

Aug. 14, 1928.

1,681,001

N. D. LEVIN

APPARATUS FOR LOADING CARS

Filed April 17, 1917

4 Sheets-Sheet 1

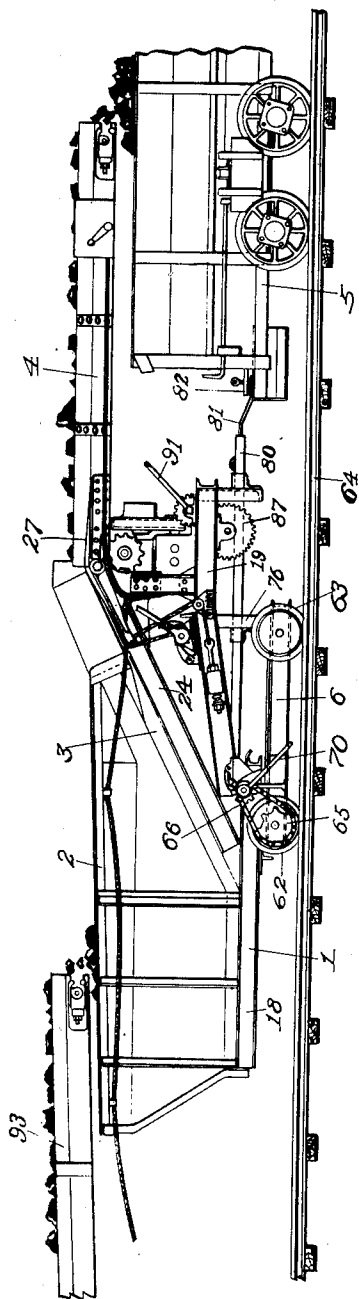


Fig. 1.

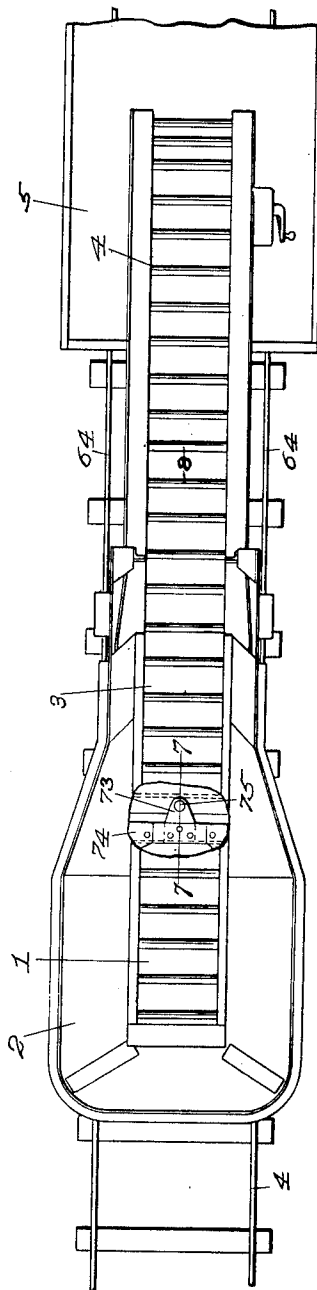


Fig. 2.

WITNESSES:
Harry C. Dean.
Dudley F. Fisher.

INVENTOR.
Nils D. Levin
BY
H. A. Blair
ATTORNEY.

Aug. 14, 1928.

