Sept. 4, 1928. 1,683,045

E. C. MORGAN

MINING AND LOADING APPARATUS

Filed Jan. 10, 1923 5 Sheets-Sheet 1

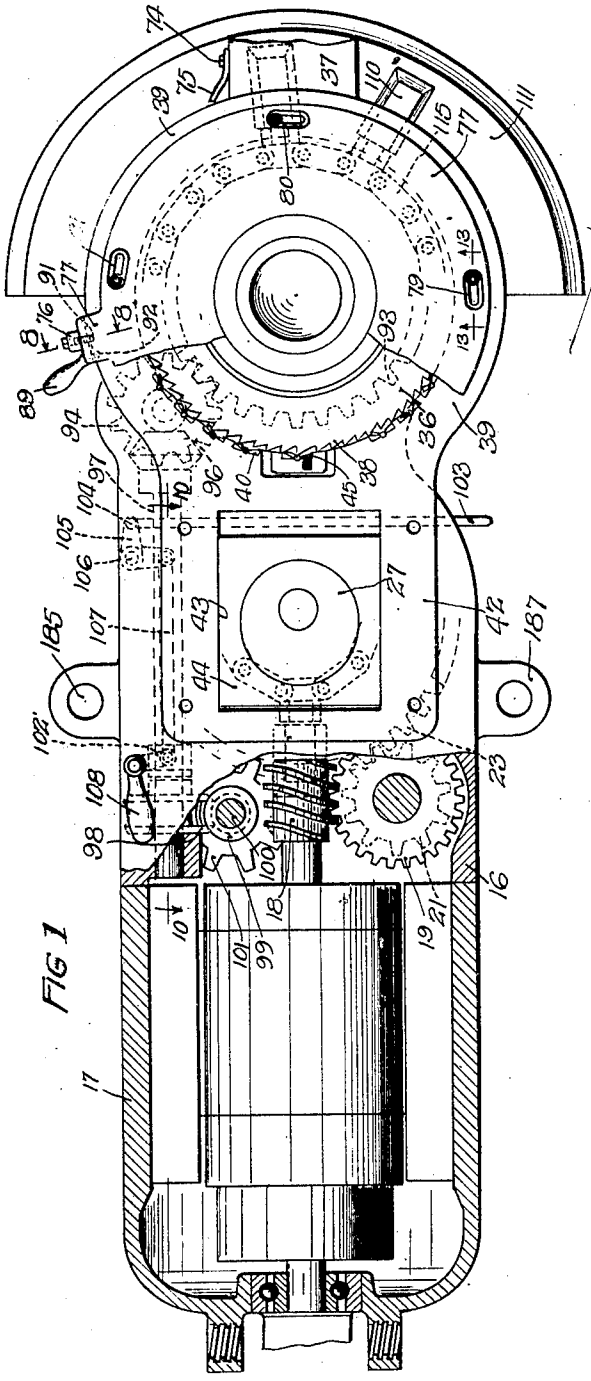

FIG 1

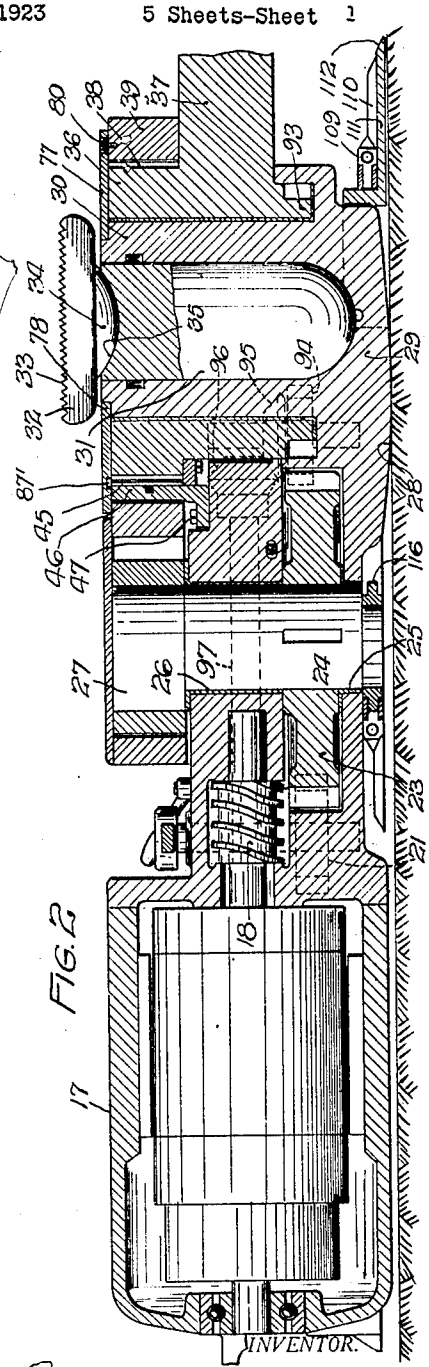

FIG 2

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Sept. 4, 1928. 1,683,045

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MINING AND LOADING APPARATUS

