Aug. 18, 1925. 1,550,239

F. BILLINGS ET AL

LOADING SYSTEM

Filed March 1, 1923 3 Sheets-Sheet 1

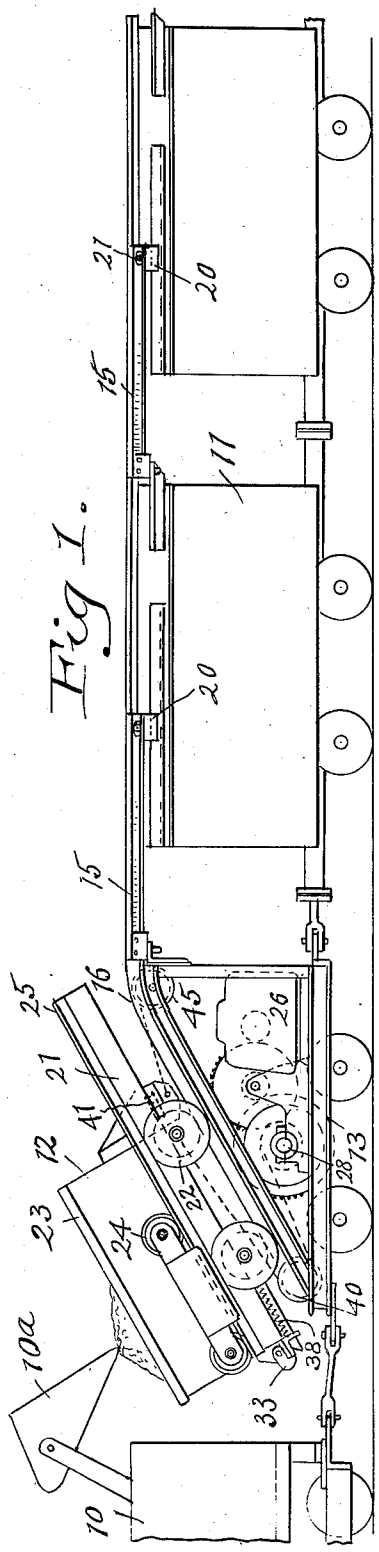


Fig. 1.

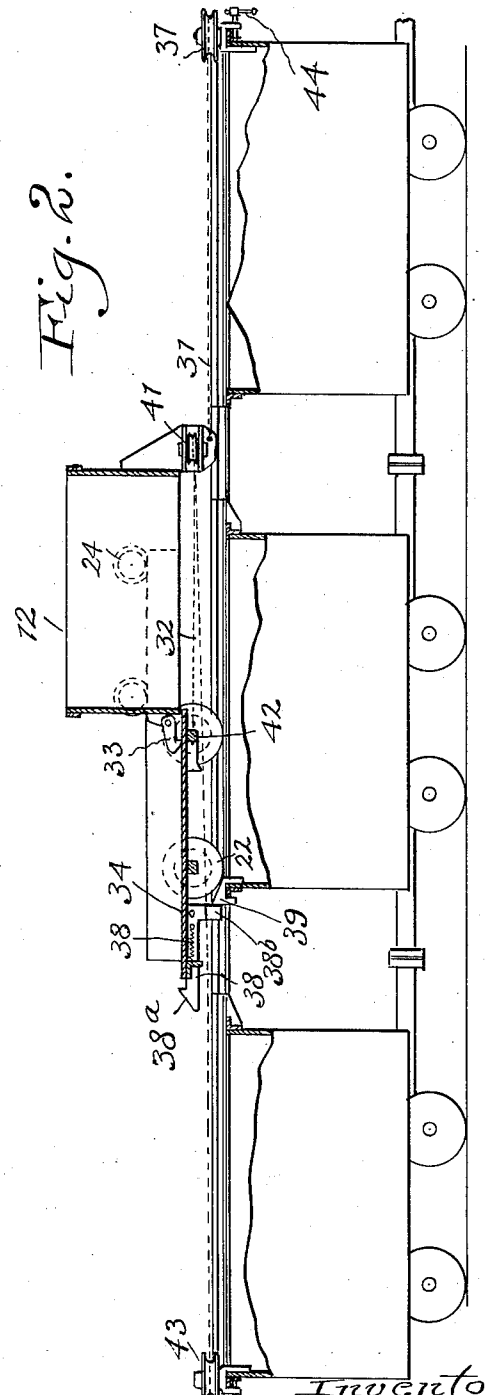


Fig. 2.