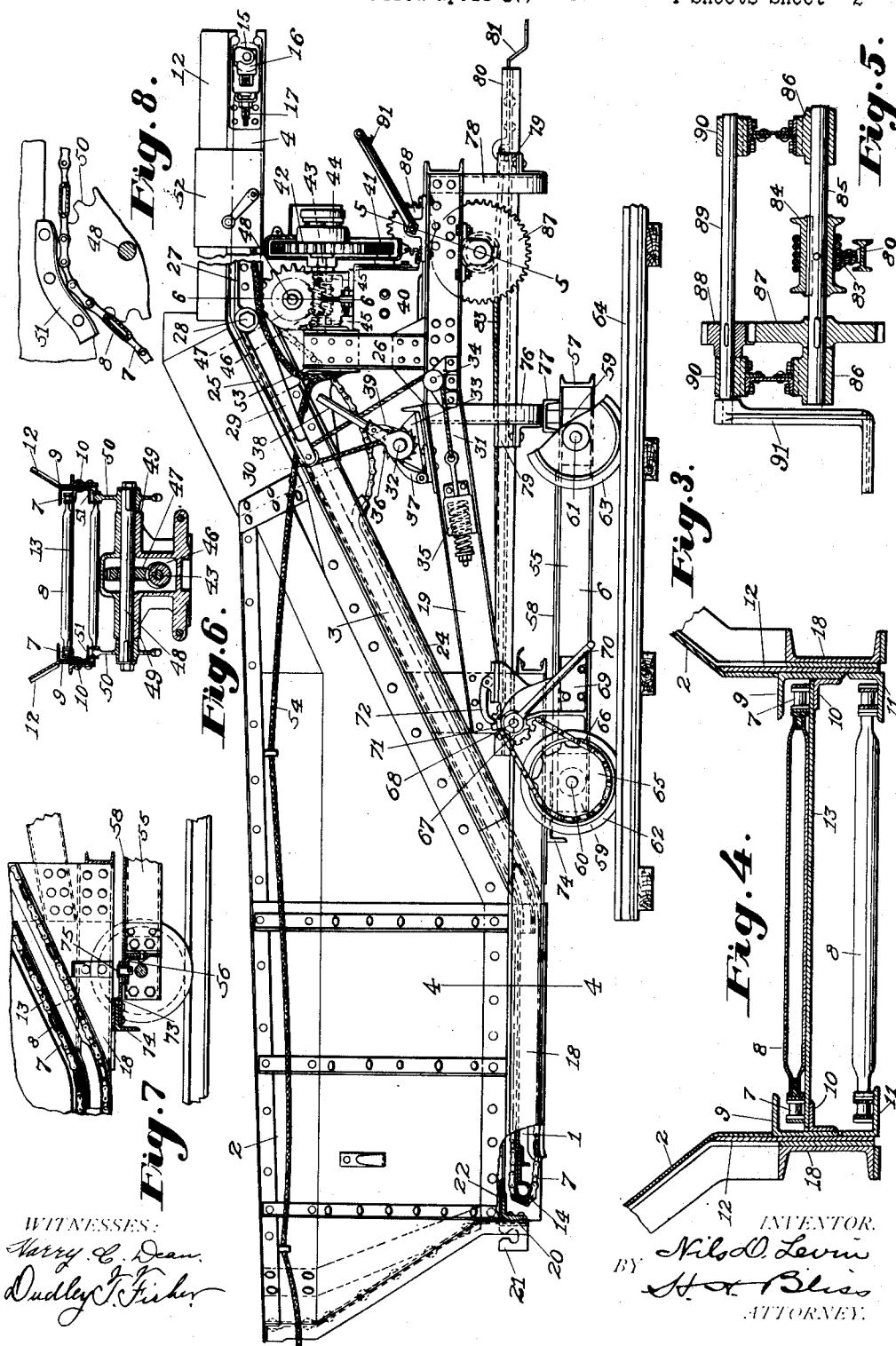
1,681,001

N. D. LEVIN

APPARATUS FOR LOADING CARS

Filed April 17, 1917

4 Sheets-Sheet 2



Aug. 14, 1928.

