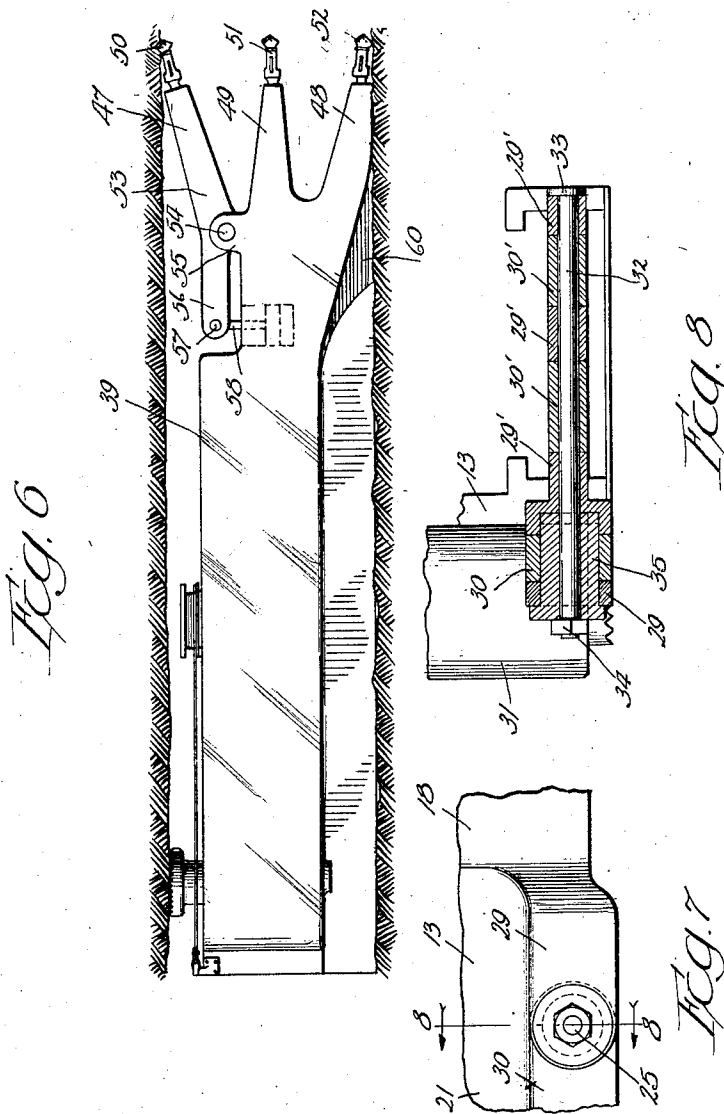
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5 Sheets-Sheet 3



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5 Sheets-Sheet 4

Fig. 9

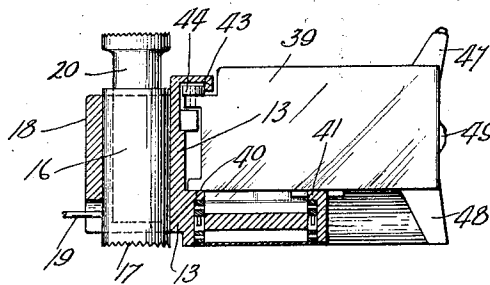


Fig. 10

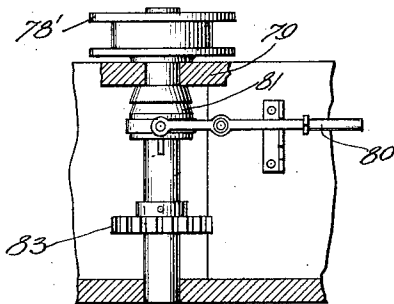


Fig. 11

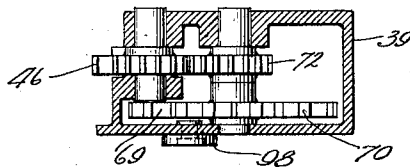
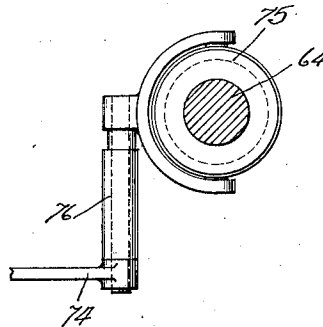


