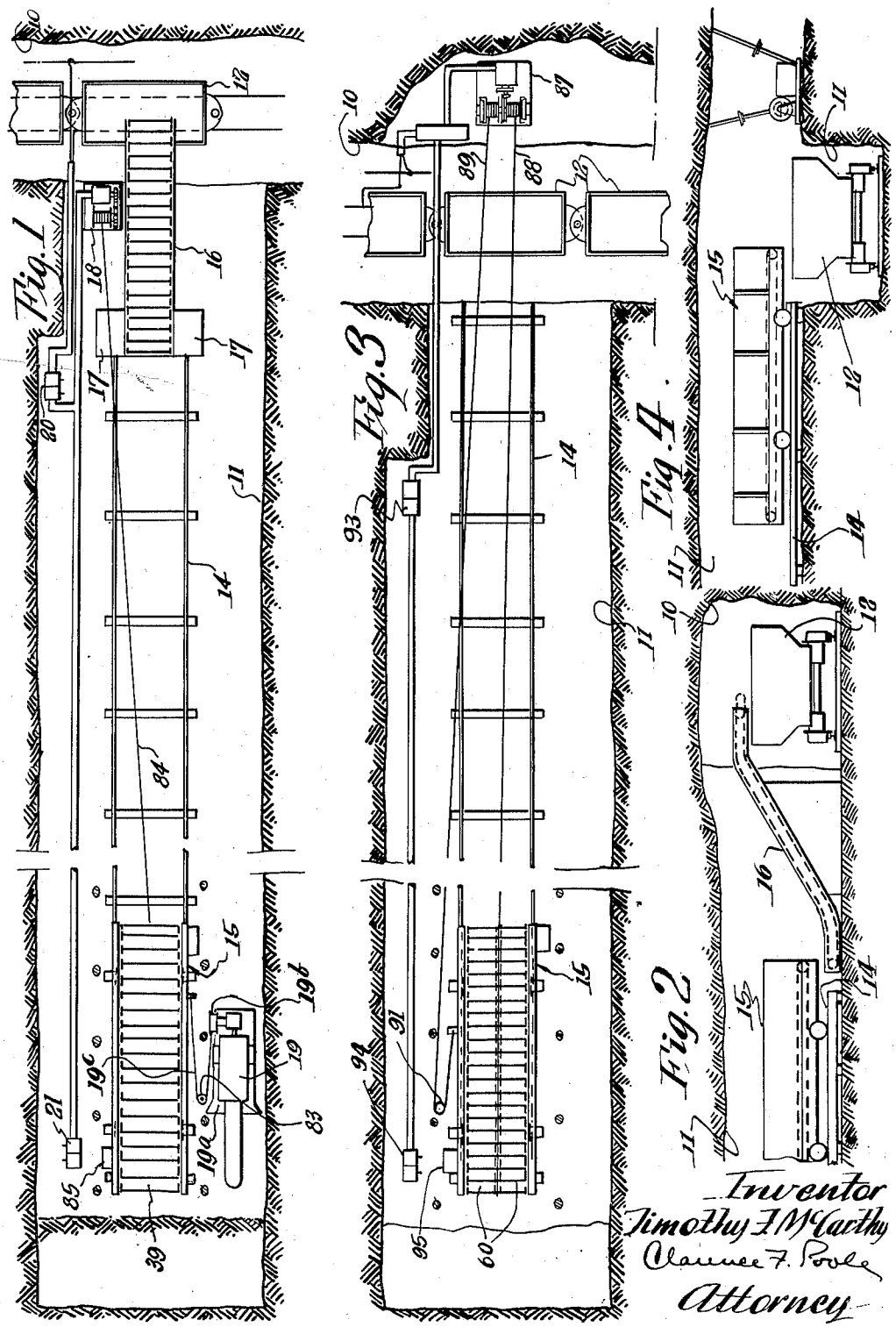
Jan. 10, 1939. T. F. McCARTHY 2,143,522

METHOD OF MINING AND APPARATUS THEREFOR

Filed March 17, 1937 3 Sheets-Sheet 1



Jan. 10, 1939. T. F. McCARTHY 2,143,522

