

Nov. 6, 1923.

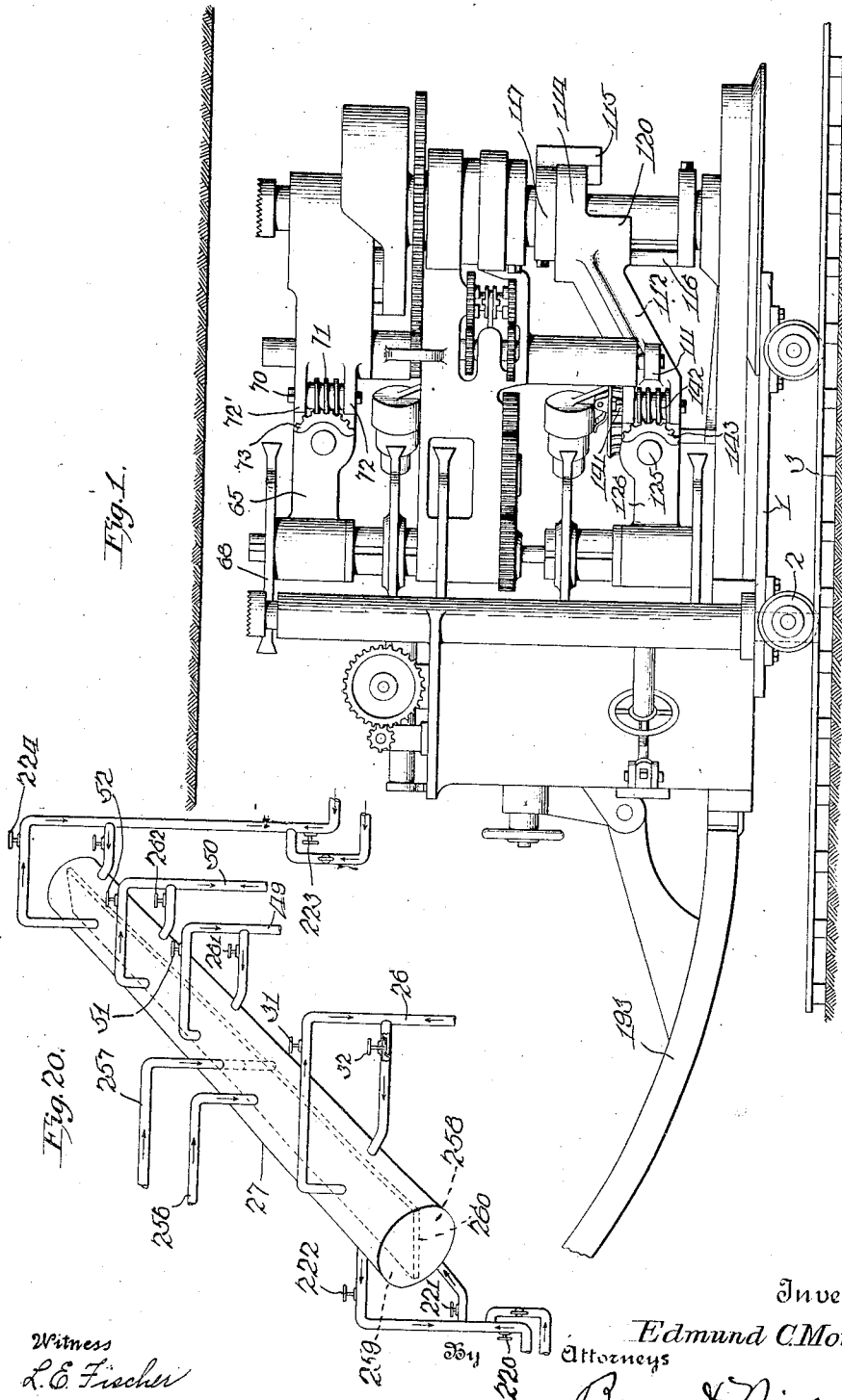
E. C. MORGAN

1,473,157

LOADING MACHINE

Original Filed April 30, 1913

10 Sheets-Sheet 1



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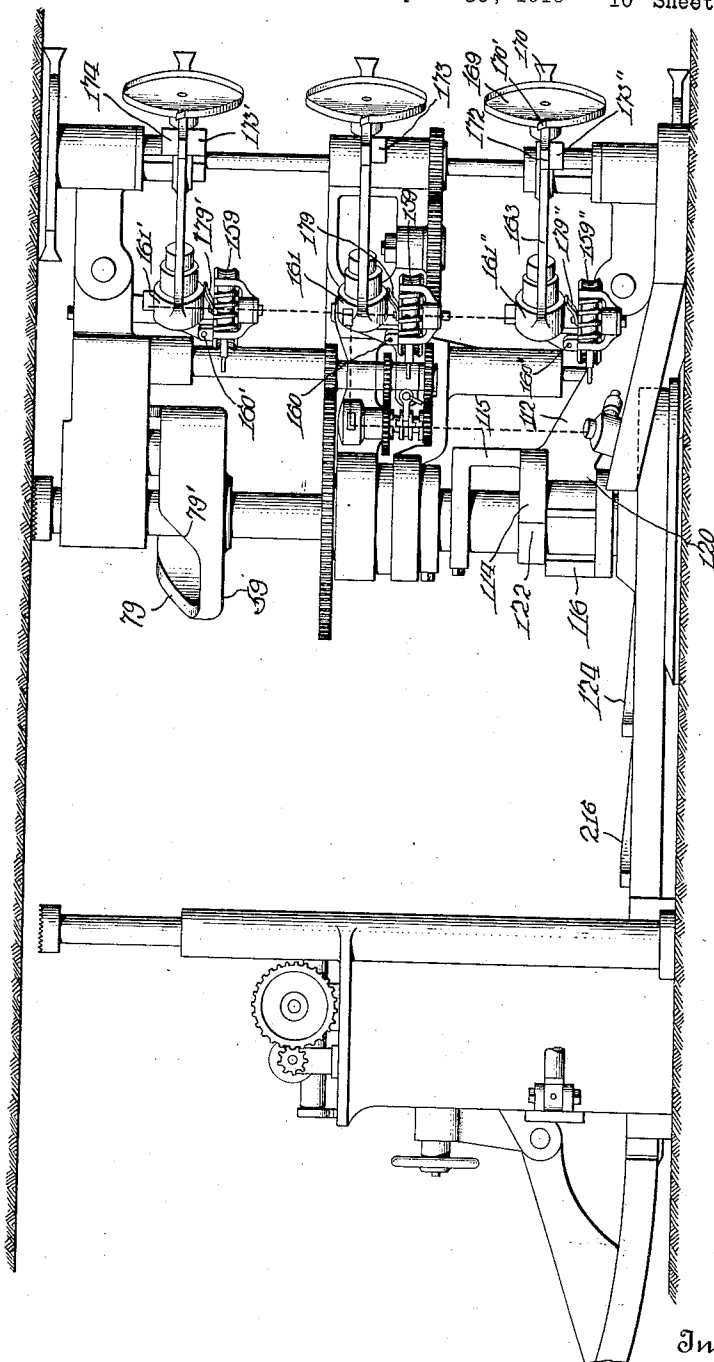
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Fig. 2



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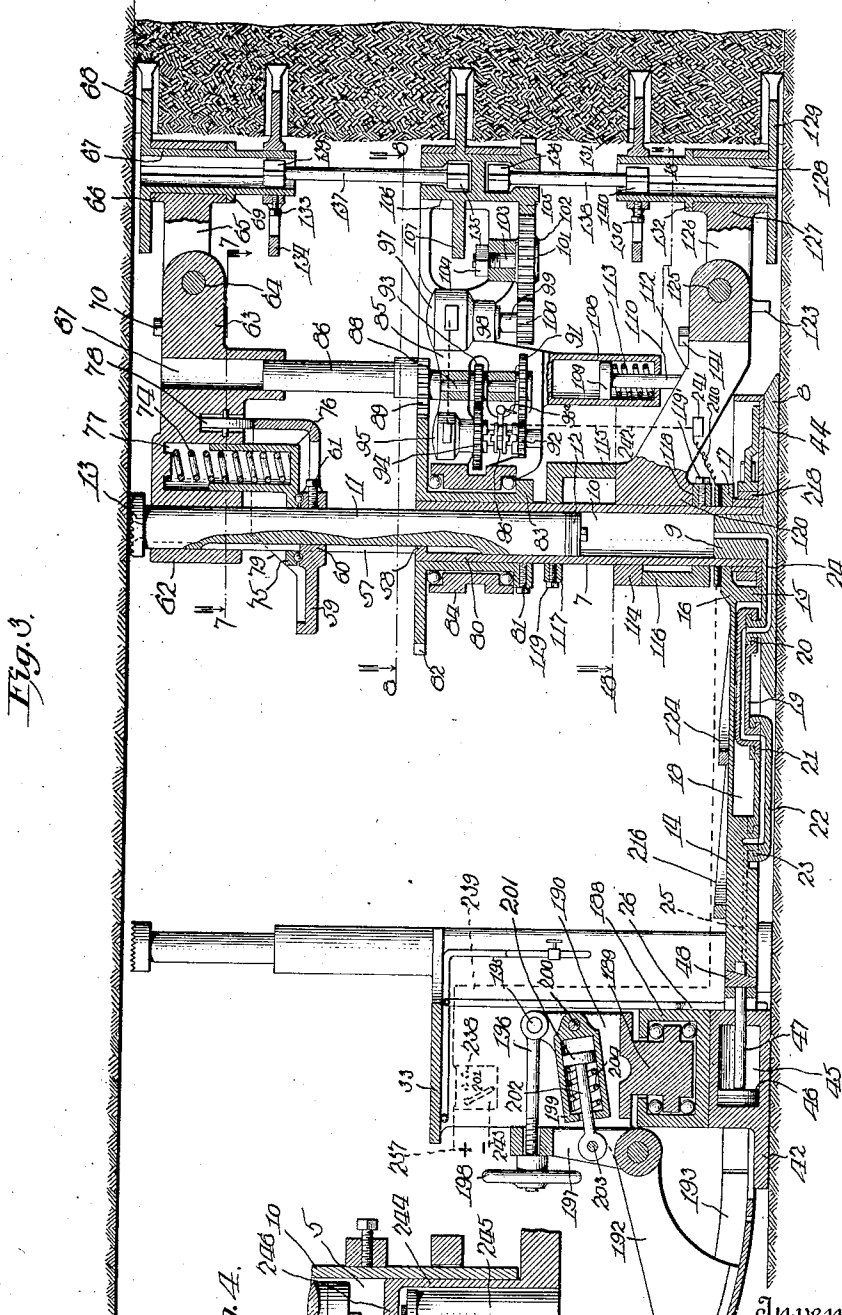
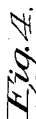
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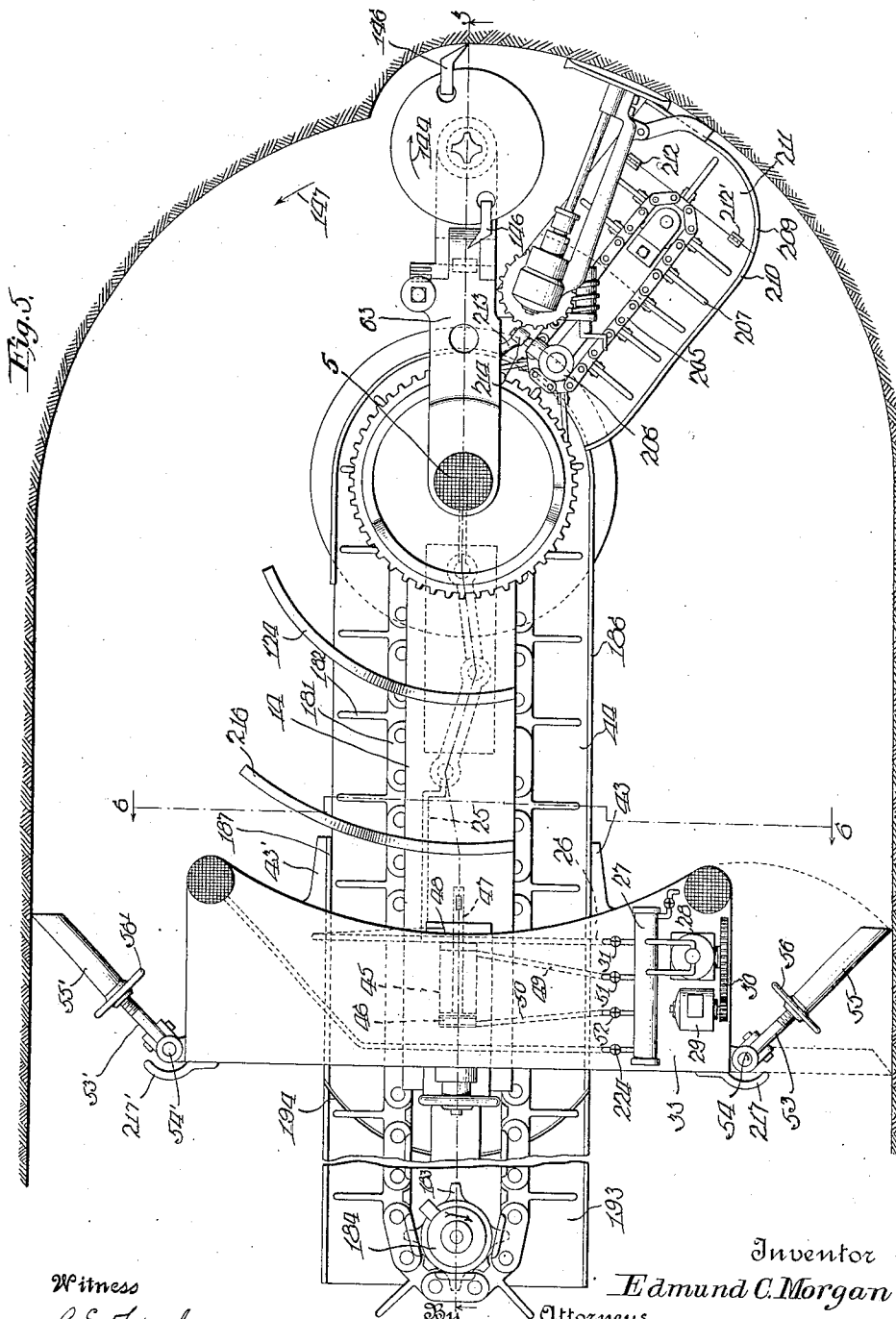


Fig. 5.

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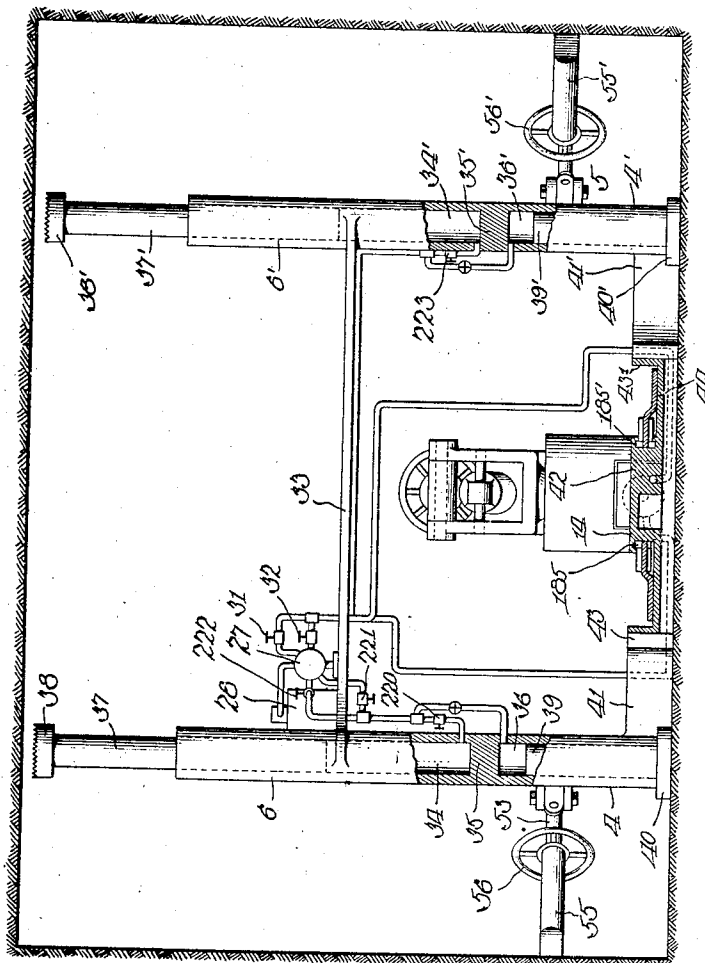
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Fig. 6.



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Fig. 7.

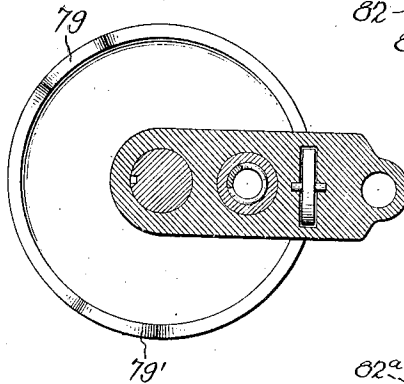


Fig. 10.