Fig. 12

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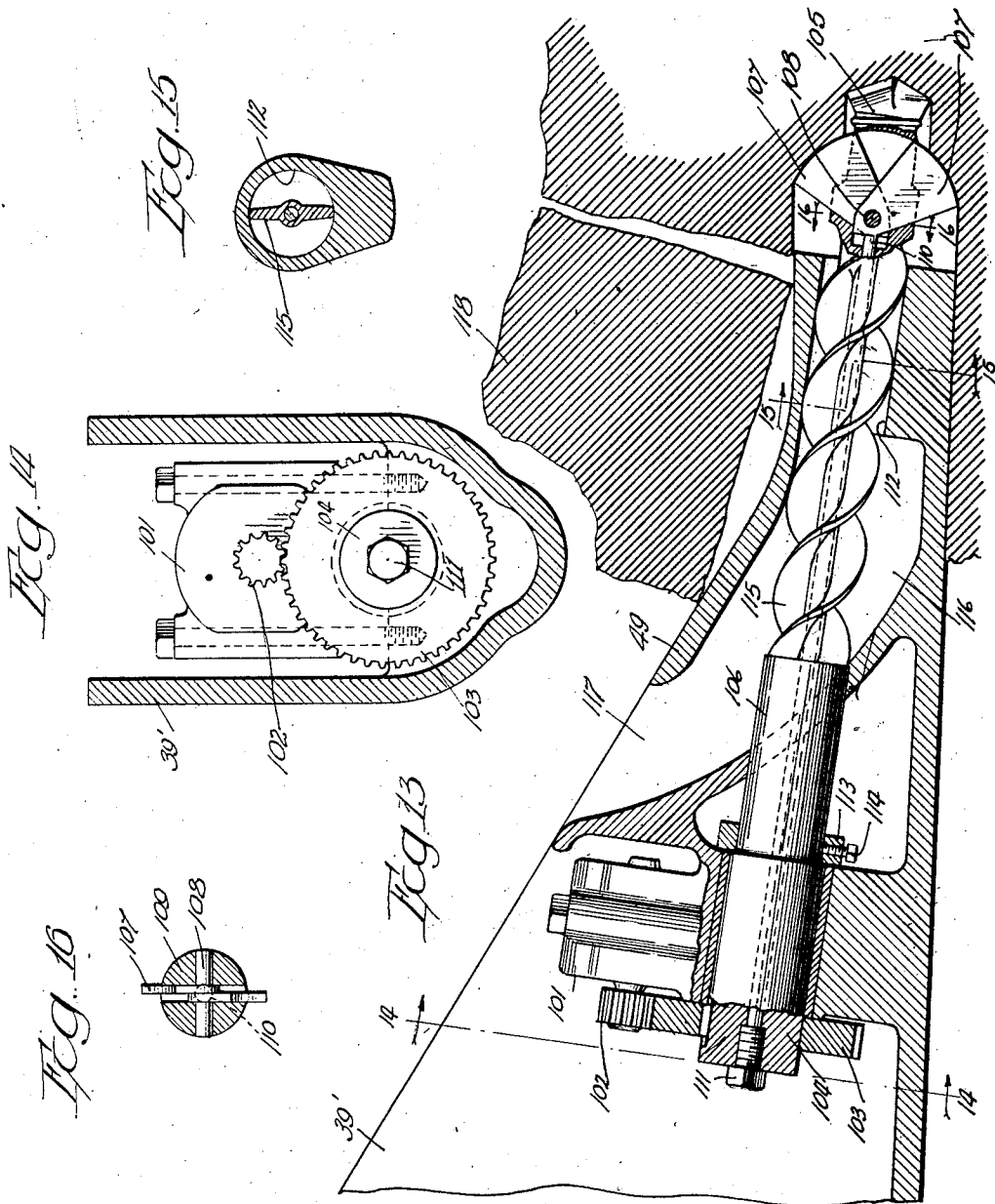
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LONG WALL MINING AND LOADING MACHINE

Filed Sept. 22, 1922

5 Sheets-Sheet 5



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UNITED STATES PATENT OFFICE.

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LONG-WALL MINING AND LOADING MACHINE.

Application filed September 22, 1922. Serial No. 589,817.

My invention relates to mining and loading machines and one of its objects is the provision of improved and efficient apparatus of this type.

5 A further object of the invention is the provision of a mining machine having an upright series of spaced-apart dislodging tools comprising cutting mechanism and means for taking care of the cuttings.

10 Another object of the invention is the provision of an upright series of spaced-apart drills combined with dislodging mechanism and means for directing the cuttings from the drills to positions of non-interference with the feeding of the drills.

15 Another object of the invention is the provision of an upright series of spaced-apart drills combined with an elongated conveyer having a stationary frame along which such drills may be fed to prepare the mine vein for dislodgement from the unmined mass, mechanism being also provided for directing the cuttings, as well as the dislodged blocks of material onto such conveyer.

25 A further object of the invention is the provision of an upright series of spaced-apart drills combined with wedging dislodging mechanism traveling along a frame anchored and adapted to abut against a mine wall during the operation of such dislodging mechanism.

Other objects of the invention will appear hereinafter, the novel features and combinations being set forth in the claims.

