Nov. 28, 1967 P. C. O'LEARY 3,355,041

HAULAGE TRAIN FOR UNDERGROUND MATERIALS

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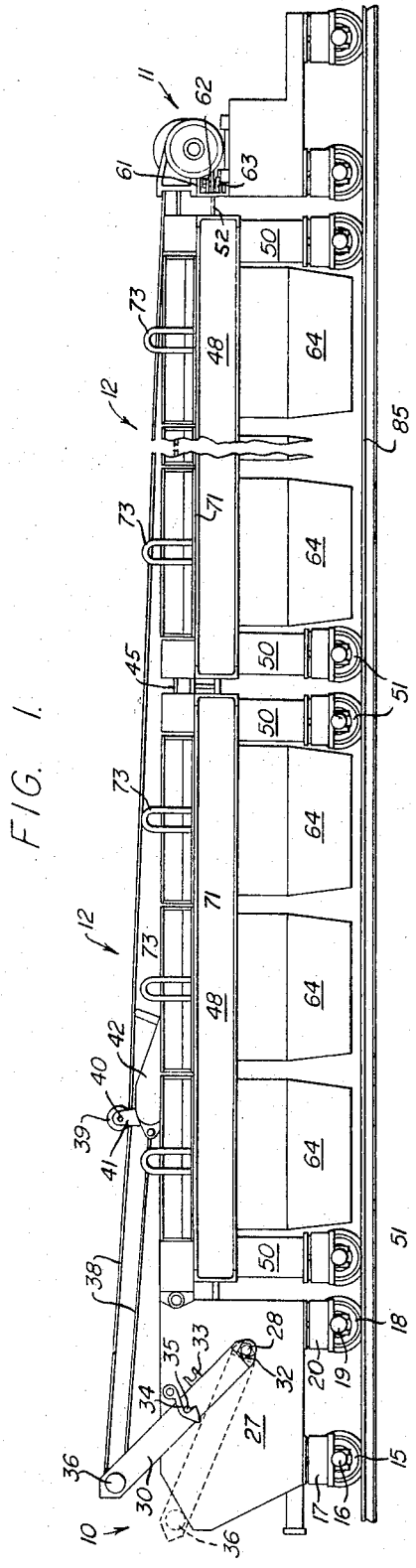


FIG. 1.

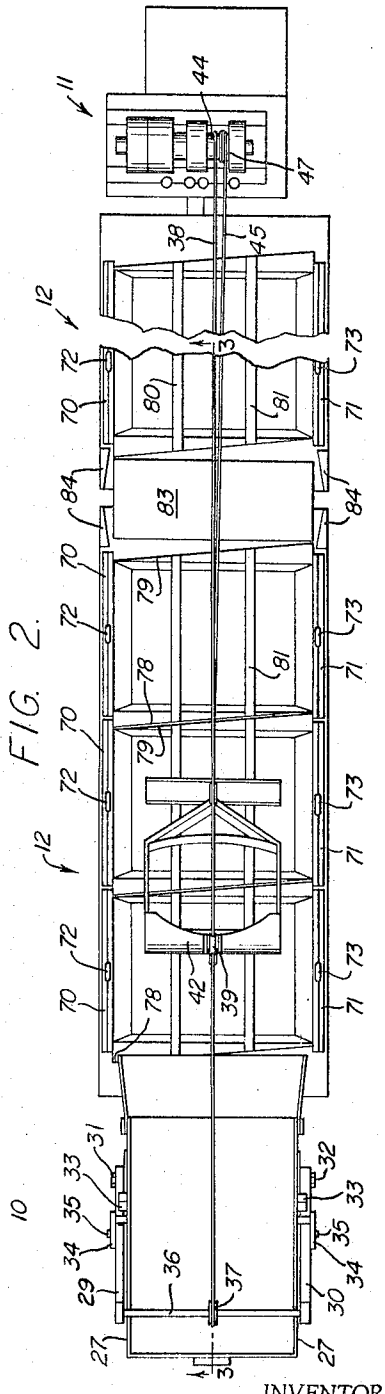


FIG. 2.

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FIG. 3.