Filed Jan. 10, 1923 5 Sheets-Sheet 2

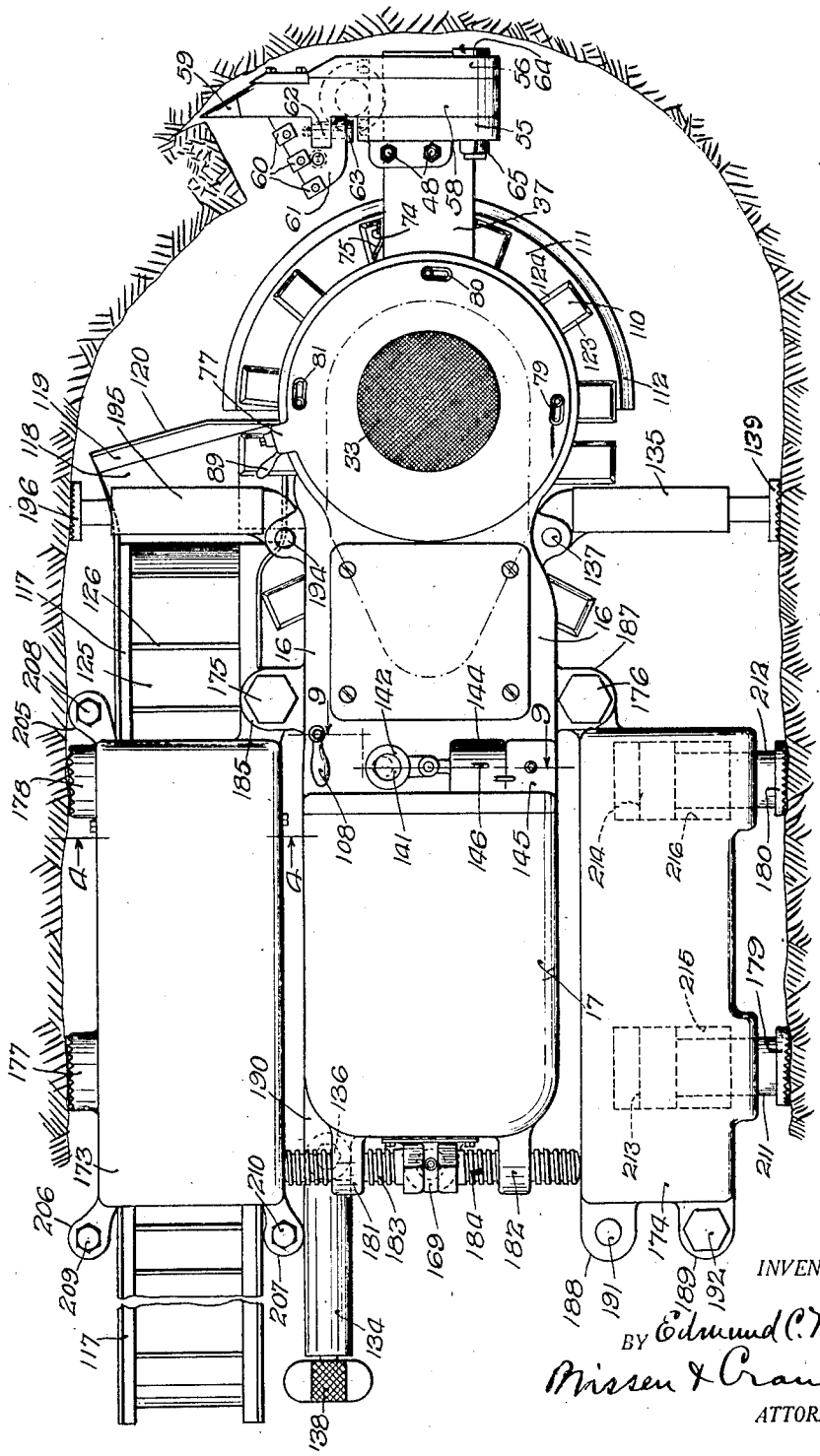

FIG 3

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MINING AND LOADING APPARATUS

Filed Jan. 10, 1923 5 Sheets-Sheet 3

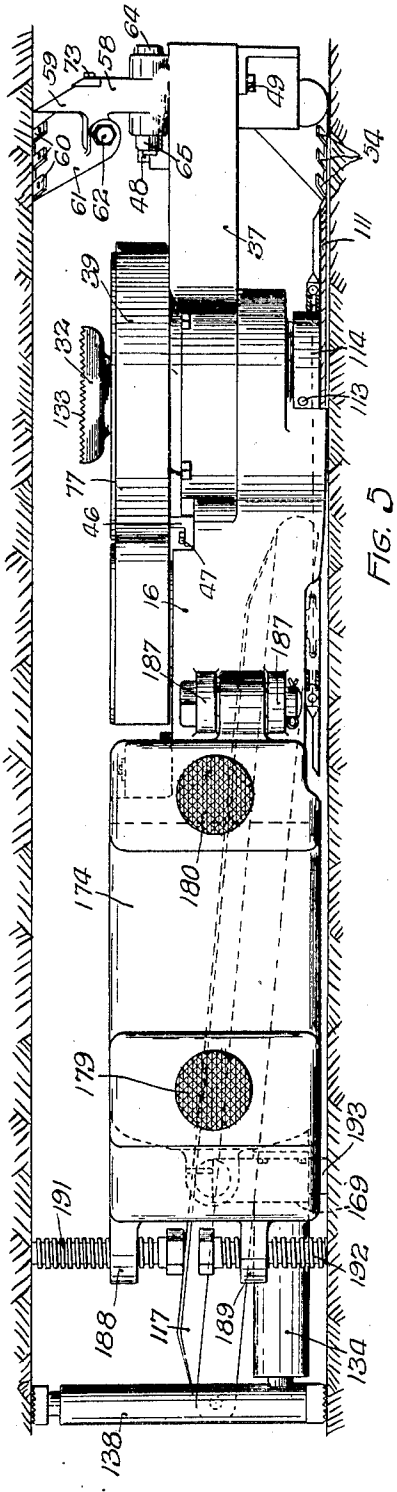

FIG. 5

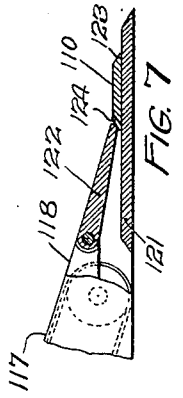

FIG. 7

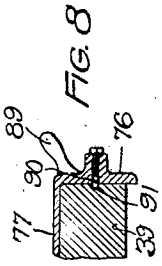

FIG. 8

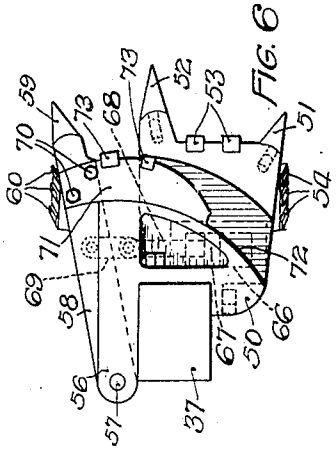

FIG. 6

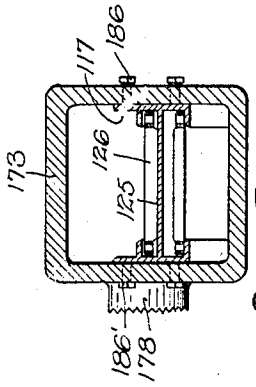

FIG. 4

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MINING AND LOADING APPARATUS

Filed Jan. 10, 1923 5 Sheets-Sheet 4

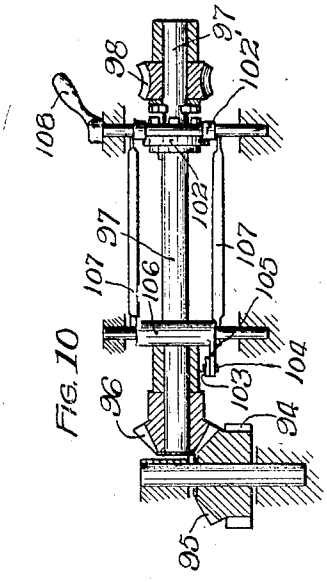

FIG. 10

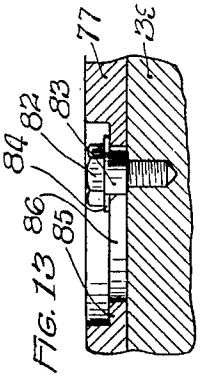

FIG. 13

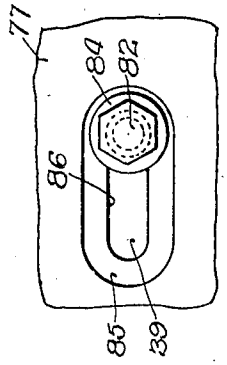

FIG. 14

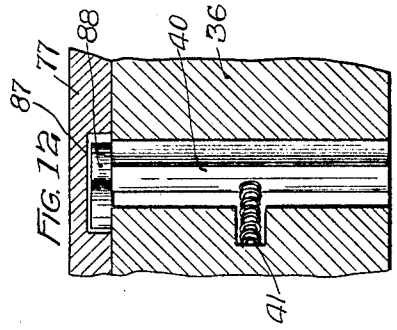

FIG. 12

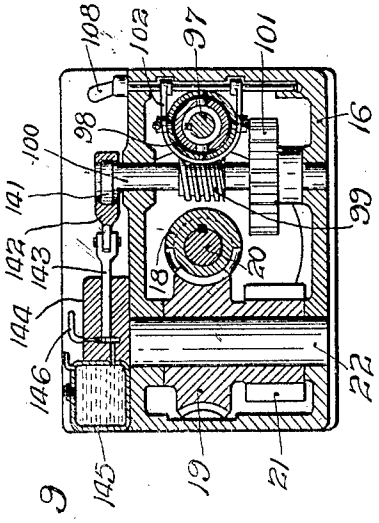

FIG. 9

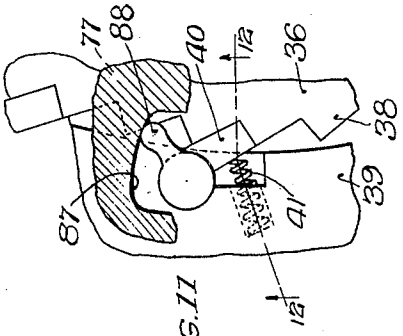

FIG. 11

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MINING AND LOADING APPARATUS