35 Referring to the accompanying drawings—Fig. 1 is a plan view of the improved system of mining embodying an anchored sectional conveyer together with a mining machine and the mechanism for adjusting the positions thereof;

40 Fig. 2 is an elevational view of a mining machine and the loading mechanism along which the mining machine is fed;

45 Fig. 3 is a right-hand elevation of the structure shown in Fig. 1;

Fig. 4 is a plan view showing details of the mining machine and the cooperative parts of the anchored section of the conveyer;

50 Fig. 5 is a sectional elevation of Fig. 4 looking in the direction of the arrows;

Fig. 6 is an elevational view of the mining machine shown in Fig. 4, showing particularly the dislodging mechanism;

Fig. 7 is a rear side view of the joint between the sections of the conveyer shown in Fig. 1, but broken away and enlarged;

Fig. 8 is a sectional view of Fig. 7 on the line 8—8 looking in the direction of the arrows;

Fig. 9 is a sectional elevation on the line 60 9—9 of Fig. 4;

Fig. 10 is an enlarged elevation of a portion of Fig. 4 on the line 10—10 looking in the direction of the arrows;

Fig. 11 is an enlarged sectional plan view of a portion of Fig. 5 on the line 11—11 looking in the direction of the arrows;

Fig. 12 is a sectional elevation taken on the line 12—12 of Fig. 5 looking in the direction of the arrows;

Fig. 13 is an enlarged sectional plan view of the drilling and dislodging mechanism provided with means for taking care of the cuttings from the drilling mechanism;

Fig. 14 is a sectional view of Fig. 13 taken 75 on the line 14—14 looking in the direction of the arrows;

Fig. 15 is a sectional elevation of Fig. 13 on the line 15—15 looking in the direction of the arrows; and

Fig. 16 is a sectional view of Fig. 13 on the line 16—16 looking in the direction of the arrows.

The present application is a continuation in part of my co-pending application, Serial No. 482,164, filed July 2, 1921, for an improvement in Long-wall mining and loading machines, the latter disclosing and claiming coal mining mechanism and combined coal mining and loading mechanism comprising spaced-apart piercing tools in an upright series for dislodging coal from a mine wall for delivery to the elongated conveyer, whereas in the present application such piercing mechanism is modified by substituting therefor drills to provide openings for the wedges to act in and mechanism is added to take care of the cuttings produced by the drills.

Inasmuch as the conveyer frame constitutes the supporting frame for the mining machine, I will first describe the conveyer mechanism.

Referring to Figs. 1, 4 and 9 it will be seen that the conveyer frame 13 is adapted to rest in stationary position on the floor of a mine chamber. At the rear end portions of the

conveyer frame 13 are located hydraulic roof jacks, as shown at 14, 15 in Fig. 1. As shown in Fig. 9, each roof jack comprises a cylinder 16 having a shoe 17 at its lower end. This cylinder may be free to slide up and down in a cylindrical extension 18 of the conveyer frame 13. The cylinder 16 is provided with a supply pipe 19 and the usual valve mechanism for controlling the supply of liquid pressure medium to the cylinder 16 to force the plunger 20 upwardly and the cylinder 16 downwardly. By having the cylinder 16 movable relatively to the conveyer frame, the latter will more readily adapt itself to the irregularities of the floor level when the roof jacks are in anchored positions.

The elongated conveyer comprises a plurality of sections, as shown at 13, 21, 22, 23 and 24 in Fig. 1, each section being anchored at its end portions, as illustrated in Fig. 9. Furthermore, in order to permit the elongated conveyer frame to be anchored between the floor and roof which may extend somewhat irregularly in elevation, the conveyer frame is not only made sectional, but also pivotally connected, as shown in Figs. 1, 7 and 8. In Fig. 1 pivotal connections are shown at 25, 26, 27 and 28. The details of these pivotal connections will be understood by referring to Figs. 7 and 8. Extending from the cylindrical guide 18 is an arm 29 which is bifurcated, as shown at the upper right-hand portion of Fig. 4, to receive the arm 30 of the next adjacent conveyer section. Fig. 7 shows the pivot 25 of Figs. 1 and 4, and Fig. 8 shows the cylinder 31 at the left-hand portion of Fig. 1.

The adjacent frames 13 and 21 are pivotally connected together by a bolt 32 which passes through interlooping tubular extensions 29' and 30' from the arms 29 and 30, respectively, in the nature of the well-known door hinge. The bolt 32 has a head 33 at one end and a nut 34 at the other end for securely fastening the bearing hub 35 in the position shown in Fig. 8. This bearing hub is enlarged to strengthen the pivotal connection between the rear section frames, while the pivotal mechanism between the sides of the conveyer is of smaller diameter so as to provide sufficient space for the travel of the movable element of the conveyer mechanism.

The conveyer preferably comprises spaced-apart endless chains with cross-flights arranged between them at intervals to slide along the stationary bed or way, as shown at 36 in Figs. 4 and 5. The conveyer may be driven by a motor, as shown at 37 in Figs. 1 and 2. The rear end of the conveyer may be located at 38, as shown in Fig. 5, rearwardly of the starting position of the mining machine shown in Fig. 1.

As shown in Fig. 9, the mining machine frame 39 rests on and slides along guideways 40 and 41 which are located longitudinally of the conveyer at the sides of the slideway 36

along which the cross-flights 42 travel. The upper horizontal surface, as well as the forward vertical face of the conveyer guide frame 41 is engaged by the mining machine frame which is made angular in shape for this purpose, as shown in Fig. 9.