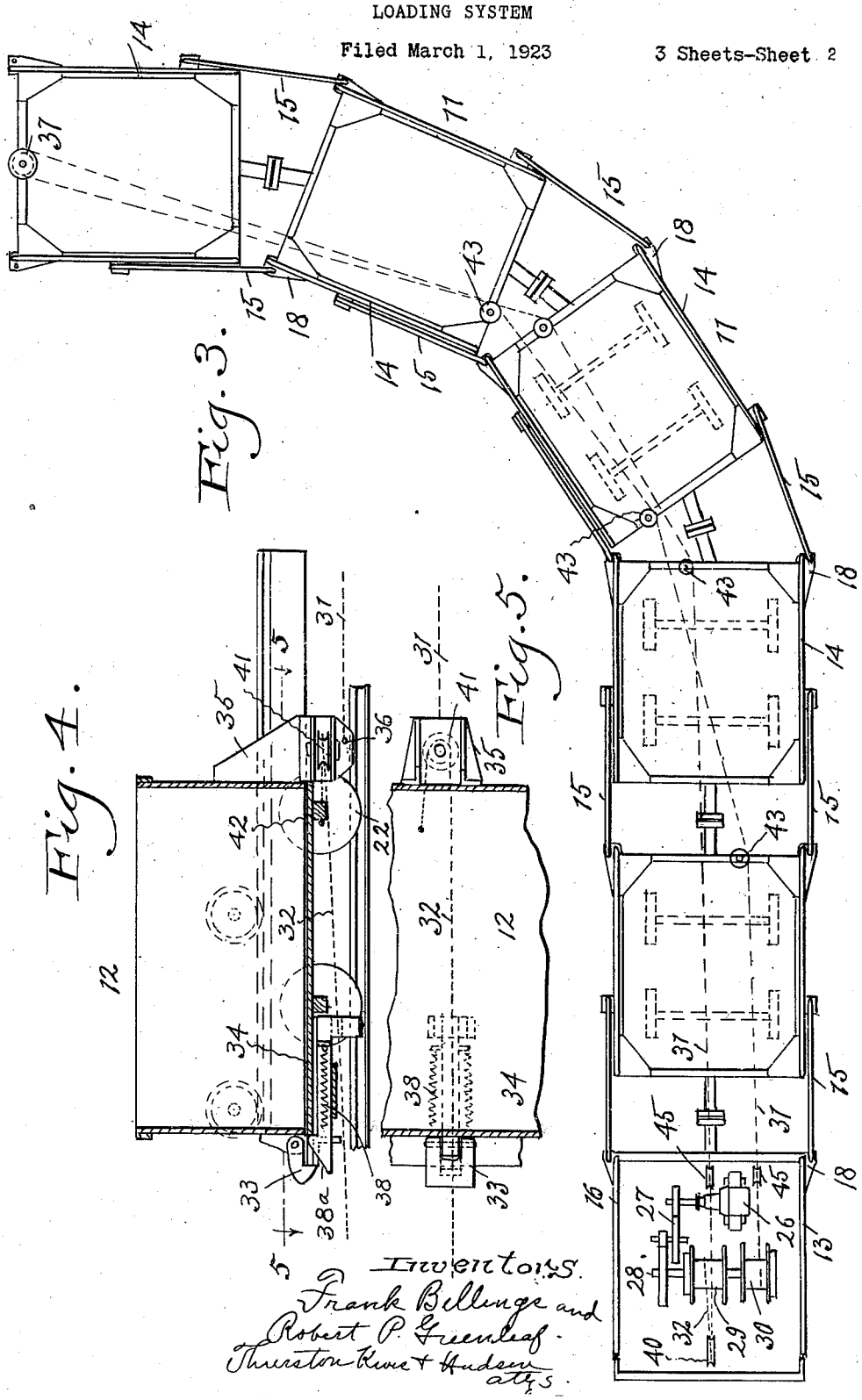
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LOADING SYSTEM

