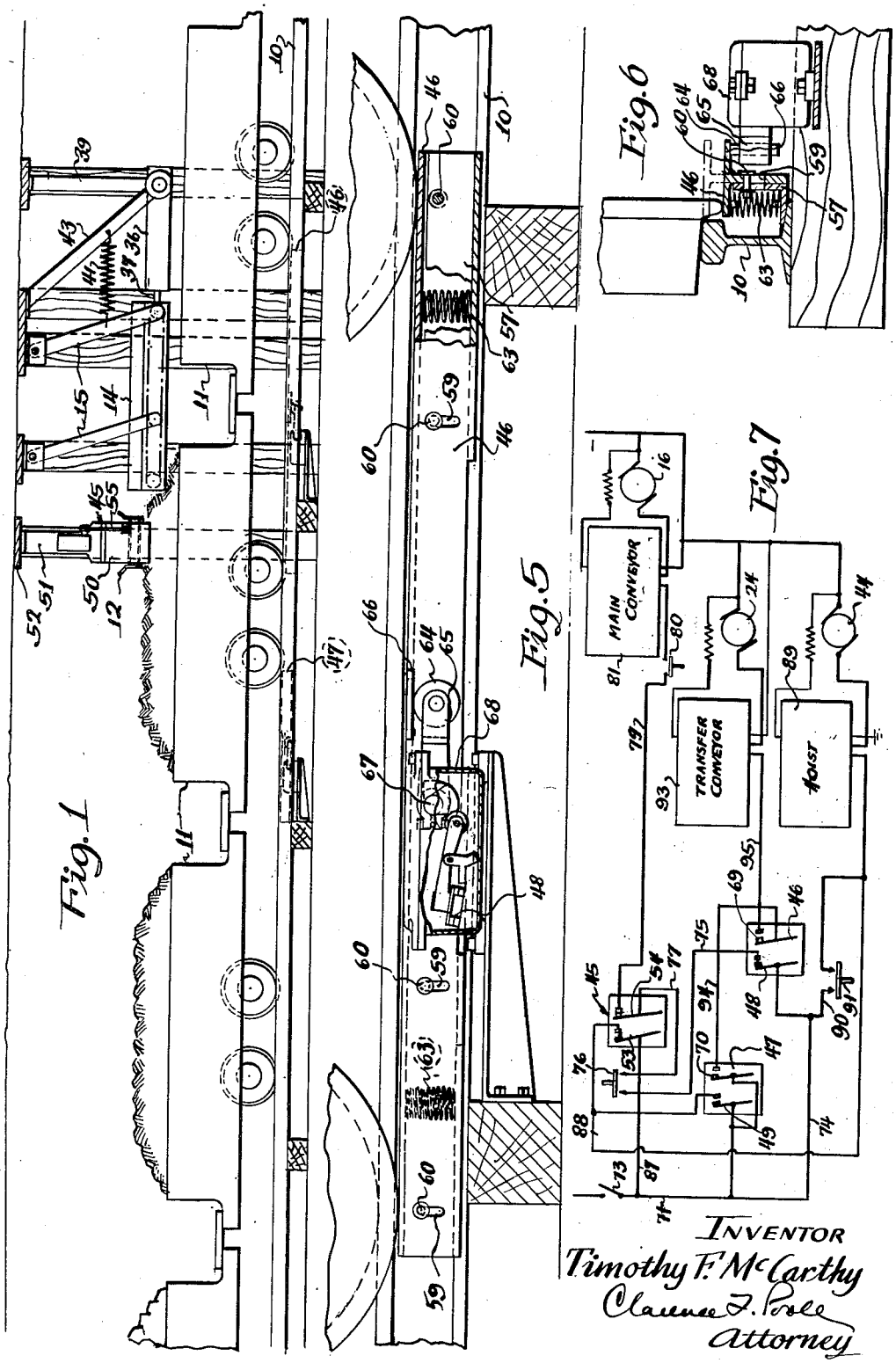
Nov. 17, 1953 T. F. McCARTHY 2,659,498

AUTOMATIC CAR LOADING STATION

Filed May 3, 1947 3 Sheets-Sheet 1



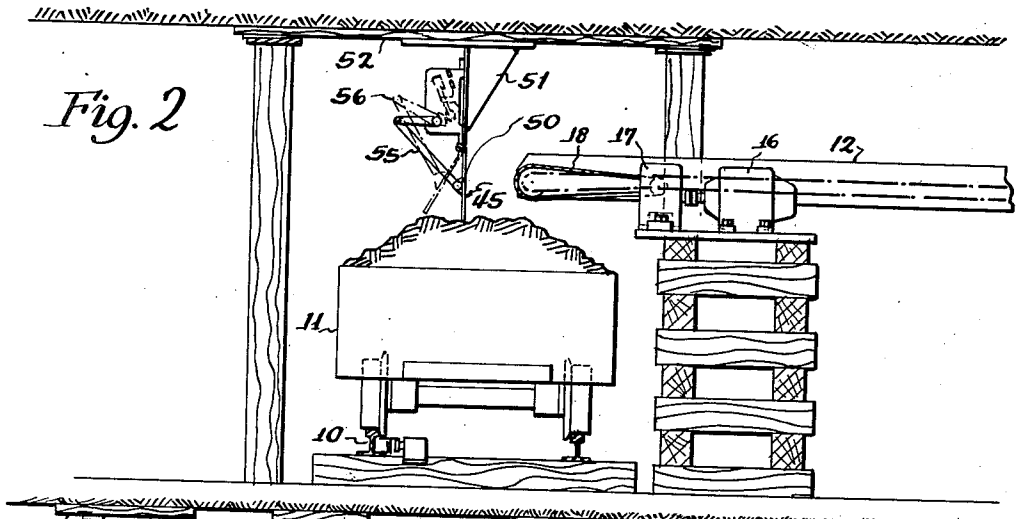
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AUTOMATIC CAR LOADING STATION