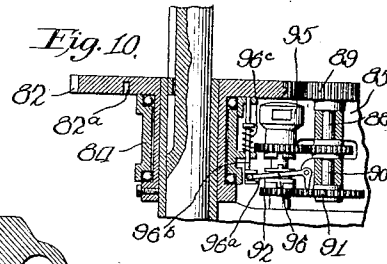
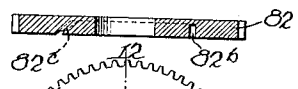


Fig. 12.



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Fig. 10.

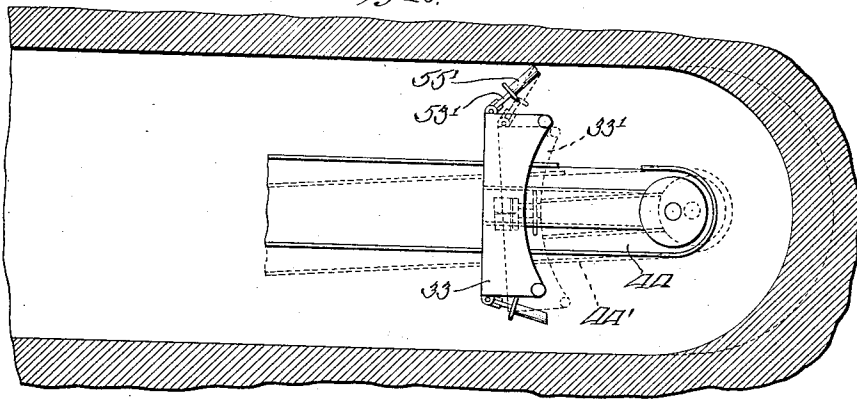
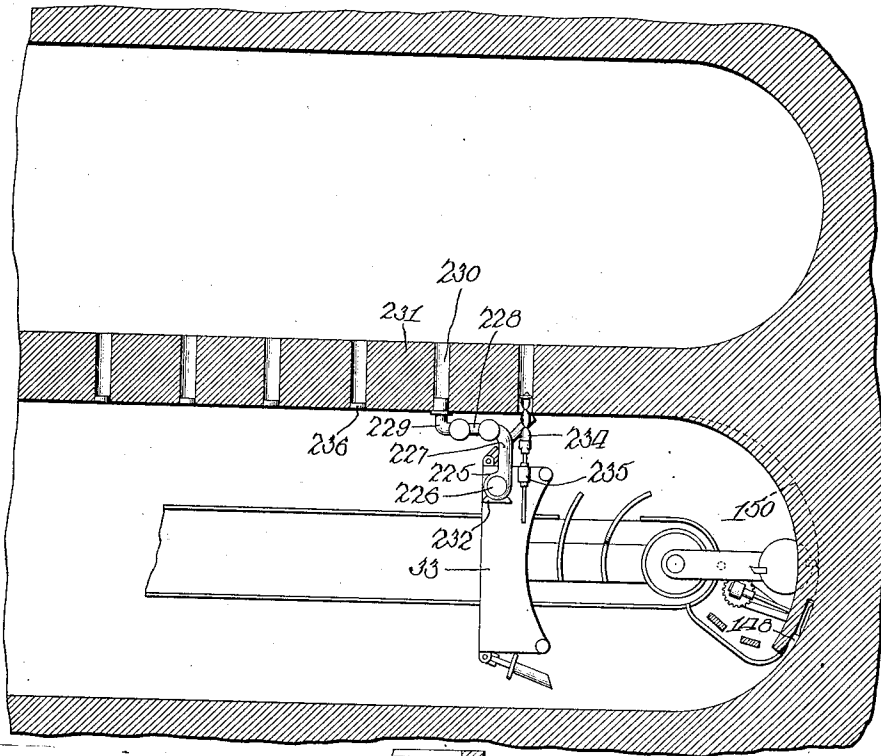


Fig. 12

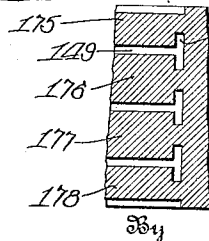


Fig. 14

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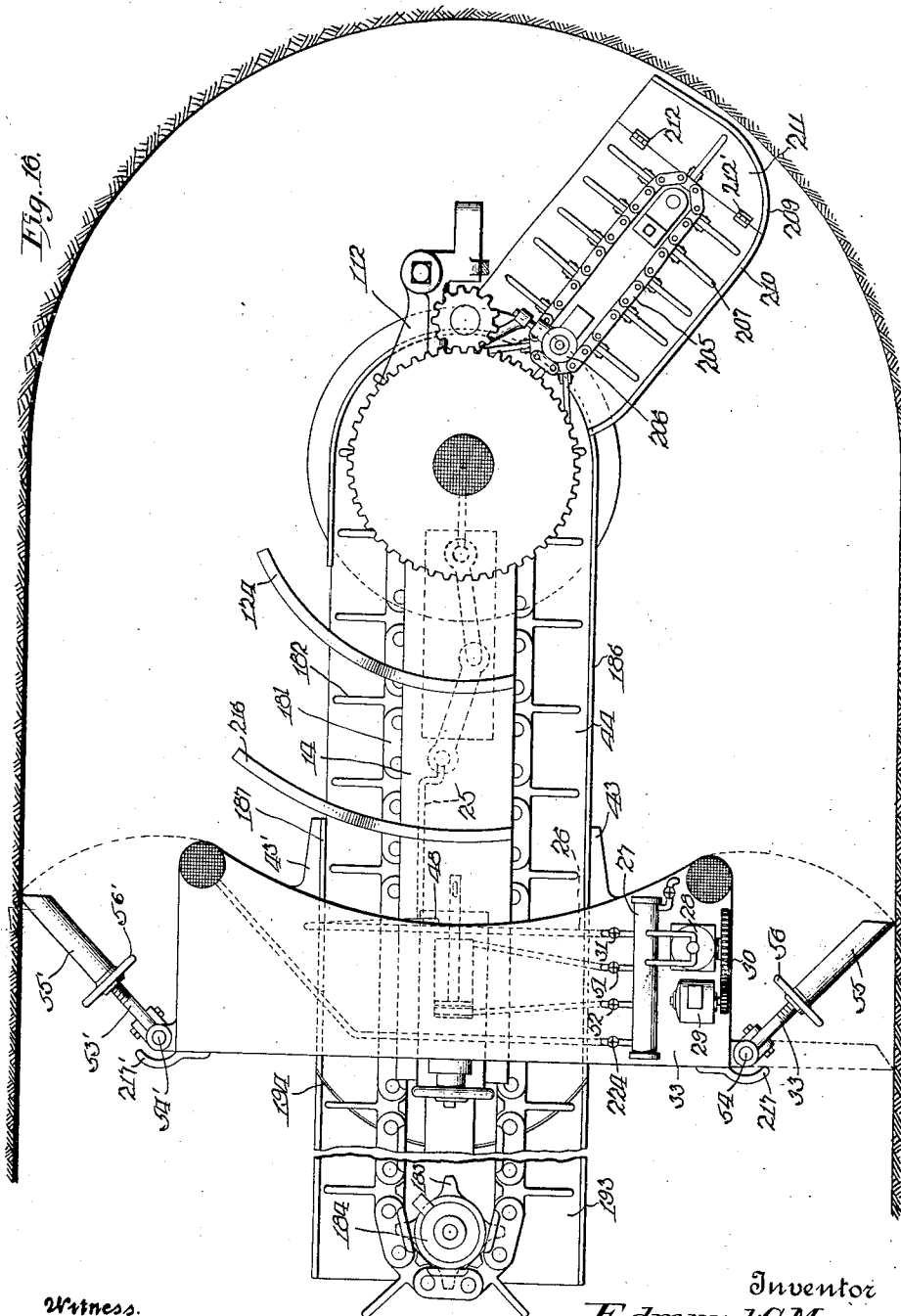
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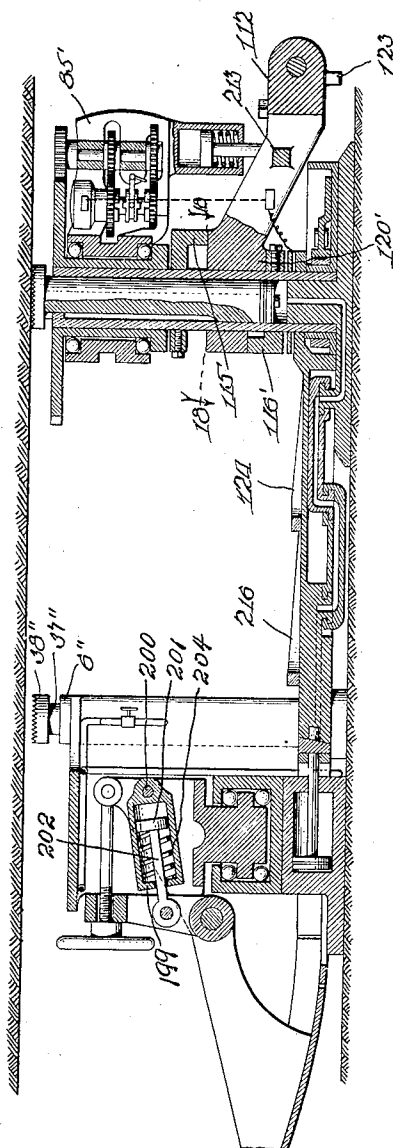
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Fig. 18.

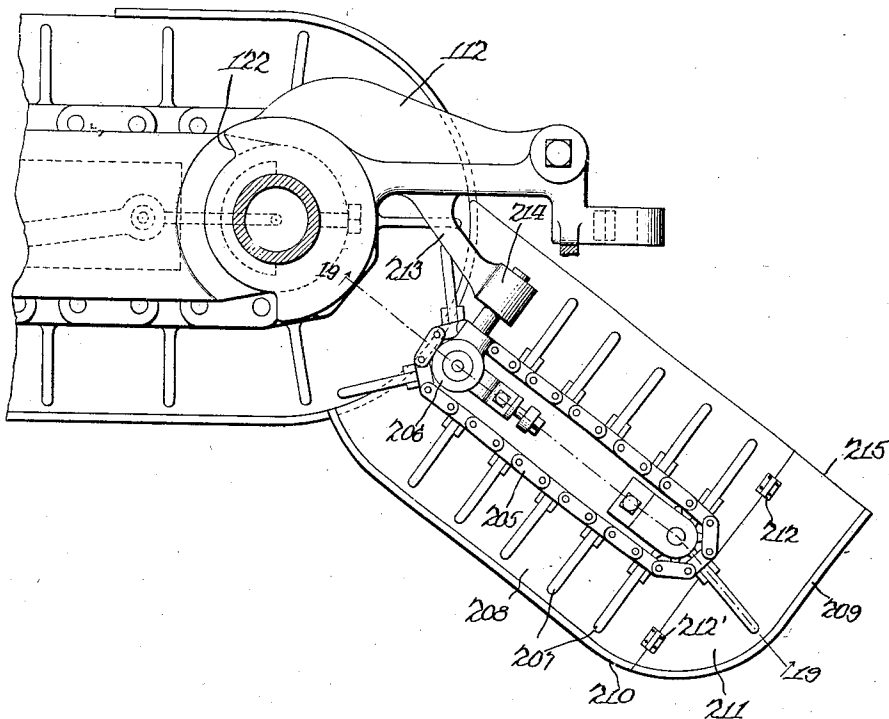
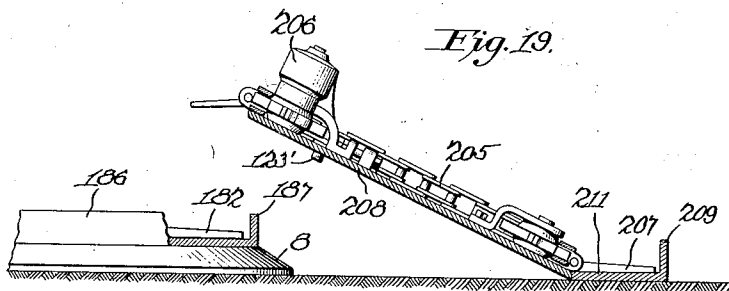


Fig. 19.



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UNITED STATES PATENT OFFICE.

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

LOADING MACHINE

Original application filed April 30, 1913, Serial No. 764,487. Divided and this application filed May 13, 1919. Serial No. 296,867.

To all whom it may concern:

Be it known that I, EDMUND C. MORGAN, a citizen of the United States, residing in New York city, county of New York, and State of New York, have invented a new and useful Improvement in Loading Machines, of which the following is a specification.

My invention relates to loading machines particularly adapted for loading coal, either in combination with mining mechanism in a mining and loading machine, or separately from said mining mechanism. The present application discloses subject-matter in common with the disclosure in my copending application Serial No. 764,487, filed April 30, 1913, for an improvement in mining machines.

One of the objects of the present invention is the provision of simplified and improved loading apparatus particularly adapted for loading coal in low roof mine chambers.

More particularly it is the object of the present invention to provide an arcuately movable conveyer at the forward end of the stationary conveyer arranged so that the forward conveyer will be continually in delivery communication with the stationary conveyer throughout a range of arcuate movement of the forward conveyer of 180 degrees or more, and to provide operating and adjusting mechanism for the loading machine.

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

In my copending application, Serial No. 764,487, filed April 30, 1913, for an improvement in mining machines, I have described and claimed the mining mechanism shown in the present application, and also such mining mechanism combined with the loading mechanism in a combined mining and loading machine, as shown in the present application, whereas the claims hereto appended in the present application are directed to the loading apparatus used without the mining mechanism, that is, with all of the cutting mechanism removed or omitted.

Referring to the accompanying drawings,

Fig. 1 is an elevational view of a mining and loading machine mounted on a truck for transportation; Fig. 2 is an elevational view of the mining and loading machine in a mine preparatory to cutting operation; Fig. 3 is a sectional elevational view on the line 3—3 of Fig. 5, looking in the direction of the arrows; Fig. 4 is a fragmentary vertical sectional view of a modification for lifting the forward portion of the mining and loading machine; Fig. 5 is a plan view of the entire mining and loading machine; Fig. 6 is a vertical sectional view taken on the line 6—6 of Fig. 5, looking in the direction of the arrows; Fig. 7 is a sectional plan view taken on the line 7—7 of Fig. 3; Fig. 8 is a sectional plan view taken on the line 8—8 of Fig. 3; Fig. 9 is a side elevational view taken on the line 9—9 of Fig. 8, looking in the direction of the arrows; Fig. 10 is a fragmentary vertical sectional view of a modification illustrating means for automatically controlling the speed of the cutting mechanism for cutting and noncutting operations; Fig. 11 is a plan view of a large gear by which the entire mechanism is given a rotary motion; Fig. 12 is a sectional view of Fig. 11; Fig. 13 is a diagrammatic view showing the manner in which the entire loading machine may be shifted to various angles to change its path of travel in the mine; Fig. 14 is a sectional plan view of two rooms of the mine with an intervening wall and apparatus for removing dust from the mining and loading machine room to the next adjacent room; Fig. 15 illustrates a sectional elevational view through the mine wall after the horizontal and vertical kerfs have been cut by the mining machine; Fig. 16 is a plan view and Fig. 17 is a longitudinal sectional elevation of an adaptation of the loading apparatus of the other views, to very low roof mine chambers; Fig. 18 is an enlarged sectional plan view of the forward part of Fig. 16 taken on the line 18—18 of Fig. 17; Fig. 19 is a sectional elevational view of the forward conveyer on the line 19—19 of Fig. 18, to show the relative positions of the forward and rear conveyers; and Fig. 20 on the first sheet of the drawings, is a diagrammatic view of the piping connections for the flow of liquid to operate the plungers of the ceil-

ing jacks of the loading apparatus shown in Figs. 16 and 17, as well as of the loading apparatus shown in Figs. 1, 2, 3, 5 and 6.

Fig. 1 shows the mining and loading machine folded up compact and mounted on a truck 1 which is provided with wheels 2 adapted to travel on the track 3. By means of two rear hydraulic jacks shown at 4, 4' in Fig. 6, and one hydraulic jack shown at 5 in Fig. 5, the mining and loading machine may be lifted up off the truck 1 and the latter moved out from under the mining and loading machine, after which the mining and loading machine may be moved to the position in the mine where it is to be used. The hydraulic roof jacks 6, 6' at the rear portion of the mining and loading machine, and the hydraulic roof jack 7, shown in Fig. 3 at the forward portion of the machine, may then be relied upon to hold the framework in its proper position while the cutting and loading operation is being performed.

The mining and loading machine shown in the drawings comprises a circular base plate 8 at the forward portion of the machine, which is provided with a central hub 9 over which fits the vertical hollow cylinder 10 of the forward hydraulic jack 7. Extending into the upper end of the cylinder 10 is the plunger 11, the lower end of which may be provided with a leather cup packing to form a piston 12, and the upper end of which may be provided with a shoe 13 serrated on its upper surface.