METHOD OF MINING AND APPARATUS THEREFOR

Filed March 17, 1937 3 Sheets-Sheet 2

Fig. 5

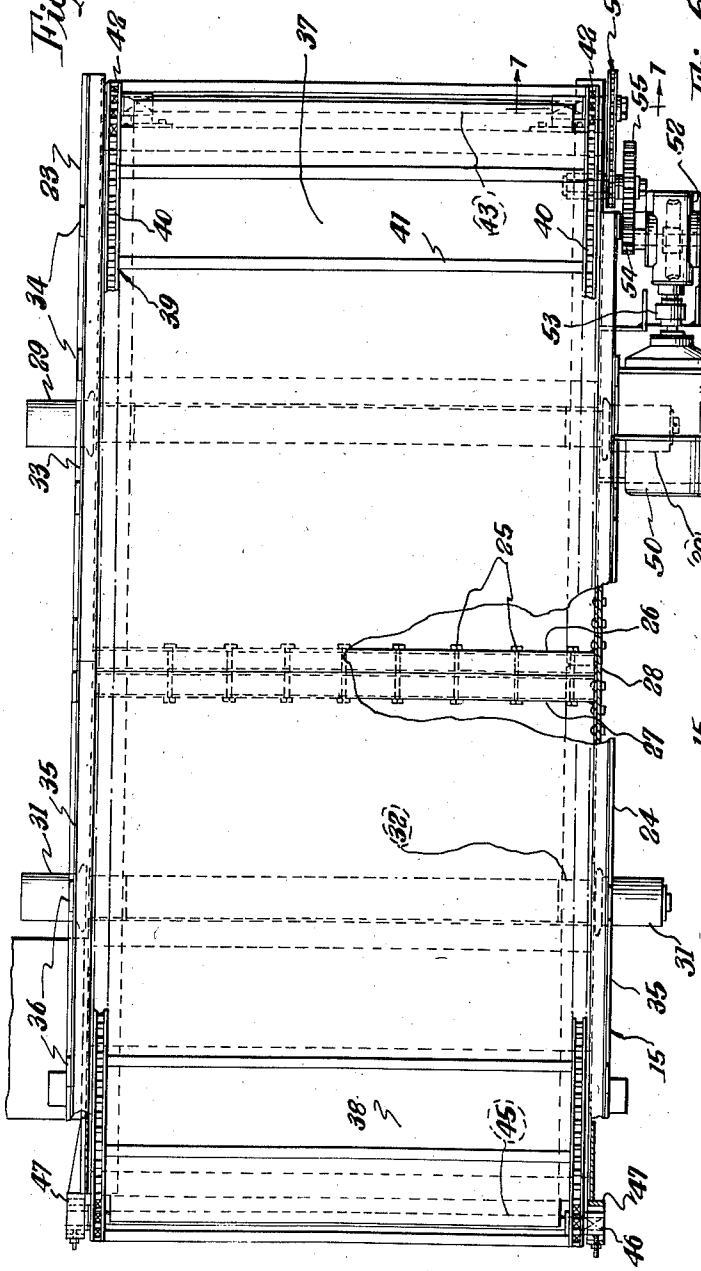


Fig. 6

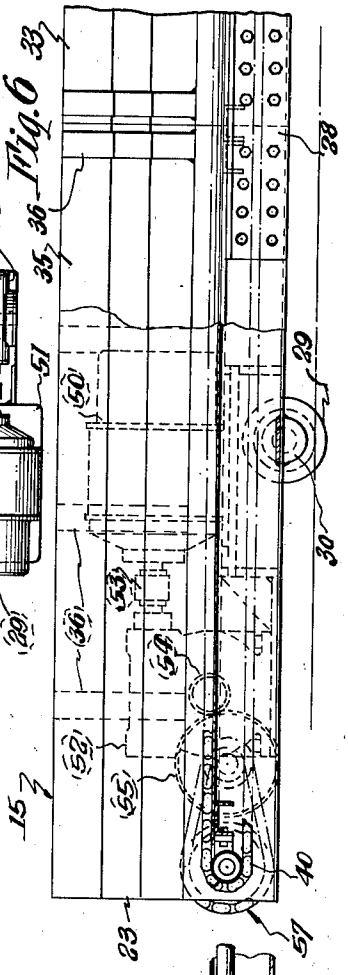
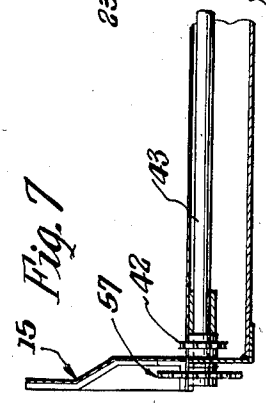