Filed Jan. 10, 1923 5 Sheets-Sheet 5

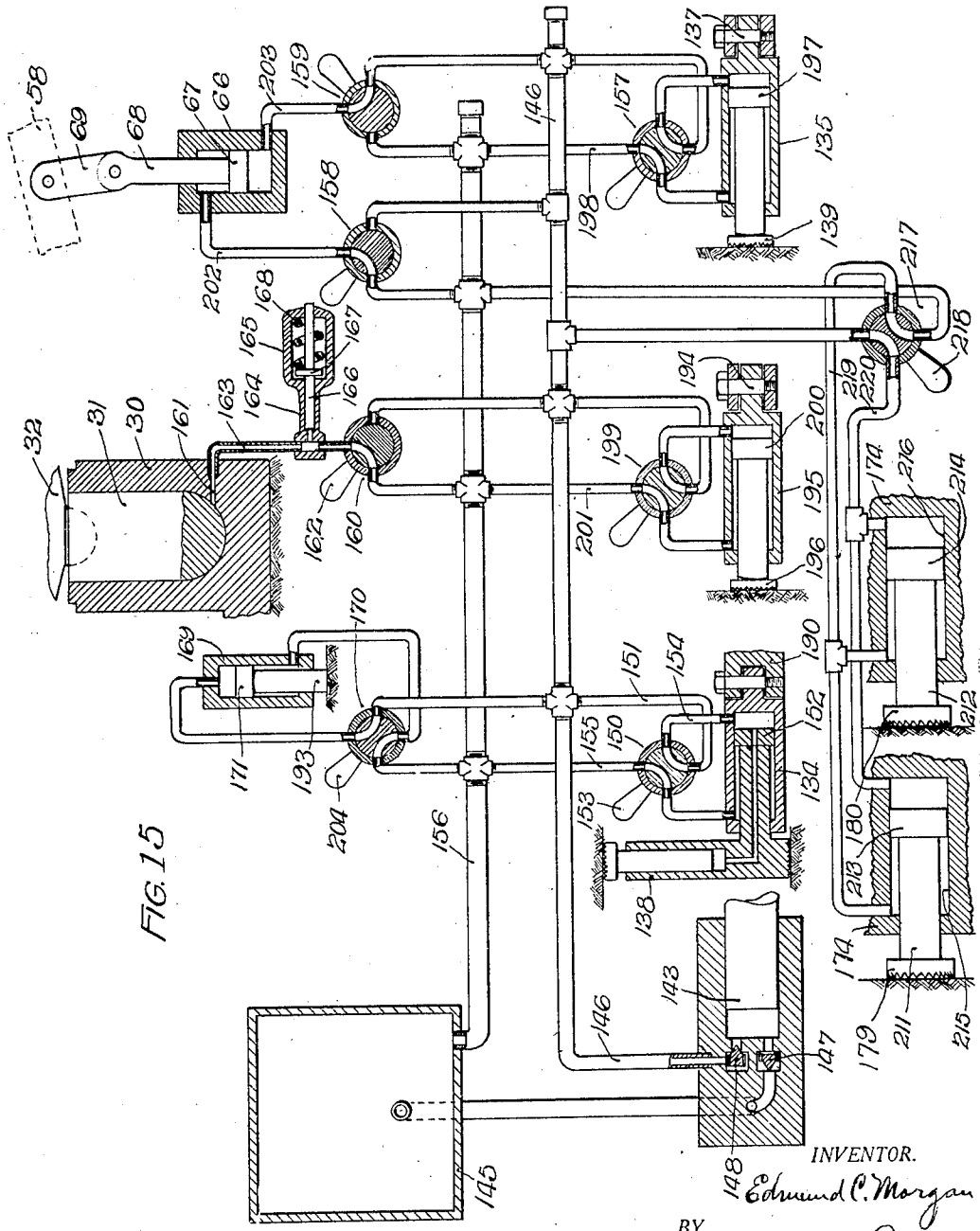

FIG. 15

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Patented Sept. 4, 1928. 1,683,045

UNITED STATES PATENT OFFICE.

EDMUND C. MORGAN, OF NEW YORK, N. Y.; OLIVE EUGENIE MORGAN EXECUTRIX OF SAID EDMUND C. MORGAN, DECEASED.

MINING AND LOADING APPARATUS.

Application filed January 10, 1923. Serial No. 611,711.

My invention relates to mining and loading apparatus wherein the main frame is held stationary while the dislodging mechanism operates to mine coal from an upright mine wall for delivery to loading apparatus in position to receive it adjacent the place of dislodgment, and one of the objects of the invention is the provision of simple and improved apparatus of this character.

A further object of the invention is the provision of improved operating mechanism for that type of dislodging means which comprises dislodging tools which are rigidly connected to a supporting frame to move bodily therewith.

More particularly it is the object of the present invention to provide a system of hydraulic anchoring apparatus between the roof and floor and between the side walls of the mine chamber to hold stationary the main frame for that type of mining machine wherein the dislodging tools are mounted on a supplemental frame to move bodily therewith relatively to the main frame.

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

In the accompanying drawings—

Fig. 1 is a plan view of my improved mining machine and a part of the loading apparatus;

Fig. 2 is a central longitudinal sectional view of Fig. 1;

Fig. 3 is a plan view of the complete mining and loading machine including my improved wall jack anchoring mechanism;

Fig. 4 is a sectional view taken on the line 4—4 of Fig. 3 looking in the direction of the arrows;

Fig. 5 is an elevational view of the mining and loading machine shown in Fig. 3;

Fig. 6 is an end elevation of the dislodging mechanism;

Fig. 7 is a sectional detail of the connection between the forward conveyer and the side conveyer of the mining and loading machine;

Fig. 8 is a sectional detail taken on the line 8—8 of Fig. 1 looking in the direction of the arrows;

Fig. 9 is a sectional elevation taken on the line 9—9 of Fig. 3 looking in the direction of the arrows;

Fig. 10 is a sectional view taken on the line 10—10 of Fig. 1 looking in the direction of the arrows;

Fig. 11 is an enlarged detail of the releasing means for the pawl and ratchet mechanism shown in Fig. 1;

Fig. 12 is an enlarged sectional elevation of a portion of Fig. 11;

Fig. 13 is a detailed sectional elevation of Fig. 1 taken on the line 13—13 looking in the direction of the arrows;

Fig. 14 is a plan view of Fig. 13; and

Fig. 15 is a diagrammatic illustration of the system of hydraulic anchor controlling mechanism.

By referring to Figs. 1 and 2 it will be seen that to the rear end of the main frame 16 is connected an electric motor 17, the shaft of which carries a worm 18 which is in mesh with the worm gear 19. As shown in Fig. 9, the motor shaft 20 is keyed to the worm 18 and the worm gear 19 is integral with the gear 21, and both the worm gear 19 and the gear 21 are mounted on the vertical shaft 22, which in turn is mounted on the main frame 16. The gear 21 meshes with the large spur gear 23, as shown in Figs. 1 and 2. The spur gear 23 is keyed to the vertical shaft 24 journaled in suitable bearings 25 and 26 in the main frame 16. Secured to the upper end of the shaft 24 is an eccentric 27 for operating the feeding means of the dislodging mechanism hereinafter described.