Pivoted to the lower portion of the cylinder 10 is a horizontal plate 14, the forward portion of which is provided with a shoe 15 adapted to slide over the upper surface of the circular base plate 8, as shown in Fig. 3. The forward end of the plate 14 may extend upwardly at 16 to the collar 17 which forms the pivotal connection between the plate 14 and the lower portion of the cylinder 10, as shown in Figs. 3 and 5.

On the lower side of the horizontal plate 14 is a rectangular recess 18 for receiving the pipe 19 and the couplings 20 and 21 at its ends. A pipe 22 is also located underneath the plate 14 between the couplings 21 and 23. It will be seen by referring to Figs. 3 and 5 that a passageway 24 is provided through the hub 9 and the base plate 8 to the pipe 19. This establishes communication between the cylinder 10 beneath the piston 12 and the pipe 19. A passageway 25 in the rear portion of the plate 14 connects the coupling 23 to a pipe 26 which extends to a drum 27 of the electrically operated hydraulic pump mechanism, as shown in Fig. 5. This pump mechanism comprises a pump proper, designated 28 in Fig. 5, an electric motor 29, and intermediate gearing 30. Between the pipe 26 and the drum 27 are two valves, the one designated 31 being for

the supply and the one designated 32 being for the exhaust. Any suitable type of hydraulic pump may be employed in which supply pressure may be obtained by opening the valve 31, and the exhaust controlled by means of the valve 32.

When it is desired to firmly anchor the forward portion of the mining and loading machine in adjusted position, the valve 32, shown in Figs. 6 and 20, will be closed, and the valve 31 opened. Now, when the electric hydraulic pump is operated, hydraulic pressure will be exerted in the pipe 26, and such pressure transmitted to the pipes 22 and 19 and through the passage 24 into the cylinder 10 beneath the piston 12. Continued operation of the hydraulic pump will lift the plunger 11 against the roof of the room in the mine and firmly anchor the shoe 13 in the desired position, and the valve 31 may be closed. The jack 7 will be held in such position until the valve 32 is opened, whereupon the weight of the plunger 11 will cause the water to recede from the cylinder 10 and allow the plunger 11 to descend to a lower position.

At the rear portion of the mining and loading machine, is located a horizontal connecting plate 33 in an intermediate position, as shown in Fig. 6, between the rear hydraulic jacks 6 and 6', the latter being in vertical alinement with the floor jacks 4 and 4'. The horizontal plate 33 supports the hydraulic pumping mechanism as shown in Fig. 6. The ends of the plate 33 are rigidly connected to the cylinders 34, 34' of the hydraulic jacks 6, 6' respectively. Beneath the cylinders 34, 34' are partitions 35, 35' to provide independent cylinders 36, 36' for the hydraulic lifting jacks 4, 4'. The roof jacks 6, 6' are provided with plungers 37, 37' which have shoes 38, 38' the latter being preferably serrated on their upper horizontal surfaces. The lifting jacks 4, 4' comprise plungers 39, 39' which have shoes 40, 40' at their lower ends.

As shown in Fig. 6, which is a sectional elevational view of Fig. 5, taken on the line 6-6 looking in the direction of the arrows, the lower ends of the cylinders 36, 36' are connected by inwardly extending brackets 41, 41' and the intermediate connecting plate 42. The laterally extending brackets 41, 41' may have forwardly extending portions 43, 43', as shown in Fig. 5, which serve as guides for the longitudinal movement of the conveyor frame 44. At the central portion of the connecting plate 42 is a hydraulic cylinder 45 in which is located a piston 46 at the inner end of the piston rod 47, the latter extending forwardly and being attached to the crosshead 48 at the rear end of the plate 14. Pipes 49 and 50 extend between the ends of the cylinder 45 and the hydraulic pumping apparatus, as shown in Fig. 5. By means of

a set of valves 51, similar to those designated 31 and 32 in Fig. 6, water may be forced into the cylinder 45 ahead of the piston 46, or the water may be permitted to be exhausted therefrom. In a similar way, a set of valves 52 may be operated to produce or relieve pressure back of the piston 46. In Figs. 5 and 6 I have shown manually operable jacks comprising screw-threaded rods 53, 53' which are pivoted at 54, 54' to the frame 33 which is attached to the vertical lifting jack cylinders 36 and 36' respectively. On the screw-threaded rods 53, 53' are the shoes 55, 55' which may be adjusted to various angles against the side walls and moved outwardly by means of the wheels 56, 56'. The brackets 217, 217' may be provided to limit the rearward adjustment of the manual jacks as indicated by the dotted line positions in Fig. 5, in which positions said jacks may retain the rear portion of the mining and loading machine midway between the mine walls when such rear portion is being moved forwardly in the manner hereinafter described.

I will now describe the kerf-cutting mechanism to show that the loading apparatus herein disclosed is well adapted for use in a combined mining and loading machine as well as without such cutting mechanism. The preferred kerf-cutting mechanism which is particularly adapted for use with the loading apparatus disclosed, comprises mechanism which is supported by brackets secured to the cylinder and plunger of the forward central hydraulic roof jack. The plunger 11 is provided with a vertical slot 57, as shown in Fig. 3, into which slot fits the feather or spline 58 at the upper end of the cylinder 10, so that the plunger may have vertical up and down motion, but is prevented from being rotated. On the plunger 11 is rotated a disc bracket 59 which is prevented from turning on the plunger 11 by the feather 60 and which may be fixed in adjusted position by means of the set screw 61. That is to say, the disc bracket 59 cannot turn relatively to the plunger 11 but may be adjusted to various vertical positions on the plunger 11 and held in adjusted position by means of the set screw 61. At the upper end of the plunger 11 and surrounding the same, is a collar bearing 62 to which is connected the upper horizontal bracket 63 to the forward end of which at 64 is pivoted the cutter-carrying arm 65. The outer end of the arm 65 is provided with a collar bearing 66 in which fits the tubular shaft 67. At the upper end of the tubular shaft 67 is located the horizontal disc cutter 68 and beneath the cylindrical collar bearing 66 is a ring collar bearing 69, on the outer surface of the tubular shaft 67. By means of the nut 70, the worm 71 mounted between the bearings 72 and 72', as shown in Fig. 1, may

be turned in either direction so as to oscillate the segmental worm gear 73 and thereby tilt the arm 65 and the disc cutter 68 to various angles. It will be seen by referring to Fig. 3, that the bracket 63 is yieldingly counterbalanced by means of the spring 74 on the disc bracket 59 which is fixed to the plunger 11. Surrounding the plunger 11 is a ring 75 on ball bearings which rest on the hub portion of the disc 59. The ring 75 is provided with a cylindrical cup 76 which telescopes into the cylindrical recess 77 on the under side of the bracket 63 near the cylindrical collar bearing 62. It will therefore be seen that the bracket or arm 63 and the parts carried thereby are in part supported by the spring 74 and the ring 75 on the ball bearings on top of the hub portion of the disc 59. The main support for the bracket 63 is by means of the wheel 78 which is pivoted in suitable position in the bracket 63 intermediate its ends, as shown for example in Fig. 3. The wheel 78 rides on the upper cam surface of the disc bracket 59 which cam surface is cylindrical in plan view, as shown in Fig. 7, but which is provided with inclined cam surfaces at 79, 79' so as to vary the elevation of the bracket 63 and cutter 68 at certain periods. This can easily be accomplished because the cylindrical collar 62 is free to slide up and down on the plunger 11, the spring 74 acting as a cushion in the descent and because of its counterbalancing action facilitating the ascent.

At the upper end of the cylinder 10 is mounted a cylindrical collar 80 which may be secured in adjusted position by means of the set screw 81. To the upper end of the cylindrical collar 80 is secured the circular or disc gear 82. At the lower end of the cylindrical collar 80 is a ring bearing 83 to form a ball race. Between the ring bearing 83 and the under surface of the disc gear 82 and surrounding the cylindrical collar 80, is a freely movable cylindrical collar 84. It will be seen that this collar 84 is connected by ball bearings to the collar 80 and is supported on the ring bearing 82. Securely attached to the freely movable cylindrical collar 84 is a bracket arm 85 which supports a plurality of parts. The bracket arm 85 is an intermediate frame for the cutter mechanism, but its principal utility is to support mechanism for rotating this frame 85 as well as the parts connected thereto, including the forward arcuately movable scooping conveyer.

Rigidly connected to the frame 85 and extending upwardly therefrom, is a vertical rod 86 which has a sliding connection with the arm 63 by fitting into the cylindrical opening 87 which extends vertically through the arm 63, as shown in Fig. 3. By this means whenever the frame 85 is moved hori-

zonally or rotated on an upright axis, the arm 63 will be likewise rotated because of the connection through the rod 86.

Journalled in the upper portion of the frame or arm 85 is a short vertical shaft 88, at the upper end of which is a pinion 89 which meshes with the disc gear 82. In the lower portion of the frame 85 is journalled an extension of the shaft 88 at the lower end of which is a gear wheel 91 which meshes with a pinion 92 which is also mounted in the frame 85, as shown in Fig. 3. Immediately mounted on the shaft 88 is a gear 93 which meshes with the gear 94. An electric motor 95, provided with suitable starting mechanism, is mounted in the frame 85 near the cylindrical collar 84. I prefer to mount this motor 95 so that its shaft will occupy a vertical position. Gears 92 and 94 are loosely mounted on the shaft of the electric motor 95, but the clutch member 96 is splined thereto and may be manually operated by the handle 6^a, or automatically operated by any suitable means such, for instance, as illustrated in Figs. 10, 11 and 12, so as to connect the motor shaft to either the gear 94 or the gear 92.

It should be understood that the pinion 89, the gears 93 and 91, and the shaft 88 are mounted to rotate together. It will also be observed that the gear 92 is small as compared with the gear 91, and that the gear 94 is large as compared with the gear 93. Therefore, when the gear 92 is thrown in, the pinion 89 will be rotated slowly to effect feeding movement of the cutting mechanism about a vertical axis extending vertically through the center of the forward roof jack. When the gear 94 is thrown in, however, the pinion 89 will be rotated comparatively fast, which should be done when the cutting mechanism is to be moved to a new cutting position after a plurality of kerf cutters have completed a series of cuts simultaneously. In the event that this mechanism is to be controlled manually, the clutch 96 may be operated each time the speed of rotation is to be changed, by means of the handle 96^a, this being done by the operator.

As above stated, I have illustrated in Figs. 10, 11 and 12 a modified construction by means of which the change in speed may be automatically controlled during the rotary movement of the mechanism. Referring to these views it will be seen that a rod 96^b may be mounted in suitable brackets formed on the collar 84 to reciprocate vertically. This rod is constantly urged in a vertical direction in its bearings by means of a spring 96^c positioned between a collar on the rod and the lower bearing of the rod. The lower end of the rod is provided with a forked end in position to engage the handle 96^a so that when the rod is reciprocated vertically it

will shift the handle 96^a to throw the clutch member 96, as previously described. The reciprocation of the rod 96^b may be accomplished automatically at the proper time by means of a concentric groove 82^a formed in the under side of the gear 82, as illustrated in Figs. 10, 11 and 12. This groove or slot 82^a extends through an arc of substantially 180 degrees. During the time that the cutting mechanism is in its cutting position, that is during the rotation thereof through the arc in which the cutting of material actually takes place, the rod 96^b is held in its lowermost position because its upper end is in contact with the under surface of the gear 82. This position of the arm 96^b holds the clutch member 96 in such position as to hold the slow speed gears 91 and 92 in driving relation with the mechanism, as above explained. When the cutting mechanism leaves its cutting position, however, the end 82^b of the slot 82^a arrives in position to allow the rod 96^b to be moved upwardly by the spring 96^c into said slot, and thereby shift the clutch to the high speed set of gears 93 and 94. The cutting mechanism will then travel at a comparatively high speed, as above explained, until it again arrives in cutting position, whereupon the rod 96^b will be forced downwardly out of the slot 82^a and thereby shift the clutch back to the slow speed gears. In order that the rod 96^b may be properly forced downward out of the groove 82^a the end 82^c of said groove is inclined or formed as a cam, as shown in Fig. 12. The end 82^b of the slot or groove 82^a may be abrupt since the spring 96^c will act to shift the rod 96^b upwardly at the proper time. By means of this modified arrangement, it is unnecessary for the operator to watch the speed changing mechanism since the change in speed will automatically occur at the proper times.

An additional electric motor 97 is also mounted in the frame 85 and preferably in vertical position, as shown in Fig. 3. If desired, the electric motor may be provided with speed changing gears in the casing 98. This electric motor 97 may also be provided with suitable starting and regulating apparatus independently of the electric motor 95, although both motors may be connected to a common source of supply, comprising removable socket switch connections.

At the lower end of the shaft 99 of the electric motor 97, is a pinion 100 which meshes with the gear 101, the latter being mounted to rotate in the bearing 102 which is supported by means of the bolt 103 and nut 104 at the outer portion of the frame 85, as shown in Fig. 3. The gear 101 meshes with the gear 105 which is located at the lower end of the hub 106 of the disc cutter 107.

Suspended from the frame 85 is an en-

closed cylinder 108 in which is located the piston 109, the piston rod 110 of which is connected at 111 to the lowermost cutter frame arm 112, as shown in Figs. 1 and 3.

Between the piston 109 and the lower end of the cylinder 108 is a spring 113 which acts on the piston 109 and constantly tends to lift the arm 112. The hub portion 114 of the rotatable arm 112 is held between the stops 115 and 116 when the arm 112 is in the position shown in Fig. 3. The stops 115 and 116 are arranged vertically and connected to collars 117 and 118 respectively, which surround the cylinder 10. The stop 115 may be adjusted to various vertical positions along the post 10 and may also be rotated to various positions. After the stop 115 is in the desired position, it will be held there by means of the set screw 119. The stop 116 is similarly adjustable and may be held in adjusted position by means of the set screw 119'. The upper surface of the hub 114 may engage the lower end of the stop 115, as shown in Fig. 3, and when freed from this stop during rotation, such upper surface may engage the lower surface of the collar 117, as shown in Fig. 1. The hub 114 is cut away at the side opposite the arm 112 so as to form the interlocking member 120 which is shown in Fig. 1. So long as the interlocking member 120 rests on the stop 116, as shown in Fig. 1, the arm 112 is free to be rotated in either direction, but as soon as the arm 112 is rotated to such position that the member 120 is freed from the stop 116, the hub 114 together with the arm 112 is free to descend. It cannot then be moved backwardly but can then be moved forwardly to the point where the member 120 engages the stop 116. The latter therefore assures the proper lifting of the arm 112 together with the hub 114, for if it be attempted to rotate the arm 112 beyond the point where it should be lifted, such motion will be arrested by the stop 116. It should also be observed that the hub 114 is cut away at its upper portion, as indicated at 122 in Figs. 2 and 18, so as to be of less diameter over that portion opposite the arm 112. This will permit the hub 114 to move within the stop 115 when in the position shown in Fig. 1. By referring to Fig. 3, it will be seen that a sufficient space is provided between the stop 115 and the post 10 for the collar portion of the hub 114 when the arm 112 is in position for upward movement along the post 10. When in the position shown in Fig. 2, the hub 114 is kept from being lifted because the stop 115 is in position to act as an abutment to prevent upward movement of the arm 112 and to hold the latter in the position shown in Fig. 3.

On the lower side of the outer end of the arm 112 is a depending lug 123 which will engage the cam surface 124 when the arm

112 is rotated a sufficient distance. The cam 124 is arc-shaped in plan view, as shown in Fig. 5, and is securely attached to the upper surface of the rectangular plate 14. The part of the cam 124 which extends from the plate 14 is inclined downwardly so as to be in position to receive the depending lug 123 of the arm 112 and gradually lift the latter. When the lug 123 engages the cam 124 the hub 114 is in such position that it has run out from under the stop 115 and is free to be lifted. By the time that the end of the cam is reached, such cam has lifted the hub 114 to a position where the interlocking member 120 is near the stop 116 and about to ride on top of the same. It will be seen that the lug 123 is of sufficient length to assure the engagement of the interlocking member 120 with the upper surface of the stop 116 before the lug 123 leaves the cam 124. After the lug 123 leaves the cam 124 the stop 116 will hold the hub 114 and the arm 112 in its uppermost position until the arm 112 and the disc cutter thereon are entirely clear of the conveying apparatus hereinafter described. The stop 116 may be varied in width as desired, but preferably it should be such as to permit the arm 112 to descend again when the outer end of the same approaches the mine wall and a new cut is about to be made.

When the hub 114 is freed from the stop 115 and the cam 124 lifts the arm 112, the spring 113 shown in Fig. 3 will act as a counterbalance to facilitate such upward motion of the arm 112. The spring 113 also cushions the fall of the arm 112 when the weight of the latter causes the same to descend after the hub 114 is freed from the stop 116.

At the outer end of the arm 112 is pivoted at 125 the disc-carrying arm 126 which is provided with a cylindrical bearing 127 in which is journaled the tubular shaft 128, as shown in Fig. 3. The lower end of the tubular shaft 128 is provided with a disc cutter 129 mounted in a horizontal position at the base of the mine wall in a plane adjacent the floor of the mine chamber in position to cut a kerf the bottom of which will be approximately in the plane of such floor. At the upper end of the tubular shaft 128 is secured in adjusted position by means of the set screw 130, an additional disc cutter 131. Intermediate the ends of the tubular shaft 128 is a ring collar 132 for supporting the tubular shaft 128 on the outer end of the arm 126.