Fig. 7



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METHOD OF MINING AND APPARATUS THEREFOR

Filed March 17, 1937 3 Sheets-Sheet 3

Fig. 8

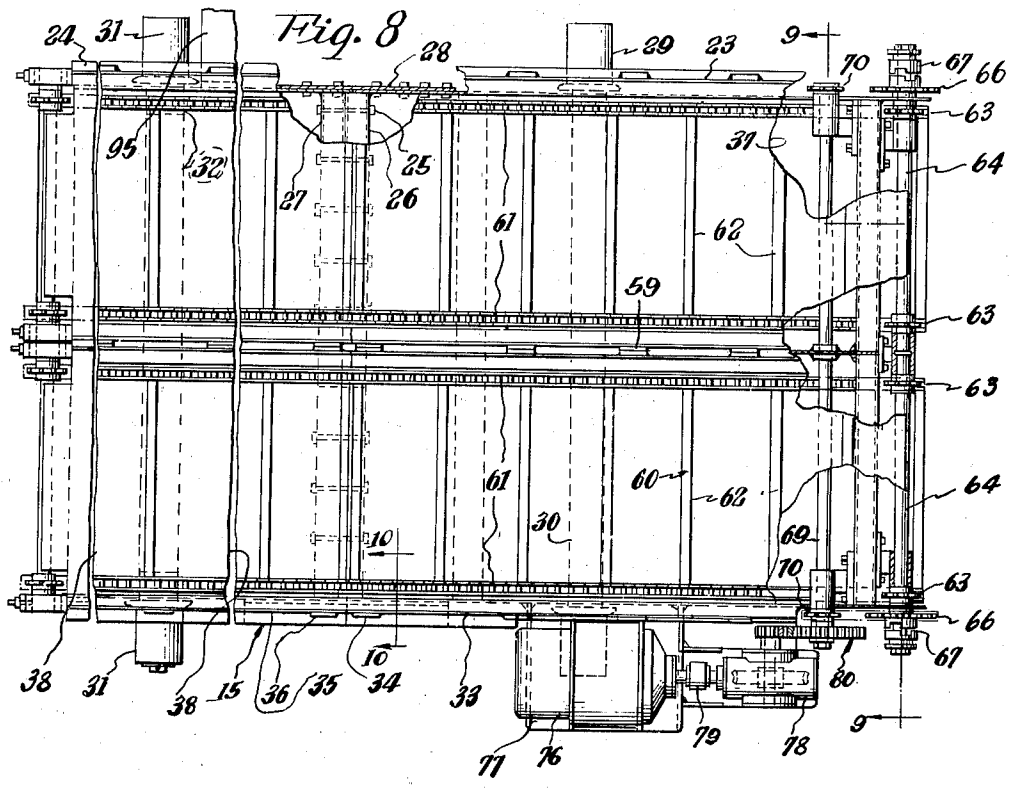


Fig. 9

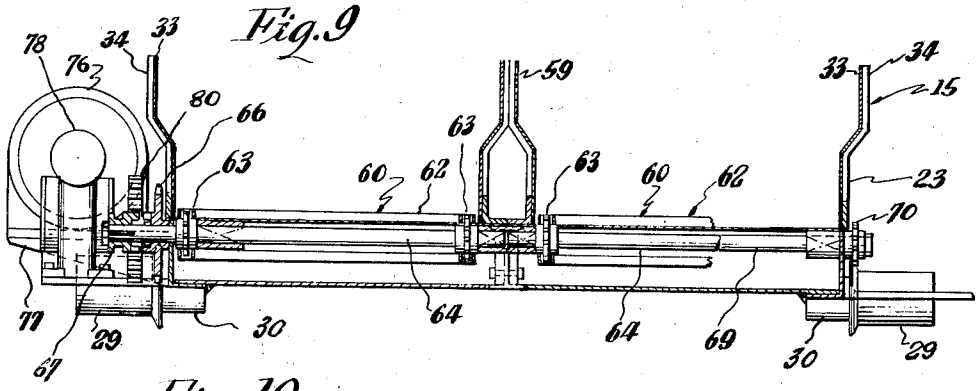
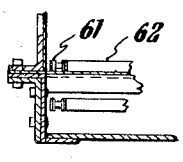