Filed March 1, 1923 3 Sheets-Sheet 2



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F. BILLINGS ET AL

LOADING SYSTEM

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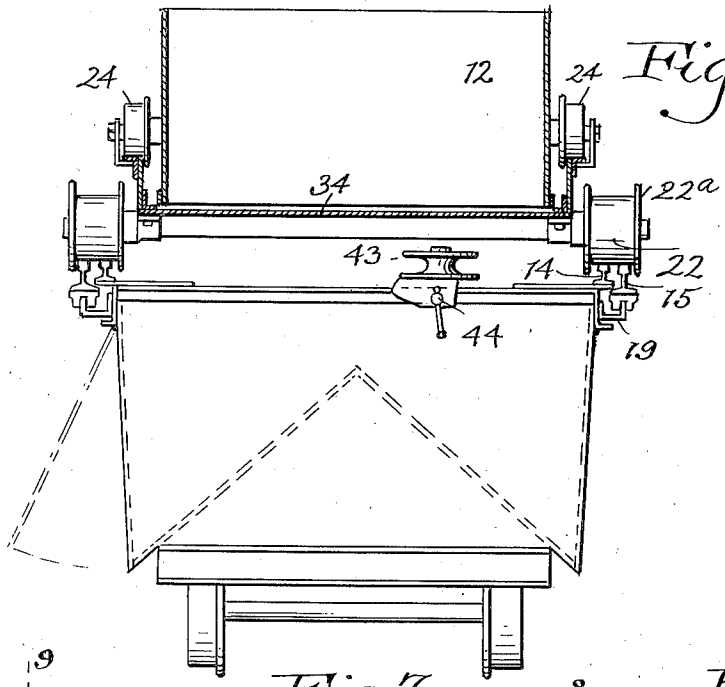


Fig. 6.

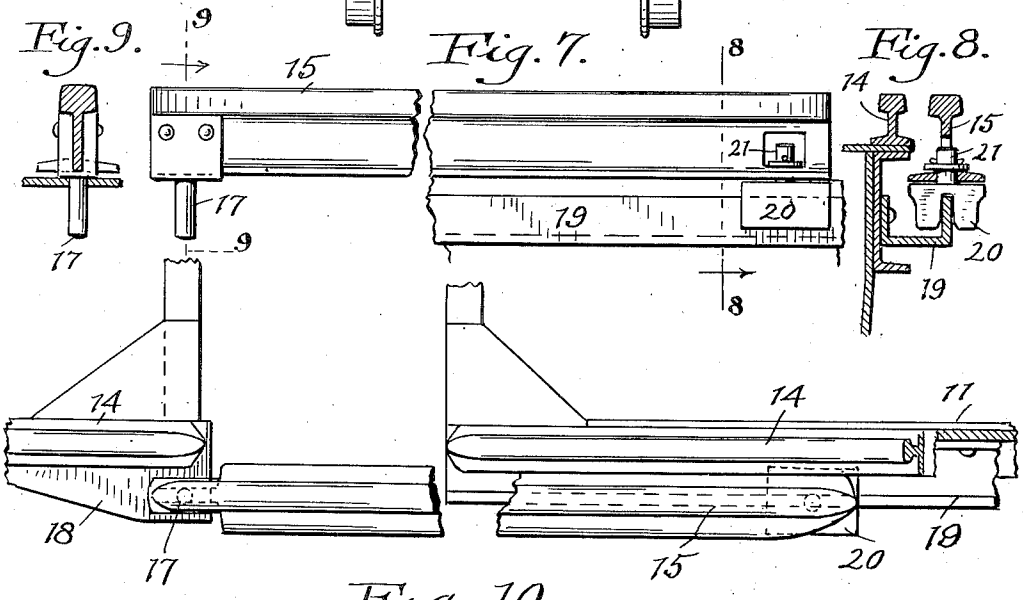


Fig. 10.