Filed May 3, 1947 3 Sheets-Sheet 2

Fig. 2



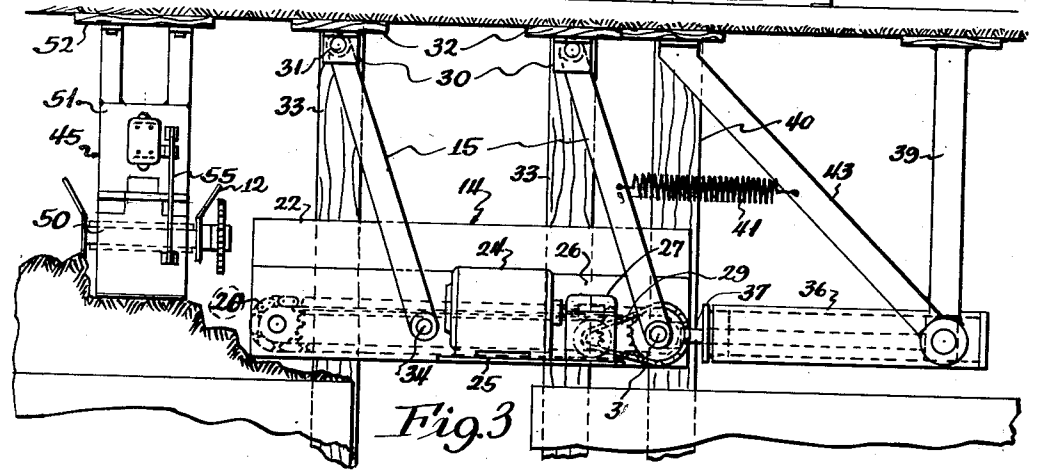


Fig. 3

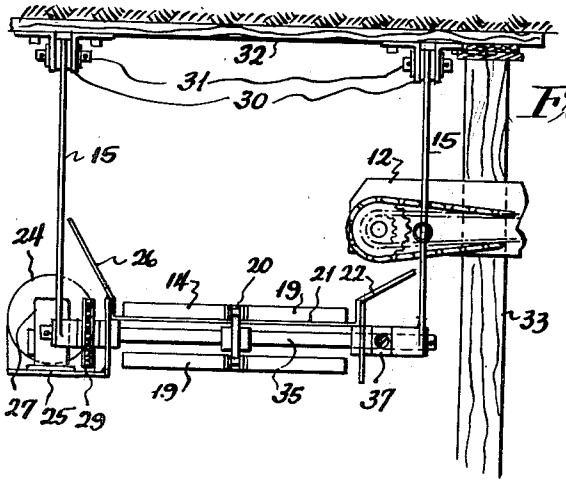


Fig. 4

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AUTOMATIC CAR LOADING STATION

Filed May 3, 1947 3 Sheets-Sheet 3

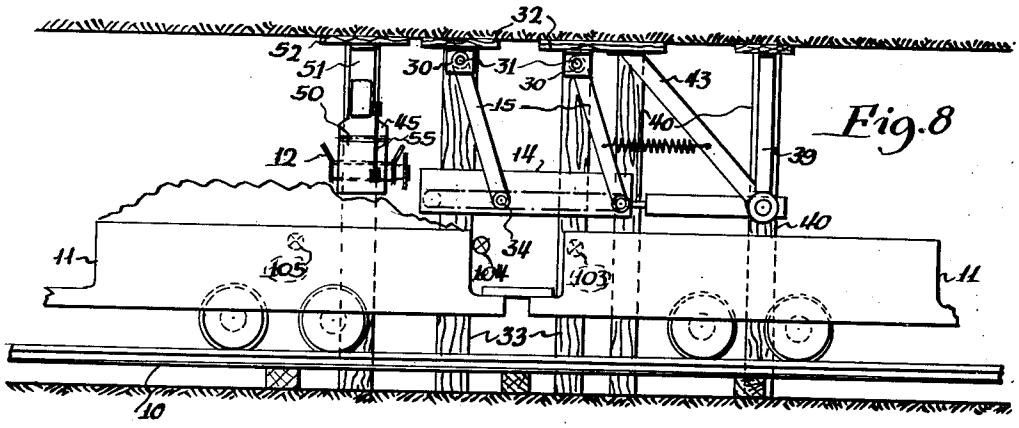


Fig. 8

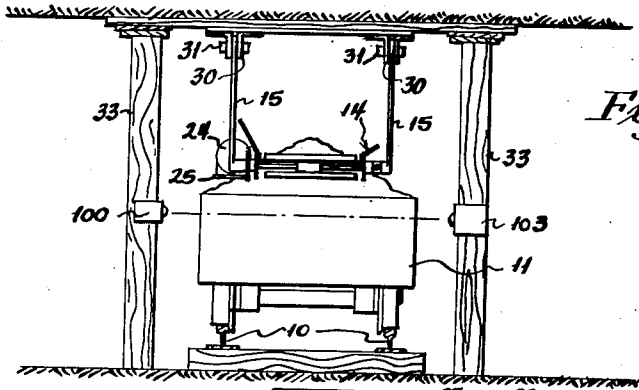


Fig. 9

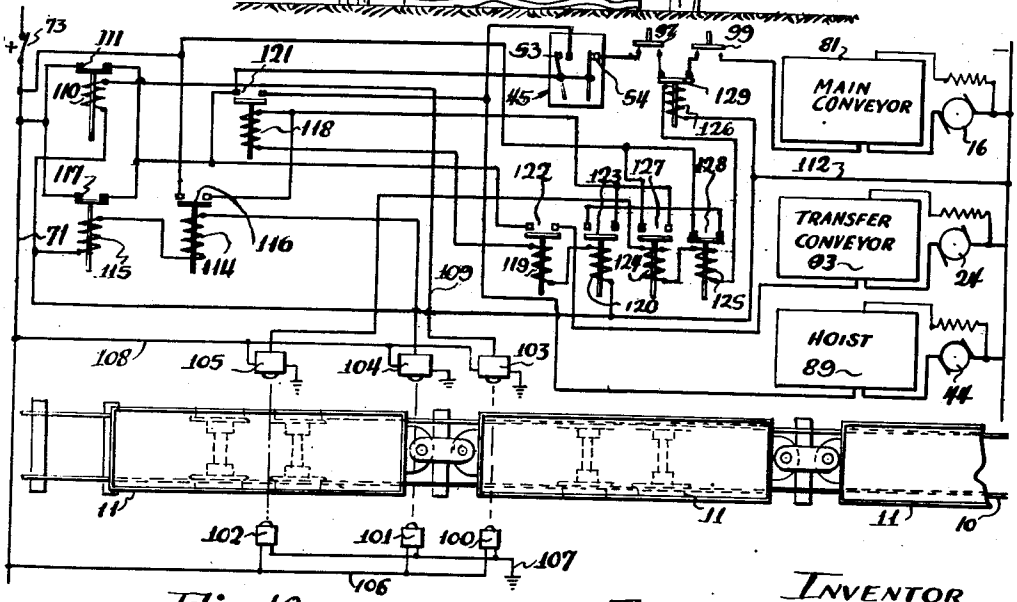


Fig. 10

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AUTOMATIC CAR LOADING STATION

Timothy F. McCarthy, Indiana, Pa.

Application May 3, 1947, Serial No. 745,755

14 Claims. (Cl. 214—42)

1

This invention relates to improvements in automatic car loading stations, and more particularly relates to an improved electrical control system for controlling the loading of a plurality of mine cars with loose material, such as coal, from a conveyor.