Fig. 10



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UNITED STATES PATENT OFFICE

2,143,522

METHOD OF MINING AND APPARATUS THEREFOR

Timothy F. McCarthy, Indiana, Pa., assignor to Goodman Manufacturing Company, Chicago, Ill., a corporation of Illinois

Application March 17, 1937, Serial No. 131,397

10 Claims. (Cl. 262—1)

This invention relates to improvements in methods of mining and apparatus therefor, and more particularly relates to a new and improved method and apparatus for loading coal in mines which is adapted for use in thin coal seams.

In mining thin seams of coal it has frequently been the practice to extend a sectional conveyer of the belt, chain or shaker type into the room up to the working face and load this conveyer by hand or other loading means such as an auxiliary face conveyer extending along the working face. Such a loading system has several disadvantages, particularly in seams of coal of low head room, among which are the facts that it is difficult and expensive to extend the conveyer as the face advances due to the bulk of the parts of the conveyer sections and the restricted space in which the men work, and that they must be confined to a restricted area in the mine.

Among the objects of my invention are to overcome these difficulties by providing a novel system for transporting the mined coal from the coal face to the entry which utilizes a mobile car having a capacity sufficient to hold the entire amount of coal obtained from a working place in one cutting and shoveling operation, which car has a conveyer extending along its bottom to facilitate loading and unloading.

Another object of my invention is to utilize a car in the system which is so arranged that different grades of coal in the seam, or dirt or rock, may be separated and loaded or unloaded separately from each other.

Still another object of my invention is to provide a loading system utilizing a car of the class described which will facilitate the loading of the coal in a simpler, cheaper, and more efficient manner than formerly.

Other objects of my invention will appear from time to time as the accompanying specification proceeds.

My invention may be more clearly understood with reference to the accompanying drawings wherein:

Figure 1 is a diagrammatic view of a mine room shown in horizontal section, illustrating one form of loading system which embodies my invention;

Figure 2 is a diagrammatic view of the mine room shown in Figure 1, shown in vertical section, illustrating another stage in the operation of the mining system than is shown in Figure 1;

Figure 3 is a diagrammatic view of a mine room shown in horizontal section, illustrating another form in which the mining system of my invention may be embodied;

Figure 4 is a diagrammatic view of the mine room and entry shown in vertical section, illustrating another stage in the operation of the mining system than is shown in Figure 3;

Figure 5 is a top plan view of a conveyer car of a type which may be used in the system of my invention, with parts broken away and shown in horizontal section;

Figure 6 is an enlarged partial fragmentary side elevation of the device shown in Figure 5;

Figure 7 is a sectional view taken substantially along line 7—7 of Figure 5;

Figure 8 is a plan view of a modified form of conveyer car with certain parts broken away and in section, illustrating another form of car which may be used in the mining system of my invention;

Figure 9 is a sectional view taken substantially along line 9—9 of Figure 8; and

Figure 10 is a sectional view taken substantially along line 10—10 of Figure 8.

Referring now in particular to Figures 1 and 2 of the drawings, 10 designates generally a mine entry from which extend mine rooms 11. A track having mine cars 12 movable therealong extends along the entry for transporting the coal out of the mine, although various types of conveyers may be used in place of the cars if desired. A track 14 is extended into the mine room from the entry to a point disposed adjacent to the working face. As herein shown, this track is of a relatively wide gauge, being wider than the gauge of the track in the entry in order that it may accommodate a car 15 having a capacity sufficient to transport the entire amount of coal obtained from the working place in one cutting and shooting operation, which in a coal seam averaging 36 inches in height will approximate 28 tons for a 40 foot face.

An elevating conveyer 16 is shown as being provided at the end of the track 14 adjacent the entry, for receiving material discharged from the car 15 and delivering it onto the mine cars 12. Said conveyer may be of any form and as herein shown has deflecting plates 17 on each side thereof to guide material from the relatively wide car 15 onto the narrower elevating conveyer. Said elevating conveyer is not described in detail since it is no portion of my present invention.