It should also be observed that at the lower end of the tubular shaft 67 is adjustably secured by means of the set screw 133 an additional disc cutter 134. At the interior upper and lower portions of the hub 106 are rolling mill couplings 135 and 136, which are loosely mounted and connect the

shafts 137 and 138 respectively to the rolling mill couplings 139 and 140. The couplings 135, 136, 139 and 140 are such as to allow the shafts 137 and 138 to have considerable play sidewise or from a vertical position. The tubular shafts 67 and 128 have a free sliding vertical motion on the couplings 139 and 140 but both must rotate whenever the shafts 137 and 138 rotate. The couplings 135 and 136 are also such that although considerable play may be given to the shafts 137 and 138 rotary motion of the hub 106 will be transmitted to these shafts. In this instance I have shown the couplings 135, 136, 139 and 140 as each comprising four longitudinal fans or feathers on enlargements at the ends of the shafts 137 and 138. On the interior of the tubular shafts 67 and 128 are longitudinal slots in which these fans are slidable.

By means of the nut 141, the worm 142 shown in Fig. 1 may be turned to lift or lower the cutter-carrying arm 126. The worm 142 is journaled vertically in bearings secured to the arm 112 in position to mesh with the segmental worm gear 143 at the inner end of the arm 126. It will therefore be seen that both the uppermost cutter-carrying arm 65 and the lowermost cutter-carrying arm 126 may be moved to various angular positions by means of the worm gearing adjusting mechanism.

Although I have shown five disc cutters spaced apart and arranged at different elevations, there may be a greater or less number of such cutters. For instance, an additional disc cutter could be easily connected to the intermediate frame 85 above or below the disc cutter 107 and secured in adjusted position by means of a set screw similar to the means for fastening the disc cutter 131 or 134 in position.

After the forward roof jack has been operated to hold the front portion of the mining and loading machine firmly in fixed position, and it is desired to start the cutting operation, the various disc cutters should have their carrying frames properly adjusted. The lowermost cut should be level with the floor of the mine chamber, hence the stop 116 should be lowered and fastened in such adjusted position by means of the set screw 119'. The cylindrical collar 80 can be moved up or down along the post 10 within certain limits, to vary the position of the disc cutter 107. The sliding connections at the couplings 139 and 140 will permit free vertical adjustment of the frame 85. It will also be observed that the rod 86 is free to slide in the cylindrical opening 87 in the frame 63, and the enclosed cylinder 108 can be moved up or down on the piston 109. In some cases it is not of importance just where the cutter 107 makes its cut and therefore the

tension of the spring 113 in the cylinder 108 may be varied by changing the elevation of the frame 85. By lifting the frame 85 the spring 113 will be put under greater tension, and by lowering the frame 85 such spring will have less tension. The uncounterbalanced portion of the weight of the arm 63 would then be carried on the uppermost arc-shaped surface of the cam bracket 59, by means of the roller 78, as shown in Fig. 3.

The cutters 68 and 134 may be arranged in horizontal position or given an angular or inclined position by actuating the nut 70. After all the various parts have been adjusted, the current to the motor 97 may be turned on in the proper direction to rotate the various disc cutters in the direction indicated by the arrow 144 in Fig. 5. The cutting tools 146 will then cut horizontal kerfs into the mine wall as shown in Fig. 3. The cutting tools 146 may be and preferably are removable or detachable from the cutting discs which carry them so that they may be conveniently removed and resharpened or a broken tool replaced.

In order to advance the cutters in feeding direction, the current to the electric motor 95 should be turned on in the proper direction to rotate the pinion 89 in an anticlockwise direction when viewed in plan. This pinion meshes with the gear 82 which is held in fixed position by the set screw 81 on the post 10. When the clutch 96 is thrown in to effect the rotation of the pinion 92, motion will be transmitted to the gear 91, the shaft 88 and the pinion 89, whereupon the frame 85 will be slowly rotated in the direction indicated by the arrow 147 in Fig. 5. This feeding movement of the frame 85 will be transmitted by means of the vertical rod 86 to the arm 63, the collar 78 of which will guide the arm 63 in a horizontal plane until the incline 79 is reached, when the arm will descend. This descent will not be abrupt, however, because the spring 74 will cushion the action, and when the roller 78 again rides upon the cam surface 79', shown in Figs. 2 and 7, the spring 74 will facilitate the ascent, because it acts in the manner of a counterbalance. It should be observed that the cam surfaces 79 and 79' should be so adjusted that when the horizontal kerfs in the mine wall are completed the arm 63 will be about to descend, and when a new cut is to be made the arm 63 will again ascend to its proper position at the opposite side of the mine wall.

As the frame 85 is rotated, it carries with it the cylinder 108 which acts on the piston 109 and the piston rod 110 to carry along the lowermost frame 112. It will therefore be seen that the coupling shafts 137 and 138 will be maintained in substantially vertical alinement with each other and in vertical

alignment with the tubular shafts 67 and 128. The principal function of the particular type of coupling shown is to permit the uppermost and lowermost cutters to be moved to different angular planes, either horizontal or inclined upwardly or inclined downwardly.

I prefer to mount on each of the cutter-carrying arms or frames 63, 85 and 112 an electrically operated vertical disc cutter, as shown in Figs. 2, 5 and 8. These vertical disc cutters will each make a cylindrically shaped kerf, as shown at 148 in the diagram of Fig. 15, at the inner ends of the horizontal kerfs 149. A vertical cylindrical kerf made by a vertical disc cutter is also represented in Fig. 14. The arc-shaped dotted line 150 in Fig. 14 represents the path that the vertical disc cutters will take in continuing the kerf 148. The construction shown in Fig. 8, which is a plan sectional view of Fig. 3, taken on the line 8—8, is typical of the mechanism for supporting and operating the vertical disc cutters. Extending laterally from the frame 85, as shown in Fig. 9, is a bracket 152 provided with a vertical opening therethrough into which fits the pin 153 which may be held in vertical adjusted position by means of the set screw 154. At the upper end of the pin 153 is securely attached the horizontal bar 151 at the outer end of which is a fork 156 for supporting the bearings 157, 157' for the worm 158, as shown in Fig. 8. A crank 155 affords a means for turning the worm 158 manually. The worm 158 meshes with a worm gear 159 which is mounted for rotation on the bar 151. On the upper surface of the gear 159, at 160, is pivoted the rear end of the electric motor 161.

Extending from the frame of the motor 161 is a comparatively long arm 163, as shown in Fig. 8, the outer end 164 of which forms a means of attaching and holding a bearing 165 for the outer end of the shaft 166. If desired, the bearing 165 may be held in position by means of the bolts 167.

The shaft 166 is preferably coupled to the shaft of the motor 161 by means of the coupling device 168 which will permit the shaft 166 to be removed when desired and replaced by another one. The shaft 166 is preferably made integral with the cutter disc 169. The cutters 170 and 170' may be separate and removable, or integral with the disc. When the disc cutters 169 need repair, the entire disc, together with the shaft 166, may be easily removed by withdrawing the coupling pin at the coupler 168 and inserting another shaft with a new or sharpened disc cutter thereon. By means of this construction, the disc cutters may be quickly removed, thus saving considerable time. The horizontal disc cutters 134 and 131, shown in Fig. 3, are also readily removable

and can be replaced by entire new disc cutters. In a similar manner the other disc cutters may be made removable.

Near the outer end of the arm 163 is pivoted at 171 a trailer 172 having a breaking down cam 173 at its outer end and on the under side, as shown in Figs. 2 and 8. There may also be such a cam breaker on the upper side of the trailer 172, as shown at the upper right hand portion of Fig. 2 at 174. Such a cam breaker on the upper side is particularly useful for breaking down the uppermost slab of coal to be mined. By referring to Figs. 2 and 15, it will be seen that when the horizontal and vertical kerfs are made, there should be at least one such cam breaker for each slab of coal being cut. For instance, the cam 174 would be relied upon to break down the slab 175, the cam 173' to break down the slab 176 and the cam 173'' would break down the slab 178.

As shown in Fig. 2, the small electric motors 161, 161' and 161'' are pivoted at 160, 160' and 160'' to the upper surfaces of the worm gears 159, 159' and 159'' respectively, and are yieldingly held in a substantially horizontal position by means of the leaf springs 179, 179' and 179''. By thus having the small electric motors 161, 161' and 161'' yieldingly mounted, irregularities in the coal, such as comparatively hard substances, will not injure the cutting mechanism.

It should be understood that each unit for operating the vertical disc cutters may be lifted or lowered and held in adjusted position by means of a set screw such as that shown at 154 in Fig. 9. It should also be noted that each unit is adjustable to various radial positions. This radial adjustment is effected by the manually operated worm gearing. Each unit also has its motor yieldingly mounted, as shown at 179, 179' and 179'' in Fig. 2. Each unit also has a breaker arm pivoted to the arm which extends outwardly from the electric motor, as shown in Fig. 8. Each unit also comprises a bearing for the outer end of the cutter disc shaft, and a coupling at its inner end by which the cutter and its shaft may be easily removed and replaced by a new one. I also prefer to pivot the trailers carrying the breaking down cams, in such a way that they may have a limited oscillating movement whereby they will adjust themselves to the condition of the cuts and the material. This lost motion is limited by the shoulders 180, as illustrated in Fig. 8. The electric motors 161, 161' and 161'' being carried with the cutterframes 85, 63 and 112 respectively, will remain in substantially vertical alignment and it will therefore be easy to supply proper wiring for the same from the same source of supply that furnishes current to the feeding electric motor 95 and the cutter-

operating motor 97. Since the rotation of the cutter-carrying frame is continuous, the feed wire may be connected to electric slip rings on the ring 17 below the collar 118, where slip rings can be located, insulated from each other but connected to the wires which place the various motors in parallel to each other. (See Fig. 3.)

I will now describe the conveyer mechanism and show that it is particularly adapted for use with the kerf cutting mechanism hereinbefore described, in a combined mining and loading machine, although such conveying mechanism may be used without the cutting mechanism described in a simple loading machine. An endless chain 181, as shown in Fig. 5, provided with laterally extending flights 182, extends around a driving sprocket 183. An electric motor 184 is connected directly to the sprocket 183 to drive the latter. The chain 181 travels in the grooves 185, 185' in the lateral faces of the longitudinal plate 14, as shown in Fig. 6. The forward portion of the endless chain 181 extends around the pulley 218 at the lower end of the post comprising the cylinder 10, as shown in Fig. 3. The conveyer trough frame 44 is connected to the longitudinal plate 14, as shown in Fig. 6 and is provided with vertical flanges 186 and 187, as shown in Fig. 5. However, the vertical flange 187 is broken away adjacent the cams 124 and 216.

As shown in Figs. 2, 16 and 18, the forward portion of the flange 186 is curved to form a trough or receptacle for the flights 182 to travel along and for receiving material from the swinging conveyer 210.

The rear portion of the trough 44 is supported directly on the connecting plate 42 and is slidable thereon, as shown in Fig. 3. Mounted upon the plate 42 by being secured thereto, is a ball bearing swivel socket 188 in which is located the swivel or axle 189 of the bracket 190. To the rear end of the bracket 190 are pivoted the vertical arms 192 to the lower end of which is secured the extension 193 of the conveyer trough. It will be seen by referring to Fig. 1 that this extended conveyer trough is curved upwardly so that mine cars may be run under the same. The lower end of the extension 193 is curved, as indicated at 194 in Fig. 5, so as to make a turntable connection with the rear end of the conveyer trough 44.

To the upper end of the pivoted bracket 190 is pivoted at 195 the screw-threaded rod 196 which extends loosely through the upper end of the lever arm 197 which is secured to the arms 192. By means of the wheel 198 on the screw-threaded portion of the rod 196, the arm 197 can be moved backward to effect the lifting of the extension conveyer trough 193. By turning the wheel 198 back-

ward the conveyer trough extension 193 may be lowered.

In order to facilitate the lifting and lowering of the conveyer extension 193, I prefer to connect a cushioning device between the arm 197 and the pivoted support 190. This cushioning device comprises a cylinder 199 pivoted at 200 to the pivoted support 190 and a piston 201 which is connected to the piston rod 202, the latter being pivoted at 203 to the bracket arm 197, as shown in Fig. 3. A spring 204 is located between the piston 201 and the end of the cylinder 199 opposite the pivotal point 200. The spring 204 counterbalances nearly all of the weight of the conveyer trough extension 193, so that by turning the wheel 198 the extension may easily be lifted. The counterbalanced weight of the extension should be sufficient, however, to lower the same against the action of the spring 204 when the wheel 198 is turned in a direction to release the arm 197.

I have not shown power-operated or automatic mechanism for swinging the extension 193 about its pivot 189 as this can easily be done manually. The connection between the rear end of the conveyer trough 44 and the extension 193 is maintained by the adjacent arcuate ends indicated at 194. The parts at 194 are determined by the pivot 189 as a center. The conveyer chain 181 may be sufficiently slack and flexible to permit the desired lateral movement of the conveyer trough extension 193.

At the forward portion of the mining machine is a supplemental conveyer, as shown in Figs 5, 18 and 19, comprising an endless chain 205 which is arranged to be operated by an electric motor 206 geared to the chain 205 having laterally extending flights 207 which move in the conveyer trough 208 at the forward end of which is the vertical flange 209 joining the vertical flange 210. The forward portion 211 of the conveyer trough is hinged at 212, 212' so as to allow such forward portion to occupy a substantially horizontal position, although the main portion may occupy various inclinations, such for instance as that shown in Fig. 19.

The conveyer trough 208 and parts mounted thereon, including the electric motor 206, are supported by means of the bracket arm 213 which extends laterally from the cutter-frame 112, as shown in Fig. 5. The arm 213 is pivotally connected at 214 to the supplemental conveyer. This pivotal connection will permit vertical movement of the lowermost cutterframe 112 and also of the rear portion of the supplemental conveyer, while the forward portion of the latter remains on the floor of the mine chamber. The forward lateral edge 215 of the supplemental conveyer trough, will then exercise its maximum efficiency in acting as a scoop for

collecting substantially all material in its path. As above indicated, the supplemental conveyer must be lifted or elevated to such position that it will pass over the main conveyer during the portion of the rotation of the cutting apparatus when in non-cutting position, and for this reason I provide an arc-shaped cam 216 similar to the arc-shaped cam 124, the cam 216 being located farther in the rear or behind the cam 124, as shown in Figs. 2, 3 and 5. When the lug 123, shown on the lower side of the cutter frame 112 in Fig. 3, engages the cam 124, the arm 213 will be lifted, and therefore the rear portion of the supplemental conveyer will be lifted. When the lug 123 with respect to its center of rotation, is about on the section line 11—11 of Fig. 10, the rear portion of the supplemental conveyer will be in the position represented in Fig. 19. During the lifting of the rear portion of the supplemental conveyer, the outer or scooping end is dragged toward the base plate 8 and therefore will be brought nearer the center of rotation, that is, the vertical axis of the cylinder 10. At such time, however, the frame 112 is substantially at its uppermost limit of travel and the outer or scooping end of the conveyer will be in position to engage and ride up on the cam 216 as the cutter frame 112 continues to rotate. The free end of the supplemental conveyer will thus be lifted up over the main conveyer. The parts are properly proportioned to assure the holding of the supplemental conveyer clear of the main conveyer. When the lug 123 becomes disengaged from the cam 124, the stop 116 still holds the cutter frame 112 in its elevated position. After the outer end of the supplemental conveyer leaves the cam 216, it may safely drop clear of the main conveyer. Then when the cutting operation is about to be repeated, the stop 116 will be engaged and the frame 112 will descend to its lowermost position, as shown in Fig. 3, whereupon the rear end of the supplemental conveyer will again descend and engage the upper end of the flange 186 or outer wall of the conveyer trough 44. As the cutters are advanced to produce the horizontal and vertical cuts the breakers on the trailers continue to break down the coal which is scooped up and moved by means of the conveyer flights 207 onto the main conveyer, where the conveyer flights 182 will move the coal to the extension 193 and thence out into mine cars on a mine track lead along the mine chamber to a position under the overhanging conveyer extension 193.

By referring to Figs. 16, 18 and 19 it will be seen that the gathering conveyer is connected at 214 to the frame 112 so as to have a swinging movement on a horizontal axis at 214 and also to have a bodily swinging

movement with the frame 112 on a vertical axis within the boundary of the receiver comprising the vertical wall 186, 187 at the forward end of the rear frame. The front frame comprising the base 8 is adjustable angularly relative to the rear frame which may swing on such vertical axis. Both the gathering conveyer and the delivering or discharge conveyer comprise non-traveling belt run-ways. Each conveyer also comprises an endless transmission belt carrying spaced lights which traverse the run-ways. The line of draft of the delivering or discharge conveyer extends forwardly and around the vertical axis so that the receiver comprising the vertical wall 186 will be open to this line of draft. The line of draft of the gathering conveyer may be on either side of the endless belt because the motor 206 is an electric motor and may be reversed so that the flights 207 may traverse the ways alternately at the forward and return portions of the belt. This is advantageous to loosen the material particularly along the run-way in advance of the upright wall 210 when material tends to become choked along this run-way. In other words, the reversibility of the transmission belt 205 relieves choking conditions which may occur under some circumstances.