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UNITED STATES PATENT OFFICE.

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LOADING SYSTEM.

Application filed March 1, 1923. Serial No. 621,999.

To all whom it may concern:

Be it known that we, FRANK BILLINGS and ROBERT P. GREENLEAF, citizens of the United States, and residents, respectively, of Cleveland, in the county of Cuyahoga and State of Ohio, and Shaker Heights, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Loading Systems, of which the following is a full, clear, and exact description.

This invention relates to a system of loading cars involving the use of a loading machine, and has particular reference to loading mine cars with ore, coal and the like which is shoveled or otherwise picked up by the loading machine.

The principal object of the present invention is to increase the efficiency of a loading machine by doing away with the necessity of frequent shifting to and from the machine of the cars which are designed to carry away the material.

More particularly the invention aims to do away with the necessity of removing the loaded material after a single car has been filled, and on the other hand to provide means whereby a series or a train of cars may be brought up to the machine and all of them loaded, before it is necessary to move them away from the loading machine to the point where the material is to be discharged or dumped therefrom.

It is also an object of the invention to accomplish this with apparatus which can be conveniently transported through the mine passageways and around the curves which are frequently of short radius.

Heretofore it has been proposed to load a series of cars with a loading machine by the use of an extensible or collapsible conveyor, but a scheme or system of that kind is not entirely feasible, not only because of the difficulty of transporting it around the curves, but it cannot be very successfully operated if the cars are left in loading position on a curve. In other words, it requires a straight section of track for the extension or collapsing of the conveyor by which the material is carried from the loading machine to the different cars in the series.

In accordance with the present invention we employ in connection with a loading machine of any suitable type, a skip which is designed to be filled with material by the loading machine, and is adapted to be run back and to be dumped into any one of the cars of the series. Furthermore, in accordance with this invention, provision is made for supporting and running the skip on the cars themselves, regardless of whether the cars are in a straight line on a section of straight track, or standing on a curve, thus doing away with the necessity of a special trackway or other support for the skip.

The invention may be further briefly summarized as consisting in certain novel details of construction, and combinations and arrangements of parts which will be described in the specification and set forth in the appended claims.

In the accompanying sheets of drawings wherein we have shown one embodiment of our invention, Fig. 1 is a side elevation showing the rear end of a loading machine, the skip, and a section of a train of mine cars designed to be filled by the loading machine and skip; Fig. 2 is a side view with parts in section showing a number of mine cars and illustrating how the skip runs over rails at the top of the cars and how material may be dumped from the skip into the cars; Fig. 3 is a top plan view of a series of cars and of a power unit which actuates the skip, showing how the transporting system which we use for conveying the material from the loading machine to the different cars may be utilized with the cars positioned on a curve; Fig. 4 is a vertical sectional view of the skip; Fig. 5 is a horizontal sectional view substantially along the line 5—5 of Fig. 4; Fig. 6 is an end view of one of the cars showing the skip supported thereon and in vertical section; Fig. 7 is a side view on an enlargel scale of a skip rail at the top of the car; Fig. 8 is a sectional view substantially along the line 8—8 of Fig. 7; Fig. 9 is a sectional view substantially along the line 9—9 of Fig. 7; and Fig. 10 is a top plan view of portions of the adjoining ends of two cars showing the rails which are arranged at the top thereof and showing the pivoted connecting means between them.