A hoist 18 is provided which is herein shown as being positioned adjacent the entry. Said hoist may be of a single drum type for moving the car 15 from the face to the elevating conveyer 16, although if desired a two drum hoist such as is shown in Figure 3 may be provided for

moving the car along the track in either direction. A mining machine 19, which effects the undercutting operation, may be positioned adjacent the working face after completion of the cutting operation. Said mining machine may be of any suitable construction and when jacked in a stationary position, may provide motive power to move the empty car into the working place.

The mining machine 19, as herein shown, is mounted on a flitting truck 19a after the cutting operation, which with said mining machine may be jacked in a stationary position on the ground when it is desired that the mining machine be the activating force for moving the car 15 up to the working place. Said truck is adapted to slide along the mine bottom and transport the mining machine from cutting place to cutting place when desired at a faster rate of speed than if the feed drums of the mining machine were used for this purpose, and is of a construction well known to those skilled in the art so will not herein be described in detail. Said truck is provided with a winding drum 19b which is adapted to have a flexible cable 19c wound thereon. Said cable serves to move said truck and mining machine over the ground when attached to a fixed abutment remote from said truck, and said cable, when attached to said car, may move it toward the working face when desired. The winding drum 19b may be driven from the motor of the mining machine 19 through the usual power connections from the truck drive in a manner well known to those skilled in the art, which will not herein be described in detail since it is no portion of my present invention.

Operation of the hoist 18 is controlled by means of a push button controller 20 disposed in the mine room adjacent the elevating conveyor 16, and another push button controller 21 disposed adjacent the working face. The electric control system for controlling operation of said hoist by means of these push button controllers is well known to those skilled in the art and is no portion of my present invention so will not herein be described in detail.

With reference now in particular to the details of the car 15, as shown in Figures 5, 6 and 7, said car is of a sectional construction to permit extension thereof so that its capacity may be increased where desired and includes a head frame section 23 and a tail frame section 24. Said sections are of a box-like construction with open ends and are detachably secured together by means of suitable bolts 25, 25 extending through abutting end pieces 26 and 27 of said head and tail sections respectively, and by connecting side plates 28, 28 which extend across and are secured to the abutting sides of said sections. Said sections are so arranged that the capacity of the car may be increased by inserting intermediate conveyer sections (not shown) which may be of a construction similar in form to the tail section 24 and may be secured to said head and tail sections in the same manner said head and tail sections are secured together.

The head frame section 23 is mounted on a pair of track wheels 29, 29 on stud axles 30, 30 secured to said frame in a suitable manner. The tail section 24 is likewise mounted on a pair of track wheels 31, 31 on stud axles 32, 32. Said wheels are of a relatively small diameter but have a relatively wide tread to prevent the car from derailing when negotiating turns, especially where the system is laid out so that the car must travel into an entry or where the track is so laid out that one car may be used in more than one room. It should, of course, be understood that if desired the wheels may be mounted on swivels to aid in negotiating curves.

The head section 23 is provided with retaining side walls 33, 33 which are detachably secured to spaced apart upright supporting members 34, 34. These side walls are of a usual construction and if desired, may be so constructed as to be extended vertically to take care of various working heights in the mine. In a like manner, the tail section 24 is provided with corresponding side walls 35, 35 secured to upright supporting members 36, 36. The side walls 33, 33 and 34, 34 are so arranged that they may readily be lowered during the loading operation to facilitate loading over the side of the car if desired.

A bottom plate 37 extends along the bottom of the head frame section 23. A similar bottom plate 38 extends along the bottom of the tail frame section 24. Said bottom plates are so arranged that they may be removed when connecting or disconnecting the sections of the car so that ready access to the bolts 25, 25 may be attained.

A conveyer 39, herein shown as being a flight conveyer, extends along the bottom of the frame sections 23 and 24 of said car and includes a pair of spaced endless chains 40, 40 having spaced apart flights 41, 41 carried therebetween. Said chains are adapted to move over the bottom plate 38 of said tail frame section and the bottom plate 37 of said head frame section, which bottom plates form a surface along which material may be moved by said flights.