1,681,001

N. D. LEVIN

APPARATUS FOR LOADING CARS

Filed April 17, 1917

4 Sheets-Sheet 3

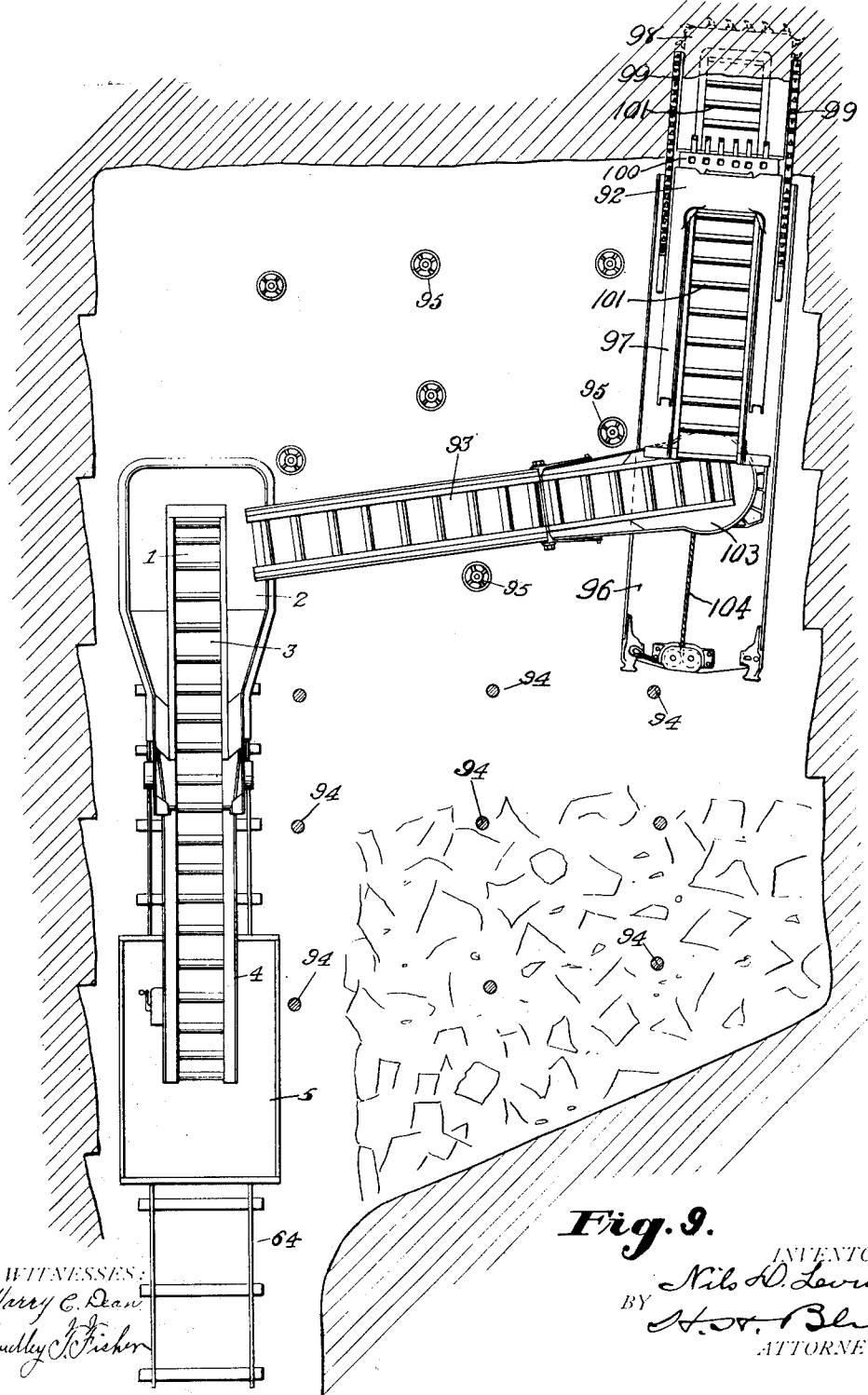


Fig. 9.

INVENTOR.

Nils D. Levin

BY

H. W. Blum

ATTORNEY.

WITNESSES:
Harry C. Dean
Dudley J. Fisher

Aug. 14, 1928.

1,681,001

N. D. LEVIN

APPARATUS FOR LOADING CARS

Filed April 17, 1917

4 Sheets-Sheet 4

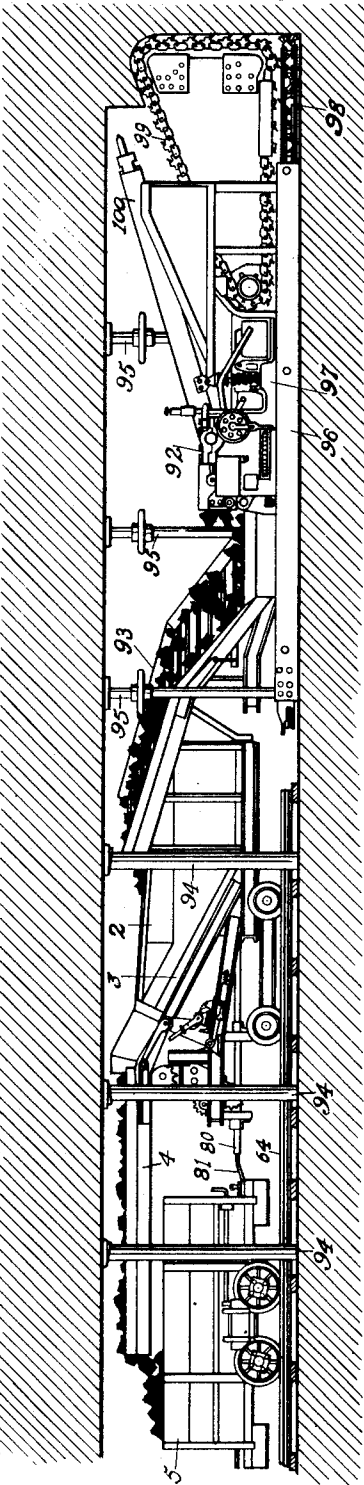


Fig. 10.

WITNESSES:
Harry C. Dean
Dudley R. Fisher

INVENTOR
Nils D. Levin
BY
Carrollman, Dwyer & Co.
ATTORNEYS

Patented Aug. 14, 1928.

1,681,001

UNITED STATES PATENT OFFICE.

NILS D. LEVIN, OF COLUMBUS, OHIO, ASSIGNOR TO THE JEFFREY MANUFACTURING COMPANY, OF COLUMBUS, OHIO, A CORPORATION OF OHIO.

APPARATUS FOR LOADING CARS.

Application filed April 17, 1917. Serial No. 162,649.

This invention relates to improvements in the mechanism used in mine rooms or chambers, having low roofs for taking up or receiving the newly dislodged coal at points near the bottom and raising it to either of several elevated points of delivery so that it can be deposited in the standard pit cars which, in practice, are variably positioned to receive it, and take it out of the mine.