While our invention does not involve any particular construction of loading machine per se it does comtemplate a loading machine as a part thereof, but such loading machine may be of any suitable type, it be-

ing necessary only that it have suitable means for delivering to the rear of the machine the coal, ore, or other material that is to be loaded into the cars. In Fig. 1 we have illustrated at 10 a portion of a loading machine which will have suitable device or devices for shoveling or otherwise picking up material and for discharging it at the rear of the machine. In the present instance the machine has a swinging shovel 10^a which is designed to be given a filling stroke at the front of the machine, and then to be swung upwardly and rearwardly over the machine to discharge the material at the rear. A machine of this type is illustrated in numerous patents granted in our names, or in the name of Robert P. Greenleaf, one of the co-inventors herein, and among these patents may be mentioned the following: No. 1,286,168 dated November 26, 1918; No. 1,297,150 dated March 11, 1919; No. 1,322,476 dated November 18, 1919; No. 1,322,477 dated November 18, 1919; No. 1,322,478 dated November 18, 1919.

Obviously instead of using a machine of the shovel type, other types may be employed, such as those involving a hoe and a rearwardly extending conveyor onto the front end of which the material is scraped by the hoe. Machines of this type are illustrated in a number of patents granted jointly in our names, or in the name of one or the other of us, and among these are the following: No. 1,095,786 dated May 5, 1914; No. 1,162,768 dated December 7, 1915; No. 1,265,729 dated May 14, 1918.

As before stated, our improved system contemplates filling a number of cars before taking them away to be dumped, instead of handling one car at a time, i. e. bringing it to the loading machine to be filled and removing it when filled. A series of cars such as may be utilized and moved to and from the loading machine are shown at 11, Fig. 5 showing a series of five of the cars coupled together, although the number may be greater or less than that shown in this figure. In any event a sufficient number of cars will be handled at one time to enable our loading system to be operated most efficiently. Additionally our system contemplates a device for conveying the material from the rear end of the loading machine to the several cars 11, and in this instance this is in the form of a skip 12 which is operated by a so-called power unit 13 which is adapted to be positioned next to the loading machine, or between the latter and the first car 11 adjacent thereto.

In order that the skip may be run back and forth between the power unit or the rear end of the loading machine and the several cars, and in order that a skipway or track separate from the cars may be dispensed with, we contemplate running the skip over the cars themselves, and this constitutes a very important feature of our invention.

In order that the skip may be run over the cars, the sides of the cars are equipped with rails to accommodate the wheels of the skip, and in the form of our invention illustrated, this is done in such a way that the train of cars may be run around the curves of mine passageways and may be loaded on a curve as illustrated in Fig. 3. In the form of our invention illustrated, the trackway for the skip is formed by providing along each side of each mine car at the top thereof a fixed straight rail 14, and by connecting together the corresponding rails 14 of adjacent cars by pivoted or articulated rail sections 15. Each car is provided with a pair of these pivoted sections 15, which are connected to similar rails of an adjoining car while the rails 14 of the car next to the power unit are similarly connected to rails 16 of the power unit, which rails also accommodate the skip.

Each pivoted rail 15 is at one end pivoted by means of a pivot stud 17 (see Figs. 7, 9 and 10) to a bracket 18 at the end of the car, and at its other end this pivoted rail has a telescopic or sliding connection with the rail of the car ahead or behind as the case may be. To bring about this sliding or telescopic connection between the articulated or pivoted rail extending from one car with the fixed straight rail of the adjoining car, each car is provided along each side and beneath the straight rail 14 with an upwardly facing channel 19. On the outer flange of this channel there slides a shoe 20 having an upstanding stud 21 with which the end of the rail section 15 engages; that is to say, this shoe has a swivel connection with the end of the rail section 15, and when the train of cars is passing around a curve, the shoe 20 will slide along the flange of the channel 19, the shoe at one side of the car moving forwardly and that at the other side rearwardly, depending upon which side of the car is on the inner side of the curve. This is clearly illustrated in Fig. 15.