The endless chains 40, 40 extend along the upper and lower sides of the bottom plates 37 and 38 and are driven from drive sprockets 42, 42 on a transverse drive shaft 43 at the discharge end of the head section 23. A transverse shaft 45 about which said endless chains turn is mounted in bearing members 46, 46 at the outer end of the tail section 24. Said bearing members are longitudinally adjustable in support brackets 47, 47 in a usual manner to provide a means for adjusting the tension of said chains.

The conveyer 39 is driven by a motor 50, which as herein shown, is an electric motor of an ordinary construction. Said motor is mounted on a support bracket 51 extending outwardly from one side of the head frame section 23 and is directly connected with and drives a speed reducer 52 through a coupling member 53. Said speed reducer is of an ordinary construction and has a pinion 54 on its drive shaft which meshes with and drives a spur gear 55. Said spur gear drives the transverse shaft 43 by means of a chain and sprocket drive generally indicated by reference character 57.

It may be seen from the foregoing that material such as coal may be loaded on the tail end of the car and gradually moved towards the head end thereof by periodically operating the conveyer 39.

Referring now to the modified form of car shown in Figures 8, 9 and 10, said car is constructed in a manner similar to that shown in Figure 5 so like reference characters will be applied to like parts. Said car is divided into two parallel extending conveyer sections by means of a central partition 59. Each of these sections has a conveyer 60 mounted therein, which is of the ordinary flight type and includes a pair of spaced endless chains 61, 61 having flights 62 mounted therebetween. Said endless chains are trained

around and driven from drive sprockets 63, 63 on coaxial transverse shafts 64, 64 which are so arranged as to be driven independently of each other. Each shaft 64 has a sprocket 66 freely mounted on its outer end. Said sprockets are adapted to be selectively connected with said shafts by means of suitable jaw clutches generally indicated by reference character 67. The sprockets 63, 63 are driven from a transversely extending shaft 69 by means of sprockets 70, 70 disposed adjacent opposite ends of said shaft and suitable drive chains (not shown) connected between said sprockets and the sprockets 63, 63.

The transverse shaft 69 is driven from a motor 76 mounted on a bracket 77 projecting from one side of the car frame 23. Said motor is directly connected with a speed reducer 78 by means of a drive coupling 79. Said speed reducer drives the shaft 69 by means of a gear train generally indicated by reference character 80. Thus, either of the conveyers 60 may be selectively driven from the motor 76 to permit the loading and discharge of one conveyer independently of the other.

Referring now in particular to the details of the mining system shown in Figure 1, a kerf is first cut in the coal face by means of a mining machine, such as the shortwall machine 19. After the cutting operation the machine is withdrawn from the face and preferably moved onto the flitting truck 19a which is positioned along the track 14. Said mining machine and truck are then held in this position by means of suitable jacks in a usual manner. The feed rope 19c may then be trained forwardly from the winding drum 19b on said truck, to and around a sheave 83, and rearwardly from said sheave to the car 15 to which it is connected. Power is then applied to said feeding drum for moving the car 15 up to the working face. The car is then loaded in a suitable manner, such as by hand, the conveyer being operated periodically as it is loaded, to move the coal towards the discharge end thereof. After the working place has been completely cleaned up, the hoist 18, which is connected to said car by means of a cable 84, is operated by means of one of the push buttons 21. Said hoist thus moves the loaded car rearwardly along the track, the operator riding with the car on a step 85 of said car. When the car approaches the elevating conveyer 16 the operator alights from the car and stops the hoist 18 by means of one of the push buttons 20. At this point the car is unloaded onto the elevating conveyer 16 by periodically operating the conveyer 39. Said elevating conveyer is controlled and operated by means of a separate motor (not shown) and loads onto the mine cars 12, 12 as they are moved under its discharge end.

Referring now in particular to the form of my mining system illustrated in Figures 3 and 4, the bottom is shown as being taken up along the entry to increase vertical clearance for the mine cars and permit the conveyer car to discharge directly into the mine cars without the use of an auxiliary elevating conveyer. In this form of my invention a two drum hoist 87 is shown as being utilized for moving the car towards and from the face. One cable 88 from said hoist is connected to the discharge end of the car 15 and another cable 89 extends forwardly from said hoist around a guide sheave 91 and is connected to said car at 92.