The principal objects of my invention are to provide a new and improved conveyor loading station, including an automatically operable electrical control means therefor of a novel form and arrangement which is operable by movement of the cars along the mine track and by the height of the coal on the cars, so as to uniformly load a trip of mine cars from a main line conveyor.

In carrying out my invention I provide a main line conveyor for loading a trip of mine cars as it travels along a mine track and provide a hoist for moving these cars along the track. I also provide switching or control devices operated by the cars as they move along the track, for starting the main line conveyor, when the cars are spotted beneath the discharge end of the conveyor, and further provide an electrical switching or control device operable by engagement with the coal in the cars as the coal reaches a predetermined height therein, for starting or stopping the hoist or causing the hoist to continue to operate until the car is fully loaded, and further control operation of said hoist and conveyor by said first mentioned control devices operated by the mine cars. I also provide a transfer conveyor extending in a direction parallel to the mine track, which is movable into position to receive coal discharged from the main line conveyor and convey it across the gaps between the cars into the next succeeding empty car, to avoid spillage of material in the gaps between the cars and to permit continuous loading of the train of cars without shutting down the main line conveyor, and I operate this transfer conveyor by the first mentioned control devices which are operated by the mine cars as they move along the track.

These and other objects of my invention will appear from time to time as the following specification proceeds and with reference to the accompanying drawings wherein:

Figure 1 is a view in side elevation of a train of mine cars traveling beneath the discharge end of a main line conveyor and illustrating a loading station constructed in accordance with my invention;

Figure 2 is a transverse sectional view showing the main line conveyor discharging into a mine

2

car and showing the position of the control means operable to cause the trip to progressively move along the track when the coal in the main line conveyor reaches a predetermined height;

Figure 3 is an enlarged view in side elevation showing certain details of the transfer conveyor for transferring material across the gap between adjacent cars, and also showing the control means operable to cause movement of the car when the coal therein reaches a predetermined height;

Figure 4 is an enlarged transverse sectional view showing the transfer conveyor in position to receive coal as it is discharged from the main line conveyor;

Figure 5 is an enlarged fragmentary view in side elevation looking towards the inside of one of the track rails with certain parts shown in substantially longitudinal section, and showing certain details of the control means operable by movement of the mine cars along the track;

Figure 6 is a fragmentary transverse sectional view drawn to substantially the same scale as Figure 5 and showing certain other details of the control means for the loading station not shown in Figure 5;

Figure 7 is a wiring diagram diagrammatically illustrating one form of the electric circuit for controlling operation of the loading station of my invention;

Figure 8 is a fragmentary view in side elevation somewhat similar to Figure 1, but showing the use of photoelectric relays for controlling certain operations of the loading station of my invention instead of control devices operated by the car wheels, as in Figures 1 to 7;

Figure 9 is a transverse sectional view showing the photoelectric relays in side elevation; and

Figure 10 is a wiring diagram diagrammatically illustrating the form of electric circuit for controlling operation of the loading station with photoelectric relays.

In Figure 1 of the drawings a track 10 is shown as extending along the entry of a mine and having a trip of mine cars 11, 11 movable therealong in material receiving relation with respect to a main line conveyor 12 which may extend from a mine room or entry. A transfer conveyor 14 extending parallel to the mine track is shown as being suspended from the mine roof on parallel links 15, 15 for movement into position beneath the discharge end of said main line conveyor, to convey material across the gap between adjacent cars, during movement of the trip along the track.

The main line conveyor 12 may be of any well known form and is herein shown as being driven by an electric motor 16, through a speed reducer 17 and a chain and sprocket drive 18. The showing of said conveyor is for illustrative purposes only and is no part of my present invention so need not be shown or described in detail.

The transfer conveyor 14 is herein shown as being a center strand flight conveyor including a plurality of parallel spaced flights 19, 19 connected to and extending laterally in opposite directions from an endless chain 20 movable along a pan 21 of a conveyor framework 22. Said chain and flights are driven from a motor 24 mounted on a plate 25 extending laterally from one side wall 26 of said conveyor framework, through a speed reducer 27 and a chain and sprocket drive indicated generally by reference character 29.

The parallel links 15, 15 suspending the transfer conveyor 14 from the mine roof are herein shown as being pivotally mounted adjacent their upper ends between the vertical legs of parallel spaced angles 30, 30 on pins 31, 31. Said angles are secured to and depend from cross beams 32, 32, held in engagement with the mine roof by means of props 33, 33. The lower ends of said links, closest to the main line conveyor 12, are pivotally mounted on the outer ends of a transverse shaft 34, mounted on and extending from opposite sides of the framework 22 of said transfer conveyor. The lower ends of the other pair of said links are pivotally mounted on the outer ends of a transverse shaft 35, which is herein shown as being driven from the motor 24, and as forming a drive shaft for driving said conveyor.

A cylinder 36 having a piston rod 37 extensible therefrom is selectively operable to move said transfer conveyor into material receiving relation with respect to the main line conveyor 12 for conveying material across the gap between adjacent ends of any two cars of the trip. As herein shown, said cylinder is trunnioned adjacent its head end between support frames 39, 39 depending from and held in engagement with the mine roof by means of props 40, 40. Said piston rod is pivotally connected at its free end to the transverse shaft 35 so that upon the admission of air or any other fluid to the head end of said cylinder, said transfer conveyor may be moved towards and into material receiving relation with respect to said main line conveyor in an obvious manner. A tension spring 41 is connected between one parallel link 15 and a brace 43 of said frame 39, for returning said piston rod within said cylinder and moving said transfer conveyor away from said discharge conveyor when fluid pressure is released from the head end of said cylinder.

A hoist (not shown) is provided to advance the cars 11, 11 along the track 10 as the loading of said cars progresses by winding in a flexible cable (not shown) attached to the outby end of the first car of the trip. Said hoist is driven by a motor generally indicated by reference character 44 and shown diagrammatically in Figures 7 and 10 of the drawings. Operation of said hoist is controlled automatically by the height of the coal in the mine car by means of a flapper switch 45 and by means of two depressible track bars 46 and 47 extending along the inside of one rail of the track 10 and adapted to be engaged by the flanges of the wheels of the cars as they pass thereby and operate switches 48 and 49 and close the contacts of said switches as the trip passes over said track bars, and to keep said contacts closed as long as the cars are passing along the track beneath the discharge end of said conveyor, as will hereinafter more clearly appear as this specification proceeds.