The method of mining coal almost universally practiced in the United States is that known as the "room and pillar" system, comprising an arrangement of tunnels, or entries, somewhat analogous to the streets of a city, from which branch off rooms or chambers, in which the principal mining operations are conducted. Tracks are laid along the entries with branches extending into the rooms, and upon these tracks travel the pit cars provided for the transportation of the coal from the working face to the outside. These pit cars range from eight to ten feet in length, about four feet in width, and their height varies according to the thickness of the vein which is being mined. They usually have a capacity ranging from one ton in very thin veins to four or five tons in the thickest veins. As the entries are very narrow, and it is usually not practicable to make any material increase in their width at the room necks, the curves in the tracks must be very sharp, the customary radius of curvature being about ten feet. This necessitates the building of pit cars, locomotives, and any other trucks which must enter the mine rooms, with very short wheel bases, usually not much over thirty inches.

A very small proportion of the coal in the United States is more than five or six feet in thickness, and the height of the mine room is usually limited to the thickness of the vein. The width of mine rooms is governed primarily by the character of the overlying strata, which is usually a more or less fragile slate, subject to rapid deterioration when exposed to the air, which necessitates the placing at frequent intervals in the mine room of roof-supporting props. In order to provide space in which to pile the refuse material, such as impure bands of fallen roof slate, which accumulates in the mine room, the mine tracks are commonly placed at one side of the room close to the rib, and the presence of the gob, or piles of refuse material, together with the numerous roof props

in the room very narrowly limit the space available for mining operations.

Mechanical coal mining machines, adapted to dislodge and remove the coal from its natural bed, are commonly provided with conveying devices arranged to receive the coal as it is broken down and discharge it into cars positioned upon the mine track in the rear of the machine. The extremely limited space in which these operations must be conducted prevents such an arrangement of mine tracks as will permit of more than one car being placed within reach of the loading apparatus, and when this car has been loaded the operation of the mining machine must be suspended until the loaded car has been removed and an empty one set in its place. Such frequent interruption of its operation materially reduces the output of the machine. As the rate of dislodging the coal varies with the different stages of the cycle of operation of the mining machine the time required for loading the car is subject to a wide variation which greatly reduces the efficiency of the system of transportation thereby still further reducing the capacity of the mining machine.

Numerous devices have heretofore been proposed whereby a plurality of cars may be brought within the effective range of the loading conveyors, to thereby reduce the delays occasioned by the shifting of the cars, but all of these devices with which I am familiar possess certain inherent defects which, in the limited space available and under the exacting conditions existing in mines, have prevented their successful operation.

The especial object of this invention is to provide an improved apparatus for loading cars in mines, in conjunction with mechanical mining machines, or similar devices, whereby the interrupting of the operation of the mining machine to allow removal and replacement of cars may be avoided, and delays in loading cars due to irregular operation of the mining machine may be prevented.

In the drawings there is illustrated a mechanism embodying my improvements.

Fig. 1 is a side elevation of the preferred embodiment of my invention.

Fig. 2 is a plan view of the devices illustrated in Fig. 1.

Fig. 3 is an enlarged side elevation of the

apparatus illustrated in Figs. 1 and 2 certain parts being broken away to reveal other parts.

Fig. 4 is a cross section along the line 4—4 of Fig. 3.

Fig. 5 is a cross section taken along the line 5—5 of Fig. 3.

Fig. 6 is a cross section taken along the line 6—6 of Fig. 3.

Fig. 7 is a longitudinal section taken along the line 7—7 of Fig. 2.

Fig. 8 is a detail of the driving devices for the conveyer chain.

Fig. 9 is a plan view of a mine chamber showing the method of operation of the devices of my invention in conjunction with a mechanical mining machine of well known construction.

Fig. 10 is a view in vertical section of a mine chamber showing my invention in its proper relation to a mechanical mining machine of a well known type, and illustrating the conditions under which the apparatus is designed to work.

Like numerals refer to similar parts in the several figures.

As illustrated in the drawings my invention consists essentially of an elongated conveyer of the well known chain and scraper type, having a substantially horizontal receiving portion 1 positioned in relatively low planes and provided with a storage hopper 2, an inclined elevating portion 3 and a substantially horizontal loading section 4 positioned in relatively high planes and adapted to extend above the car 5 when it is positioned on the mine track in the rear of the machine. The conveyer, together with its actuating and controlling devices, is mounted upon a truck 6 of relatively short wheel base such as is suitable for traveling around the short curves of the mine track, and the parts are so distributed relative to the truck as to maintain a stable equilibrium under all conditions of service.