The forward bottom portion 28 of the main frame is curved, as shown in Fig. 2, to facilitate sliding of the machine over the mine floor. Above the forward base portion 29 of the main frame is a cylinder 30 for receiving the plunger 31 of a hydraulic roof jack for anchoring the main frame. This hydraulic roof jack comprises a shoe 32 having an upper serrated surface 33 and a lower bowl-shaped bottom 34 fitting into the dish-shaped recess 35 in the upper end of the plunger 31.

The cylinder 30 is provided with a cylindrical outer surface to serve as a supporting standard and also as a cylindrical bearing for the hub 36 of the arm or supplemental frame 37 to which the dislodging mechanism is rigidly connected for bodily movement therewith.

The hub 36 is provided on its upper peripheral portion with ratchet teeth 38, as shown in Figs. 1 and 2. Surrounding the ratchet teeth is a ring 39 which carries a series of pivoted

pawls 40 preferably extending approximately entirely around the hub 36.

The pawl and ratchet mechanism is shown in detail in Fig. 11. The pawls 40 are pivoted to the ring 39, the same being spaced apart and arranged in series almost entirely around the ring 39. These pawls are each urged by its spring 41 into engagement with the notches between the ratchet teeth. When the ring 39 together with the pawls carried thereby is oscillated back and forth by means of the eccentric 27 the pawls 40 will move the hub 36 in feeding direction when the ring 39 is moved in a clockwise direction, and when the latter is retracted the pawls 40 will be permitted by the springs 41 to ride over the ratchet into the next notches.

By referring to Fig. 1 it will be seen that the ring 39 is provided with a rearwardly extending yoke 42 which is provided with a rectangular opening 43, the side walls of which are engaged by the plate 44, at the center of which is located the eccentric 27. Therefore when the motor 17 is operated to rotate the eccentric 27 in an anti-clockwise direction, as viewed in Fig. 1, the plate 44 will be moved back and forth in the rectangular opening 43 in the yoke 42. At the same time the plate 44 will be oscillated laterally which will effect oscillation of the yoke 42 and the ring 39, and when the latter is oscillated the pawls 40 will be moved forward and backward to effect continuous forward rotation, step by step, of the hub 36 and therefore of the arm 37 and the dislodging mechanism mounted on the outer end of this arm.

In order to lock the arm 37 against retrograde movement when the pawls 40 are retracted a spring-pressed pawl 45 is mounted on the standard 46 which is secured at 47 to the main frame 16, as shown in Fig. 2. This spring-pressed pawl 45 is similar in construction to the spring-pressed pawl 40 shown in Fig. 11, but since the pawl 45 is mounted substantially on the main frame it acts as an abutment to prevent retrograde movement of the ratchet ring 36 after the latter has been moved forward one step.

The dislodging mechanism is shown in Figs. 3, 5 and 6 as secured to the outer end of the arm 37 by means of the bolts 48 and 49. The dislodging mechanism may therefore be adjusted radially to various positions along the arm 37 relative to the central upright axis of the bearing standard 30.

The dislodging mechanism comprises a frame 50 to which are rigidly attached the splitting and digging tools 51, 52, that designated 51 being located at the floor, and that designated 52 being located midway between the floor and roof in advance of the floor dislodging device 51. Intermediate the dislodging tools 51 and 52 are auxiliary piercing tools 53 for the purpose of trimming off the ragged wall left by the main splitting tools. At the floor are additional trimming piercing implements 54 secured rigidly to the frame 50.

At the upper portion of the frame 50 are spaced-apart rearwardly extending arms 55 and 56, as shown in Fig. 3. To the rear ends of these arms is pivoted at 57 (Fig. 6) an arm 58 which carries at its outer end the roof splitting tool 59. Secured to the arm 58 are roof trimming piercing implements 60, as shown in Figs. 3, 5 and 6. These roof trimming tools may be mounted on an auxiliary arm 61 pivotally connected at 62 to the arm 58 so as to be adjusted on an axis at right angles to the radial arm 37. After the adjustment is made the bolt 63 will be relied upon to hold the arm 61 in adjusted position relative to the arm 58. After the arm 58 has been moved to adjusted position the bolt 64 may be used in connection with a nut 65 to hold the arm 58 in adjusted position. However, it is preferred to provide a hydraulic motor 66 comprising a cylinder with a piston 67 therein and a piston rod 68 connected by a link 69 to the arm 58 for adjusting the elevation of this arm and locking it in adjusted position.

Secured at 70 to the arm 58 is an arcuate guide 71 which is adapted to move along the arcuate guideway 72 for reinforcing the dislodging tool 59. Mounted on the arcuate bar 71 are wall trimming devices 73, as shown in Fig. 6.

Connected at 74 to the arm 37 is a spring 75, as shown in Fig. 3. This spring 75 is adapted to engage an overhanging downward extension 76 from the plate 77, as shown in Fig. 8. The plate 77 is mounted on top of the hub 36 and pivotally connected at 78 to the upper end of the cylinder 30. The plate 77 is of sufficient diameter to extend over a portion of the ring 39, as shown in Figs. 1 and 2. The plate 77 is connected to the ring 39 by means of a plurality of spaced-apart pin and slot connections, as shown at 79, 80 and 81 in Fig. 1. These pin and slot connections may each be constructed as shown in detail in Figs. 13 and 14. The bolt 82 is secured to the ring 39 so that a washer 84 may rest on the loop-shaped seat 85. The collar 83 may be guided along the slot 86 and the friction between the washer 84 and the seat 85 regulated so that the plate may have a circumferential sliding movement relatively to the ring 39. Therefore when the spring tripping device 75 engages the abutment 76 the plate 77 will be moved circumferentially relatively to the ring 39 a distance equal to the length of the slot 86 in the plate 77. This circumferential movement of the plate 77 to a limited extent relatively to the ring 39 is for the purpose of operating a series of cams 87, one of which is shown enlarged in Fig. 11. These cams are located on the bottom of the plate 77 in

spaced relation corresponding to the respective pawls 40, there being also a similar cam 87′ for the pawl 45 shown in Fig. 2. Each of the pawls 40 and the pawl 45 is provided with a lever, as shown at 88 in Fig. 11. These levers are secured to the pawls and extend upwardly into the cams 87. Therefore when the plate 77 is automatically shifted upon the dislodging mechanism reaching the limit of its feeding movement, the levers 88 are operated to throw the pawls 40 out of engagement with the ratchet teeth and thereby free the arm 37 for restoring movement in reverse direction to initial position.

When desired all of the pawls may be thrown out of engagement with the ratchet teeth by means of the lever 89 shown in Fig. 1 which is secured to the plate 77, as shown in Figs. 1 and 8. When the plate 77 is shifted circumferentially relatively to the ring 39 as permitted by the pin and slot connections 79, 80 and 81 the spring-pressed pin 90 is forced out of its notch 91 and upon reaching the notch 92 will snap into the same to hold the plate 77 in its shifted position so that the pawls 40 will remain in released position on return of the arm 37 to initial position. By moving the lever 89 in the opposite direction or clockwise direction the pin 90 may be moved back into the notch 91, whereupon the pawls will be restored to and held in their ratchet engaging positions.

In order to return the arm 37 together with the dislodging mechanism mounted thereon to initial position after such dislodging mechanism has completed its stroke of approximately 180 degrees, power driven mechanism is provided by mounting a gear wheel 93 at the lower end of the hub 36, as shown in Fig. 2, and connecting to this gear wheel 93 a pinion 94 which is connected to the motor 17 by a train of gearing. As shown in Fig. 2, the spur gear 94 carries a beveled gear 95 which meshes with another beveled gear 96 which is connected to the forward end of the shaft 97.