The flapper switch 45 includes a flapper plate 50 pivotally mounted on and depending from a support frame 51 secured to and depending from a cross beam 52 extending along the mine roof. Said flapper plate pivots about an axis extending longitudinally of the track and is adapted to be engaged by and moved outwardly by the coal loaded onto the car 11 by the conveyor 12, as said coal reaches a predetermined height. Outward movement of said plate a predetermined distance will close contacts 53 of said switch, to connect the hoist motor 44 in the main line circuit and cause said hoist to operate until said plate drops to a depending position, when it will open said contacts. Other contacts 54 of said switch are normally closed and are opened by said flapper plate when said flapper plate is moved outwardly a distance further than the distance necessary to close the contacts 53, to shut off the motor 16 which drives the conveyor 12, in cases of failure of the hoist when the conveyor continues to load while said car is in a stationary position on the track. Said switch and contacts may be of any well known form of commercial type, such as cam operated switch type HLA–3, illustrated in Bulletin 102HL of the Clark Controller Company, and are no part of my invention so are not herein shown or described. Said switch is herein shown as being operated by the flapper plate 50 by means of a link 55 pivotally connected to the side of said plate opposite from the conveyor 12 and having operative connection with a crank arm 56, secured to the cam shaft for operating said switch.

The track bar 46 is shown in Figures 5 and 6 as being constructed from an angle iron, a horizontal leg of which is engaged by the flange of a track wheel and the vertical leg of which abuts and is guided for vertical movement along the vertical leg of an angle iron 57 spaced inwardly from the track rail. Said angle iron 57 is herein shown as being secured at its horizontal leg to the inner lower flange of a rail of the track 10. Said track bar has a plurality of vertical longitudinally spaced slots 59, 59 formed in its vertical leg and guiding said track bar on pins 60, 60 secured to and projecting from the vertical leg of the angle 57. A plurality of compression springs 63, 63 are interposed between the horizontal legs of said angles to move said track bar vertically when the car wheels are out of engagement therewith, it being understood that the horizontal leg of said track bar extends towards the upper flange of the rail a distance sufficient so that its upper surface is engaged by the flange of the car wheel as it passes thereby, to depress said track bar.

The switch 48 is operated by the track bar 46 through a roller 64 on the outer end of a pivoted arm 65. Said roller is adapted to engage the under surface of a plate 66 secured to and projecting from the top portion of said track bar. Said arm 65 is secured to a transverse shaft 67 journaled in a casing 68 for said switch. Said casing forms an enclosure for said switch 48 and for another switch 69 associated therewith and operable with said switch 48. Said switches may be of a well known form of cam operated type switch such as the type HLA–3 switch illustrated in Bulletin 102HL of the Clark Controller Company, and are no part of my present invention so are not herein shown or described in detail.

The track bar 47 is vertically guided on the

inner side of a rail of the track 10 in the same manner as the track bar 46, but is shorter than said track bar 46. Said track bar 47 is provided to close switches 49 and 70 when the wheels of a mine car are in engagement therewith. Said switches 49 and 70 are similar to the switches 48 and 69 and control operation of the motor 44 for the hoist and the motor 24 for the transfer conveyor 14, as will hereinafter more clearly appear as this specification proceeds.

It should here be noted that the track bar 46 is of a length substantially equal to the distance between adjacent axles of two connected mine cars and that the distance between said track bars is substantially equal to the wheel base of said mine cars so that the two track bars 46 and 47 are in a depressed position as long as the train of cars moves along the rails and until the last car wheel moves out of engagement with said track bar 46. The length of the track bar 47 may be varied but should be short enough to stop the main line conveyor when the inby end of the last car of the trip clears the discharge end of the conveyor. The length of said track bars, of course, depends upon the size of cars used, it being understood that with the loading station of my invention herein disclosed all of the cars in the trip must be of the same wheelbase.

Referring now to Figure 7 showing the electrical circuit for controlling operation of the conveyors 12 and 14 and the hoist motor 44 by means of the flapper switch 45 and the track bars 46 and 47, a positive conductor 71 is connected with a source of power by a manually operated master switch 73. Said master switch is provided to shut down the entire conveyor system when desired. A conductor 74 connects the positive conductor 71 with the switch 48, which is operated by the track bar 46. When the track bar 46 is depressed by a wheel of the mine car, the contacts of said switch 48 will be closed and current will pass through said contacts to and through a conductor 75, a manually operated switch 76, and through the contacts 54 of the flapper switch 45, which contacts are normally closed. A conductor 79 and manually operated switch 80 connect said contacts 54 with a starter 81 for the conveyor motor 16. Said manually operated switches 76 and 80 may be located one at the heading and the other at the face, to permit the conveyor 12 to be manually stopped from the loading point or the face when it is desired to shut down the conveyor for any reason. Said contacts 54 of said flapper switch only open to stop said conveyor automatically when the conveyor 12 continues to operate after failure of the motor 44 driving the hoist, to prevent the spilling of coal over the sides of the car. The starter 81 for starting the conveyor motor 16 and the conveyor 12 may be of any well known form including a plurality of contactors or relays (not shown) arranged to automatically start said motor through a resistance (not shown) when power is applied to said starter to energize said relays, and to automatically cut said resistance from said motor 16 as said motor starts. Said starter is no part of my present invention so is not herein shown or described. Thus as soon as a car wheel engages and depresses the track bar 46, the switch 48 will close and the main conveyor 12 will start.

When the conveyor 12 has loaded the advance or outby end of the first car of the trip to a predetermined height, the coal loaded on said car will move the flapper plate 50 outwardly to close the contacts of the switch 53. This will connect a starter 89 for the hoist motor 44 in the main power circuit through a conductor 88, to start said hoist motor and hoist and advance the trip along the track 10. Said starter for said hoist motor may be of a form similar to the starter 81 and is no part of my present invention so is not herein shown or described in detail.

A conductor 90 is connected from the conductor 71 to the conductor 88 and has a manually operated switch 91 therein. Said switch is normally open and is provided to permit manual control of the hoist motor 44 when desired.

As the first car is advanced to a position where the coal in the car is below a predetermined height, the flapper plate 50 will drop to a depending position. The switch 53 will then open and the hoist motor 44 will stop until the coal in said car again reaches the required level, at which time said flapper plate will move outwardly and close said switch 53 and start the hoist motor 44, to again advance said car.

When the first car advances to a position where its front track wheels engage the track bar 47, the switches 49 and 70 will close. This will close a circuit from the conductor 71 through the contacts of the switch 49. Said contacts are connected with the conductor 88, to supply power to the hoist motor 44 to operate the hoist and advance the trip along the track when the flapper 50 is in a depending position and the switch 53 is open. The rate of travel of the trip may be such that the cars will normally be loaded to the required height as the trip continuously moves along the track, and when this is the case, after the first car is loaded the only purpose of said flapper switch will be to open the switch 54 and shut down the conveyor, in case of failure of the hoist motor 44, to avoid loading a stationary car too high and spilling coal over its sides.