By referring to Fig. 19 it will be seen that the reversible traveling conveyer flights which traverse the ways on the pan 208 sweep in horizontal arcs at opposite ends of the ways and at the discharge end the flights have a free sweep from one way to the other, the receiver being disposed beneath the discharge end of the gathering conveyer. It will also be seen that the ways which lead out of the receiver provide the base of the latter. Furthermore the reversibility of the belt 205 renders the ways on the pan 208 alternately available for conveying the material in a common draft direction from the floor to the opening above the receiver. When the flights 207 move across the upper end of one way to the upper end of the other they have a non-conveying arm arc sweep. In other words, duplex ways are provided on the pan 208 and the reversible transmission belt 205 carries spaced flights which may traverse the ways alternately in the forward and return portions of the belt and in a horizontal non-conveying arc from one way to the second. When the scooping attachment comprising the plate 211 and the vertical wall 209 is hinged to the pan 208, as shown at 212 and 212', the gathering conveyer is intended to operate only in one direction of horizontal sweep over the mine floor in advance of the supporting framework, but when the scooping attachment is omitted by removing the hinges 212, 212', the gathering conveyer may be swept arcuately across the mine floor in opposite direc-

tions and the belt conveyer 205, 207 driven in either direction, as may be desired. However, whether the scooping attachment is connected to the pan 208 or not the motor 5 206 may be reversed whenever desired so as to drive the flights 207 in either direction along the ways so as to relieve choking conditions when necessary and to efficiently deliver the picked up material to the receiver 10 through an angle of 180° or more between the gathering conveyer and the delivering conveyer, or between the supplemental frame 112 and the framework on which it is mounted. It should also be noted that the upright 15 axis of swinging movement of the gathering conveyer and the supplemental frame 112 coincides with the axis of relative swinging movement of the forward frame 8 and the rear frame on which the delivering conveyer 20 is mounted. This upright axis of swinging movement of the gathering conveyer also coincides with the forward upright axis of the arcuate bearing for the chain 181, the latter being driven by the motor 184 and the 25 rear section 193 being swingable horizontally for the purpose of delivering material to mine cars on a track directly back of the longitudinal length of the machine or to mine cars on tracks on opposite sides of the 30 longitudinal length of the machine.

It should be understood that although the stop 116 by engaging the interlocking member 120 of the arm 112, holds the latter in its uppermost position even after the lug 123 35 runs off the cam 124 shown in Fig. 5, the arm 112 should drop to its lowermost position just as soon as the conveyer trough 44 is entirely cleared. This operation is desired so that the disk cutter 129 will be 40 ready for operation just as soon as it approaches the wall of the mine. The supplemental conveyer trough 208 will also descend at its outer end while the lug 123' on the under side of the conveyer trough 208 is still 45 on the cam 124. It should be understood that the parts may be so related that the lug 123' on the bottom of the trough 208 will be approximately at the same distance from the vertical central axis of the post 10 as the 50 lug 123 on the arm 112 and as the cam 124. The cam 216 serves as an additional support for the conveyer trough, or may be used as the sole support of the conveyer trough when the latter is lifted too high for the lug 123' to engage the cam 124. However, the 55 lug 123' will not run off the cam 124 radially because the lug and cam are of sufficient width to prevent this. The lug 123' will finally run off the cam 124 a short time after 60 the conveyer trough 208 runs off the cam 216. The conveyer will then drop onto the flange or side wall 186 of the main conveyer trough 44, and continued rotation of the supplemental conveyer trough 208 will allow 65 the latter to return to its lowermost po-

sition. It will therefore be seen that when the lug 123 first runs up on the cam 124, the rear end of the supplemental conveyer will be lifted to the position represented in Fig. 19. As soon as the arm 112 and the parts 70 carried thereby are entirely clear of the conveyer trough 44, the arm 112 will drop and the rear end of the supplemental conveyer will also descend. The forward end of the supplemental conveyer, however, will still 75 be elevated by the cams 124 and 216. Continued rotation of the supplemental conveyer will finally cause the forward portion thereof to reach its scooping position on the floor of the mine chamber. As the horizontal 80 disc cutters produce the horizontal kerfs, and the vertical rotary cutters produce the vertical kerfs, the trailers carrying the breaking down cams are continually effecting the breaking off of the coal in large pieces 85 which fall onto the supplemental conveyer trough 208 or onto the floor at the base of the mine wall in position to be scooped up by the scooping edge 215 onto the platform 211 from which the coal is conveyed by the 90 flights 207 to the main hopper at the forward end of the conveyer trough while the flights 182 move the pieces of coal to the extension 193 and thence into the mine cars. It should be particularly observed that by employing intermediate vertical disc cutters 95 following the horizontal disc cutters, the coal may be broken down in large pieces. This is because a disc cutter can produce deeper cuts than tools which move in arcs of 100 circles but do not rotate. In the construction shown in the drawings, a single rotary disc cutter produces a vertical kerf which extends both above and below the horizontal 105 kerf and communicates with the latter, as shown in Fig. 15. By referring to the latter view, it will be seen that the uppermost slab 175 and the lowermost slab 178 are not as thick as the intermediate slabs 176 and 177. The intermediate slabs can be made larger 110 because of the rotary disc cutters which extend into the coal above and below the horizontal kerfs. Furthermore, the additional weight of the larger intermediate slabs will assist in breaking them loose from the mine 115 wall. By this method of mining coal vertical arc-shaped kerfs are produced by rotary disc cutters at one operation, such vertical kerfs communicating with the horizontal kerfs to cut large intermediate slabs which 120 are broken down by means of the cams at the ends of the trailers loosely connected to the vertical disc cutter-carrying arms. Therefore the horizontal kerfs are each completed by a single rotary disc cutter, and each of 125 the arc-shaped vertical kerfs is produced by a single vertical disc cutter. Only a single cam or wedge acts for breaking down a certain slab of coal which has been cut, as indicated in Fig. 15. The mining operation is 130

therefore such that by means of tools following each other closely, the coal may be cut and broken down in large blocks and immediately conveyed by the supplemental conveyer onto the main conveyer and thence to the mine cars. It will thus be seen that the loading apparatus herein disclosed is particularly adapted for use in connection with mechanism which dislodges coal from an upright mine wall in crescent-shaped masses and allows such coal to fall to the floor at the base of the mine wall or directly onto the supplemental conveyer which moves along an arc to conform with the arcuate feeding path of travel of the cutting apparatus. It should also be noted that the loading apparatus is adapted for use separately from mining mechanism, particularly where the coal has been dislodged by a separate mining machine in crescent-shaped masses and left in its dislodged position at the base of an upright curved wall along which the supplemental conveyer of the loading apparatus is adapted to travel so as to gather up and load all of the dislodged coal. Such loading operation may be started at the base of the pile of dislodged coal and the supplemental conveyer may be moved continuously in the same direction to scoop up material which may roll down from the pile of coal closer to the mine wall. As the scooping and conveying operation continues, the supplemental conveyer may be moved forward step by step to new positions by means of the motor comprising the cylinder 45, accompanied by proper operation of the roof jacks.

As soon as the cutting operation begins, the rear portion of the mining machine comprising the roof jacks 6, 6' after releasing the latter, may be moved forward. This may be done even while the conveying operation is taking place. This will not interfere with the continued operation of the mining and loading machine or with the continued operation of the loading apparatus when the mining mechanism is omitted, because the fore portion of the machine is securely held in position by means of the hydraulic jack 7. When the valve 220 in Fig. 6 is open and the exhaust valve 221 is also open, and the supply valve 222 is closed, the plunger 37 will descend. In a similar manner by opening the valve 223 the plunger 37' may be caused to descend. This will entirely loosen the rear roof jacks 6 and 6' and free the rear portion of the machine. Now when the supply valve shown at 51 in Fig. 5 is open, and the electric hydraulic pump is operated, the piston 46 in the cylinder 45 (see Fig. 3) will receive hydraulic pressure, as will also the forward inside end of the cylinder 45. The exhaust valve 52 being open at this time, the plate 42, together with the hydraulic jacks 6 and 6' will be moved forward. The

valves at 224 and at 222, as shown in Fig. 20, may now be operated to secure supply pressure from the hydraulic pump, the valve 221 being closed but the valves 220 and 223 being open. The plungers 37 and 37' may then be forced upwardly against the roof of the mine and firmly set in position so as to securely anchor the rear portion of the machine. After the crescent-shaped masses of material have been dislodged from the upright mine wall in advance of the machine, and while the cutter frames are passing over the intermediate portion of the machine, the exhaust valve 32 may be opened to relieve the pressure in the cylinder 10 below the plunger 11 of the forward hydraulic jack. The latter will therefore descend and the shoe 13 will be released from the roof of the mine. Because of the sliding connection of the frame 63 with the vertical rod 86, as shown in Fig. 3, and because of the rolling mill coupling 139, the plunger 11 may have free descent. By now letting in hydraulic pressure back of the piston 46 and relieving it ahead of the piston, the forward portion of the machine, including the main conveyer trough and the base plate 8, together with the parts mounted thereon, will be moved forward to a new cutting and loading position. As soon as the forward portion of the machine has been moved to its new cutting and loading position, the hydraulic pressure will be again exerted in the cylinder 10 to force the plunger 11 to its uppermost position. It will therefore be seen that as soon as the dislodgment of crescent-shaped masses of material is effected, the disc cutter 68 will be permitted to descend. The latter will therefore be in a lower position while the arm 63 is swinging around over the plate 14 or the intermediate portion of the machine. As soon as the mine wall is approached by the cutters again, the plunger 11 will have been driven upwardly and the cutter 68 will be in a position to begin a new cut farther into the mine wall. The operation is therefore such that as soon as the forward portion of the mining and loading machine is anchored, the cutting operation of new kerfs will begin, and as soon as this takes place the rear portion of the machine is being loosened and moved to a new forward position and then again firmly anchored. When the cutting of the kerfs is completed, the forward jack is again released and the forward portion of the machine moved forward and again anchored for positioning the machine so that new kerfs can be produced. The mining and loading machine may therefore be operated continuously with little or no interruption, and coal in large blocks may be conveyed away as soon as it is broken down, and even while the

rear portion of the machine is being moved forward to a new position. It may be desirable to change the direction of movement of the entire machine, whether used as a combined mining and loading machine or when used as a simple loading machine. I have therefore provided the manually operable side jacks comprising the shoes 55 and 55', as shown in Figs. 5 and 6. By referring to Fig. 13 it will be observed that if the sleeve 55' and rod 53' are lengthened out, the plate 33, together with the parts connected thereto, will be shifted to the dotted line position 33'. It will then be evident that the conveyer trough 44 will also be shifted to a new position, as indicated by the dotted lines 44' in Fig. 13. When the rear portion of the machine is thus shifted, and the hydraulic jacks 6, 6' firmly anchor such rear portion of the machine, the forward movement of the forward portion of the machine will be in a different direction. For instance, as indicated in Fig. 13, when the plate 33 and the parts connected thereto are shifted to the dotted line position 33', forward movement of the machine will be at an angle to at one side of the previous line of movement. Therefore, by operating the one or the other of the jacks 55 or 55', the path of intermittent travel of the mining machine may be varied as desired.

By connecting the brackets 217 and 217' to the rear frame of the mining machine, as shown in Fig. 5, the rearward movement of the jacks 55 and 55' may be limited so that the jacks may be adjusted to have such a length that when perpendicular to the rear frame they will slip along the side walls of the room and prevent the rear portion of the machine from swerving out of the straight line of travel.

As shown in Fig. 14, an air suction fan 225 is mounted on the horizontal plate 33. Directly connected to the suction fan 225 is an electric motor 226. The suction fan or blower 225 is carried by a pipe 227 to the flexible coupling 228 which in turn is connected to the elbow 229, the latter fitting into an opening 230 in the mine wall 231. When the suction fan 225 operates it draws the dust laden air in the room where the mining and loading operation is taking place, through the intake opening 232 and blows it through the opening 230 into the next adjacent room. The holes 230 in the mine wall 231 may be produced by the boring tool 234 which is connected to be operated by the electric motor 235 mounted on the plate 33. When the kerf cutters are operating and producing slack or coal dust which floats in the air, the blower 225 is constantly taking such dust laden air and blowing it into the next adjacent room. The electrically operated blower is there-

fore a means of ventilating the mine and of putting the coal dust into a place where it will not interfere with the mining and loading machine or with the operator.

At the same time that the room in which the mining and loading operation is taking place is being ventilated, the boring tool 234 is producing a new opening through the wall 231. The new opening through the wall 231 may be located ahead of the opening through which the blower is sending the dust laden air, any suitable or convenient distance preferably a considerable distance so that the opening in service may serve the machine for a considerable portion of advance of travel. It may, however, be located a distance equal approximately to the travel that the forward portion of the mining and loading machines makes when moved to a new cutting and loading position. Therefore, when the rear portion of the mining machine is moved forward the elbow 229 will be in proper position to ventilate through the opening which has just been made through the mine wall. The opening which has just been left by the elbow, can be closed by means of a plug 236. Therefore, at the time that the cutting operation of the mining machine is taking place all of the openings back of the ventilator are plugged up and the opening by the tool 234 is still incomplete. Therefore the only communication between the mining machine room and the next adjacent room is through the opening 230 through which the blower is operated.

The electric wiring for the machine is diagrammatically illustrated in Figs. 2 and 3. The main supply wire 237 may be connected to a motor starter or master controller 238 from which the supply wire 239 extends along the center portion of the longitudinal plate 14 to a fixed circular ring as previously described, mounted on the collar 17 and insulated therefrom. Above this fixed ring is a slip ring insulated from the hollow post 10 and connected by the flexible wire 240 to the binding post 241 on the arm 212. The wire 240 may comprise convolutions so as to be sufficiently flexible to permit the arm 212 to rise or descend without interfering with the continuity of the slip ring arrangement on the collar 17. A wire 242 extends upwardly from the binding post 241 to each of the various electric motors 95, 97, 161, 161' and 161''. Each of the electric motors may comprise a separate switch which is represented by small rectangles. The outgoing terminal of each motor may be grounded to the machine so that the current may be fed into the apparatus by the positive wire 237 and taken from the apparatus by the negative wire 243.

The electric motors 235 and 226 may also be connected by a branch wire from the wire

239, and this branch wire have its other terminal grounded to the machine in a well known manner. Each of these motors may also be supplied with separate switches. It will therefore be seen that each electric motor may be turned on or off independently of the other electric motors. There is one common supply wire extending from the positive main to each of the electric motors. The master controller 238 may be used to turn on current when all the electric motors are connected so as to immediately operate them. It should be understood, however, that each motor may be turned on and off by means of its own switch. This will not interfere with the operation of the other motors because there is a common supply wire and each motor has one terminal grounded to the framework of the machine. The motors are therefore connected in parallel and are preferably series-wound motors which will automatically exert such power as is required of them in accordance with the hardness of the material to be cut. For instance, if the kerf cutters shown in Fig. 3 meet with unusually hard material the motor 97 will rotate more slowly but more powerfully, and at the same time the feeding motor 95 will rotate more slowly and more powerfully, until the unusually hard material has been cut through, when the motors will automatically speed up again to operate the kerf cutters at a normal rate of speed. By mounting the electric motors upon the various cutter arms for separate and independent operation of the cutter, the efficiency of the apparatus is increased by the elimination of gearing and because the operation of the mining and loading machine is more easily controlled.

In Fig. 4 a modification is shown for permitting the lifting jack to be used for the forward portion of the mining and loading machine. This lifting jack comprises a cylinder 244 and a plunger 245. The upper end 246 of the cylinder 244 is provided with a passage 247 which is controlled by the three-way valve 248 which may be operated by the manual wheel 249 outside of the cylinder 10. When the three-way valve 248 is moved to the position shown in Fig. 4, the passage 247 is closed, but the passage 24' then communicates with the upper end of the plunger 245. When hydraulic pressure is then exerted through the passage 24, the cylinder 244 will be lifted while the plunger 245 rests on the floor of the mine chamber. When the pressure in the passage 24 is relieved, the weight of the forward portion of the mining and loading machine will cause the latter to descend. In this way the forward portion of the mining and loading machine may be lifted and lowered as desired by means of this hydraulic jack. The valve 248 is so constructed that when desired the

plunger 11 may be operated independently of the lifting jack, or both may be operated simultaneously, depending upon which direction the valve 248 is turned. When it is desired to move the mining and loading machine to another location in the mine, the lifting jack shown in Fig. 4 may be operated to elevate the forward portion of the machine, and the hydraulic jacks 4 and 4' may be operated to lift the rear portion of the machine. The truck comprising the platform 1 and the wheels 2, as shown in Fig. 1, may be then run under the mining and loading machine so that the latter may be transported easily on the track 3 to another room or elsewhere in the mine. When transporting the mining and loading machine on the truck to a new location, it is preferable to fold up the mining and loading machine compactly, as shown in Fig. 1, by operating the cutter bracket arms and the forward swinging conveyer until they occupy a position over the intermediate portion of the machine, when the current to the motors may be cut off entirely by moving the master controller switch 238 back to initial or open position.