As shown in Fig. 10, the shaft 97 is keyed to a worm gear 98 which is located at the rear portion of the main frame 16, as shown in Fig. 1. Meshing with the worm gear 98 is a worm 99 on a vertical shaft 100. At the lower end of this shaft 100 is a spur gear 101 which meshes with the large gear 23 to receive power therefrom. As shown in Figs. 1, 9 and 10, a clutch 102 is mounted on the shaft 97 so as to connect the gear 98 to the shaft 97. By referring to Fig. 10 it will be seen that since the gear 98 is loose on the shaft 97, the throwing in of the clutch 102 will transmit power from the gear 98 to the shaft 97 and thus effect rotation of the arm 37 in a clockwise direction through the train of gearing comprising the beveled gears 95 and 96 and the spur gears 94 and 93.

In order to automatically stop the restoring movement imparted to the arm 37 I have provided a cross-rod 103 in position to be struck by the arm 37 when the latter reaches its initial position. This cross-rod 103 is pivoted at 104 to a bell crank lever 105 which is pivoted to the main frame 16 at 106. A rod 107 connects the bell crank lever 105 to the clutch element 102′. It will thus be seen that the clutch may be moved to released position either by means of the handle 108 or by means of the arm 37 automatically engaging the rod 103.

The loading apparatus comprises an endless conveyer 109 which has spaced-apart flights 110 adapted to travel over a semi-circular ring receiving plate 111, as shown in Figs. 1 and 3. The forward edge of the plate 111 may be beveled, as shown at 112, and this semi-circular ring plate may be hinged to the sides of the base 29, as indicated at 113 in Fig. 5, and the upright cylindrical surface 114 may be provided as a bearing for the sprocket chain 115. This sprocket chain meshes with a sprocket 116 at the bottom of the vertical shaft 24, as shown in Fig. 2. Therefore when the eccentric 27 is driven anti-clockwise the flights 110 will be moved circumferentially along the receiving plate 111 toward the receiving end of the lateral conveyer 117, as shown in Fig. 3. The forward lower end of the conveyer 117 may be inclined downwardly at 118 and then extended horizontally at 119 to the forward beveled edge 120, as shown in Figs. 3 and 7. A rearward extension on the horizontal flat portion 119 may be provided at 121 and a portion of the inclined scoop of the conveyer provided with a hinged section 122, as shown in Fig. 7, for permitting the flights 110 to readily pass under such hinged section. The edges of the flights 110 are beveled, as shown at 123 and 124, so that when the flights 110 ride under the plate 122 they may readily pass under the same and cause the lower end of the latter to scrape the material off the flights and thus keep material from passing rearwardly with the flights. The conveyer 117 may be of the endless chain scraper type comprising a stationary bed or way 125 and spaced-apart scrapers or cross-flights 126 connected between endless chains mounted on the conveyer frame in position to cause the scrapers to travel over the bed 125.

By referring to Fig. 3 it will be seen that comparatively large and very strong wall jacks 173 and 174 are pivoted respectively at 175 and 176 to the sides of the main frame 16. The wall jack 173 is provided with a pair of spaced-apart wall-engaging shoes 177 and 178 and the wall jack 174 is likewise provided with a pair of spaced-apart wall-engaging shoes 179 and 180. Projecting rearwardly from the frame of the motor 17 are spaced-apart brackets 181 and 182 through which are screw-threaded large bolts 183 and 184

in position to engage the inner lateral sides of the jack frames 173 and 174 so as to move the shoes 177 to 180, inclusive, against the spaced-apart walls of the mine chamber, after which the hydraulic motors comprising the plungers 211, 212, fixed to the pistons 213, 214 in the cylinders 215, 216, may be operated. The wall jacks will thus cooperate with the roof jack comprising the shoe 32, 33 in holding the main frame very firmly anchored during the operation of the dislodging mechanism.

The conveyer frame 117 may be pivoted to the bracket 185 which extends from one side of the frame 16. As shown in Fig. 4, the wall jack 173 is tubular in construction to afford a passageway for the conveyer frame 117 which may be secured to the inner sides or walls of the frame 173, as indicated at 186, 186'. It should be noted that by reason of the pivotal connection of both the conveyer 117 and the wall jack frame 173 the bolt 183 may be operated over a sufficient distance to firmly anchor the shoes 177 and 178 against the side wall while at the same time maintaining the receiving end of the conveyer 117 in communication with the forward conveyer 110.

The wall jack frame 174 is pivoted at 176 to the bracket 187 secured to one side of the frame 16. As shown in Figs. 3 and 5, rearwardly extending brackets 188 and 189 are connected to the rear end of the wall jack frame 174. These brackets are provided with screw-threaded openings to receive the bolts 191 and 192. These bolts are in position to engage the roof and floor, respectively, as shown in Fig. 5, so as to take the strain of the frame 174 from the spaced-apart ears 187 which extend from the frame 16. It is preferred, however, to arrange the wall jacks 173 and 174, as shown in Fig. 3, so that both of the bolts 183 and 184 may be operated, thereby necessitating a minimum amount of movement of the conveyer 117 and so that the latter may be maintained in accurate delivery communication with the forward conveyer 110. In addition to the wall jacks 173 and 174 there may be a rear jack 134 pivoted at 136 to a bracket 190 at the rear corner of the motor frame 17. A roof jack 138 is connected to the rear end of the horizontal jack 134. When the roof jack 138 is anchored and the wall jacks 173 and 174 are released the jack 134 may be operated to move the entire machine forward. During this forward movement the wall jack shoes 177 to 180, inclusive, while not gripping the side walls may be sufficiently close thereto to act as guides during the forward movement of the entire mining and loading machine. During this forward movement the forward roof jack 30 is, of course, released. During the operation of the dislodging mechanism while the forward roof jack is in anchored position and the wall jacks 173 and 174 are in anchored position, the roof jack 138 may cooperate with the jack 134 to assist the forward roof jack in resisting rearward thrusts exerted by the dislodging mechanism.

At the rear end of the motor frame 17 is secured an upright floor jack 169 provided with a floor-engaging shoe 193, as shown in Fig. 5. By controlling the position of the shoe 193 the entire machine may be guided forward either upwardly or downwardly according to the pitch of the mine vein.

As shown in Fig. 9, the upper end of the vertical shaft 100 is provided with an eccentric cam 141 for engaging the eccentric strap 142 which is connected to the plunger 143 of a hydraulic motor 144 for pumping liquid from the tank 145 into the pressure supply pipe 146. The pumping mechanism may be located as illustrated at 144 in Fig. 3.

Fig. 15 represents more or less diagrammatically a system of hydraulic circuits and connections and the controlling mechanism therefor. When the pump plunger 143 is reciprocated by the mechanism shown in Fig. 9 liquid may be drawn from the tank 145 and forced into the pressure supply pipe 146 in accordance with the control permitted by the check valves 147 and 148. By means of the valve 150 the hydraulic jack 134 may be given horizontal movements, but it should be noted that the connections are such that when pressure is directed into the horizontal cylinder the roof jack 138 is at the same time operated to anchored position. When the valve 150 is in the position shown in Fig. 15 the pressure supply pipe 146 is connected to the cylinder 134 to the right of the piston 152. When the valve 150 is given a quarter turn to the right by means of the lever 153 the pressure pipe 151 is connected to the cylinder 134 to the left of the piston 152 and the pipe 154 is connected to the pipe 155 which leads to the exhaust pipe 156. Therefore the roof jack 138 may be released and moved toward the right to a new position when desired. That is to say, when pressure is supplied to the right of the piston 152 the roof jack 138 is anchored and the whole machine moved forward by operation of the horizontal jack 134. When the roof jack 138 is released, the framework of the mining and loading machine remains stationary and pressure exerted to the left of the piston 152 will move the roof jack 138 forward to a new position.