The contacts of the switch 70 close with the switch 49 to connect a starter 93 for the transfer conveyor motor 24 to the main line conductor 71 through a conductor 94, the contacts of switch 69, which is closed by the track bar 46 engaged by the wheels of the next succeeding car of the trip, and a conductor 95 connecting said switch 69 to said starter, to start said transfer conveyor. The transfer conveyor 14, starting shortly before the first car is completely loaded, may be moved into material receiving relation with respect to the main conveyor 12 when said car is completely loaded, by the admission of fluid under pressure to the head end of the cylinder 36 under the control of the operator of the loading station. Said transfer conveyor may then convey the coal across the gap between the first two connected cars into the outby end of the next succeeding car. Said transfer conveyor may be held in this cuttings receiving position until the outby end of the next succeeding car is beneath the discharge end of said main line conveyor, at which time fluid under pressure may be released from said cylinder 36, to permit the spring 41 to move said transfer conveyor away from said main line conveyor to the position shown in Figure 1, so the car may be loaded directly by said main line conveyor.

The trip may thus be continuously loaded by moving the transfer conveyor 14 to convey material across the gap between adjacent cars, as each car is fully loaded. This may be repeated until the last car of the train of cars moves out of engagement with the track bar 46. At this time the contacts of the switches 48 and 69 will open. This will disconnect the starter 93 for the motor

24 from the main line circuit and stop said motor and transfer conveyor. Also opening of the contacts of the switch 68 will break the circuit to the starter 81 for the motor 16 to stop said main line conveyor. The wheels of said last car engaging the track bar 67, however, will keep the switches 69 and 70 closed, to continue operation of the hoist motor 44 until said car has been moved to a position beyond the outby end of said track bar, at which time said contacts 69 and 70 will open and stop said hoist motor 44. A mine locomotive may then pick up said trip and a new trip may be spotted with the outby end of the first car of the trip in material receiving relation with respect to said main line conveyor. In this position the track wheels of said first car of the trip will depress the track bar 66 to again start the loading operation of the next trip in the manner just described.

In Figures 8, 9 and 10 of the drawings, the track bars 46 and 47 and the switches operated thereby are replaced by three photoelectric relays including light sources 100, 101 and 102, projecting beams of light across the entry onto photoelectric cells 103, 104 and 105 respectively. Said light sources and cells are spaced suitable distances apart determined by the length of the cars 11, 11, so as to operate the hoist motor 44, main line conveyor 16, and transfer conveyor motor 24, in the proper sequence. In this form of my invention the flapper switch 45 controls the loading of the cars in the same manner as in the disclosure of my invention shown in Figures 1 to 7 inclusive, and the same motors, conveyors, hoist and starters are used, so the same part numbers will be applied to the parts that are the same as in Figures 1 to 7 inclusive.

In Figure 10 the master switch 73 connects the positive conductor 71 to the main line circuit, to permit the entire system to be shut down when desired. Manually operated switches 97 and 99 are connected in the power line to the starter 81, to permit the main conveyor to be shut off manually from the working face or the heading when desired. The light sources 100, 101 and 102 are connected to the conductor 71 through a branch conductor 106 and are connected to ground through a conductor 107.

When a light beam is established on the photoelectric cell 103 by the light source 100, current will flow from the positive conductor 71 through a conductor 108, photoelectric cell 103, conductor 109 and a coil 110 of a relay 111 to ground through a return conductor 112. This will energize said coil and open said relay, it being understood that said relay is normally closed and is provided to connect the switches and relays for controlling operation of the motors 16, 24 and 44 in the main line circuit when the light beam projected by the light source 100 is broken by a car of the trip, as will hereinafter more clearly appear as this specification proceeds.

When a light beam is established on the photoelectric cell 104 by the light scurce 101, current from the positive conductors 71 and 108 will flow through said photoelectric cell and through coils 114 and 115 of relays 116 and 117 respectively, and to ground through the return line 112. This will energize said coils and close relay 116 and open relay 117. Closing of relay 116 will connect coils 118, 119 and 120 and relays 121, 122 and 123 in the power circuit to energize said coils and close said relays. Closing of relay 121 will connect the starter 89 for the hoist motor 44 in the circuit to start said motor and hoist, and closing of relay 122 will connect the starter 93 for the transfer conveyor motor 24 in the circuit and start said motor and transfer conveyor. When the relay 117 is open the beam will be broken to the cell 103 by the next succeeding car of the trip, which will permit relay 111 to close and retain the starter 81 and motor 16 in the circuit. Relay 123 is a lock-in relay and coil 120 serves to lock in the contacts thereof.

When the outby end of the car 11 interrupts the beam projected on the cell 104, coils 114 and 115 of contactors 116 and 117, respectively, will be deenergized and relay 117 will close and relay 116 will open. The hoist motor 44, however, will continue to operate because hold-in relay 123 is closed and by-passes the current through a parallel circuit formed by a relay 128 which is normally closed.

Relay 117 is in parallel with relay 111 and when both of said relays are open, the hoist, transfer conveyor, and main line conveyor are disconnected from the main power line and stop. Said relay 117 is provided so that when the last car of the trip is loaded and moves to a position to establish a light beam to the cells 104 and 105 at the same time, the entire system will be shut down.

When a light beam is established on the photoelectric cell 105, current will flow from the positive line 71 through said photoelectric cell 105, to and through coils 124, 125 and 126 of relays 127, 128 and 129, respectively, to ground through the negative conductor 112. This will energize said coils and close the relay 127 and open the relays 128 and 129 in a delayed time interval. When time delay relay 123 opens, the hoist will continue to run because current flows through the parallel circuit established by the closing of the relay 127. Closing of relay 127 will energize coils 118, 119 and 120 of relays 121, 122 and 123, respectively, to close said relays and continue operation of the hoist motor 44 through the relay 121. Relay 129 is also a time delay relay and is normally closed and opens in a delayed time interval after the light beam to the cell 105 is established. Said relay serves to prevent starting of the main line conveyor until the first car of the trip is in material receiving relation with respect to said conveyor and the light beam to said cell 105 is broken. Opening of said relay is delayed for a time interval sufficient to prevent stopping of the main line conveyor, when a light beam is established to the cell 105 at the gaps between the cars as they pass thereby.