A portion of the bottom of the mining machine frame is adapted to slide over the mine floor, but in order to decrease the friction of feeding travel of the mining machine, I prefer to provide a track 43 to be engaged by a roller 44 pivotally connected to the mining machine frame, as shown in Fig. 9 in full lines, and in Fig. 4 in dotted lines. An additional guide roller is shown at 98 in position to engage the inside of a conveyer frame.

Each of the conveyer frame sections is provided with a rack and when the sections are pivotally connected together, as shown in Fig. 1, these racks are located in alignment with each other. The rack on the frame 13 is illustrated at 45 in Figs. 4 and 5. These racks are for the purpose of being engaged by a power operated gear 46 on the mining machine to effect feeding of the mining machine rectilinearly along the conveyer framework while the latter is held stationary by the series of roof jacks.

The coal dislodging mechanism comprises an upright series of combined drill and splitting tools shown at 47, 48 and 49 in Fig. 6. In this view I have shown the drills 50, 51 and 52 extending beyond wedging frames which are adapted to enter the holes produced by the drills, as illustrated more clearly in Fig. 13.

The uppermost coal dislodging device 47 is mounted on an arm 53 which is pivoted at 54 on a standard 55 secured to the mining machine frame 39. The rear arm 56 is pivoted at 57 to a plunger rod 58 of a hydraulic motor which may be operated in a well-known manner to adjust the elevation of the coal dislodging device 47 and lock the same at adjusted elevation.

As shown in Figs. 4 and 6, the frame 39 at its forward end portion is provided with a downwardly and forwardly extending dislodging device 59 and a scoop 60 so that the floor will be properly trimmed or leveled and the dislodged material deflected onto the conveyers which are arranged end to end with the single set of conveyer flights moving along the entire length of the sectional conveyer frame.

The mechanism for rotating the gear 46 so as to effect rectilinear feeding movement of the spaced-apart dislodging tools and the movement of the dislodged material onto the conveyer bed 36 is shown in Figs. 4 and 5. A motor 61 is mounted on the rear end of the mining machine frame 39 and coupled at 62 to speed reducing gearing shown diagrammatically at 63. A beveled pinion 64 extends from the right-hand end of the speed reducing gearing casing and meshes with a horizontal bevel gear 65 which is mounted loosely

on the vertical shaft 66, the latter being in turn journaled in bearings 67 and 68 connected rigidly to the frame of the mining machine. At the lower end of the shaft 66 is a pinion 69 which meshes with a large gear 70 on a vertical shaft 71 which is journaled in bearings connected rigidly to the mining machine frame. Secured to the vertical shaft 71 is a pinion 72 which meshes with the gear 46, as shown in Fig. 4.

By means of a handle 73 for operating a lever 74, the clutch 75 may be operated on the pivot mounted on the bracket 76 secured to the front side of the speed reducing gearing casing, as shown in Fig. 4. When the clutch is thrown in and the motor is operating, power may be transmitted through the gearing 64, 65, 69 and 70 to the pinion 72 to drive the gear 46 and thereby cause the whole mining machine to travel along the sectional conveyor. When this operation takes place the resistance due to the dislodging operation is counteracted by the series of roof jacks and also by reason of the fact that the left-hand end of the conveyor frame 13 may abut against the mine wall, as indicated at 77 in Fig. 1.

In order to retract the mining machine along the conveyor to the initial position shown in Fig. 4, I provide rope-winding mechanism comprising a rope 77' with its free end adapted to be anchored at 78 to the rear end of the conveyor section 13. The other end of the rope 77' is connected to and wound on a rope-winding drum 78' mounted on a vertical shaft journaled in the cross-piece 79 rigidly connected to the mining machine frame. By means of a lever 80 pivoted to one side of the gear casing 63 a cone clutch 81 may be operated to connect or disconnect the winding drum 78' to the bevel gear 65 through the gears 82 and 83, as shown in Figs. 5 and 10.

After a mining operation has been effected by moving the mining machine along the dotted line 84 of Fig. 1, the roof jacks are all released and then the motors 85 and 86 are operated to operate the rope-winding mechanisms 87 and 88 to exert pulls on the ropes 89 and 90 to move the entire mining and loading apparatus forwardly to a new location. During this operation the frames 91 and 92 may be anchored between the floor and the roof by means of the roof jacks shown diagrammatically at 93 and 94 in Fig. 1. When this adjustment of the mining apparatus is made to a new location, the supplemental conveyor 95 may likewise be moved to proper position to receive the dislodged material from the conveyor 36 for delivery into a mine car 96 on a track 97 in the entry shown at the right-hand portion of Fig. 1.