As shown in Figs. 6 and 20, the drum 27 may be divided by a longitudinal partition 260 into a supply compartment 259 and an exhaust compartment 258. By comparing Figs. 5 and 6 with Fig. 18, it will be seen that the pipe 256 is the supply pipe, and the pipe 257 the return or exhaust pipe. The valves 31 and 32 being simple valves are either open or closed according to the way in which they have been manipulated. If the valve 32 is closed and the valve 31 open, and the electric motor 29 started to operate the pump, fluid pressure will be exerted through the pipe 26. The pipe 26 communicates through the pipe 25 and the flexible connections shown in Fig. 3 with the cylinder 10 wherein the hydraulic pressure acts on the plunger 11 to move its serrated upper end 13 against the roof of the mine chamber and hold the forward frame 8 and all the supports for the cutting mechanism, firmly in position. After the cutting operation has been completed and it is desired to release the forward hydraulic jack, the valve 31 is closed to cut off the supply pressure, and the valve 32 is opened so that the water in the cylinder 10 can flow freely into the exhaust compartment 258 of the drum 27.

In the same manner, as shown in Fig. 6, when the valve 221 is closed and the valves 222 and 220 are opened, supply pressure will be exerted in the cylinder 34 to force the plunger 37 upwardly. When it is desired to release the plunger 37, the valve 222 is closed and the valve 221 opened, so that the water in the cylinder 34 may flow freely through the valve 221 into the exhaust compartment 258 of the drum 27.

In like manner, pressure may be exerted on the piston 46 in the cylinder 45, either on one side or the other thereof, according to the direction in which it is desired to move the forward frame relatively to the rear frame. Figs. 3 and 5 show the relative positions of the frames after the rear frame has been moved forward while the forward frame is being held stationary. In order to accomplish this, it will be seen by referring to Fig. 20, that the opening of the valve 51 and the closing of the valve 261 enables the supply pressure to be exerted in the cylinder 45 ahead of the piston 46, the valve 52 being closed and the valve 262 being open during this operation. If the rear frame is held stationary by the hydraulic jacks, and the forward frame given freedom of movement, pressure may be exerted through the pipe 50 by opening the valve 52 and closing the exhaust valve 262 immediately below the same. At the same time, the valve 51 is closed and the valve 261 opened so that the water in the cylinder 45 ahead of the piston 46 may be exhausted into the lower compartment 258 of the drum 27.

By referring to Fig. 3, it will be seen that the plunger 11 is entirely removable out of the upper end of the cylinder 10, and that the circular bracket 59 and the collar 62 and therefore the frame 63 together with the cutters 68 and 134, are entirely removable from the plunger 11. The arm 126, together with the cutters 129 and 131, may be entirely detached at the pivot 125 from the arm 112. The hub 106, together with the cutter 107 and the flexible shafts 137 and 138, may also be detachably mounted on the frame 85. Or if desired, the frame 85 may be replaced by a shorter frame such as that designated 85' in Fig. 17, without the motor 97 and the parts actuated thereby, as shown in Fig. 3, and also omitting the vertical post 86 of Fig. 3. Furthermore, the arm 112 of Fig. 3 may be shortened as indicated at 112' in Fig. 17, when the lowermost cutters are to be omitted. The omission of the cutting apparatus from the mining and loading machine produces a simple loading machine particularly adapted for gathering and loading coal dislodged by the mining machine which operates arcuately along an upright mine wall. For instance, if a separate machine in one mine chamber produces a plurality of spaced-apart horizontal kerfs, and the machine is then removed to permit blasting down of the cut coal, such a machine may proceed to the next adjacent chamber, and after the blasting takes place, the loading machine hereinbefore described as not being provided with any cutting mechanism whatever, may be brought up to the mine wall to gather and load the dislodged material. By omitting

the cutting apparatus, the framework of the machine may be substantially decreased in height, as shown in Fig. 17, so that a loading machine will be produced which will be particularly adaptable for operation in comparatively low roof mine chambers. Fig. 16 illustrates a plan view of such loading apparatus particularly adaptable for comparatively low roof mine chambers. Due to blasting operations along an arcuate mine wall, the coal may be spread considerably back from the unmined mass, and therefore the loading operation may proceed while the forward hydraulic roof jack holds the forward portion of the machine in fixed position while the supplemental conveyer rotates through approximately 180° while maintaining delivery communication with the main conveyer. This arcuately movable supplemental conveyer may be rotated continually in the same direction by being moved along the cams 124 and 216 over the main conveyer. While the forward supplemental conveyer is being moved arcuately from the mine wall back toward the mine wall, the forward hydraulic jack may be released and the piston 46 operated while the rear hydraulic jacks 6, 6' of Fig. 6 are retained in roof propping position. After the forward hydraulic jack has been moved forward to a new position, it may again be operated against the roof so that the forward supplemental conveyer may gather coal along a path somewhat closer to the unmined mass. The scooping and loading operation may be repeated as often as desired, without step by step movement of the forward hydraulic roof jack, such as when the coal tends to roll from the pile close to the mine wall down into the path just passed over by the scooping portion of the forward supplemental conveyer.

Inasmuch as the stops 115 and 116 cooperate with the hub 114 and the interlocking member 120 of the arm 112 of Fig. 3, they cooperate with the arm 112' of Fig. 17 in the same manner, as hereinbefore described. However, when the cutting mechanism is omitted, such stops and interlocking member may be decreased in vertical dimensions, as illustrated at 115', 116' and 120' in Fig. 17. But if desired, the exact construction with respect to the stops 115 and 116 and the interlocking member 120, as shown in Fig. 3, may be used, and even the arm 112 of the same dimensions shown in Fig. 3 may be retained, together with the lug 123 for riding on the cam 124, the arm 126 being omitted by detachment from the arm 112 at the pivot 125.

When the cutters 68 and 134 are omitted, as illustrated at the upper right hand portion of Fig. 17, the rear hydraulic jacks 6, 6' may also be decreased materially in elevation, as illustrated at 6'', 37'' and 38''

at the upper left-hand portion of Fig. 17. By comparing Fig. 17 with Fig. 3, it will be seen that when the machine is not provided with any cutting mechanism, the remaining loading apparatus may be substantially reduced in height so as to operate in comparatively low roof mine chambers.

After the forward supplemental conveyer arcuately gathers up material from the mine floor and conveys it to the main conveyer through a range of approximately 180°, such material is moved to the extension 193 which is adapted to overhang a mine car on a mine track back of the loading machine. This extension may be adjusted in elevation by means of the wheel 198 and it may also be adjusted so as to be directed to a mine car on a parallel track by moving the extension on the swivel 189. It should be noted that there is illustrated only a single main conveyer chain 181 which extends around the forward hydraulic jack and entirely out to the outer end of the extension 193. On account of the flexibility of the chain 181 and the guiding of the flights 182 thereof along the vertical walls 186 and 187 of the main conveyer trough, the extension 193 may be adjusted in position laterally as well as in elevation to a certain extent without interfering with the operation of the main flight conveyer. Preferably the motor 184, shown at the left-hand end of Fig. 5, is operated so as to rotate the driving sprocket wheel 183 in a clockwise direction, as viewed in plan, so that the conveyer flights will be moved freely along the open space adjacent the cams 124 and 216 and will convey material along the trough 44 on the opposite side and toward the outer end of the extension 193. When the extension 193 is moved laterally on the swivel 189, the flights which tend to wipe along the wall 186 will simply slip off the end thereof at the arcuate edge 194, and on the other side the chain will be slack, so that when the flights move against the end of the wall 187 at the arcuate edge 194, such flights will be readily directed along the inner side of such wall 187.

Inasmuch as the loading machine is particularly adapted for loading coal which has been dislodged by an arc wall machine, the devices illustrated at the lateral ends of the rear frame 33 in Fig. 5 may be used in the manner illustrated in Fig. 13 to properly position the loading machine to operate accurately along the arcuate wall and at a suitable distance therefrom. It should also be noted that the abutments 217 and 217' may be used to limit the rearward movement of the shoes 55, 55' so that when the rear frame is moved forward such shoes may occupy the dotted line positions illustrated in Fig. 5 and hold the frame 33 midway between the lateral walls of the mine chamber, thereby assuring a central longitudinal

movement of the loading machine and preventing the forward supplemental conveyer from being moved too close to the mine wall at certain portions of its path of travel. It is desirable that when the last portion of the loading operation takes place, the forward hydraulic roof jack shall be located approximately at the center of curvature of the mine wall, so that the final arcuate movements of the scooping conveyer shall be able to gather and load into the main conveyer substantially all of the material which has been dislodged by the separate arc wall machine previously operated preparatory to blasting down the coal.

Attention is called to the fact that in my copending application, Ser. No. 764,487, filed April 30, 1913, for an improvement in mining machines, I have described and claimed the mining machine as well as the combined mining and loading machine herein disclosed, and the present application is therefore a continuation of said copending application so far as common subject-matter is concerned. In fact, Figs. 1 to 15 inclusive and Fig. 20 of the drawings of the present application are exact copies of similar drawings in said copending application except that in Fig. 3 of the present case the ventilating apparatus is omitted, but this is shown in Fig. 15. Fig. 16 modifies Fig. 5 by omitting the cutting apparatus and showing the machine as a simple loader. Fig. 17 is a modification of Fig. 3 since it omits the cutting apparatus and shows the height of the loading machine about half the height of the combined mining and loading machine of Fig. 3. Figs. 18 and 19 are copied from similar views in said copending application, except that Fig. 18 omits the cutter disc.

It will thus be seen that the loading machine includes a main frame having mounted thereon a main conveyer comprising the endless chain 181 and the flights 182. A swinging supplemental frame 112 is mounted on the main frame, and has connected thereto gathering means comprising a supplemental conveyer, as shown in Fig. 16. The main frame or supporting frame has the main conveyer so arranged thereon that its forward receiving portion is in an approximately horizontal plane closely adjacent the surface on which the machine is supported. The supplemental conveyer constitutes a receiving section pivoted to the forward end of the main conveyer. The turntable mechanism is capable of swinging this receiving section horizontally into various angular positions relative to the main conveyer so that material may be received from various directions tangentially corresponding to the respective positions of the receiving section. The gathered material is delivered to the forward arcuate trough or receptacle at the forward end of the main frame in a low

position relative to the mine floor thus adapting the loading machine for use in very low roof mines.

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 desire therefore not to be restricted to the precise construction herein disclosed.

Having thus described an embodiment of my invention, what I claim and wish to have secured by Letters Patent of the United States is:

1. In a loading machine, the combination with supporting framework, of a roof jack for anchoring the forward portion thereof, turntable mechanism mounted on said roof jack, a main conveyer on said framework, a receptacle at the forward end of said conveyer in a position adjacent the mine floor, a scooping chute connected to said framework to move arcuately concentrically with said roof jack through a range of about 180 degrees from a position at one side of the machine at right angles to the longitudinal length thereof to a position at the other side of the machine at right angles to the longitudinal length thereof, a traveling supplemental conveyer in said chute in delivery communication with said receptacle throughout the 180 degree range of movement thereof, means for operating said conveyers, and a motor for operating said turntable mechanism to swing said chute from one side of the machine to the other to effect the gathering of material from the mine floor in advance of said framework and deliver it to said mine conveyer for transfer toward loading position.

2. In a loading machine, the combination with supporting framework, of turntable mechanism comprising a gear adapted to occupy a stationary position in fixed relation to said framework, a conveyer on said framework with its receiving end adjacent the surface on which the machine is supported, gathering mechanism pivotally connected to said framework concentrically with said gear to have a range of gathering movement from one side of said machine at right angles thereto to the other side of said machine at right angles thereto through an angle of about 180 degrees, and a motor for operating said turntable mechanism to swing said gathering mechanism while the latter is delivering material to said conveyer.

3. In a loading machine, the combination with a supporting frame, of a conveyer on said frame, an arcuate receptacle at the forward end of said conveyer, gathering mechanism pivotally connected to said frame concentrically with said arcuate receptacle to have a range of gathering movement

from one side of the machine at right angles to the length thereof to the other side of the machine at right angles to the length thereof, and means for operating said gathering mechanism including swinging movement thereof through about 180 degrees while remaining in delivery communication with said conveyer throughout such angle.

4. In a loading machine, the combination with a supporting frame, of a conveyer thereon, a receptacle at the forward end of said conveyer, gathering mechanism comprising a scoop and a supplemental conveyer, means for mounting said gathering mechanism on said supporting frame to have a pivotal connection therewith concentric with said arcuate receptacle and to have a range of swinging movement through an angle of about 180 degrees from a position at one side of the machine at right angles to the longitudinal length thereof to a position at the other side of the machine at right angles to the length thereof while remaining in delivery communication with said first-named conveyer throughout such angle of 180 degrees, and means for operating said gathering mechanism including swinging thereof through such angle on said pivotal connection.

5. In a loading machine, the combination with a main frame, of an endless traveling conveyer with its receiving end in a low position relative to the surface on which the machine is supported, an arcuate receptacle for the said receiving end of said conveyer, a supplemental frame connected to said main frame for arcuate movement on an upright axis concentric with said arcuate receptacle and in planes substantially at right angles to said axis, a supplemental conveyer mounted on said supplemental frame to move bodily therewith, and means for swinging said supplemental frame and said supplemental conveyer from one side of the machine at right angles to the length thereof to the other side at right angles to such length through an angle of about 180 degrees while said supplemental conveyer remains in delivery communication with said first-named conveyer by means of said arcuate receptacle.

6. In a loading machine, the combination with a main frame, of an endless traveling conveyer mounted thereon and extending from a position adjacent the surface on which the machine is supported at the forward end of said frame to an elevated position rearwardly of said frame to overhang a mine car, a receptacle at the forward receiving end of said conveyer and having an arcuate contour, a supplemental frame connected to said main frame for arcuate movement relatively thereto on an upright axis back of the forward arcuate edge of said re-

- ceptacle, gathering mechanism mounted on said supplemental frame and movable arcuately and bodily therewith in position to deliver material at said arcuate edge into
 5 said receptacle, turntable mechanism for moving said supplemental frame and said gathering mechanism about such upright axis while delivery communication between said gathering mechanism and said recep-
 10 tacle to said conveyer is maintained at said arcuate edge during such arcuate movement, and means for operating said gathering mechanism to deliver material to said receptacle and said conveyer for transfer
 15 by the latter to said mine car.
7. In a loading machine, the combination with a main frame, of a supplemental frame mounted thereon for arcuate movement on an upright axis, an endless traveling conveyer on said main frame, a receptacle at the forward end of said conveyer, the forward edge of said receptacle being arcuate on an axis concentric with the axis of arcuate movement of said supplemental
 20 frame, radial gathering mechanism mounted on said supplemental frame to move bodily therewith to gather material and deliver it to said receptacle at said arcuate edge thereof, and means for operating said gathering mechanism including swinging movement thereof while delivery communication is maintained with said conveyer at said arcuate edge of said receptacle.
8. In a loading machine, the combination
 35 with a conveyer adapted to rest approximately flat on the floor of a mine chamber, of gathering mechanism connected to said conveyer as a separate unit but maintained in delivery communication therewith, said gathering mechanism being mounted to hav-
 40 ing a swinging movement on an upright axis, means for operating said gathering mechanism including swinging movement thereof on said upright axis to gather material from the floor and deliver the same to said conveyer adjacent the floor, and means for operating said conveyer to transfer toward loading position the material received from said gathering mechanism during the
 50 arcuate swinging movement of the latter.
9. In a loading machine, the combination with a main conveyer, of framework for supporting said conveyer with its forward receiving end approximately at the floor on
 55 which the machine rests, a supplemental frame mounted on said framework for movement relatively thereto in a curved path on an upright axis, means separate from said conveyer for removing loose material from the floor in advance of the machine along such curved path and delivering such material to said receiving end of said main conveyer just above the floor, and means for maintaining delivery communication between said separate removing means and said conveyer dur-
 60 ing the swinging movement of said separate removing means.
10. In a loading machine, the combination with a main frame, of a conveyer thereon, a roof jack at the forward portion thereof, a supplemental frame pivoted to said roof jack, a supplemental conveyer on said supplemental frame movable bodily therewith while maintained in delivery communication with said main conveyer, and means for
 75 swinging said supplemental frame together with said supplemental conveyer on said roof jack as an upright axis.
11. In a loading machine, the combination with a bodily movable frame, of means for
 80 holding said frame in fixed position between the floor and roof of a mine chamber, a rotary frame mounted on said first-named frame, gathering mechanism carried by said rotary frame, means for rotating said ro-
 85 tary frame continuously in one direction to effect the gathering of material along arcuate paths, means for operating said gathering mechanism, apparatus for controlling the release of said holding means, and
 90 means for advancing said first-named frame and the parts carried thereby during a portion of the travel of said rotary frame.
12. In a loading machine, the combination with framework comprising a forward section
 95 and a rear section, conveyer apparatus mounted on the forward section and movable bodily therewith, means for anchoring the forward section between the floor and roof of the mine chamber, separate means
 100 for anchoring the rear section between the floor and roof of the mine chamber, and mechanism for effecting relative movement between said sections to enable the forward section and the conveyer mechanism mount-
 105 ed thereon to be advanced step by step to new operating positions.
13. In a loading machine, the combination with a main frame, of a conveyer mounted thereon, vertical anchoring mechanism, a
 110 supplemental frame pivoted to said anchoring mechanism, gathering mechanism on said supplemental frame for delivering material to said conveyer, means for completely rotating said supplemental frame together
 115 with said gathering mechanism horizontally about said anchoring mechanism, apparatus for turning said main frame about the vertical axis of said anchoring mechanism, and means for advancing said gathering mechanism in a direction dependent upon the turning adjustment of said main frame.
14. In a loading machine, the combination with an upright support, of a carrier pivoted to said support for movement thereon,
 125 gathering mechanism connected to said carrier, means for operating said gathering mechanism, a device for positively preventing upward movement of said carrier during a predetermined pivotal movement of
 130

said carrier on said support, and a spring connected to said carrier tending to elevate the same when released from said device.