Hydraulic wall jacks may be pivoted to the sides of the frame 16, as shown in Fig. 3, at 137 and 194, the wall jacks being designated 135 and 195, respectively. These wall jacks are provided with wall-engaging shoes 139 and 196, respectively. The control of these wall jacks 135 and 195 is illustrated in Fig. 15. By means of the valve 157 pressure from the pressure supply pipe 146 may be

directed to either side of the piston 197, the exhaust pipe being indicated at 198.

The wall jack 195 may be controlled by the valve 199 to direct the pressure from the supply pipe 146 to either side of the piston 200. The exhaust pipe is indicated at 201.

By means of the valves 158 and 159 the hydraulic motor 66 shown in Fig. 6 on the dislodging mechanism may be operated to adjust the position of the uppermost arm 58 and lock the latter in adjusted position. That is to say, by moving the valves 159 and 158 to the positions shown in Fig. 15 supply pressure may be exerted on the piston 67 to move the same upwardly while the pipe 202 is connected to the exhaust pipe 156. When the arm 58 has been moved to adjusted position the piston 67 may be locked in the cylinder 66 by closing the valves 158 and 159 so that communication through the pipes 202 and 203 may be cut off from either the supply pipe 146 or the exhaust pipe 156. By means of the valve 160 hydraulic pressure may be exerted in the cylinder 30 of the forward roof jack of the main frame of the machine. The supply pressure medium enters the cylinder 30 through the passage 161 to move the plunger 31 upwardly so that the shoe 32 will engage the roof of the mine chamber. When the valve 160 is in the position shown in Fig. 15 the cylinder 30 is connected to the exhaust pipe 156, but when the lever 162 is given a quarter turn to the right the pressure supply pipe 146 will be connected to the cylinder 30. When this occurs the pressure medium will flow from the pipe 163 into the cylinder 164 of the accumulator 165, the latter comprising a plunger 166 having a collar 167 engaging a strong spring 168. It is preferred to include the accumulator 165 in the system because the operation of the dislodging tools may cause such vibrations as to tend to effect a yielding of the roof or floor to the pressure of the forward roof jack. When this yielding action tends to take place the accumulator will immediately act to cause the plunger 31 to move the required distance to maintain a desired anchoring action even though the valve 160 may be moved to such position to lock the plunger 31 in its roof-engaging position.

The upright floor jack 169 shown at the rear end of the framework of the machine in Fig. 5 may be controlled by the valve shown at 170 in Fig. 15. When the valve 170 is in the position shown in Fig. 15 the supply pressure pipe 146 will be connected to the cylinder 169 above the piston 171 to thrust the plunger 93 downwardly and thereby lift the rear end of the main frame on the curved bottom shown at 28 in Fig. 2, as a fulcrum. By giving the lever 204 a quarter turn to the right the upper end of the cylinder 169 will be connected to the exhaust pipe 156 and the supply pressure supply pipe 146 will be connected to the cylinder 169 beneath the piston 171. The rear end of the main frame can thus be lowered on the curved bottom as a fulcrum. When the inclination of the machine has been adjusted by means of the floor jack 169 the valve 170 may be moved to such a position that the piston 171 in the cylinder will be locked in adjusted position, after which the plunger 193 may slide over the mine floor and act as a rear support for the mining and loading machine.

After the wall jacks comprising the shoes 177, 178, 179, 180 have been adjusted to positions against the side walls, the hydraulic motors 215 and 216 may be operated by the valve 217. When the handle 218 is in the position shown in Fig. 15 supply pressure is exerted back of the pistons 213, 214 to move the shoes 179, 180 to anchoring positions and at the same time forcing the shoes 177, 178 against the opposite wall. The shoes may be released by turning the handle 218 a quarter turn in a clockwise direction as viewed in Fig. 15. The pipes 219, 220 are connected to opposite ends of the cylinders 215, 216 to enable the valve 217 to control the plungers 211, 212. It should be understood that Fig. 15 is a diagrammatic view showing the pipe connections between the various parts but that in actual practice flexible connections are provided for the pivoted hydraulic jacks. Such connections may be afforded by the well known metal pipes composed of spirally connected strips and capable of withstanding high internal pressures and remaining water tight.

If desired, brackets 205, 206 and 207 may be connected to three corners of the frame 173, as shown in Fig. 3, and these brackets provided with bolts 208, 209 and 210, respectively, each similar to the bolt 192 shown in Fig. 5.

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 the 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 dislodging mechanism adapted to be held in continuous engagement with the coal at a mine wall for continuous forward movement over a predetermined path of travel, means for supporting said dislodging mechanism for such movement, means for effecting the operation of said dislodging mechanism to dislodge coal from such path, and multiple wall jack mechanism comprising a supplemental frame pivoted to one side of the mining machine and having wall engaging shoes distributed along said supplemental frame.

2. In a mining machine, the combination with supporting framework, of dislodging mechanism mounted thereon for feeding movement relatively thereto, and anchoring mechanism distributed along said framework and comprising a supplemental frame pivoted to said framework intermediate the ends thereof, and having a plurality of hydraulically operated wall engaging shoes distributed along said supplemental frame.

3. In a mining machine, the combination with an elongated supporting frame, of mining mechanism mounted on the forward end thereof, and anchoring apparatus distributed along both sides of said framework, such anchoring apparatus comprising supplemental frames pivoted to the sides of said supporting frame intermediate the ends thereof and each supplemental frame having thereon a plurality of distributed wall engaging shoes.

4. In a mining machine, the combination with a supporting framework, of mining mechanism mounted thereon, a wall-gripping anchoring jack pivoted to one side of said framework intermediate the ends thereof, and means mounted at the rear end of said framework independently of said jack but in position to engage the same for moving the latter on its pivotal connection to said framework.

5. In a mining machine, the combination with a supporting frame, of mining mechanism mounted thereon, a supplemental frame pivoted to said supporting frame for adjustment relative thereto, anchoring mechanism on said supplemental frame in position to act upon an upright mine wall in a direction transversely of the path of the machine, and screw-threaded mechanism mounted on said supporting frame separately from said supplemental frame but in position to abut against the same to swing the latter on its pivotal connection to said frame to adjust the position of said anchoring mechanism at said upright mine wall.

6. In a mining machine, the combination with a supporting frame, of mining mechanism mounted thereon, an anchoring jack pivoted to said frame and comprising a plurality of gripping shoes, and means between said frame and said anchoring jack for swinging the latter on its pivotal connection to said frame.

7. In a mining machine, the combination with a supporting frame, of mining mechanism mounted thereon, an anchoring device pivoted to said frame and comprising a plurality of spaced-apart wall-gripping shoes, spaced-apart adjustable floor and roof-gripping devices, and means mounted on said supporting frame in position to engage said anchoring device to swing the same on its pivotal connection with said supporting frame to force said gripping shoes against the wall of a mine chamber.

8. In a mining machine, the combination with a supporting frame, of mining mechanism mounted thereon, a supplemental frame pivoted to one side of said supporting frame intermediate the ends thereof, a plurality of wall-gripping anchoring devices distributed along said supplemental frame, and means at the rear end of said supporting frame for swinging said supplemental frame on its pivot to said supporting frame to adjust the positions of said wall-gripping anchoring devices.