The conveyer is of the well known construction consisting of two similar endless chains 7 connected together at spaced intervals by a plurality of cross bars 8 which serve as scrapers to move the material which is to be loaded. The chains 7 are adapted to travel along guide ways formed of angle bars 9, 10 and 11 attached to the plates 12 which serve as sides of the conveyer trough. A transversely extending plate 13 attached to the angles 10 holds these guide ways in operative relation and forms the bottom of the conveyer trough. At its forward end the plate 13 is turned upon itself to form a loop 14 around which the chains 7 and flights 8 turn. At the rearward end of the conveyer the chains and flights turn around an idler shaft 15 which is journaled in bearings 16 attached to the side plates 12 of the conveyer trough. The bearings 16 are of

the well known take up type having adjusting screws 17 by which the bearing may be moved longitudinally of the conveyer to adjust the slack of the chains 7. Attached to the side plates 12 of the conveyer trough, along the horizontal receiving portion of the conveyer, are channel bars 18 which constitute the forward sections of the side sills of the supporting structure. Similar channel bars 19 which constitute the rearward section of the side sills, are connected to the channel bars 18 but offset vertically therefrom to afford a more convenient clearance under the rearward part of the machine. Attached to the forward ends of the channel bars 18 is an end sill 20 to which is secured a draw bar 21 adapted for connection with a locomotive for convenient transportation from one working place to another. The rearwardly extending flange 22 of the end sill 20 projects above the forward end of the bottom plate 13 to prevent the escape of the material at the forward end of the conveyer. Built upon the side sills 18 and end sill 20 is the hopper 2, adapted to receive the material to be loaded, having a sufficient storage capacity to allow the removal of a loaded car and its replacement by an empty one without the interruption of the flow of material from the source of supply.

Channel bars 24 extend along the sides of the inclined portion 3 of the conveyer and are attached at their upper ends to hinge castings 25 to which are also attached the upper ends of the vertical channel bars 26 rising from the side sills 19 to form a triangular frame for the support of the conveyer. Hinge members 27, secured to the side plates 12 of the loading section 4 of the conveyer, are pivotally connected to the hinge members 25 by the pivot bolts 28 to support said loading section. Formed on these hinge members 27 are forwardly extending arms 29 having, at their outer ends, sheave rollers 30 over which pass the adjusting ropes 31. These ropes 31 are attached at one end to a winding shaft 32, journaled in bearings 33 attached to the channel bars 19, and at the other end, after passing around guide sheaves 34, are resiliently attached to the anchor castings 35 fixed to the channel bar 19. Attached to the winding shaft 32 is a ratchet wheel 36 adapted to be engaged by a retaining pawl 37 to prevent rotation of the shaft in the unwinding direction. A ratchet lever 38 is arranged to oscillate about the shaft and is provided with a pawl 39 adapted to engage the teeth of the ratchet wheel. By the manipulation of the ratchet lever 38 the shaft 32 may be rotated to wind the ropes 31 thereby depressing the forward ends of the arms 29 producing a corresponding elevation at the rearward end of the conveyer section 4. The unwinding of the ropes 31 permits the depression of the

discharge end of the conveyer, and the engagement of the ratchet wheel by the retaining pawl 37 holds the loading section 4 in any desired position of vertical adjustment.

Supported upon the side sills 19 is an electric motor 40 the armature pinion 41 of which engages with a spur gear 42 mounted upon a longitudinal shaft 43 to which it may be connected by a suitable friction clutch 44. The shaft 43 is journaled in bearings 45 of a gear housing attached to the motor frame and carries a worm 46 which engages a worm wheel 47. The worm wheel 47 is fixed upon a transverse driving shaft 48 journaled in bearings 49 of the gear housing. To the projecting ends of the shaft 48 are fixed the sprocket wheels 50 which engage the under side of the lower strand of the conveyer chains 7 at the point where they change direction from the horizontal loading section 4 to the inclined portion 3 of the conveyer. Curved shoes 51, attached to the supporting frame, engage the upper sides of the chains 7 to hold them in contact with the sprocket wheels 50 to insure the driving of the conveyer. A starting box 52 suitable for the control of the motor 40 is supported upon the side plate 12 of the loading section 4 of the conveyer, convenient to the hand of the operator. The connections between the starting box 52 and motor 40 are made by conductors included within the conductor cable 53 supported along the frame work of the conveyer. A similar cable 54 extends from the motor 40 to the source of electric supply, and through this cable current is received to actuate the motor.

The truck 6 comprises a steel frame formed of the side sills 55 and end sills 56 and 57 to which are attached the floor plate 58. Attached to the side sills 55 are journal bearings 59 in which are journaled the axles 60 and 61. The axles 60 and 61 are provided with traction wheels 62 and 63 which support the truck upon the rails 64 of the mine track. Attached to the projected end of the axle 60 is a sprocket wheel 65 connected through an endless chain 66 with a sprocket wheel 67 upon the crank shaft 68. The crank shaft 68 is journaled in bearings of the bracket casting 69 fixed to the side sills 55 and is provided with a hand crank 70 by which the sprocket wheel 67 may be rotated to rotate the axle 60 to propel the truck along the track rails 64. Fixed to the shaft 68 is a ratchet wheel 71 adapted to engagement with a pawl 72 to lock the crank shaft against rotation in either direction, thereby holding the axle 60 from revolving and the truck from movement along the track rails. The truck as above described, is necessarily of a relatively short wheel base such as is suitable to pass around the short curves of the mine tracks, and the conveyer supporting structure is so positioned