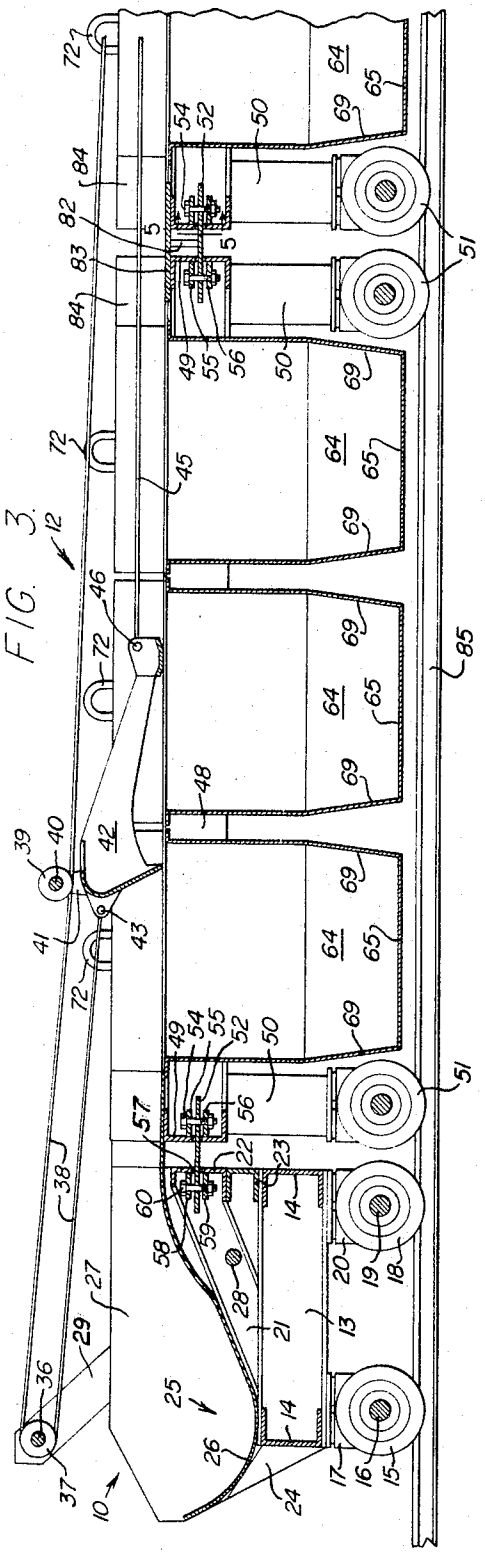


FIG. 5.

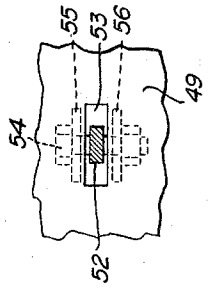
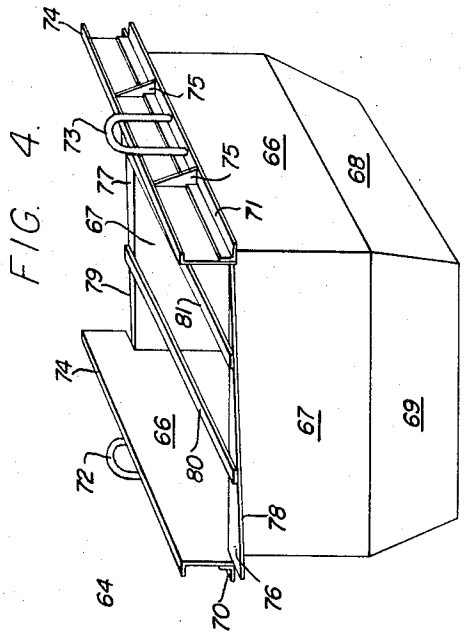


FIG. 4.



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# HAULAGE TRAIN FOR UNDERGROUND MATERIALS

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## ABSTRACT OF THE DISCLOSURE

A train for hauling material underground, including cars having individually vertically lifted tubs and scraper loading means for carrying mucked material over the tops of the cars and for dumping into them.

### *Brief description*

This invention relates to transport equipment for hauling broken rock and other materials from mine drifts and tunnels. It is particularly concerned with providing a train of receptacles that can be loaded within the limited confines of a mine drift or tunnel, hauled to a location beneath a vertical shaft, and lifted to the surface.

In mining and some tunneling operations, earth materials must be removed from the advancing face of the drift or tunnel and hoisted to the surface through a vertical shaft. The use of vertical shafts along the length of a drift or tunnel may be necessary, because, for example, the drift or tunnel does not have any other exit or because it is advantageous to reduce the distance the load must be transported.

The presently accepted method of transporting such earth materials or "muck," is to use small mine cars that are individually maneuverable into a position where they are loaded by a conventional mucking machine. The cars are then individually driven to a position at the bottom of the vertical shaft, from where they are hoisted to the top of the shaft, driven to an unloading area, and emptied, before again being lowered to resume the cycle of operation. This type of operation is unsatisfactory for many reasons, but principally because it requires a great deal of manpower (an operator for each mine car), and because each small car must be individually manipulated into hoisting position beneath the vertical shaft so that the entire car, including the chassis, wheels, motor, etc. can be lifted to the surface and can be lowered back to running position on the tracks after being dumped.