As shown in Fig. 6, the lowermost dislodging device 48 occupies such a position as to travel along the desired floor level, while the

uppermost dislodging device 47 is adjustable in elevation in accordance with the height of the roof of the mine chamber. There is also an additional dislodging device 49 intermediate the floor and the roof. It should be noted that the frames of the dislodging devices 48 and 49 are rigidly connected to the frame 39 and may be integral therewith, and during the operation of the mining machine the uppermost dislodging device 47 is locked by the hydraulic mechanism in rigid connection with the frame 39. Therefore when the mining machine frame is fed rectilinearly along the conveyor frame each of the wedging devices 47, 48 and 49 travels into the holes produced in advance thereof by the drilling mechanism shown in detail in Fig. 13. It should be understood that each of the arms 47, 48 and 49 of Fig. 6 is provided with the drilling mechanism shown in Fig. 13. The drilling mechanism on each arm is operated individually or independently of the drilling mechanism on the other arms, but they are operated simultaneously during the feed of the mining machine frame 39 along the working face of the coal vein.

Referring to Figs. 13 and 14 it will be seen that there is located within the U-shaped auxiliary frame 39' an electric motor 101 which is connected by the pinion 102 and gear 103 to the shaft 104 of the drill 105 which extends through the wedge frame 49.

The cutting tools at the extreme outer end of the cutting mechanism are adapted to drill a hole approximately the same diameter as the cylindrical extension 106 of the shaft 104. Additional cutting tools 107 are provided so as to enlarge the drill hole to the width of the forward end of the wedge frame 49. The cutting tools 107 are pivotally mounted at 108 to the frame 109, as shown in Figs. 13 and 16. The rear ends of the cutting tools 107 are provided with adjacent flat cam surfaces adapted to be engaged by the forward end of the rod 110 which extends through the axis of the shaft 104 to the rear end thereof to be engaged by the cap screw 111. When the latter is in the position shown in Fig. 13, the rod 110 is forced forwardly to engage the cam surfaces at the rear ends of the cutting tools 107 to force the latter outwardly to the positions shown in full lines in Fig. 13. When the cap screw 111 is loosened and withdrawn, the cutting tools 107 are free to be brought into folded relation so as to permit the cutting mechanism to be withdrawn from the cylindrical opening 112 in the wedge frame 49. Such withdrawal may be effected by first releasing the collar 113 by loosening the set screw 114.

Connected to the shaft extension 106 is a spiral conveyor 115 mounted to rotate with the shaft 104 and therefore also with the drilling mechanism. The cuttings produced by the drilling mechanism are free to enter the

cylindrical opening 112 and be conveyed into the chamber 116 by means of the spiral conveyer 115 and thence to the passageway 117 for delivery to the conveyer 36. As the mining machine travels along the mine vein the drills operate to produce holes or openings for the wedge frames to enter to facilitate the splitting of the coal blocks, such as that illustrated at 118 in Fig. 13, from the mine wall and direct such dislodged material into position to be moved onto the conveyer 36 by the scoop and deflector 59, 60 shown in Fig. 4. At the same time, the spiral conveyer 115 conveys the cuttings from the drills through the passageway 117 to the scoop and deflector 59, 60 for delivery onto the conveyer 36. It will thus be seen that notwithstanding the use of the drilling mechanism the cuttings will not block the feed of the mining machine, but the latter may be fed along the mine continuously and uninterruptedly. Without providing means for transferring the cuttings from the drilling mechanism the tendency would be for the cuttings to become packed where the cutting tools are operating and therefore exert such resistance as to prevent the cutting tools from being operated, thus rendering the cutting mechanism impractical.

It should also be noted that by providing the expansible cutting tools 107 for cutting sufficient clearance to permit the wedging mechanism to operate as indicated in Fig. 13, the cuttings are readily fed to the spiral conveyer. Furthermore, by having the cutting mechanism arranged so that it can be folded by releasing the cap screw 111, and by releasing the collar 113 the cutting mechanism may be withdrawn through the opening 112 without retracting the entire mining machine from the mine wall. Therefore the cutting bits may be quickly renewed whenever desired, without changing the position of the mining machine, except to a slight extent, such as may be necessary to facilitate removal of the dull bits and the replacement thereof by newly sharpened bits.

It will be seen by referring to Figs. 4, 6 and 13 that the cuttings produced by each drill are conveyed rearwardly through the wedging mechanism, and furthermore the cuttings are delivered to the scoop 60 at a position rearwardly of the points of application of the wedging mechanism to the cut coal. In other words, by making the wedge mechanism tubular the cuttings produced in advance of the wedge are taken care of inside of the space occupied by the wedging mechanism and such cuttings are delivered to the scoop 60 for transfer to the conveyor at a position where they cannot interfere with the operation of the wedging mechanism. Ample clearance is therefore always provided for operation of the wedging mechanism and the cuttings are continuously

conveyed rearwardly so as to not interfere with the continuous forward feed of the drilling mechanism.

Obviously those skilled in the art may make various changes in the details and arrangement of parts without departing from the spirit and scope of my invention as defined by the claims hereto appended, and I wish therefore not to be restricted to the precise construction herein disclosed.

Having thus fully disclosed an embodiment of my invention, what I desire to secure by Letters Patent of the United States, is:

1. In a mining machine, the combination with a supporting frame, of means for anchoring said frame between the floor and roof of the mine chamber to serve as a fixed rigid abutment, means including drilling mechanism to penetrate coal in its native bed and dislodge such coal along the face of the mine wall between the floor and roof of the mine chamber, means for removing the cuttings during the operation of said drilling mechanism, and means for operating said penetrating and dislodging means.