upon it that its center of gravity will fall well within the wheel base under all conditions of service. At the forward end of the truck the supporting structure has a pivot bearing comprising a pivot plate 73 fixed to a transverse angle bar 74 attached to the side sills 18. This pivot plate 73 bears upon the end sill 56 of the truck frame to which it is attached by the pivot pin 75. At the forward end of the truck the supporting structure has a sliding bearing formed by a U shaped angle bar 76 the upturned ends of which are attached to the side sills 19. This U shaped angle bar 76 slidably engages a truck bolster 77, formed of a suitable channel bar attached to the side sills 55 of the truck frame, and affords a sufficient lateral movement about the pivot pin 75 to accomplish the necessary lateral adjustment of the discharge end of the conveyer. A second U shaped angle bar 78 is attached to the extreme rearward end of the side sills 19 and to the bars 76 and 78 are attached guide ways 79 in which is longitudinally slidable the car shifting bar 80. The car shifting bar 80 is formed of a suitable I beam and has affixed to its outer end a draw eye 81 adapted to engagement with the draw bar 82 of the mine car 5. At each end of the bar 80 is attached an end of a rope 83 which is wound about and attached to a winding spool 84. The winding spool 84 is mounted upon a transverse shaft 85 journaled in bearings 86 attached to the side sills 19. Mounted upon the shaft 85 is a spur gear 87 which engages a spur pinion 88 fixed upon the crank shaft 89 journaled in bearings 90, and adapted to be rotated by the hand crank 91. By the rotation of the hand crank 91 the rope 83 may be wound and unwound upon the spool 84 to move the bar 80 longitudinally in its guide ways and move the car 5 relative to the discharge end of the conveyer to distribute the material throughout the length of the car.

In Fig. 9 I have illustrated a mine room in which the coal is being mined by a machine indicated by 92. It is of the breast feed type, adapted to remove the coal by a horizontal series of cuts under the coal or into its bed at the bottom of the face of the room. It comprises a base or pan 96 which rests upon, and is universally movable over, the floor of the mine to properly position the machine relative to the variable face of the coal. Longitudinally movable in this base is a main frame 97 carrying the active elements 98 and 99. The first of these is a cutter 98 which forms a horizontal kerf at the bottom of the face, and at 99 are two cutters which form vertical kerfs communicating with, and at the outer ends of, the horizontal kerf. There is a reciprocating pick mechanism 100 on the frame to impinge on the partly severed coal and

break it down. There is also a receiving conveyor 101 on the frame with its forward end extended into the bottom kerf to receive the dislodged coal. It carries the coal rearward and upward to points adjacent the mine roof, and discharges it into a secondary conveyor 93. The latter conveyor is pivotally supported upon the main frame 97 in such manner that it can swing horizontally and deliver coal to a car upon a track positioned at either side of the mine room, or on any of the longitudinal lines thereof, and irrespective of the position of the mining machine. The latter is repeatedly varied in its position from side to side of the room. The secondary conveyor 93 has a hopper 103 below the elevated end of the primary conveyor 101, and it is inclined upward to points adjacent the mine roof so that its delivery end, after being swung laterally, can be positioned above the receptacle to which it discharges the coal which it carries. When the cutting and dislodging mechanism has been advanced to its forward limit into the coal the feeding mechanism (including the cable 104) is manipulated to draw the main frame 97 rearward on the supporting base 96, and the machine is moved laterally into a new position to under-cut and dislodge another mass of coal from the face wall.

This operation is repeated until the coal has been removed from the entire width of the room face, the machine and the conveyor-loading devices being moved from place to place, laterally, at each operation. And after the coal has all been removed for a predetermined distance from the face, the machine is moved bodily forward to new positions at varying distances from the pit cars.

The mining machine thus indicated in Fig. 9 is the same, identically, which is illustrated and described in my co-pending application, Serial Number 782,522, filed August 1, 1913 (Patent No. 1,378,360, May 17, 1921).

By the operation of such a machine the coal is delivered in a more or less irregular stream varying at different stages in the cycle of operation and with the condition of the coal which is being mined. In a mine room such as here illustrated timber posts 94 are provided to support the mine roof, the frequency and arrangement of which depends more or less upon local conditions. It is also customary in the immediate vicinity of such mining machines to use steel posts 95 which are easily adjustable and removable, for the protection of the miner and the machine. As the machine advances these steel posts are replaced by the permanent wooden posts above referred to. In many districts the coal is overlain by draw slate, and similar refuse material,

which must be taken down to guard against its falling on the miners. This refuse material is usually gobbled or piled in irregular heaps, among the roof supporting posts to the rear of the active mining operations. To facilitate the arrangement of roof supporting timbers and to afford sufficient space to gob the refuse material, the track 64 is commonly laid at one side of the mine room and the extremely limited space left available renders undesirable any track arrangement by which more than one car at a time can be placed within reach of the intermediate conveyor 93. This necessitates the suspension of the operation of the mining machine during the time occupied in shifting the cars, while the irregularity of the delivery of coal seriously interferes with the efficiency of the system of transportation.