Principal objects of this invention are to provide a material haulage train that requires only a single operator, and to provide such a train that is capable of self-loading and of transporting a large quantity of muck on any given run and that does not require transfer of the muck for hoisting to the surface but avoids the usual difficulties of raising complete cars and of repositioning such cars on tracks.

To accomplish these objects, I employ as a feature of my invention, one or more material-carrying cars, each made up of a wheeled chassis and a series of individually removable tubs. The tubs are adapted to be lifted from the chassis, hoisted up a vertical shaft, dumped, and then lowered back into position on the chassis. One or more of these cars are preferably coupled between a loading car and a control car to form a train. The loading car is then positioned adjacent to the advancing face of the drift or tunnel to receive muck, and a scraper, operated from the control car, is used to move the muck backwardly from the loading car over special bridging structure to the individual tubs of each material-carrying car. As the loaded train is moved beneath a vertical shaft, the



tubs are individually grasped and raised from their cars by hoisting means, hoisted to the surface, dumped, and lowered back down the shaft to their original or corresponding positions on the material-carrying cars of the train. While the material-loading car shown is adapted to receive ore or other material from a conventional mucking machine it should be apparent that it could as well include its own mucking and loading apparatus.

There is shown in the accompanying drawings a specific embodiment of the invention representing what is presently regarded as the best mode of carrying out the generic concepts in actual practice. From the detailed description of this presently preferred form of the invention, other more specific objects and features will become apparent.

In the drawings:

FIG. 1 is a view in side elevation of a material haulage train embodying the invention, an intermediate portion being broken out for convenience of illustration;

FIG. 2, a corresponding top plan view;

FIG. 3, a longitudinal vertical section taken on the line 3—3 of FIG. 2;

FIG. 4, a perspective view of one of the tubs of the material-carrying cars; and

FIG. 5, a fragmentary vertical section taken on the line 5—5 of FIG. 3.

### *Detailed description*

Referring now to the drawings:

In the illustrated embodiment of the invention a material loading car **10** and a control car **11** have a plurality of material-carrying cars **12** coupled therebetween to form a train that is suitable for hauling ore or other material along the limited confines of a drift or tunnel.

Material-loading car **10** includes a box-like frame made up of interconnected side stringers **13**, only one of which is shown, FIG. 3, and end stringers **14**. A pair of front wheels **15** are journaled on a front axle **16** extending through wheel supports **17** that depend from side stringers **13** at one of their ends, and a pair of rear wheels **18** are similarly journaled on a rear axle **19** extending through wheel supports **20** that depend from the other ends of side stringers **13**. Inclined stringers **21** rest on side stringers **13** and extend upwardly to a cross member **22** that is supported by upright posts **23**. The inclined stringers, together with side stringers **13** and interconnected plates **24** that extend out from the side stringers, and only one of which can be viewed in FIG. 3, provide support for a cradle shown generally at **25**.

The cradle can have a bottom **26** of curved plate steel, as illustrated, or it can be of the type disclosed in U.S. Patent No. 2,876,915, issued March 10, 1959 to E. R. Borcherdt, with overlapping wear bars (not shown). Outer side panels **27** extend upwardly to form, with the bottom **26**, a receiving bed for material dumped therein by a mucking machine (not shown).

A bar **28**, threaded on both ends, extends through inclined stringers **21** to form a pivot shaft for a pair of boom arms **29** and **30**. Nuts **31** and **32**, FIG. 2, threaded on the ends of the bar, hold the boom arms on the pivot shaft. When the boom arms are not in use they are allowed to fall to the dotted line position of FIG. 1 so that the train will have a desired low silhouette. When in use, however, they are pivoted clockwise until they abut stops **33** protruding from side panels **27**. Swinging hooks **34** are then engaged with pins **35** to securely hold the boom arms in the raised operating position.

A shaft **36** extends between the free ends of arms **29** and **30** and a sheave **37**, around which a cable **38** is passed, is journaled thereon. Cable **38** also passes beneath a sheave **39** rotatably mounted on an axle **40** that is carried by a frame **41** on the top of a scraper **42**.

One of the ends of the cable is connected at 43 to the head of the scraper 42 and its other end is connected to a power driven drum 44, mounted on the control car 11. Another cable, 45, has one of its ends connected to the tail of the scraper at 46 and its other end connected to another power driven drum 47 carried by the control car.

As will be further explained, proper operation of power driven drums 44 and 47 will result in scraper 42 being moved to distribute material dumped into the material-loading car 10 to the material-carrying cars 12 of the train. For this reason, the bottom 24 of the material-loading car is shaped to have a scooped out portion that curves smoothly up and beyond the supporting frame to form a cantilevered guide for the scraper.