Thus it will be seen that we have provided at the top and along opposite sides of the several cars of the train or series, a flexible or extensible and collapsible track, the sliding or telescopic arrangement between the fixed and pivoted rail sections allowing the cars to travel around curves or to be positioned on a curve for loading without interrupting the continuity of the skip track.

The skip 12 may be constructed in various ways, and while the preferred construction is illustrated, it may be otherwise constructed. In this instance, the skip comprises a wheeled truck portion 21 consisting of a truck frame with wheels 22 and a mov-

able body portion 23 which is normally held in fixed position on the truck portion, but which may move relative thereto so as to discharge the load from the skip, the body portion having wheels 24 which are designed to travel over rails 25 on the frame of the truck portion. The manner in which the body portion is supported on the truck portion and by which it is guided so that it may travel along the same is well illustrated in Fig. 6.

As before stated, the truck portion of the skip is provided with track wheels 22, and these wheels travel along the track formed by the rails 16 of the power unit 13, and by the rails or rail sections 14 and 15 at the top of the cars 11. Obviously the gauge of the track along the mine cars is not fixed, but varies somewhat as the cars swing relatively while traveling around a curve. Therefore, in order that the skip may accommodate itself to this slightly varying gauge and to the telescopic trackway formed at the top of the cars 11, each of the wheels of the skip is provided with flanges 22ª at both its inner and outer sides, and with a relatively wide face between the flanges. This construction which is illustrated in Fig. 6 enables the skip to remain on the track and to accommodate itself thereto notwithstanding the fact that the track may be straight or curved and of a slightly varying gauge for the reasons stated above.

This skip is designed to be pulled rearwardly away from the loading machine 10 and forwardly toward the same. To do this we propose to use the well-known head and tail rope system of skip operation, and to make clear how this may be done, we will refer to the power unit 13.

This power unit includes a truck frame having wheels which like the wheels of the loading machine 10 and the cars 11 are designed to travel along the tracks. This power unit may be coupled to the loading machine and to the mine car adjacent to it if desired, and these parts will be coupled together if the several units are being conveyed at the same time through the mine passageways. When all the cars 11 of the series have been filled, the foremost car is, of course, uncoupled from the power unit and the skip rails at the top of the foremost car are disconnected from the rails 16 for the power unit which remains with the loading machine while the loaded cars are being conveyed away to the dumping point, or are being brought back to be again loaded.

As already stated, the power unit is provided with track rails 16 which accommodate the skip. These rails are preferably inclined, extending as shown downwardly and forwardly from the level of the skip track rails at the top of the cars 11. Any suitable means may be provided for holding the skip in loading position on these inclined rails, such as by curving upwardly the lower ends of the rails 16 to form positive stops. The purpose of arranging the rails in inclined position as shown, is to enable the skip to be placed in low enough position that it may receive the load from the shovel 10ª of the loading machine or equivalent conveying member which is designed to transfer the material from the loading machine.

On the skip beneath the track rails 16 is arranged a suitable power mechanism by which the skip is caused to travel back and forth along the track rails on the cars 11. This mechanism includes a suitable motor or engine 26 (see left hand end of Fig. 3) which may be an electric motor or a motor or engine operated by any suitable energy, such as air. This motor or engine 26 is connected by gearing designated as a whole by the reference character 27 to a shaft 28 provided with two rope drums 29 and 30, one of which is adapted to receive the head rope 31 and the other the tail rope 32 which are connected to and operate the skip. These ropes go about the drums 29 and 30 in opposite directions so that when one is wound on its drum the other is unwound from the other drum.