2. In a mining machine, the combination with a supporting frame adapted to abut against an upright mine wall in a mine chamber, of a plurality of penetrating devices each comprising a drill, means for operating the drills, mechanism for exerting a continuous thrust on said penetrating devices for moving them along said frame while the latter serves as an abutment, and automatic means for removing the cuttings produced by said drills.

3. In a mining machine, the combination with a supporting frame comprising a wall abutment, of dislodging means comprising drilling mechanism adapted to penetrate the solid of the mine wall and tear away the face of the mine vein, and means for exerting a continuous forward thrust on said dislodging means away from such wall abutment.

4. In a mining and loading machine, the combination with a supporting frame, of dislodging mechanism comprising a drill in advance of a wedge for penetrating the solid of a coal vein and by wedging action tearing the face therefrom, means for operating said dislodging mechanism to penetrate and tear the coal from the mine wall, means for directing the cuttings away from said drill to facilitate feed thereof, and conveyor mechanism in position for receiving and conveying away the coal dislodged.

5. In a mining and loading machine, the combination with a supporting frame, of dislodging means comprising drilling mechanism adapted to penetrate coal in its native bed and tear it from the unmined mass, means for operating said dislodging means, a conveyor in position for receiving the material dislodged, and mechanism for directing the cuttings of said drilling mechanism onto said conveyor.

6. In a mining machine, the combination with a supporting frame, of means for anchoring said frame between the floor and roof of the mine chamber to serve as a fixed rigid
 5 abutment, means including drilling mechanism to penetrate coal in its native bed and dislodge such coal along the face of the mine wall between the floor and roof of the mine chamber, means for automatically transfer-
 10 ring the cuttings from the drilling mechanism, and means for operating said penetrating and dislodging means.

7. In a mining machine, the combination with a supporting frame adapted to abut
 15 against an upright mine wall in the mine chamber, of a plurality of penetrating devices each comprising a drill, means for operating the drills, mechanism for exerting thrusts on said penetrating devices for moving
 20 them along said frame while the latter serves as an abutment, and conveying mechanism for removing the cuttings produced by said drill.

8. In a mining machine, the combination
 25 with a supporting frame comprising a wall abutment, of dislodging mechanism comprising drilling mechanism adapted to penetrate the solid of the mine wall and tear away the face of the mine vein, and means for exerting
 30 a forward thrust on said dislodging means in a direction away from such wall abutment.

9. In a mining machine, the combination with a supporting frame, of dislodging mechanism comprising a drill in advance of a wedge
 35 for penetrating the solid of a coal vein and by wedging action tearing the face therefrom, means for operating said dislodging mechanism to penetrate and tear the coal from the mine wall, and means for directing the cut-
 40 tings away from said drill through said wedge to facilitate the feed of said drill.

10. In a mining and loading machine, the combination with a supporting frame, of dis-
 45 lodging mechanism comprising a drill in advance of a tubular wedge for penetrating the solid of a coal vein and by wedging action to tear the coal therefrom, means for operating
 50 said dislodging mechanism to penetrate and tear the coal from the mine wall, means for conveying the cuttings through said tubular wedge to a position rearwardly of the oper-
 55 ating portion of said wedge, and conveyor mechanism in position for receiving and conveying away the coal dislodged and also the cuttings produced.

11. In a mining machine, the combination with a supporting frame, of a wedge mounted
 60 thereon with a passageway extending there- through from the forward end of one side of the rear portion thereof, a drill extending through said wedge in position to produce
 a hole in the mine wall for entry by its forward end of said wedge, means for driving
 65 said drill, means for feeding said drill and moving said wedge into the hole produced

by said drill, and means associated with said drill for conveying the cuttings thereof through said passageway to facilitate feed
 of said drill and movement of said wedge.

12. In a mining machine, the combination
 70 with a supporting frame, of a wedge rigid therewith for bodily travel therewith, said wedge having a passageway for cuttings, a drill mounted on said wedge in position to bore a hole in advance thereof for entry by
 75 the forward end of said wedge, means for driving the drill, means for moving the supporting frame along the mine wall to feed said drill and to operate said wedge to dis-
 lodge coal from the mine wall, and means for
 80 conveying the drill cuttings through said passageway during such feeding movement of said drill.

13. In a mining machine, the combination with a supporting frame, of a wedge rigidly
 85 connected thereto, a drill extending to a position in advance of said wedge to produce a hole in the mine wall for entry of the forward end of said wedge, means for driving
 said drill, means for moving said frame along
 90 the mine wall and feed said drill and to operate said wedge to effect dislodgment of coal from the mine wall, and a conveyor within
 said wedge for transferring cuttings from
 95 said drill rearwardly of the active portion of said wedge.