In operation of the loading station by the photoelectric cells 103, 104 and 105, the first car of the trip may be spotted, preferably by a mine locomotive, beneath the discharge end of the conveyor 12 in position to interrupt the light beams projected by all three light sources 100, 101 and 102. The relays 111 and 129 are normally closed when the light beams to their respective cells are interrupted and will connect the starter 81 for the main conveyor motor 16 with the positive line 71 through the contacts 54 of the flapper switch 45, to start said main line conveyor and load the outby end of the first car of the trip. As the outby end of the car is loaded to the desired height, the contacts 53 of flapper switch 45 will then be closed by outward and upward pivotal movement of the flapper plate 50 effected by engagement with the coal loaded in said car, as has been previously

described. The hoist motor 44 will then start and the cars will move along the track until a point may be reached during loading of the first car when the flapper plate 50 will drop and open the contacts 53 to stop operation of said hoist motor 44 until the level of the coal in said car again reaches the desired height.

As said first car progresses along the track to a position where its inby end clears the source of light 101, a light beam will be established to the photoelectric cell 105. This will energize the coils 114 and 115 of relays 116 and 117 and close the relay 116 and open the relay 117. At this time the light beam from the light source 100 to the photoelectric cell 103, will be broken by the outby end of the second car of the trip and the relay 111 will close to connect the contacts 54 of the flapper switch 45 with the positive line 71 and cause the conveyor 12 to continue to operate. The coils 118, 119 and 120 of the relays 121, 122 and 123 will be energized upon closing of the relay 117 and the starter 89 for the hoist motor 44 will be connected in the main power circuit through the relay 121, to cause said hoist to continue to operate when the contacts 53 of the flapper switch 45 are opened by dropping of the flapper plate 50. At the same time the relay 122 will close a circuit to the starter 93 for the transfer conveyor motor 24 to start the transfer conveyor 14. Said transfer conveyor may then be moved beneath the discharge end of said main line conveyor by the cylinder 36 and piston 37, to convey the coal across the gap between adjacent ends of the cars until the outby end of the next adjacent car of the trip is in material receiving relation with respect to the conveyor 12. Fluid may then be released from the cylinder 36 to permit the spring 41 to move said transfer conveyor away from the main line conveyor. The light beams projected by the light sources 100, 101 and 102 will then be broken and loading of the second car of the trip will be controlled by the flapper switch 45 in the same manner as the first car.

As the last car of the trip is being loaded and passes the light source 100 to establish a beam to the photoelectric cell 103, the relay 111 will open. As loading of said car progresses further, a light beam will be established to the photoelectric cell 104 to open the relay 117 and close the relay 116. This will disconnect the starters for the motors 16, 24 and 44 from the main power line 71. Movement of said car beyond the photoelectric cell 105 will establish a light beam to said cell and open the relay 123. The relays will then be reset for another change of cars and the conveyor 12 will start to discharge into the first car of the trip as soon as the light beam established on the photoelectric cell 105 is broken.

While I have herein shown and described one form in which may invention may be embodied, it will be understood that the construction thereof and the arrangement of the various parts may be altered without departing from the spirit and scope thereof. Furthermore, I do not wish to be construed as limiting my invention to the specific embodiment illustrated, excepting as it may be limited in the appended claims.

I claim as my invention:

1. In an automatic loading station for loading a trip of mine cars with loose material such as coal, a main line conveyor supported in discharge relation with respect to a trip of cars movable along a mine track, a motor for driving said conveyor, a hoist for progressively moving the trip of cars beneath the discharge end of said main line conveyor, a motor for driving said hoist, a main power line, electric switching means operable by the first car of a trip of cars when said first car is spotted in material receiving relation with respect to said main line conveyor, for connecting said motor for said main line conveyor in said power line, to start said conveyor, and a flapper plate disposed adjacent the discharge end of said conveyor and depending from the mine roof, said flapper plate having a switching means associated therewith having first contacts normally open and second contacts normally closed, and being movable about an axis extending longitudinally of the mine car by the coal discharged on said car as it reaches a predetermined height, to close said first contacts and connect said hoist motor in said power line to start said hoist and cause said car to move along said track, to completely load said car to substantially the same level for its entire length, said flapper plate also being operable to open said second contacts and stop said main line conveyor when the level of coal in said car exceeds said predetermined height.

2. In an automatic loading station for loading a trip of mine cars with loose material such as coal, a main line conveyor supported in cascade relation with respect to a trip of cars movable along a mine track, a motor for driving said conveyor, a hoist for progressively moving the trip of cars beneath the discharge end of said main line conveyor, a motor for driving said hoist, a main power line, electric switching means operable by the first car of a trip of cars when said first car is spotted in material receiving relation with respect to said main line conveyor including a depressible track bar of a length substantially equal to the distance between adjacent wheels of two coupled cars of the trip of cars, for connecting said motor for said main line conveyor in said power line, to start said conveyor, and electric switching means operable when the coal in the car being loaded reaches a predetermined level adjacent the discharge point of said conveyor, for connecting said hoist motor in said power line, to start said hoist and cause said car to move along said track, to completely load said car to substantially the same level for its entire length, and other electric switching means operable by said first car upon movement of said car beyond a predetermined point including another depressible track bar spaced from said first track bar in the direction of travel of the trip of cars along the track a distance substantially equal to the wheel base of the cars of the trip of cars, for connecting said hoist motor in said main line circuit to continue operation of said hoist after said first car has passed beyond said first named switching means operable by the coal loaded in the car and said first named switching means has moved to an open position.

3. In an automatic loading station for loading a trip of mine cars with loose material such as coal, a main line conveyor supported in cascade relation with respect to a trip of cars movable along a mine track, a motor for driving said conveyor, a hoist for progressively moving the trip of cars beneath the discharge end of said main line conveyor, a motor for driving said hoist, a main power line, electric switching means operable by the first car of a trip of cars when said first car is spotted in material receiving relation with respect to said main line conveyor, for connecting said motor for said main line conveyor in said power line, to start said conveyor including a depressible track bar on the up track side

of said conveyor and terminating adjacent said conveyor and electric switching means operable by the coal loaded in the car when the coal reaches a predetermined level adjacent the discharge point of said conveyor, for connecting said motor for driving said hoist in said power line, to start said hoist and move said car along said track and completely load said car to substantially the same level for its entire length, other electric switching means operable by said first car upon movement of said car beyond a predetermined point including a second depressible track bar spaced from said first track bar on the down track side of the said conveyor a distance substantially equal to the wheel base of the mine cars of the trip of cars, for connecting said hoist motor in said main line circuit to continue operation of said hoist after said loaded car has passed beyond said second named switching means operable by the coal loaded in the car and said second named switching means has moved to an open position, and other electric switching means associated with said second named switching means operable by the coal loaded in the car, said last mentioned switching means being operable by the coal loaded in the car to disconnect said motor for said conveyor from said main power line when the level of coal in the car being loaded exceeds said predetermined level.