A suitable system of remote controls is provided for controlling the hoist 87 and movement of the car to and from the face, which, as herein shown, includes a push button controller 93 disposed adjacent the discharge point of the hoist and another push button controller 94 at the face. These push button controllers control the hoist by means of a suitable system of electrical contactors in a well known manner which is not herein shown or described since it is no portion of my present invention.

In Figure 3 a two compartment car is shown as being used in the system. After the cutting and shooting operation the car is drawn to the working face by means of the hoist 87. Coal is then loaded into one compartment of the car while dirt or rock may be loaded into the other compartment, unless there is no dirt present, in which case both compartments may be loaded with coal. When the entire place has been cleaned up and loaded onto the conveyer car, it is moved towards the entry by operation of the push button controllers 94. The operator then steps on a step 95 and rides with the car until it reaches a position adjacent the push button controller 93 at which time he alights and stops the car by means of said last mentioned push button controller when its forward end is overhanging the entry so as to discharge onto the mine cars 12. Either one of the conveyers 60 is then periodically unloaded. The other conveyer 60 is then periodically operated until all of the dirt and rock have been loaded on other of the cars 12, it being understood that the cars are moved along the entry beneath the discharge end of said conveyer car by means of a suitable mining locomotive or hoist.

It will be seen from the foregoing that a simplified form of car having a conveyer therein to facilitate loading and unloading has been provided which is so constructed that it may have capacity sufficient to hold all of the coal taken from the working face after one cutting and shooting operation, and that said car may be separated into compartments to separate different grades of coal when there is more than one grade of coal in the coal seam, or to separate the rock from the coal where there is rock or dirt which it is desired to clean from the coal at the face.

It may also be seen that a simplified system of mining has been provided which consists in the steps of cutting and shooting, and loading the broken coal into a car, and periodically moving the material in the car towards its discharge end by operation of a conveyer extending along the bottom of the car, until the working place has been cleaned up, and then moving the car to the entry and unloading it onto mine cars, or any other suitable material transporting means, by periodically or continuously operating the conveyer in the car. It will also be understood that the car may be used to transport supplies to the working face if desired and may be remotely controlled either from the face or the entry so that the services of one man only will be required to control its operation.

It should be understood that while I have herein shown the hoist as being mounted at the entry for moving a car towards and from the face for the purposes of simplicity, that a hoist may be mounted on the car if desired, or that any other form of propelling means may be provided for moving the car.

While I have herein shown and described one form in which my 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 myself to the specific embodiments illustrated, excepting as they may be limited in the appended claims.

I claim:

1. In a coal mining and loading system, the method of mining and loading coal which consists in extending a track into the working place, providing a mining machine in the working place and undercutting the coal with said mining machine, breaking down the undercut coal, positioning the mining machine to one side of the working place and holding it from movement with respect to the ground, providing a car on said track having a conveyer extending along its bottom, said car being of a capacity sufficient to transport the entire amount of coal cut from the working place, securing a flexible member extending from a winding drum, driven by the motor of said mining machine, to said car, providing a hoist adjacent the entry, connecting a flexible member from said hoist to said car, moving said car to the working place by the application of power to said winding drum, loading mined coal onto said car, moving said loaded car from the working place by means of said hoist, and operating said conveyer to unload said car onto material transporting means in said entry.

2. In a coal mining and loading system, the method of mining and loading coal which consists in extending a track into the working place, providing a car on said track having a conveyer extending along its bottom, said car being of a capacity sufficient to transport the entire amount of coal cut from the working place, providing a track extending along the entry adapted to have mine cars movable therealong, providing an elevating conveyer at the rear end of said first mentioned track which extends over said second mentioned track for moving material from said conveyer car to said mine cars, providing a mining machine in the working place and undercutting the coal with said mining machine, breaking down the undercut coal, positioning the mining machine adjacent to said first mentioned track and holding it from movement with respect to the ground, securing a flexible member extending from a winding drum on said mining machine to said conveyer car, providing a hoist adjacent the entry, connecting a flexible member from said hoist to said car, moving said car to the working place by the application of power to said winding drum, loading the mined coal from the working face onto said car, moving said loaded car from the working face by the application of power to said hoist, periodically operating said conveyer to unload onto said elevating conveyer, and independently operating said elevating conveyer as the mine cars are positioned thereunder.