14. In a mining machine, the combination with a supporting frame, of a wedge rigidly
 100 connected thereto to move bodily therewith and having a passageway extending from the forward end along an inner curved wall to one side of said wedge back of the active por-
 tion thereof, drilling mechanism mounted on
 said wedge to drill a hole in advance of said
 105 wedge, and means for conveying cuttings from said drilling mechanism through said passageway.

15. In a mining machine, the combination with a supporting frame, of a coal-breaking
 110 extension on said frame in position to enter a drill hole in a mine vein, said extension having a cylindrical bore extending there-
 through, a drill shaft extending axially through said bore, expansible cutting mecha-
 115 nism mounted at the outer end portion of said drill shaft in position to cut a hole of larger diameter than said bore and of suffi-
 cient size for entrance of said coal-breaking extension, and mechanism for permitting
 120 holding of said cutting mechanism for withdrawal rearwardly through said bore.

16. In a mining machine, the combination with a wedge, of means for supporting said
 125 wedge for movement along a mine wall, drilling apparatus mounted on said wedge and comprising expansible cutting mechanism to cut an opening for said wedge to enter, means
 for supporting said expansible cutting mecha-
 130 nism for withdrawal from said wedge in a direction opposite to its feeding direction,

and means for operating said drilling apparatus.

17. In a mining machine, the combination with a supporting frame, of a prying device on said frame in position to enter a drill hole in a mine vein, drilling mechanism having a driving shaft extending through an opening in said prying device, expansible cutting mechanism connected to said shaft beyond the forward end of said opening in position to enlarge the diameter of the opening produced by said first-named drilling mechanism during the operation of the latter, and adjustments for permitting removal of said drilling mechanism and said cutting mechanism through said opening in a direction opposite to the feeding direction.

18. In a mining machine, the combination with a coal-breaker adapted to enter a drill hole in a mine vein and dislodge the coal therefrom, of drilling mechanism having a driving shaft extending axially through a cylindrical opening in said coal-breaker, a spiral conveyer in said shaft to fit said cylindrical opening and serving to convey rearwardly the cuttings from the drilling mechanism, and means for supporting said drilling mechanism and conveyer in operative position and for removal of both as a unit rearwardly from said frame axially of said driving shaft.

19. In a mining machine, the combination with a wedge having a passageway therein extending rearwardly from its smaller forward end, drilling mechanism at such forward end for producing an opening in the mine vein for said wedge to enter, means for operating the wedge to split material from the mine vein and at the same time feed said drilling mechanism, a conveyer for transferring the cuttings from the said forward end of said wedge through said passageway rearwardly, and means for driving said drilling mechanism.

20. In a mining machine, the combination with a wedge frame having a forward end of reduced dimensions, of drilling mechanism mounted on said wedge frame in position to drill a hole in the mine wall for entry of the forward end of said wedge frame, means connected to said drilling mechanism for conveying cuttings produced thereby through said wedge frame, means for driving said drilling mechanism, and means for effecting feeding movement of said drilling mechanism by moving said frame to carry the drilling mechanism bodily therewith and thereby secure operation of said wedge simultaneously with the feed of said drilling mechanism.

21. In a mining machine, the combination with a wedge having a cuttings conveyer passageway extending therethrough, of drilling apparatus comprising a shaft extending through said passageway to extensible cutting mechanism at the outer end portion of

said wedge, a spiral conveyer on said shaft to rotate therewith, and means for supporting said extensible cutting mechanism for withdrawal through said passageway together with said spiral conveyer, and means for operating said drilling apparatus.

22. In a mining machine, the combination with a portable frame, of a coal splitting wedge mounted thereon to move bodily therewith in position to enter a drill hole in a mine wall and split coal from the unmined mass, a drill comprising a rotary shaft supported in said wedge, pivoted auxiliary cutting mechanism adapted to occupy an expanded position to drill an enlarged hole for said wedge to enter as aforesaid, a rod extending through said rotary shaft in position to engage said auxiliary cutting mechanism, and means for engaging said rod to lock the same against said auxiliary cutting mechanism to hold the latter in expanded relation.

23. In a mining machine, the combination with a wedge adapted to enter a drill hole in a mine vein, of means for moving said wedge to split material from a mine vein, a drill shaft, a cutting bit pivoted to said drill shaft to swing on an axis transverse of the axis of said drill shaft, a rod extending through said drill shaft for positioning said cutting bit, and means for locking said rod in a predetermined position for holding said cutting bit in expanded position to cut a hole of sufficient diameter for said wedge to enter as the same is moved along the mine vein.

24. In a mining machine, the combination with a supporting frame, of a drill mounted thereon and comprising a drill shaft, a pair of axially cutting bits pivoted on a common axis to the outer end portion of said shaft transversely of the axis thereof and each having cam surfaces at their rear ends, an auxiliary rod extending through said drill shaft in position to engage said cam surfaces at points in alignment with said transverse axis of the pivot of the cutting bits, and means for forcing said rod against said cam surfaces to hold said auxiliary bits in extended position to cut a hole of larger diameter than the hole cut by said drill and during continued operation of the latter.