15. In a loading machine, the combination with supporting framework, of a main conveyor mounted on said framework, a supplemental conveyor pivoted to said framework, means for imparting a rotary motion to said supplemental conveyor as a whole, mechanism for effecting the elevation of said supplemental conveyor when passing over said main conveyor, and means for maintaining delivery communication between said supplemental conveyor and said main conveyor when said supplemental conveyor is moving along the space in advance of a vertical plane extending transversely through the upright axis of movement of said supplemental conveyor.

20 16. In a loading machine, the combination with a supporting frame, of a main conveyor mounted thereon to have a forward receiving position adjacent the bottom of the machine, gathering mechanism pivotally connected to said supporting frame as a separate unit and comprising a scoop movable laterally along an arcuate path, a receptacle at the forward end of said main conveyor adjacent the bottom of the machine, and means for operating said gathering mechanism including swinging movement thereof as a unit separate from said main conveyor but while being maintained in delivery communication with said main conveyor at said receptacle.

35 17. In a loading machine, the combination with a supporting frame, of a main conveyor mounted thereon and having a forward receiving portion operable in an approximately horizontal plane approximately at the bottom of the machine, a supplemental conveyor connected to said supporting frame to communicate with said main conveyor approximately at the bottom of the machine, a scoop connected to said supplemental conveyor to move bodily therewith, and means for swinging said supplemental conveyor to cause said scoop to move along horizontal arcuate lines to direct material onto said supplemental conveyor for transfer to said main conveyor while delivery communication between said supplemental conveyor and said main conveyor is maintained.

50 18. In a loading machine, the combination with a supporting frame, of a main conveyor mounted thereon, a supplemental conveyor connected to said frame to communicate with said main conveyor and for movement over the main conveyor, means for swinging said supplemental conveyor over a predetermined path of travel while maintaining operative communication with said main conveyor, means for operating said conveyers to effect the transfer of ma-

terial toward loading position, and mechanism for effecting the elevation of said supplemental conveyor when being moved over said main conveyor.

19. In a loading machine, the combination with a supporting frame, of a main conveyor thereon, a supplemental conveyor pivoted to said frame, means for driving said conveyers, means for swinging said supplemental conveyor on its pivotal connection to said supporting frame, and mechanism for effecting the lifting of the supplemental conveyor over said main conveyor to permit said supplemental conveyor to be moved into position to receive material and transfer the same to said main conveyor.

20. In a loading machine, the combination with supporting framework, of a main conveyor on said framework with its forward portion in an approximately horizontal plane, a supplemental conveyor mounted on an inclined plane and connected to said framework while in operative communication with said main conveyor, and means for operating said conveyers to transfer material toward loading position.

21. In a loading machine, the combination with a main frame, of a main conveyor mounted thereon, a swinging supplemental frame mounted on said main frame, gathering means comprising a supplemental conveyor operatively connected to said main conveyor, and means connected between said gathering means and said supplemental frame to effect dragging of the gathering means on the ground over an arcuate path of travel to gather material and convey the same to such main conveyor during the swinging of said supplemental frame.

22. In a loading machine, the combination with a supporting frame, of a roof jack at the forward portion thereof, a main conveyor mounted on said frame in position to travel around said roof jack, a supplemental conveyor connected to said main frame to have a swinging movement relatively thereto on the upright axis of said roof jack and concentric to the forward arcuate path of travel of said main conveyor around said roof jack, and means for operating said supplemental conveyor including the swinging thereof while delivery communication is maintained with said main conveyor at the forward arcuate path thereof forwardly of said roof jack.

23. In a loading machine, the combination with a main frame, of a hydraulic roof jack at the forward portion thereof, a main conveyor on said frame in position to travel around said roof jack while the latter is in anchored position, a receptacle for the forward end of said conveyor, said receptacle comprising an arcuate wall concentric with the upright axis of said roof jack, a supplemental frame pivotally connected to said

roof jack for arcuate movement on such upright axis, and a supplemental conveyer on said supplemental frame in position to be maintained in delivery communication with

5 said main conveyer along said arcuate wall, and means for operating said supplemental conveyer including swinging thereof on said upright axis while such delivery communication is maintained.

10 24. In a loading machine, the combination with a main conveyer, of a hydraulic roof jack for the forward portion thereof, a supplemental conveyer approximately radial relative to said roof jack, means for swinging said supplemental conveyer arcuately

15 relatively to said roof jack, and means for maintaining delivery communication between said supplemental conveyer and said main conveyer during the swinging movement of said supplemental conveyer and while said roof jack remains anchored.

20 25. In a loading machine, the combination with a supporting frame, of loading mechanism mounted thereon, means on said frame at a plurality of spaced-apart points for lifting the machine to permit a wheeled truck to be moved thereunder, and means for controlling the operation of said lifting means to cause the latter to engage the

25 ground, lift the machine and lower the same onto said truck after the latter has been moved under the machine so that said machine may be transported by means of said truck.

30 26. The combination with a loading machine, of a plurality of lifting devices comprising two which are spaced-apart at one end of said machine to afford room for the movement of a truck under said machine between such two lifting devices, and means

35 for operating said lifting devices to lift the machine a sufficient distance to permit the truck to be moved under the machine and let down onto said truck for transportation.

40 27. The combination with a loading machine, of a plurality of hydraulic roof jacks for said machine, a plurality of hydraulic floor jacks for said machine, means for operating said roof jacks to anchor said machine in the mine chamber, and means for

45 operating said floor jacks for elevating said machine to permit the latter to be loaded onto a truck for transportation.

50 28. In a loading machine, the combination with supporting framework, of an upright roof jack for the forward portion of said framework, gathering mechanism mounted on the forward portion of said framework to swing arcuately on such roof jack as an

55 axis, means for operating said gathering mechanism including swinging the same on said axis, and means for receiving material from said gathering mechanism during its operation and transferring such material

60 along said supporting framework toward loading position.

29. In a loading machine, the combination with a supporting frame, of three roof jacks therefor spaced-apart triangularly, rotary

65 gathering mechanism mounted to swing about the forward roof jack as an axis, and means for operating said gathering mechanism including swinging thereof about said axis while said roof jacks are in anchored

70 positions.

30. In a loading machine, the combination with supporting framework comprising a forward upright standard, of conveyer mechanism having one section extending

75 back from the forward portion of said framework and the other section movable bodily relative to said framework while remaining in delivery communication with said first-named section through a pre-

80 determined path of movement, means for mounting the said other section on said framework for movement to folded position back of said standard during transportation, means for operating the conveyer mechanism when out of folded relation, and

85 means for anchoring said framework during the operation of said conveyer mechanism.

31. In a loading machine, the combination with supporting framework, of a flight

90 conveyer on said framework in position to operate in a substantially horizontal plane approximately at the bottom of the machine, an additional flight conveyer connected to

95 said framework and extending on a downward incline to the surface on which said framework is mounted and in advance of

100 such framework in position to receive material from such surface, means for swinging said additional flight conveyer, arcuately

105 relatively to said framework, and means for driving said additional flight conveyer to deliver material to said horizontal receiving conveyer.

32. In a loading machine the combination with framework comprising three sections, a forward section, a rear section and

110 an intermediate section of a roof jack constituting an upright standard on the forward section, a single endless conveyer extending from the forward end of the intermediate

115 section to the rear end of the rear section, and an additional conveyer on the forward section in position to gather material and deliver it to the forward end of

120 said main conveyer.

33. In a loading machine, the combination with a supporting frame, of an anchoring jack for the forward portion of said

125 supporting frame, additional anchoring mechanism for the rear portion of said supporting frame, a forward swinging conveyer, means for driving said swinging conveyer circumferentially and in horizontal

planes independently of the movement of the forward anchoring jack, and means for shifting the forward anchoring jack while said additional anchoring mechanism is in anchoring position and for shifting said additional anchoring mechanism while said forward anchoring jack is in anchoring position.

34. In a loading machine, the combination with a supporting frame, of a supplemental frame pivotally connected thereto for swinging adjustment relatively to said supporting frame, and a single endless conveyer extending from one end of said supporting frame to the opposite end of said supplemental frame for operation throughout the various adjustments of said supplemental frame relatively to said main frame.

35. In loading apparatus, the combination with two relatively movable interconnected frames, of anchoring means for the forward frame forming a pivot about which the other frame may be rotated, means for advancing the rear frame while the forward frame is anchored, means operating in conjunction with said advancing means for rotating the said other frame about said pivot, and means for gathering material and conveying it along said frames.

36. In loading apparatus, the combination with two frames movable relatively to each other, of independent hydraulic jacks for anchoring said frames, a scooping and conveying unit wholly supported by the forward frame, means for moving said unit in an arc while the forward jack anchors its frame, mechanism for moving either of said frames forward while the other is anchored to secure forward adjustment of the position of the machine, and conveying mechanism on the rear frame in position to receive material from the said scooping and conveying unit.

37. In loading apparatus, the combination with a supporting post, of a carrier pivoted thereto and slidable longitudinally of said supporting post, a conveyer unit connected to said carrier, means for controlling the position of said carrier longitudinally along said post, and an additional conveyer for receiving material from said conveyer unit.

38. In loading apparatus, the combination with a support, of a carrier pivoted thereto, means for holding said carrier in a depressed position by preventing upward movement thereof during a predetermined path of travel thereof, means for elevating said carrier automatically when released from said holding device, a conveyer unit connected to said carrier, means for driving said conveyer unit, mechanism for imparting a swinging movement to said carrier and said conveyer unit, and an additional con-

veyer for receiving material from said conveyer unit.

39. In loading apparatus, the combination with a carrier, a support to which said carrier is pivotally connected, mechanism for positively holding said carrier from movement in any direction on said support except rotatively during a predetermined path of travel of said carrier, means for elevating said carrier automatically when the latter is released from said holding position, a conveyer unit connected to said carrier to move therewith, an additional conveyer, and means for operating said conveyer unit to deliver material to said additional conveyer.

40. In loading apparatus, the combination with a support, of a carrier pivoted thereto, a conveyer unit connected to said carrier, means for varying the elevation of said carrier and the said conveyer unit, an arm pivoted to said support, a dash-pot connected between said arm and said carrier, and means for turning said arm to impart a swinging movement to said carrier and said conveyer unit through said dash-pot.

41. In loading apparatus, the combination with supporting framework, of a main conveyer mounted thereon, a supplemental frame pivotally connected to said framework to swing relatively thereto on an upright axis, gathering mechanism comprising a scoop and a supplemental conveyer acting as a unit separate from said main conveyer, a flexible connection between said supplemental frame and said gathering mechanism, means for swinging said supplemental conveyer on said upright axis to effect arcuate movement of said scoop over the floor to gather material and direct it to said supplemental conveyer, means for maintaining delivery communication between said supplemental conveyer and said main conveyer through an arc of about 180 degrees while said scoop is directing material onto said supplemental conveyer, and means for driving said supplemental conveyer to deliver material to said main conveyer over a path of travel having an angle of about 180 degrees.

42. In loading apparatus, the combination with a vertical support, of an arm pivoted to said support and slidable vertically along the same intermediate the ends thereof, a conveyer unit pivotally connected to said arm, and means for swinging said arm to effect the swinging of said conveyer unit at the adjusted elevation of said arm relatively to said support.

43. In loading apparatus, the combination with supporting framework, of a main conveyer mounted thereon, a supplemental frame mounted on said framework to swing on an upright axis along arcuate lines in

horizontal planes, an endless traveling conveyer on said supplemental frame in delivery communication with said main conveyer, means for operating said conveyer, and means for completely rotating said supplemental frame together with said endless conveyer on such upright axis to effect the delivery of material to said main conveyer when said endless conveyer extends forwardly from said main conveyer and to restore said endless conveyer to initial position in readiness for another such rotary operation.

44. In loading apparatus, the combination with a supporting frame, of a main conveyer mounted thereon, a rotary arm pivoted to said supporting frame and capable of being swung on its pivot in a complete circle, a supplemental conveyer connected to said rotary arm to move therewith, means comprising an electric motor for rotating said arm in said complete circle and moving said supplemental conveyer therewith, an additional electric motor for driving said supplemental conveyer, and a separate electric motor for driving said main conveyer.

45. In loading apparatus, the combination with a supporting frame, of a main conveyer thereon, a supplemental conveyer pivotally connected to said frame for movement over a complete circle, and means for permitting free movement of said supplemental conveyer over said main conveyer.

46. In a loading apparatus, the combination with a main conveyer having a receiving end near the floor of a mine chamber, of a supplemental conveyer having a receiving end adapted to be located near the mine wall on the floor in position to receive material dislodged from said wall, said supplemental conveyer being in communication with said main conveyer, and means for elevating said supplemental conveyer and passing over said main conveyer.

47. In loading apparatus, the combination with a main conveyer, of a supplemental conveyer in operative communication with said main conveyer through an angle of approximately 180 degrees near the bottom of the machine, means for mounting said supplemental conveyer for maintaining communication with said main conveyer in such low position adjacent the bottom of the machine, means for swinging said supplemental conveyer relatively to said main conveyer while such communication is maintained, means for driving said supplemental conveyer to deliver material to said main conveyer throughout such angular movement, and means for driving the main conveyer to move the material received thereby toward loading position.

48. In loading apparatus, the combination

with a supporting frame, of a supplemental frame pivotally connected to said supporting frame and slidable up and down relatively thereto, a main conveyer on said supporting frame, a supplemental conveyer connected to said supplemental frame, means for moving said supplemental frame and said supplemental conveyer arcuately, and means for automatically shifting the plane of rotation of said supplemental frame by directing the latter up or down relatively to said supporting frame.

49. In loading apparatus, the combination with a support, of an arm pivoted thereto, an electric motor carried by said arm, turntable gearing between said motor and said support for moving said arm on its pivot when said motor is operated, said turntable gearing comprising a gear fixed to and carried by said support, an additional arm pivoted to said support, a main conveyer, a supplemental conveyer connected to said additional arm in position for delivery communication with said main conveyer, and a connection between said arms to effect swinging of said additional arm and said supplemental conveyer when said first-named arm is turned by said turntable gearing and said motor.

50. In loading apparatus, the combination with a main conveyer, of a supplemental conveyer having one end adapted to rest on the ground and slide thereover, a vertically adjustable arm, a flexible connection between said arm and said supplemental conveyer at that end of the latter remote from the sliding portion, and means for arcuately moving said arm and moving said supplemental conveyer bodily therewith.

51. In loading apparatus, the combination with a supporting frame, of a main conveyer mounted thereon to have a receiving end at the forward bottom portion of the machine adjacent the surface on which said supporting frame is adapted to rest, a supplemental conveyer connected to said frame to swing from one side of the machine to the other through an angle of about 180 degrees to deliver material to said main conveyer at any position of its arcuate travel, means for driving said conveyers, and means for swinging said supplemental conveyer through said arc while delivering material to said main conveyer.

52. In loading apparatus, the combination with a supporting frame, of a carrier pivoted to said frame to swing on an upright axis relatively thereto, a main conveyer on said frame, a supplemental conveyer pivoted to said carrier to swing relatively thereto on a horizontal axis, and means for swinging said carrier together with said supplemental conveyer on said upright axis while said supplemental conveyer maintains operating connection with said main conveyer

through a range of about 180 degrees and said supplemental conveyer is free to swing up and down on said horizontal axis.

53. In a loading machine, the combination with a supporting frame, of a conveyer pivotally connected to said frame to swing on an upright axis relatively thereto, and a pivotal connection permitting said conveyer to have an independent vertical movement relatively to said frame.

54. In a loading machine, the combination with a supporting frame, of an arm pivoted thereto on an upright axis, a conveyer pivotally connected to said arm to swing vertically on a horizontal axis, and means for rotating said arm on said upright axis to drag along said conveyer by the pivoted connection within the same and said arm.

55. In a loading machine, the combination with a supporting frame, of a supplemental frame connected thereto to swing on an upright axis through an arc of about 180 degrees, a main conveyer on said frame, a supplemental conveyer pivotally connected to said supplemental frame in position to communicate with the forward end of said main conveyer throughout the swinging movement of said supplemental frame through such arc.