9. In a mining machine, the combination with a supporting frame, of mining mechanism mounted thereon, a hydraulic wall jack pivotally connected to the forward portion of said frame, a hydraulic jack pivoted to an intermediate portion of said frame and having multiple wall-gripping means in position to act on an upright wall adjacent the machine, hydraulic mechanism for operating said hydraulic multiple jack, and means connecting the rear portion of said frame to the rear portion of said multiple jack to swing the same to wall-gripping position on its pivotal connection to the intermediate portion of said frame.

10. In a mining machine, the combination with a supporting frame, of mining mechanism mounted thereon, a pair of wall jacks pivotally connected to opposite sides of said frame intermediate the ends thereof, adjustable abutments mounted at the rear end of said supporting frame separately from said wall jacks but in position to abut against the latter, means for operating said abutments to swing the wall jacks to wall-gripping positions on their pivotal connections to said supporting frame, and hydraulic mechanism for operating said wall jacks against opposite spaced-apart upright side walls in the mine chamber to anchor said supporting frame between such side walls.

11. In a mining machine, the combination with a supporting frame, of mining mechanism mounted thereon, a pair of hydraulic jacks pivotally connected to opposite sides of the forward portion of said frame, a pair of multiple engagement jacks pivotally connected to opposite sides of said frame intermediate the ends thereof, hydraulic mechanism for controlling said hydraulic jacks, and means connected between the rear end of said frame and the rear portion of said multiple engagement jacks for operating the latter by swinging them on their pivotal connections to the intermediate portions to said frame.

12. In a mining and loading machine, the combination with a supporting frame, of mining mechanism mounted thereon, a wall jack connected to said frame, means for oper-

ating said wall jack, and conveyer mechanism supported by and extending through said wall jack.

13. In a mining and loading machine, the combination with a supporting frame, of mining mechanism mounted thereon, a wall jack comprising a tubular frame, and a conveyer supported by said tubular frame and extending through the same.

14. In a mining and loading machine, the combination with a supporting frame, of mining mechanism mounted thereon, a multiple jack comprising a tubular frame pivotally connected to said supporting frame intermediate the ends of the latter, means on the rear end of said supporting frame in position to engage said tubular frame to move the jack to wall-engaging position, and a traveling conveyer having a frame supported by the inner side walls of said tubular frame in position to convey dislodged material through said tubular frame to loading position.

15. In a mining machine, the combination with a supporting frame, of dislodging mechanism mounted thereon for movement relatively thereto and comprising spaced apart pointed wedging tools adapted to penetrate the solid coal in its native state, means for operating said dislodging mechanism by imparting a continuous forward movement to said pointed wedging tools to tear the coal from the solid face of the upright mine vein, and adjustable wall-abutment mechanism connected to both sides of said frame in position to engage the spaced-apart walls of the mine chamber and prevent movement of said frame during the operation of said dislodging mechanism.

16. In a mining machine, the combination with a supporting frame, of roof jacks for anchoring the forward portion of said supporting frame, arc-wall dislodging mechanism mounted on said frame for feeding movement relatively thereto on an upright axis, multiple wall jack mechanism comprising a supplemental frame pivoted to said supporting frame intermediate the ends thereof for adjustment of the wall jack mechanism toward and from said supporting frame, multiple jack mechanism comprising a second supplemental frame pivoted to the other side of the supporting frame intermediate the ends thereof for similar adjustment relative to said supporting frame, and adjustable abutments at the rear portion of said supporting frame for engaging the rear portions of said supplemental frames.

17. In a mining machine, the combination with a main frame, of anchoring means therefor, a supplemental frame mounted on said main frame for arcuate movement relatively thereto, dislodging mechanism connected to said supplemental frame to be stationary relative thereto but movable bodily therewith in feeding direction, means mounted on said main frame and connected to said supplemental frame for powerfully moving the latter arcuately relatively to said main frame to operate said dislodging mechanism while said anchoring means is in anchored position, and wall abutment mechanism to resist swerving of the main frame due to the operation of said moving means acting between said main frame and said supplemental frame during the operation of said dislodging mechanism.

18. In a mining machine, the combination with a supporting frame, of a supplemental frame mounted thereon for swinging movement relatively thereto, spaced-apart pointed wedging tools mounted on said supplemental frame for bodily movement therewith and adapted to penetrate the solid face of a mine vein and by wedging action split large pieces of coal from the unmined mass over a wide area between the floor and roof of a mine chamber, pawl and ratchet mechanism for swinging said supplemental frame to actuate said tools, oscillating mechanism to operate said pawl and ratchet mechanism, and anchoring means for said supporting frame including wall-abutment mechanism.

19. In a mining machine, the combination with supporting framework, of dislodging mechanism comprising coal-splitting tools adapted to have a continuous forward feeding movement along arcuate paths of travel, pawl and ratchet mechanism for feeding said dislodging mechanism, and means comprising wall abutment mechanism for holding said framework stationary during the operation of said dislodging mechanism.

20. In a mining machine, the combination with a main frame, of a supplemental frame mounted thereon to swing relatively thereto on an upright axis and comprising a radial arm, splitting tools adapted to swing into the upright face of a mine vein and split the material therefrom, means for adjustably securing said splitting tools to said arm at a predetermined distance from said axis for bodily movement with said arm along an arcuate path, means for swinging said radial arm to operate said splitting tools on such upright face, and wall abutment mechanism for preventing said main frame from swerving during the swinging movement of said radial arm and the dislodging operation of said splitting tools.

21. In a mining machine, the combination with a main frame adapted to rest on and slide over a mine floor, of a roof jack for the forward end of said main frame, a supplemental frame mounted on said main frame to swing relatively thereto on the upright axis of said roof jack, a radial arm on said supplemental frame to move bodily therewith, dislodging apparatus carried by said arm to move bodily therewith and comprising pene-

trating wedging mechanism adapted to penetrate the solid face of the mine vein and split large pieces of mineral therefrom over a wide area, a motor mounted on the main frame, power transmission mechanism between said motor and said supplemental frame and comprising pawl and ratchet mechanism for swinging said radial arm to operate said dislodging mechanism while said roof jack is in anchored position, and wall abutment mechanism adapted to resist the tendency of the main frame to swerve during the operation of said dislodging mechanism on the solid face of the mine vein.

22. In a mining machine, the combination with a main frame, of a supplemental frame mounted on said main frame for swinging movement relatively thereto on an upright axis, coal-splitting mechanism mounted on said supplemental frame in position to operate on the upright face of a solid coal vein between the floor and roof of a mine chamber and comprising an upright series of spaced-apart pointed wedging tools adapted to penetrate the solid face of the coal vein and by wedging action rip and tear the coal in large pieces from the unmined mass over a wide area extending from such floor to such roof, power transmission mechanism mounted on said main frame and connected to said supplemental frame to effect the swinging thereof to operate such coal-splitting mechanism, and means comprising a roof jack and wall abutment mechanism for holding the main frame in stationary position during the operating of said coal-splitting mechanism.

23. In a mining machine, the combination with a supporting frame, of mining mechanism mounted thereon, supplemental frames connected to opposite sides of said supporting frame in position to rest on and slide over the mine floor on opposite sides of said supporting frame, means for sliding said supplemental frames over the mine floor relatively to said supporting frame to adjust the positions thereof adjacent the side walls of the mine chamber, and hydraulic mechanism on one of said supplemental frames for firmly anchoring the supporting frame between the side walls during the operation of said mining mechanism.

24. In a mining machine, the combination with a supporting frame, of mining mechanism mounted thereon, means comprising supplemental frames one connected to each side of said supporting frame for gripping the opposite mine walls, each of said supplemental frames being adapted to rest on and slide over the mine floor, and power-operated mechanism for firmly anchoring said gripping means between the side walls to hold said supporting frame stationary during the operation of said mining mechanism.