25. In a mining and loading machine, the combination with a supporting frame, of dislodging means comprising a rectilinearly movable wedging device with the forward end adapted to enter a drill hole in a mine vein, drilling mechanism for penetrating the solid of a coal vein in advance of said wedging device to produce a drill hole for the latter to enter, means for moving the wedging device rectilinearly along the mine wall during the operation of said drilling mechanism, and means for automatically removing the cuttings directly from the drilling mechanism during the operation of the latter.

26. The method of mining coal from the

solid of the mine vein which consists in causing the application of drilling and wedging actions at distributed points across the mine vein to tear the coal from the unmined mass over an area extending across such mine vein and during the drilling removing the cuttings without interfering with the wedging actions.

27. The method of mining coal from the solid of a mine vein which consists in exerting a continuous forward moving drilling force, applying a wedging force by a translating movement corresponding to the feeding movement of the drill, while such wedging force continuously engages the coal to effect the tearing away of the coal face, and simultaneously with such drilling and wedging forces removing the cuttings without interfering with such continuous forward movement.

28. The method of mining coal from the solid of the mine vein which consists in producing holes at spaced-apart points across the mine vein, applying wedging forces in such holes to produce cleavages spaced back from the coal face to dislodge the coal over an extended area and in large lumps, and at the same time removing the cuttings from the holes back away from the unmined mass without interfering with application of the wedging forces.

29. The method of mining coal from the solid of the mine vein which consists in applying simultaneously a plurality of wedging forces along spaced-apart paths of travel across a mine vein, drilling holes to accommodate such wedging forces, and removing the cuttings freely from the drilled holes through the spaces used for the wedging forces.

30. The method of mining coal from the solid of the mine vein which consists in drilling holes along a mine vein along spaced-apart paths distributed across the mine vein, following the drilling of the holes with wedging forces in such holes to effect ripping or tearing of the coal adjacent the holes and between the same over an area extending across the mine vein, and while drilling the said holes removing the cuttings produced through the spaces of wedging actions so as not to interfere with such wedging actions and so as to facilitate the said drilling.

31. In a mining machine, the combination with a supporting frame, of spaced-apart wedging tools each mounted on said frame in stationary position relative thereto but to move bodily therewith for operation on an upright mine wall, spaced-apart drills one for each of said wedging tools in position to drill holes in advance thereof for entry by said wedging tools, power-operated mechanism for moving said frame bodily along the mine vein to operate said wedging tools along parallel paths and to feed said drills to exert a dislodging effect on the material of the mine

vein extending over an area between the floor and the roof of the mine chamber, and means connected to each drill for removing the cuttings produced thereby through the spaces occupied by said wedging tools.

32. In a mining machine, the combination with a wedge frame, of means for confining said frame to rectilinear movements, drilling mechanism mounted thereon in position to drill a hole for said wedge frame to enter, a conveyer mounted on said wedge frame for transferring cuttings from said drilling mechanism through a passageway in said wedge frame, means for driving said drilling mechanism, and means for moving said wedge frame rectilinearly to operate the same and at the same time effect feeding movement of said drilling mechanism.

33. The method of mining coal from the solid of a mine vein which consists in applying a continuously forward moving force to a wedging tool parallel to a coal face while held continuously in engagement with the coal to effect the tearing away of the coal face, drilling a hole in advance of the wedging tool for the latter to enter, and while said wedging tool is being advanced along lines parallel to the coal face removing the cuttings through the wedging space without interfering with the continuous forward movement of the wedging tool.

34. In a mining machine, the combination with an elongated frame, of a supplemental frame connected to said elongated frame to travel along the latter, a rack gear on said elongated frame, drilling and wedging mechanism on said supplemental frame, and power-operated mechanism on said supplemental frame and connected to said rack to operate the drilling and wedging mechanism.

35. In a mining machine, the combination with an elongated main frame, of a conveyer thereon, a supplemental frame adapted to travel along said main frame, a plurality of spaced-apart drilling and wedging devices mounted on said supplemental frame in position for operation on an upright mine wall adjacent said main frame, power transmission mechanism on said supplemental frame for driving the drilling devices, and additional power transmission mechanism to feed the drilling devices and operate the wedging devices.

36. A mining machine comprising a supporting frame, a wedge pivoted thereto for adjustment in elevation, a hydraulic motor for swinging said wedge on its pivot and holding such wedge in adjusted position relative to said frame, a drill extending out from the end of said wedge, and motor mechanism mounted on the wedge for driving said drill.

37. In a mining machine, the combination of an elongated main frame, of a series of roof jacks connected to said frame with sliding connections to permit free up and down move-

ment of said main frame relatively to said roof jacks, a traveling conveyer on said main frame, a supplemental frame movable along said main frame, dislodging apparatus 5 mounted on said supplemental frame to move bodily therewith and comprising drilling and wedging devices, means for driving the drilling devices, and means comprising a rack gear on said main frame for operating said wedg- ing devices and feeding said drilling devices 10 along said main frame.

In testimony whereof I have signed my name to this specification on this 19th day of September, A. D. 1922.

EDMUND C. MORGAN.