In order to avoid such delays I have devised the auxiliary loading apparatus and the method of operating the same above described. In this method of operation the auxiliary loading apparatus is moved along the mine track 64 to a position within reach of the discharge conveyor 93 of the mining machine 92 so that coal may be delivered from it into the receiving hopper 2. In this hopper 2 the coal may be allowed to accumulate until a sufficient amount has been supplied to fill a mine car 5. The draw eye 81 of the car moving bar 80 having been attached to the draw bar 82 of the mine car 5, the hand crank 91 will be manipulated to draw the car 5 forward until its rearward part shall be in position under the discharge end of the loading conveyor 4. By the manipulation of the starting switch 52 the motor 40 is actuated to drive the conveyor, which quickly transfers the coal from the hopper 2 to the mine car 5. As the coal fills the rear part of the mine car the hand crank 91 will be rotated to push the car rearwardly distributing the coal along the length of the car to completely fill it. When the car has been thus fully loaded the conveyor will be stopped, the car removed, and an empty one set in its place. Meanwhile the coal from the mining machine will be accumulating in the hopper 2 and as soon as sufficient coal is received and the car is properly placed the operation may be repeated. By the method and apparatus above described interruption of the operation of the mining machine to permit the shifting of cars is avoided, thereby materially adding to the output of the mining machine, and delays in the loading of cars, caused by irregular action of the mining machine, is prevented, largely increasing the efficiency of the system of transportation and adding greatly to the production of the mine.

What I claim is:

1. In an apparatus for loading coal in a mine chamber, the combination of a track

extending towards the working face, a car adapted to be moved along said track towards and from loading position, a receptacle adapted to be positioned adjacent to said loading position and adapted to the accumulation of a stationary mass of broken coal sufficient to fill said car, and optionally controlled means to quickly transfer the coal of said stationary mass to said car.

2. In an apparatus for loading coal in a mine chamber, the combination of a track extending towards the working face, a car adapted to be moved along said track towards and from loading position, a receptacle supported upon and movable along said track into position adjacent said loading position and adapted to the accumulation of a stationary mass of broken coal sufficient to fill said car, and optionally controlled means to quickly transfer the coal of said stationary mass into said car.

3. In an apparatus for loading coal in a mine chamber, the combination of a track extending towards the working face, a car adapted to be moved along said track to and from loading position, a conveyor adapted to receive and remove the broken coal from proximity with the working face, an accumulator receptacle adapted to receive the broken coal from said conveyor and having a capacity approximately equal to the car which is to be loaded, and an optionally controlled conveyor adapted to draw the coal from said accumulator receptacle and deliver it to a car suitably positioned upon said track in the rear of said accumulator receptacle.

4. In an apparatus for loading coal in a mine chamber, the combination of a track extending towards the working face, a car adapted to be moved along said track to and from loading position, a conveyor adapted to receive the broken coal from points adjacent the working face and deliver it to points in proximity with the mine roof, a truck supported upon and movable along said track, an accumulator receptacle mounted upon said truck adapted to receive the broken coal from said conveyor and having a capacity approximately equal to the car which is to be loaded, and an optionally controlled conveyor adapted to draw the coal from said accumulator receptacle and deliver it to a car suitably positioned upon the said mine track in the rear of said truck.

5. In an apparatus for loading coal in a mine chamber, the combination of a track extending towards the working face, a car adapted to be moved along said track to and from loading position, a conveyor adapted to receive the broken coal from points adjacent the working face and deliver it to points in proximity with the mine roof, a truck mounted upon said track independently of said conveyor, an accumulator receptacle

mounted upon said truck adapted to receive the broken coal from said conveyor and having a capacity approximately equal to the car which is to be loaded, and an optionally controlled conveyor adapted to draw the coal from said accumulator receptacle and deliver it to a car suitably positioned upon said mine track in the rear of said truck.

6. In an apparatus for loading coal in a mine chamber, the combination of a track extending towards the working face, a car adapted to be moved along said track to and from loading position, a conveyor adapted to receive the broken coal from points adjacent the working face and deliver it to points in proximity with the mine roof, a truck mounted upon said track independently of said conveyor, means to move said truck along said tracks, an accumulator receptacle upon said truck adapted to receive the broken coal from said conveyor and having a capacity approximately equal to the car which is to be loaded, and an optionally controlled conveyor adapted to draw the coal from said accumulator and deliver it to a car suitably positioned upon said mine track in the rear of said truck.