4. In an automatic loading station for loading a trip of mine cars with loose material such as coal, a main line conveyor supported in cascade relation with respect to a trip of cars movable along a mine track, a transfer conveyor extending in the direction of travel of the trip, manually controllable means for moving said transfer conveyor into material receiving relation with respect to said main line conveyor, to transfer the coal across the gaps between adjacent ends of the cars, a hoist for moving the trip along the track beneath the discharge end of said main line conveyor, a separate motor for driving each of said conveyors and said hoist, a main power line, and electric switching means for connecting said motors in said main power line to start and stop said conveyors and hoist in a predetermined order, said switching means including an electric switch operable by the first car of the trip when said first car is spotted in material receiving relation with respect to said main line conveyor, to connect said motor for said main line conveyor in said power line and start said conveyor, an electric switch operated by the coal discharged by said main line conveyor, to close its contacts when the level of the coal in the car being loaded reaches a predetermined height, to connect said motor for said hoist in said main power line and start said hoist and cause said hoist to move said cars along said track, to fully load each car to substantially the same level, and another switching means operated by movement of said cars along the track to connect said motor for said transfer conveyor to said main power line and start said transfer conveyor to transfer coal discharged by said main line conveyor over the gaps between adjacent ends of the cars, when said transfer conveyor is moved into material receiving relation with respect to said main line conveyor, said last mentioned switching means having contacts operable to cause said hoist to continue to operate after the loaded car has moved beyond said switching means operated by the coal loaded on the cars.

5. In an automatic loading station for loading a trip of mine cars with loose material such as coal, a main line conveyor supported in cascade relation with respect to a trip of cars movable along a mine track, a transfer conveyor extending in the direction of travel of the trip, manually controllable means for moving said transfer conveyor into material receiving relation with respect to said main line conveyor, to transfer the coal across the gaps between adjacent ends of the cars, a hoist for moving the trip along the track beneath the discharge end of said conveyor, a separate motor for driving each of said conveyors and said hoist, a main power line, and electric switching means for connecting said motors in said main power line to start and stop said conveyors and hoist in a predetermined order, said switching means including an electric switch operable by the first car of the trip, when said first car is spotted in material receiving relation with respect to said main line conveyor, to connect said motor for said main line conveyor in said main power line and start said conveyor, an electric switch operated by the coal discharged by said main line conveyor, to close its contacts when the level of the coal in the car being loaded reaches a predetermined height, to connect said hoist motor in said main power line, to start said hoist and cause said hoist to move said cars along said track, to fully load each car to substantially the same level, and another switching means operated by movement of said cars along the track to connect said motor for said transfer conveyor to said main power line and start said transfer conveyor to transfer coal discharged by said main line conveyor over the gaps between adjacent ends of the cars, when said transfer conveyor is moved into material receiving relation with respect to said main line conveyor, said last mentioned switching means having contacts operable to cause said hoist to continue to operate after the loaded car has moved beyond said switching means operated by the coal loaded on the cars, and another electric switch associated with said switch operated by the coal loaded on the cars, for stopping said main line conveyor when the coal discharged thereon exceeds said predetermined level.

6. In an automatic loading station for loading a trip of mine cars with loose material such as coal, a main line conveyor supported in cascade relation with respect to a trip of cars movable along a mine track, a motor for driving said conveyor, a hoist for progressively moving the trip of cars beneath the discharge end of said main line conveyor, a motor for driving said hoist, a main power line, a bar extending along a rail of the track and guided for vertical movement with respect thereto, said bar being adapted to be engaged and depressed by a wheel of a car, as the car passes thereby and being of a length substantially equal to the distance between the adjacent wheels of two connected cars of the trip of cars and terminating adjacent said main line conveyor, a switch adapted to be operated by depression of said bar and connect said main line conveyor in said power line and start said conveyor as a car engages said bar, a depending plate disposed adjacent the discharge end of said conveyor and pivotally moved by the coal discharged thereby when the coal in the car being loaded reaches a predetermined height, an electric switch, an operative connection between said plate and said switch, to close said switch and connect said motor for said hoist in said main line circuit, to start said hoist and move said car along the track when the coal loaded therein reaches a predeter-

mined height, and another bar spaced in advance of said first mentioned bar a distance substantially equal to the wheel base of the cars of the trip of cars and extending along a rail of the track and guided for vertical movement with respect thereto, said bar being adapted to be engaged and depressed by a wheel of a car, as the car passes thereby, a switch adapted to be operated by depression of said bar and connect said motor for said hoist in said main line circuit to continue operation of said hoist when said plate drops to a position to open its associated switch, to cause said hoist to move said next succeeding car into material receiving relation with respect to said main line conveyor.

7. In an automatic loading station for loading a trip of mine cars with loose material such as coal, a main line conveyor supported in cascade relation with respect to a trip of cars movable along a mine track, a transfer conveyor extending in the direction of travel of the mine cars, manually controllable means for moving said transfer conveyor into material receiving relation with respect to said main line conveyor to transfer the coal across the gaps between adjacent ends of the cars, a hoist for advancing the trip beneath the discharge end of said main line conveyor, a separate motor for driving each of said conveyors and said hoist, a main power line, a bar extending parallel to a rail of the track and guided for vertical movement with respect thereto, said bar being depressible by a wheel of a car as said car passes thereby, a switch operatively connected with said bar and operated by depression of said bar, to connect said motor for said main line conveyor in said power line and start said conveyor, a depending pivoted plate disposed adjacent the discharge end of said main line conveyor and pivotally moved by the coal discharged thereby when the coal in the car being loaded reaches a predetermined height, an electric switch, an operative connection between said plate and said switch to close said switch and connect said motor for said hoist in said main line circuit, and start said hoist and cause said hoist to advance said car beneath said main line conveyor, and another bar extending parallel to a rail of the track and guided for vertical movement with respect thereto, said bar being spaced in advance of said first mentioned bar and being depressible by a wheel of a car as said car passes thereby, switching means operatively connected with said bar and operated to connect said motors for said transfer conveyor and said hoist in said main line circuit upon depression of said bar by a car wheel, to start said transfer conveyor and continue operation of said hoist when the end of a car passes beyond said pivoted plate.