Not only does the power unit through the action of the head and tail ropes cause the skip to be run back to be dumped into a car and then returned again to the track of the power unit to be again filled by the loading machine, but we contemplate an automatic dumping of the skip, and this with the embodiment shown is accomplished in the following manner: The upper or body portion of the skip is normally secured or fastened to the truck portion by a pawl 33 (see particularly Fig. 4) having a nose or hook which normally engages over the rear end of the bottom or bed 34 of the truck portion of the skip. At the front end of the skip and attached to the forward end of the body portion thereof is a bracket 35 which extends down beneath the bed 34. To the lower end of this bracket the head rope 31 is attached and from this point of attachment it extends rearwardly to the end of the rearmost car 11, around a sheave 37 and then back to the power unit where it passes around the drum 30. Thus when the loaded skip is being pulled rearwardly the pull exerted by the head rope is applied to the body part of the skip and through the pawl 33 to the truck portion.

For the purpose of dumping the skip in any particular car when the skip is being pulled rearwardly, it is only necessary to release the upper or body part of the skip from the truck part thereof, and to retard or stop the truck part so that the upper or body part may be pulled rearwardly rela-

tive to the truck part and thus scrape the material into a designated car.

To accomplish this we provide in the present instance on the lower part of the skip a spring restrained plunger 38 with a cam nose 38[a] at its rear end and arranged so that when the plunger is moved forwardly or toward the pawl 33 it lifts and releases the hook from the bed of the skip.

To bring about the automatic actuation of the plunger 38 we contemplate using a detachable stop member 39 (see particularly Fig. 2) which can be placed by the workman at the forward end of any one of the cars 11 in position to be engaged by a depending arm 38[b] of the hook releasing plunger 38. That is to say, a workman will place the stop member 39 at the forward end of the particular car into which the skip is to be dumped, and when that particular car has been filled he will place it at the front end of the next car to be filled, it being understood that the skip will be pulled backward by the head rope until the depending part of the plunger 38 engages the stop member of the car to be filled, and when this occurs the upper part of the skip is released from the truck part and while the latter is held stationary the upper part is moved rearwardly scraping the contents of the skip into the car selected for filling.

We contemplate also the automatic restoration of the upper or body portion of the skip to its normal position on the truck part thereof, and the automatic restoration of the pawl 33 to locking position, and this is accomplished through the action of the tail rope 32. The tail rope extends from the drum 29 around a sheave 40 at the lower front end of the power unit, and from this sheave it extends around a horizontal sheave 41 at the lower part of the bracket 35, which as before stated, is secured to the end of the body portion of the skip. After passing around this horizontal sheave 41 it extends and is secured to the axle 42 of the truck part of the skip. Thus when the skip has been emptied the pull on the tail rope will first close the skip or move the body portion over the bed until the nose of the pawl 33 drops to locking position, and then move the skip as a whole onto the power unit. This action of first closing the skip is bound to take place if a slight retarding pull is applied to the head rope while the tail rope is being wound in.

To guide the head and tail ropes when the cars are positioned on a curve as shown in Fig. 3, and are being loaded while on the curve, guide sheaves 43 are designed to be placed where desired on the ends of the cars, as for example, as illustrated in Fig. 3. These sheaves can be quickly removed or applied, and are designed to be placed over the ends of the car and clamped thereto by clamping means such as illustrated at 44 in Figs. 2 and 6. Additionally the tail and head ropes are designed to pass over guide sheaves 45 arranged at the upper end of the power unit as shown in Figs. 1 and 3.

In the operation of this system the skip will be positioned on the inclined track of the power unit until it is filled, and then the skip will be run rearwardly and will be automatically dumped when it comes over a predetermined or selected car to be filled, the operator placing the stop member 39 wherever necessary, and transferring it from one car to another when a car containing the clamp is filled and another car is to be filled. By operating the power unit properly the operator will run the skip rearwardly to the desired point where it is automatically dumped and then will run it forward again to the power unit to receive another load from the loading machine, the skip each time traveling over the rails carried by the cars themselves as previously explained.