7. In an apparatus for loading coal in a mine chamber, the combination of a single track extending towards the working face, a car adapted to be moved along said track to and from loading position, a conveyor adapted to receive the broken coal from points adjacent the working face and deliver it to points in proximity with the mine roof, a truck mounted upon and movable along said track independently of said conveyor, a conveyor mounted upon said truck and having a forward horizontal section positioned in planes near the level of the track, an inclined elevating section, and a rear delivery section positioned in substantially horizontal planes adjacent the mine roof and adapted to extend above a car positioned in the rear of said truck upon said track, a hopper upon said truck surrounding the forward portion of said conveyor having its sides extending to points adjacent the mine roof and adapted to receive the broken coal from the first mentioned conveyor and to accumulate a stationary mass of broken coal sufficient to fill said car, and means within the control of the operator to actuate the last mentioned conveyor to transfer the coal of said stationary mass to said car.

8. In an apparatus for loading coal in a mine chamber, the combination of a track extending towards the working face, a car adapted to be moved long said track to and from loading position, a conveyor adapted to receive the broken coal from points adjacent the working face and deliver it to points in proximity with the mine roof, a truck mounted upon said track independently of said conveyor, a conveyor mounted upon said

truck and having a forward horizontal section positioned in planes near the level of the track, an inclined elevated section, and a rear delivery section adapted to vertical adjustment in substantially horizontal planes adjacent the mine roof and adapted to extend above a car positioned in the rear of said truck upon said track, a hopper upon said truck surrounding the forward portion of said conveyor and having its sides extending to points adjacent the mine roof adapted to receive broken coal from the first mentioned conveyor and to accumulate a stationary mass of broken coal sufficient to fill said car, and means within the control of the operator to actuate said conveyor to transfer the coal of said stationary mass to said car.

9. In an apparatus for loading coal in a mine chamber, the combination of a single track extending towards the working face, a car adapted to be moved along said track to and from loading position, a conveyor adapted to receive the broken coal from points adjacent the working face and deliver it to points in proximity with the mine roof, a truck of short wheel base supported upon and adapted to travel along said track, a conveyor mounted upon said truck and having a horizontal section extending forwardly thereof and positioned in planes near the level of the track, an inclined elevating section, and a rear delivery section positioned in substantially horizontal planes adjacent the mine roof and adapted to extend above a car positioned in the rear of said track, a hopper surrounding the forward portion of said conveyor having its sides extending to points adjacent the mine roof adapted to receive the broken coal from said conveyor and to accumulate a stationary mass thereof sufficient to fill said car, said hopper being so disposed that its center of gravity will fall within the wheel base of said truck in all stages of loading, and means within the control of the operator to actuate said conveyor to transfer the coal of said stationary mass to said car.

10. In an apparatus for mining and loading coal in a mine chamber, the combination of a track extending towards the working face, a car adapted to be moved along said track to and from loading position, a continuously acting mechanism universally horizontally movable along the coal face for dislodging the coal from its bed, means permanently connected to and movable with said dislodging mechanism to receive and remove the dislodged coal from proximity with the coal face, a movable accumulator receptacle having a capacity sufficient to hold a stationary mass of broken coal as great as that of a car load, a support for said accumulator receptacle upon said track the said coal receiving and removing devices

having a delivery element supported independently of said accumulator and its track support and adjustable relative thereto, and optionally controlled devices for delivering the coal from said accumulator to said car.

11. In an apparatus for loading coal in a low roofed mine chamber having limited trackway facilities for bringing mine cars to and from loading position, the combination of a car movable along a trackway, a receptacle positioned between the working face of the mine and said car of a capacity to hold substantially sufficient coal to load said car, means to convey broken down coal from the working face to said receptacle, and independent optionally controlled means to transfer coal from said receptacle to said car.

12. In an apparatus for loading coal in a mine, a conveyor line, consisting of independently operable front and rear sections, adapted to gather coal adjacent the coal working face and deliver it near the mine roof at a distance from the coal working face, said rear section being intermittently operative and said front section being relatively continuously operative, and a receiver intermediate said sections adapted to accumulate coal delivered by the front section during the inoperative periods of said rear section and to be drawn upon by the latter during its operative periods.

13. In an apparatus for loading coal in a mine, a conveyor line, consisting of independently operable front and rear sections, adapted to gather coal adjacent the working face and deliver it to a mine car, said rear section being intermittently operative for permitting the removal of a loaded car and the replacement of an empty car, said front section being relatively continuously operative, and a receiver intermediate said sections adapted to accumulate the coal delivered by the front section during the inoperative periods of said rear section and to be drawn upon by the latter during its operative periods.

14. In an apparatus for loading coal in a mine, a conveyor line, consisting of independently operable front and rear sections, adapted to gather coal adjacent the working face and deliver it to a mine car, said rear section being intermittently operative for permitting the removal of a loaded car and the replacement of an empty car, said front section being relatively continuously operative, and a receiver having substantially the capacity of a mine car intermediate said sections adapted to accumulate the coal delivered by the front section during the inoperative periods of said rear section and to be drawn upon by the latter during its operative periods.

In testimony whereof, I affix my signature.
NILS D. LEVIN.