56. In a loading machine, the combination with a main conveyer, of a supplemental conveyer in communication with the receiving end of said main conveyer through an arc of movement of 180 degrees or more and adjacent the floor on which the machine rests, means for swinging said supplemental conveyer through such arc to gather material in advance of said main conveyer, and mechanism for directing said supplemental conveyer over the main conveyer back of the forward end of said main conveyer.

57. In a loading machine, the combination with a supporting frame, of a main conveyer mounted thereon with its rear portion swingable into position for loading material into a mine car, a supplemental conveyer swingable on an upright axis as a separate unit in advance of said main conveyer, means for mounting said supplemental conveyer for delivering material to said main conveyer at the bottom of the machine, and means for operating said supplemental conveyer including swinging thereof on such upright axis while delivery communication is maintained with the main conveyer at the bottom of the machine.

58. In a loading machine, the combination with a supporting frame, of an elongated traveling conveyer mounted thereon, a supplemental conveyer connected to said frame and swingable through an arcuate path including a position at right angles to the length of the main conveyer and including a position in alinement with the longitudinal

dimension of said main conveyer, a receptacle at the forward end of said main conveyer at the bottom of the machine, said receptacle having a forward arcuate edge, a short distance above such bottom, and means for operating said supplemental conveyer including swinging thereof to deliver material into said receptacle.

59. In a loading machine, the combination with a main frame, of a supplemental frame, a main conveyer mounted on said main frame, a supplemental conveyer connected to said supplemental frame, means for moving said supplemental frame to drag along said supplemental conveyer, means on said main frame for permitting folding of said supplemental frame and said supplemental conveyer, and means for elevating said main and supplemental frames together with said main and supplemental conveyers to permit a transporting truck to be moved under said main frame and the transportation of the machine while folded as stated.

60. In a loading machine, the combination with a main frame, of a flight conveyer mounted on said main frame with its forward portion adapted to operate in a substantially horizontal plane, a trough for said conveyer with an arcuate wall at its forward portion, a supplemental frame having pivotal relation with said main frame within the boundary of said conveyer, a supplemental conveyer on said supplemental frame continually in delivery communication with said main conveyer along said arcuate wall, and means for operating said supplemental conveyer including the swinging of said supplemental frame to effect the delivery of material into said trough along said arcuate wall to be acted upon by said first-named conveyer.

61. In loading apparatus, adapted for operation in low-roof mine chambers, the combination with supporting framework, of a flight conveyer mounted on said framework in a position adjacent the floor of the mine chamber with its forward receiving end at the bottom of the machine, a supplemental conveyer pivotally connected to said supporting framework for swinging movement on an upright axis while in delivery communication with the forward end of said main conveyer, means for driving said conveyers, and means for swinging said supplemental conveyer on said upright axis while in delivery communication with said main conveyer.

62. In loading apparatus adapted for operation in low-roof mine chambers, the combination with a supporting frame, of a main conveyer having its forward portion at the bottom of the machine and said supporting frame adjacent the floor of the mine chamber, a supplemental conveyer connected to said frame to swing relatively thereto on

an upright axis while maintaining delivery communication with the receiving end of said main conveyer, means for driving said conveyers, and means for swinging said supplemental conveyer on said upright axis.

63. In loading apparatus adapted for operation in low-roof mines, the combination with a main frame, of a main conveyer mounted thereon with its forward portion thereof at the bottom of the machine adjacent the floor of a mine chamber, of a supplemental frame pivotally connected to said main frame for swinging movement on an upright axis, a scooping conveyer connected to said supplemental frame for movement therewith while occupying positions in delivery communication and with the receiving end of said main conveyer, means for driving said conveyers, and means for swinging said scooping conveyer to scoop material off the floor of a mine chamber in advance of said main frame while said scooping conveyer delivers such material to said main conveyer.

64. In a loading machine, the combination with supporting framework, of a main conveyer mounted thereon, a supplemental conveyer pivoted to said framework, means for imparting a rotary motion to said supplemental conveyer as a whole, mechanism for effecting the elevation of said supplemental conveyer when passing over said main conveyer, and means for driving said conveyers.

65. In a loading machine, the combination with a supporting frame in fixed relation thereto, of a main conveyer mounted thereon, a separate supplemental conveyer connected to said frame in position to deliver material to said main conveyer adjacent the floor of a mine chamber, means for swinging said supplemental conveyer over a predetermined arcuate path of travel while maintaining communication with said main conveyer, and means for returning said supplemental conveyer to its initial operating position.

66. In a loading machine, the combination with a supporting frame, of a main conveyer mounted thereon with its forward receiving end at the bottom of the machine adjacent the surface on which said supporting frame is supported, a separate supplemental conveyer connected to said main frame to communicate with said main conveyer along an arcuate path of travel adjacent the receiving end of said main conveyer, means for swinging said supplemental conveyer over a predetermined arcuate path of travel while maintaining operative communication with said main conveyer along such arcuate delivery path of travel, a scoop movable with said supplemental conveyer during such swinging movement for directing material thereon, and means

for driving said conveyers to move the material from said scoop onto said main conveyer and along the latter toward loading position during the swinging movement of said supplemental conveyer.

67. In a loading machine, the combination with a support, of a main conveyer thereon, a supplemental conveyer pivoted to said support, means for swinging said supplemental conveyer throughout a complete rotation about said support, and means for effecting the lifting of the supplemental conveyer over said main conveyer and for effecting movement of such supplemental conveyer into position to receive material and transfer the same to said main conveyer.

68. In a loading machine adapted for low-roof mine chambers, the combination with a main conveyer having a forward horizontal portion adjacent the floor of the mine chamber, a supplemental conveyer having a receiving end on the floor of the mine in position to receive material thereon at one end and in position for delivery communication at its other end with said main conveyer, means for swinging said supplemental conveyer, and means for effecting the elevation of said supplemental conveyer when passing over said main conveyer.

69. In a loading machine, the combination with supporting framework, of a main conveyer occupying a receiving position in a horizontal plane at the forward end of said framework adjacent the surface on which the machine is supported, a separate supplemental conveyer pivotally connected to said framework and in delivery communication with said main conveyer adjacent such surface, and means for swinging said supplemental conveyer while the latter maintains operative communication with said main conveyer through a range of about 180 degrees over a predetermined path along the floor of the mine chamber in advance of said framework to receive material and transfer the same to said main conveyer.

70. In a loading machine adapted for operation in a low-roof mine, the combination with supporting framework, of a main conveyer thereon with its forward portion at the bottom of the machine adjacent the floor of the mine chamber, a supplemental conveyer, means for mounting said supplemental conveyer in an inclined plane to swing through an angle of about 180 degrees while maintained in delivery communication with said main conveyer in a position a short distance above the said mine floor, and means for operating said supplemental conveyer to gather material arcuately and deliver it to said main conveyer.

71. In loading apparatus, the combination with supporting framework, of a conveyer pivoted thereto for swinging movement to

gather material at the base of an arcuate mine wall, an additional conveyer with the receiving end approximately at the mine floor and with its intermediate portion extending rearwardly in a general horizontal direction along said floor, means for driving said conveyers, an arcuate trough at the receiving end of said additional conveyer, and an arcuate wall for said trough to guide the delivery end of said first-named conveyer to said trough through a range of about 180°.

72. In a loading machine, the combination with supporting framework, of a flight conveyer thereon operating in a horizontal plane at the forward receiving end thereof, an arcuate trough for said receiving end, said trough comprising a semi-circular wall, and a supplemental conveyer pivotally connected to said framework to swing through an angle of about 180 degrees while maintained in delivery communication with said flight conveyer along said semi-circular wall of said arcuate trough at the forward receiving end of said flight conveyer.

73. In a loading machine, the combination with a supporting frame, of a conveyer thereon having a forward receiving portion in an approximately horizontal plane closely adjacent the surface on which the machine is supported, a receiving section pivoted to the forward end of said conveyer, means for swinging said receiving section horizontally into various angular positions relative to said conveyer, and means for moving said receiving section to receive material from the directions corresponding to the respective positions of said receiving section and delivering such material to said conveyer.

74. In a loading machine, the combination with a main conveyer having a receiving end substantially at the floor, means comprising an upright arcuate wall in advance of said conveyer to form a receiving receptacle immediately above the floor upon which the machine rests, a separate supplemental conveyer unit pivotally connected to said main conveyer to swing relatively thereto on an upright axis, means connected to said supplemental conveyer unit in position to gather material from the floor in advance of said main conveyer, and means for swinging said supplemental conveyer unit on such upright axis to effect the operation of said gathering means while said supplemental conveyer remains in delivery communication with said main conveyer along said upright arcuate wall.

75. In a loading machine, the combination with a supporting frame, of a rearwardly extending main conveyer mounted thereon to have a forward receiving end at the floor and a rear discharge end adapted to swing laterally to various discharge positions, a scoop connected to said frame to swing laterally relatively thereto along arcuate paths

to scoop material from the ground in advance of said receiving end of said main conveyer, a supplemental conveyer extending from said scoop to said receiving end to deliver material to the main conveyer throughout the arcuate movement of said scoop, and a receptacle substantially on the ground at the forward receiving end of said first-named conveyer to maintain communication between said conveyers.

76. In a loading machine, the combination with a supporting frame, of a main conveyer thereon, a supplemental traveling conveyer mounted on said main frame to extend as a separate unit radially therefrom in position to deliver material to said main conveyer when in predetermined relative locations, means for swinging said supplemental conveyer bodily throughout a complete rotation on an upright axis while said supplemental conveyer extends radially therefrom, and mechanism for directing said supplemental conveyer upwardly over said main conveyer back to initial operating position.

77. In a loading machine for low roof mines, the combination with a main frame adapted to rest on the floor of a mine chamber, of an elongated main conveyer on said frame with a forward receiving end and an intermediate operating portion in positions at the bottom of the machine close to the mine floor, a supplemental conveyer mounted on said main frame to swing as a separate unit on an upright axis along arcuate paths, mechanism for establishing delivery communication between said supplemental conveyer and said main conveyer at the forward receiving end of the latter closely adjacent the bottom of the machine and the mine floor while said supplemental conveyer is swung along such arcuate paths, a scoop connected to said supplemental conveyer to gather material from the floor in advance of said main frame and direct it to said supplemental conveyer, and means for swinging said supplemental conveyer to operate said scoop while such delivery communication remains established between the conveyers.

78. In a loading machine adapted for very low roof mine chambers, the combination with a frame having a symmetrically arranged elongated shallow chute, means for supporting said shallow chute close to the floor over which the machine is movable, means pivotally connected to said frame within the confines of the forward portion of said chute for gathering material from the arcuate space in advance of said frame and laterally of the forward end of said chute and delivering such material to said chute, and means traveling along said chute for transferring the material toward loading position.

79. In a loading machine, the combination

with a supporting frame, of anchoring mechanism adapted to rest by its own weight on a flat floor and be projected against the roof of the mine chamber to form an abutment, and powerful propelling mechanism comprising a longitudinally extending horizontal fluid pressure motor connected between the rear end of said frame and said abutment.

80. In a loading machine, the combination with a supporting frame adapted to move along a flat floor, of loading apparatus thereon, roof jack mechanism adapted to rest on such flat floor and slide along the same, fluid pressure mechanism for operating said roof jack mechanism to form a rigid abutment, and a horizontal fluid pressure motor connected between said frame and said abutment to act as powerful propelling mechanism to move the entire loading apparatus forward.

81. In a loading machine, the combination with supporting framework adapted to rest on the flat floor of a mine, said framework having a joint therein, of loading apparatus on said framework, means for exerting pressure on one portion of said framework to advance said loading apparatus over such flat floor, means for shifting another portion of said framework laterally, and guiding mechanism coacting with said shifting means to engage the side walls to guide the machine when moved forward.

82. In a loading machine, the combination with loading apparatus, of a plurality of upright roof jacks each adapted to rest on the floor of the mine chamber by its own weight, and means for effecting alternated operation of said upright roof jacks to advance the loading apparatus step-by-step.

83. The combination with a loading machine comprising a supporting frame, of a plurality of anchoring devices adapted to be thrust against the floor and roof of a mine chamber in fixed anchored position against movement in any direction to form abutments, propelling mechanism connected to said anchoring devices and to said frame, said propelling mechanism being adapted to move said anchoring devices forwardly relatively to said frame when said anchoring devices are released and are out of contact with the roof and to move said frame forward when the anchoring devices are in fixed position acting as an abutment, and means for controlling said propelling mechanism to effect a walking action of said anchoring devices intermittently and alternately to effect forward movement of the loading machine step-by-step.

84. A loading machine comprising a supporting frame, a fluid pressure operated roof jack for the forward portion of said frame, a fluid pressure operated roof jack to form an abutment, fluid pressure operated

mechanism between said abutment and the rear portion of said frame for advancing the loading machine, and means for selectively controlling the operation of said fluid pressure operated devices.

85. The combination with a loading machine comprising a supporting frame, of roof jack mechanism adapted to rest on a flat floor back of said frame and comprising a fluid pressure cylinder with a plunger extending upwardly therefrom, and fluid pressure motor mechanism for moving said frame forward when said roof jack mechanism is anchored and for moving the latter forward to a new position when not anchored.

86. The combination with a loading machine comprising a supporting frame, of multiple anchorage mechanism comprising a plurality of upright roof jacks adapted to rest on the floor of the mine chamber when in released position in readiness to be projected against the roof automatically, propelling mechanism between said roof jacks and said supporting frame, and means for effecting a selective control of said roof jacks and said propelling mechanism to secure a walking action of said roof jacks and a forward movement of the loading machine step-by-step.

87. In a loading machine, the combination with a supporting frame, of a roof jack for anchoring the forward portion of said frame, a main conveyer on said frame, a supplemental frame connected to said first-named frame to have a swinging movement relatively thereto on the upright axis of said roof jack, gathering mechanism on said supplemental frame in position to scoop and gather material from the floor of a mine chamber and deliver such material to said main conveyer, and means for swinging said supplemental frame on such upright axis to sweep said gathering mechanism across the mine floor.

88. In a loading machine, the combination with a supporting frame, of a hydraulic roof jack connected to the forward portion thereof, a gathering unit connected to said frame to swing on the hydraulic roof jack as an upright axis and adapted to scoop and gather material from the floor in advance of said frame, and means for operating said gathering unit including swinging thereof on such upright axis to sweep said gathering unit across the mine floor in advance of said frame.

89. In a loading machine, the combination with a supporting frame, of a roof jack for anchoring the same, gathering means adapted to scoop material from the floor of the mine chamber and connected to said frame to swing about the roof jack as an upright axis through an angle of approximately 180°, and means for operating

said gathering means while said supporting frame remains anchored by said roof jack.

90. In a loading machine, the combination with a main frame, of a roof jack for
 5 anchoring the same, a supplemental frame pivotally mounted for arcuate movement on the upright axis of said roof jack, a main
 10 conveyer on said main frame, a supplemental conveyer on said supplemental frame movable bodily therewith while maintained
 in delivery communication with said main frame, scooping mechanism at the forward
 15 receiving end of said supplemental conveyer in position to move over the floor of the mine chamber to gather material to be operated on by said supplemental conveyer
 for delivery to said main conveyer, and means for swinging said supplemental
 20 veyer and said scooping means on said roof jack as an upright axis to gather the material from the floor and transfer it toward loading position.

91. In a loading machine, the combination with an elevating conveyer comprising
 25 a reversible transmission belt having spaced arm flights, flight runways upon which the material is conveyed by the flights, the reversibility of the belt rendering said ways
 30 alternately available for conveying the material in a common draft direction, said ways at their discharge ends terminating to provide a non-conveying arm arc sweep
 from one way to the second, said conveyer
 35 being pivotally mounted at its discharge end for swinging the conveyer horizontally, gathering means associated with the receiving end of said elevating conveyer and
 40 adapted to move over the floor to scoop material therefrom for said elevating conveyer, a receiver disposed beneath the discharge

end of said elevating conveyer, a delivery conveyer comprising a flight way and endless transmission means having spaced
 45 flights traveling over said way and horizontally at each of the opposite ends of said way, and means for bodily moving both of the conveyers and said receiver.

92. In an underground loading machine, the combination with a base frame adapted
 50 to occupy a stationary position, of a supporting frame mounted on said base frame and adapted to rotate thereabout through a wide angle of 180° or more, gathering mechanism mounted on said supporting frame
 55 in position to gather material directly from the floor of the mine chamber, and a jack extending upward from said base frame through said supporting frame in position
 60 to apply pressure from the roof to said base frame for holding the latter stationary during the operation of said gathering means.

93. In an underground loading machine, the combination with a base frame, of a
 65 supporting frame mounted on said base frame and adapted to rotate thereabout through a wide angle, said supporting frame having an opening therethrough about the axis upon which it is rotatably mounted,
 70 gathering mechanism mounted on said supporting frame in position to gather material directly from the mine floor, and a roof jack projecting upward through said opening
 75 in position to apply pressure from the roof to said base for holding the latter anchored during the operation of said gathering means.

In testimony whereof I have signed my name to this specification on this 12th day of May, A. D. 1919.

EDMUND C. MORGAN.