25. In a mining machine, the combination with a supporting frame, of arc-wall mining mechanism mounted on the forward end of said frame, two supplemental frames one pivoted on each side of said supporting frame, means for swinging said supplemental frames individually to wall-engaging position, and hydraulic wall engaging jack mechanism on one of said supplemental frames for anchoring all of the aforesaid frames between the opposite walls during the operation of said arc-wall mining mechanism.

26. In a mining and loading machine, the combination with a supporting frame, of mining mechanism mounted thereon, a wall jack connected to said frame, and conveyor mechanism extending through said wall jack.

27. In a mining and loading machine, the combination with a supporting frame, of mining mechanism mounted thereon, a wall jack comprising a tubular frame, and a conveyor extending through said tubular frame.

28. In a mining and loading machine, the combination with a supporting frame, of mining mechanism mounted thereon, a wall jack comprising a supplemental frame pivotally connected to said supporting frame, means on said supporting frame in position to engage said supplemental frame to move the jack to wall-engaging position, and a conveyor supported by said supplemental frame in position to convey dislodged material toward loading position.

29. In a mining machine, the combination with a main frame, of a roof jack for the forward portion of said frame, dislodging mechanism comprising spaced-apart pointed wedging tools adapted to penetrate the solid coal face and tear large pieces of coal from the face over a wide area, means for mounting said dislodging mechanism on said frame for arcuate movement relatively to said main frame, multiple jack mechanism at both sides of said main frame, and means for operating said last-named jack mechanism to firmly anchor said main frame against swerving during the operation of said dislodging mechanism.

30. In a mining machine, the combination with a supporting frame, of mining mechanism mounted thereon, wall jack mechanism comprising supplemental frames pivoted to opposite sides of said supporting frame and each adapted to rest on and slide over the mine floor between the said supporting frame and the adjacent wall of the mine chamber, means mounted on said supporting frame in position to swing said supplemental frames laterally relatively to said supporting frame, means for lifting the rear ends of said supplemental frames off the mine floor, and power-operated mechanism for exerting powerful wall gripping action on said roof jack mechanism to firmly anchor said frame between the spaced-apart side walls of the mine chamber.

31. In a mining machine, the combination

with a supporting frame, of elongated wall jack frames pivoted to said supporting frame intermediate the ends of the latter, mining mechanism on said supporting frame, means at the rear end of said supporting frame for swinging said elongated frames away from said supporting frame toward opposite spaced-apart walls in the mine chamber, hydraulic mechanism for lifting the rear ends of said jack frames off the mine floor, roof jack mechanism for the rear ends of said wall jack frames, and a plurality of hydraulic jacks on one of said elongated frames for anchoring all of said frames firmly between said side walls.

32. In a mining and loading machine, the combination with a supporting frame, of arc-wall dislodging mechanism mounted thereon and comprising means for stripping a layer of coal from an upright arcuate face of the mine wall in advance of said frame, anchoring mechanism comprising wall jacks distributed along both sides of said supporting frame, conveyor mechanism extending along one side of said frame within the confines of the wall jack mechanism on that side, and means for delivering dislodged material to said conveyor mechanism.

33. In a mining machine, the combination with a supporting frame, of a supplemental frame mounted thereon for arcuate movement relatively thereto, dislodging mechanism mounted on said supplemental frame for bodily movement therewith and for operation on the solid upright face of a coal vein in its native state, a roof jack for anchoring the forward portion of the supporting frame adjacent said dislodging mechanism, multiple wall jacks comprising frames pivoted to opposite sides of said supporting frame intermediate the ends of the latter, and abutments between the rear end of said supporting frame and the rear side portions of the frames of said multiple jacks.

34. In a mining machine, the combination with elongated supporting framework adapted to be located between side walls of a mine chamber, of arc wall dislodging mechanism mounted on the forward portion of said framework, means for operating said dislodging mechanism, loading apparatus mounted on said framework in position to receive the dislodged coal and transfer it toward loading position, multiple jack mechanism comprising elongated frames pivoted to said supporting framework and extending along the rear side portions thereof, and means at the rear end of said framework for independently adjusting each multiple jack mechanism in its position relative to said framework and toward the respective side walls of the mine chamber.

35. In a mining machine, the combination with a supporting frame, of mining mechanism mounted thereon, supplemental elongated jack frames connected to opposite sides of said supporting frame so as to be longitudinally disposed relative thereto, means for adjusting the positions of said jack frames adjacent the side walls of the mine chamber and relative to said supporting frame, and hydraulic anchoring mechanism for said jack frames to anchor the latter and said supporting frame firmly between the side walls during the operation of said mining mechanism.

36. In a mining and loading machine, the combination with a supporting frame, of mining mechanism thereon, a wall jack connected to one side of said supporting frame, and a conveyer supported by said wall jack with its forward receiving end in position to receive dislodged material from said mining mechanism.

37. In a mining and loading machine, the combination with a supporting frame, of mining mechanism mounted thereon, a wall jack comprising a supplemental frame detachably connected to said supporting frame, and a conveyer supported by said supplemental frame in position to convey dislodged material toward loading position, said conveyer being detachable from the supporting frame together with said wall jack to afford a narrower width of the machine for transportation in a mine.

38. In a mining and loading machine, the combination with a supporting frame, of mining mechanism mounted thereon, an elongated multiple wall jack detachably and pivotally connected to one side of said supporting frame intermediate the ends thereof, and a conveyer supported by said multiple wall jack and removable from the machine together with said jack to afford a narrower width of the machine during transportation in a mine.

39. In a mining machine, the combination with a supporting frame, of arc-wall coal-stripping mechanism comprising an upright series of spaced-apart piercing tools in position to rip and tear the coal from the solid face of the coal vein, lateral abutment mechanism at the rear side portions of said frame, abutment mechanism for the rear end of said frame, means for operating said coal-stripping mechanism, and an additional lateral abutment for the forward side portion of said frame near the starting position of said coal-stripping mechanism to co-operate with the first-named lateral abutment mechanism to resist swerving of the machine during the operation of said arc-wall coal-stripping mechanism.

40. In a mining machine, the combination with a main frame, of a hydraulic roof jack for the forward portion of said main frame, dislodging mechanism mounted on said main frame for feeding movement relatively thereto in advance of said roof jack while said dislodging mechanism is held in continuous en-

gagement with the coal at the mine wall for continuous forward movement over a predetermined path of travel, supplemental frames pivotally connected to both sides of said main frame to swing relatively thereto, and a plurality of hydraulic wall jacks distributed along each of said pivotally connected supplemental frames in position for distributed application along the mine walls spaced from both sides of the main frame.

41. In a mining machine, the combination with a main frame, of a supplemental frame mounted thereon for arcuate movement relatively thereto on an upright axis, dislodging mechanism mounted on said supplemental frame for bodily movement therewith on said upright axis and comprising spaced-apart penetrating wedging tools each adapted to penetrate the solid coal in its native state and by wedging action split and tear the coal in large pieces over a wide area extending from the floor to the roof of the mine chamber, means for operating said dislodging mechanism by forcing said tools into the solid coal face along arcuate lines while said main frame remains stationary, hydraulic wall jacks pivoted to the sides of the forward end portion of said main frame to swing from positions longitudinal of the frame to positions substantially at right angles to the longitudinal length of the machine, supplemental frames pivoted to both sides of the main frame intermediate the ends thereof, a plurality of hydraulic jacks on each of said supplmental frames in position for engaging the walls on both sides of the main frame, and adjustable abutments for the rear end portions of said supplemental frames.

In testimony whereof I have signed my name to this specification on this 2d day of January, A. D. 1923.

EDMUND C. MORGAN.