Inasmuch as the skip can be run back from the power unit and dumped and brought back to the power unit very quickly, the operation of the loading machine itself is not delayed to any material extent by the operation of the skip in filling the cars, In this manner the entire series of cars can be filled and a great deal of material can be loaded before it is necessary to delay the operation of the loading machine. When all the cars are filled and the skip has been run back onto the power unit, one of the operators will disengage the head rope from the sheaves of the cars and lay it on the ground and also disengage the rails of the foremost car from the rails of the power unit, and, of course, he will uncouple the foremost car from the power unit if this had not been done previously. Then the whole train of filled cars 11 is taken away from the loading machine and dumped, after which they are again brought back to the loading machine, whereupon the loading and car shifting operations are repeated.

When the series of cars are filled in the manner explained above, by our improved loading system, and are removed from the loading machine to be dumped and then brought back to the machine again to be filled, the use of the loading machine is interrupted the least possible amount, and therefore its efficiency is greatly increased as compared with a system wherein the cars were handled individually. Therefore, by filling, switching and handling the cars in a group instead of individually, and by providing means whereby the cars can be filled while located on curves of short radius usually found in a mine, without affecting the operation of the skip, we have, we believe, succeeded in solving a problem which

has heretofore retarded the use of loading machines in mines and which while recognized heretofore, had not been successfully solved by the use of an extensible and collapsible conveyor.

While we have shown and described one embodiment of our invention, we do not desire to be confined to the exact details shown, but we aim in our claims to cover all modifications and all such changes as do not involve a departure from the spirit and scope of our invention as defined in the appended claims. Furthermore, our invention is not confined in its utility to mine work.

Having described our invention, we claim:

1. In a loading system, a series of cars adapted to be filled with material, and provided at the top with means for supporting a loading device so that the latter may travel over the cars to bring material thereto, a member at the head of said series of cars and provided with an inclined portion along which said loading device is adapted to be moved to and from the car adjacent thereto, and a loading device together with means for moving the same back and forth over said member and said cars.

2. In a loading system, a series of cars adapted to be filled with material and provided at the top with rails for a loading device, a unit in advance of the cars having inclined rails leading up to the rails of the adjoining car, and a loading device adapted to travel up along the inclined rails of said unit and over the rails of the cars.

3. In a loading system, a series of cars having rails at the top thereof, a loading device adapted to travel along the same and to dump material therein, and a power unit in advance of the cars, and provided with inclined rails leading up to the rails of the adjoining car, and provided with power means for moving the loading device back and forth over the cars to and from the power unit.

4. In a loading system, a series of cars adapted to be filled with material discharged into the top thereof, and provided at the top and along their sides with rails, and a car loading device adapted to travel along the rails and to discharge material into the different cars, the rails constituting a trackway for the loading device capable of lateral flexing to an extent sufficient to allow the loading device to travel thereover when the cars are positioned on the sharpest curve around which they are capable of traveling.

5. In a loading system, a series of cars having bodies adapted to receive material from the top thereof, and provided at the top and along the sides with rails, and a loading device adapted to travel over the rails, said rails being composed of relatively movable sections forming a trackway capable of a wide lateral flexing so as to accommodate the loading device for the sharpest curves about which the cars are designed to travel.

6. In a loading system, a series of cars having bodies adapted to be filled with material discharged into the top thereof, and provided along the sides with fixed rail sections, connecting rail sections between the cars, each pivoted to one rail section and slidably engaging the rail section on the adjoining car, and a filling device adapted to travel over the trackway formed by said rails.

7. In a loading system, a series of cars adapted to be filled with material, a loading device of the dumping type adapted to travel over the cars and to discharge material therein, means for moving said loading device back and forth over the cars, and means for selectively causing the automatic dumping of the device into the cars, comprising a trip member adapted to function on any one of the cars.

8. In a loading system, a loading machine, a series of cars adapted to be filled with material before being conveyed away from the machine, a skip adapted to travel over the cars to convey the material from the loading machine to the cars, power means for moving the skip toward and from the loading machine, and a device adapted to be positioned on any one of the cars to cause the skip to be dumped into said car.

In testimony whereof, we hereunto affix our signatures.

FRANK BILLINGS.
ROBERT P. GREENLEAF.