8. In an automatic loading station for loading a trip of mine cars with loose material such as coal, a main line conveyor supported in cascade relation with respect to a trip of cars movable along a mine track, a transfer conveyor extending in the direction of travel of the mine cars, manually controllable means for moving said transfer conveyor into material receiving relation with respect to said main line conveyor to transfer the coal across the gaps between adjacent ends of the cars, a hoist for advancing the trip beneath the discharge end of said main line conveyor, a separate motor for driving each of said conveyors and said hoist, a main power line, a bar extending parallel to a rail of the track and guided for vertical movement with respect thereto, said bar being depressible by a wheel of a car as said car passes thereby, a switch operatively connected with said bar and operated by depression of said bar, to connect said motor for said main line conveyor in said power line and start said conveyor, a depending pivoted plate disposed adjacent the discharge end of said main line conveyor and pivotally moved by the coal discharged thereby when the coal in the car being loaded reaches a predetermined height, an electric switch, an operative connection between said plate and said switch to close said switch upon upward pivotal movement of said plate, and connect said motor for said hoist in said main line circuit, to start said hoist and cause said hoist to advance said car beneath said main line conveyor, and another bar extending parallel to a rail of the track and guided for vertical movement with respect thereto, said bar being spaced in advance of said first mentioned bar and being depressible by a wheel of a car as said car passes thereby, switching means operatively connected with said bar and operated to connect said motors for said transfer conveyor and said hoist in said main line circuit upon depression of said bar by a car wheel, to start said transfer conveyor and continue operation of said hoist when the end of a car passes beyond said pivoted plate, and another switch operatively connected with said plate and movable to disconnect said drive motor for said main line conveyor from said power line when the coal discharged onto the car exceeds a predetermined height.

9. In an automatic loading station for loading a trip of mine cars with loose material such as coal, a main line conveyor supported in discharge relation with respect to a trip of cars movable along a mine track, a transfer conveyor extending in the direction of travel of the mine cars, manually operable means for moving said transfer conveyor into material receiving relation with respect to said main line conveyor to cause said transfer conveyor to transfer the coal across the gaps between adjacent ends of the cars, a hoist for advancing the trip beneath the discharge end of said conveyor, a separate motor for driving each of said conveyors and said hoist, a main power line, a photoelectric relay including a light source on one side of the mine track adapted to establish a light beam on a photoelectric cell on the opposite side of the track and disconnect said main line conveyor from said main power line when said beam is established and connect said conveyor motor with said power line when said beam is broken, to start said conveyor, a depending pivoted plate disposed adjacent the discharge end of said main line conveyor and moved upwardly by the coal discharged onto the car, when the coal reaches a predetermined height, an electric switch operatively connected with said plate and closed upon upward movement of said plate effected by the height of the coal discharged onto the car being loaded, to connect said hoist motor in said main power line, to start said motor and hoist and cause the car being loaded to advance beneath said conveyor, and another photoelectric relay including a light source adapted to establish a beam on a photoelectric cell on the opposite side of the track from said light source and connect said motors for driving said transfer conveyor and said hoist with said main power line to start said transfer conveyor and continue operation of said hoist when said plate has dropped to a position to open its associated switch.

10. In an automobile loading station for loading a trip of mine cars with loose material such

as coal, a main line conveyor supported in cascade relationship with respect to a trip of cars movable along a mine track, a transfer conveyor extending in the direction of travel of the trip and movable into material receiving relation with respect to said main line conveyor, a hoist for moving said trip of cars, a switch operable in accordance with the height of the coal loaded into said cars by said main conveyor for controlling said hoist to move said cars for loading coal to a uniform height therein, other switching means spaced in advance of said main line conveyor and operable by engagement with the advance wheels of the car being loaded, for operating said transfer conveyor, and means selectively operable for moving said transfer conveyor into position to receive the discharge from said main line conveyor.

11. In an automobile loading station for loading a trip of mine cars with loose material such as coal, a main line conveyor supported in cascade relationship with respect to a trip of cars movable along a mine track, a transfer conveyor extending in the direction of travel of the trip and movable into and out of material receiving relation with respect to said main line conveyor, a hoist for moving said trip of cars, a switch operable in accordance with the height of the coal loaded into said cars by said main conveyor for controlling said hoist to move said cars for loading coal to a uniform height therein, and switch means controlled by movement of the car being loaded along its track and connected to continue operation of said hoist and move an associated car beyond the end of said main line conveyor and to operate said transfer conveyor to transfer coal discharged by said main line conveyor over the gaps between adjacent ends of cars.

12. In an automatic loading station for loading a trip of mine cars with loose material such as coal, a main line conveyor supported in cascade relationship with respect to a trip of cars movable along a mine track, a transfer conveyor extending in the direction of travel of the trip and mounted for movement into and out of material receiving relation with respect to said main line conveyor, a hoist for moving said trip of cars, a switch operable in accordance with the height of the coal loaded into said cars by said main conveyor for controlling said hoist to move said cars for loading coal to a uniform height therein, switching means operable by movement of the car being loaded along the track for continuing operation of said hoist and operating said transfer conveyor, and means selectively operable for moving said transfer conveyor into position to receive the discharge from said main line conveyor.

13. In an automatic loading station for loading a trip of mine cars with loose material such as coal having a main line conveyor supported in material discharge relation with respect to a trip of cars movable along a track, a motor for driving said conveyor, a hoist for moving said trip of cars, a motor driving said hoist, a movable transfer conveyor mounted for movement into material receiving relation with respect to said main line conveyor, a motor driving said transfer conveyor, means selectively operable to move said transfer conveyor into material receiving relation with respect to said main line conveyor, and switching means operated by movement of the cars along the track connected to energize said hoist motor to progress the cars along the track including two depressible track bars, one on the up track side of said main line conveyor and terminating adjacent said main line conveyor, and the other spaced from said one track bar on the down track side of said conveyor a distance equal to the wheel base of the cars and operable to maintain said hoist motor energized as the car being loaded passes beyond the discharge end of said main line conveyor and to energize said transfer conveyor motor to drive said conveyor to transfer material across the gap between adjacent cars.

14. In a mine car loading system including a car track, a loading boom having its discharge end above said track at a car loading station, and a car hoist for moving cars along said track, automatic load control means for cars supported on said track comprising a load feeler plate operatively suspended at a location above and spaced outwardly of the discharge end of said loading boom for movement by car loading material as the portion of the car beneath said loading boom is filled to the top thereof, means operated by movement of said feeler plate to control said hoist to move the car relative to the loading boom as the car is filled, a first car wheel operated tread plate at said loading station, means operated by said first tread plate to maintain said loading boom in operation while the wheels of a car being loaded are on said tread plate and to discontinue such operation when the car wheels pass from said first tread plate, a second tread plate at the loaded car side of said loading station engaged by the wheels of a loaded car as the loaded car wheels leave said first tread plate, and means operated by said second tread plate to operate said hoist to move a fully loaded car from beneath said boom and place a succeeding empty car therebeneath, and a safety device supported adjacent said feeler plate and operated thereby to discontinue operation of said loading boom if the feeler plate is moved by car loading material beyond a predetermined extent.

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