3. In a coal mining and loading system, the method of mining and loading coal which consists in providing a mining machine in the working place and undercutting the coal with said mining machine, breaking down the undercut coal, providing a truck in the working place, said truck having a winding drum thereon with a flexible cable adapted to be extended therefrom, and said truck being adapted to receive said mining machine, positioning the mining machine on said truck and holding it from movement with respect to the ground, providing a car which is movable into the working place, said car having a conveyer extending along its bottom and being of a capacity sufficient to transport the entire amount of coal mined from the working place to the entry, extending said flexible cable from said winding drum on said truck to said car and securing its free end to said car, providing a hoist adjacent the entry, connecting a flexible member from said hoist to said car, moving said car to the working place by the application of power to said winding drum on said truck, loading mined coal onto said car, moving said loaded car from the working place by means of said hoist, and operating said conveyer to unload said car onto material transporting means in said entry.

4. In a coal mining system, the method of mining and loading coal which consists in extending a track into the working place, providing a conveyer car on said track, said car having a pair of separated conveyers extending along its bottom and being of a capacity sufficient to transport the entire amount of coal mined from the working place, providing a mining machine at the working place, undercutting the coal with said mining machine, positioning said mining machine to one side of the working place and securing it in such a position, attaching a flexible feed member from a winding drum, driven by said mining machine, to said car, providing a hoist at the entry and connecting a flexible member from said hoist to said car, moving said car to the face by said winding drum driven by said mining machine, loading coal into one of said compartments and loading rock or dirt in the other of said compartments until the entire working place has been cleaned out, and thence moving said car by said hoist to the entry and independently unloading said conveyers of their contents onto said material transporting means so that said rock or dirt and coal may be unloaded separately from each other.

5. In an apparatus of the class described, a sectional car having a relatively wide gauge including a head section and a tail section detachably secured together and so arranged that intermediate sections may be inserted therebetween to permit the car to be expanded to accommodate the entire amount of material mined from one working place, said car having a conveyer extending along its bottom so that material may be moved towards its rearward end by said conveyer as it is being loaded, and so that material may be discharged beyond its rear end by said conveyer.

6. In an apparatus of the class described, a sectional car having a relatively wide gauge including a head section and a tail section detachably secured together and so arranged that intermediate sections may be inserted therebetween to permit the car to be expanded to accommodate the entire amount of material mined from one working place, said car having a pair of separated independently operable conveyers extending along its bottom so that different grades of coal may be loaded into said compartments and separated from each other, or so that coal may be loaded in one compartment and rock may be loaded in the other and be independently discharged beyond the head end of said car.

7. In a loading apparatus for mines having low head room, an open end sectional car movable along a trackway extending into a working place, said car including a head section and a tail section adapted to be detachably secured thereto and being so arranged that intermediate sections may be inserted between said head and tail sections, and said car being of a capacity sufficient to hold the entire amount of coal obtained from the working place in one cutting and breaking

down operation, and a conveyer extending along the bottom of said car to facilitate loading and unloading by progressing material from the forward to rearward end thereof.

8. In a loading apparatus for mines having low head room, an open end sectional car movable along a trackway extending into a working place, said car including a head section and a tail section adapted to be detachably secured thereto and being so arranged that intermediate sections may be inserted between said head and tail sections and being divided into two compartments extending longitudinally thereof for permitting different grades of coal or rock or dirt to be loaded separately from each other, and said car having a capacity sufficient to hold the entire amount of coal obtained from the working place in one cutting and breaking down operation, and an independently operable conveyer extending along the bottom of each of said compartments to facilitate loading and unloading by progressing material from the forward to rearward end thereof.

9. In a loading apparatus for mines of low head room, an open end self-unloading sectional car movable along a trackway extending into a working place, said car being arranged to store material substantially along its entire length and including a head section and a tail section adapted to be detachably secured thereto, and a self-contained power driven flight conveyer extending along its bottom to facilitate loading and unloading by progressing material from the forward to rearward end thereof.

10. In a loading apparatus for mines of low head room, a self-unloading sectional car open at both of its ends and movable along a trackway extending into a working place, said car being arranged to store loose material substantially along its entire length and including detachable head and tail sections having a self-contained power driven flight conveyer extending along its bottom to facilitate loading and unloading by progressing the material from the forward to rearward end thereof.

TIMOTHY F. McCARTHY.