Each of the material-carrying cars 12 comprises a box-like frame, made up of side stringers 48 and end stringers 49, carried by depending corner supports 50 through which the axle for wheels 51 are passed. The cars are interconnected by drawbars 52 that pass through elongate openings 53, FIG. 5, in the end stringers and that are held in place by pins 54, each passing through upper and lower flanges 55 and 56, respectively, that are fixed to the end stringers, and through a hole in the end of the drawbar.

A slot opening 57 is also provided through cross member 22 of the material-loading car 10 and upper and lower flanges 58, and 59, respectively, are also adapted to have a coupling pin 60 passed downwardly through them and through drawbar 52. Similarly, the control car 12 has a slotted stringer 61 mounted thereon through which a drawbar can be inserted to allow a pin to be passed downwardly through an upper flange 62, a drawbar 52, and a lower flange 63.

Obviously, any desired number of material-carrying cars 12 can be coupled between the material-loading car 10 and the control car 12, and the material-loading and control cars can be positioned at either end of the train so formed.

The box-like frames of the material-carrying cars 12 serve as supports for tubs 64. These tubs, shown best in FIGS. 3 and 4, each include a flat-bottom 65 and vertical side walls 66 that are interconnected by vertical end walls 67. Downwardly converging side walls 68 interconnect the vertical side walls and the flat bottom, and downwardly converging end walls 69 interconnect the converging side walls 68 and also the vertical end walls with the flat bottom. Vertical side walls 66 extend upwardly beyond vertical end walls 67 to form side boards for guiding the scraper, in a manner to be more fully explained.

Angles 70 and 71, are respectively fixed to the outside of the opposing vertical side walls 66 and extend the full length thereof at the top edge of the vertical end walls 67. The angles of each tub rest on the top flanges of side stringers 48, as shown in FIG. 1, when the tub is carried by the frame of its material-carrying car.

Handles 72 and 73, respectively fixed to angles 70 and 71, and each fixed to a lip 74 of the adjacent vertical side wall, provide the necessary gripping means by which the tub can be raised from the material carrying car, hauled up a vertical shaft, dumped, and then be returned to the car. Braces 75 reinforce the connections between angles 70 and 71 and their adjacent vertical side wall.

Extensions 76 and 77 extend outwardly from the upper edge of the respective vertical end walls and have their edges 78 and 79 parallel, but with one side of each edge extending further out from the tub than the other side. Parallel rails 80 and 81 extend across the top opening in the tub and rest on extensions 76 and 77 to form slide surfaces for the scraper. The ends of the rails are made flush with the edges of the extensions, so that at each end of the tub one rail extends out further than the other. As will be further explained, this allows the scraper to cross the openings between material-carrying cars and to slide over the tubs. As illustrated, the material-carrying cars 12 and the tubs 64 are dimensioned such that three



tubs rest on the side stringers 48 between the end stringers 49, but it should be obvious that more or less tubs can be provided for each car, as desired.

A post 82, FIG. 3, extends upwardly from the center of drawbar 52 to support a flat, rectangular plate 83, FIGS. 2 and 3, that has its top surface level with the top surface of the rails 80 and 81 on tubs 64, when they are resting on the frame of their material-carrying car. When the material-carrying cars are coupled together to form a straight train the side edges of the flat plate 83 are closely adjacent to the ends of the rails extending the greatest distance beyond the ends of the adjacent tubs. This allows the cars to pivot with respect to each other.

An outward taper on the inside surface of side boards 84, positioned on the ends of side stringers 48 provides clearance for pivoting of the material-carrying cars and flat plate 83 with respect to each other. Obviously other conventional car couplers could be used to interconnect the cars, but the flat plate or other equivalent slide surface must be provided to allow the scraper to move car to car.

In the operation of the train the desired number of material-carrying cars 12, are coupled together within the drift or tunnel in which they are to be operated.

The material-loading car is coupled to one end of the connected material-carrying cars, and the control car is at the other end. Since the material-loading and control cars are completely separable from all other train structure they can obviously be coupled at either end of the connected material-carrying cars, and, should it be found desirable, they can be switched during the haulage operations.

The train thus formed is then moved on the tracks 85 provided, until the material-loading car is adjacent the face being advanced.

A conventional mucking machine, not shown, is used to dump material onto cradle bottom 26, from where an operator at control car 11 moves it to the material-carrying car.

In operation, the operator manipulates the controls of powered drum 44 to take up cable 38. Simultaneously therewith he operates drum 47 to release cable 45. The scraper is thus dragged over the rails 80 and 81 of the material-carrying cars and over the bridging plates 83 toward the material-loading car. Continued pulling on cable 38 will lift the scraper from the train, toward the elevated sheave 37. At this time, if mucked material has not already been dumped in the cradle of the material-loading car, it is placed therein using a conventional mucking machine. Both cables are then slacked off and the scraper is allowed to drop into the material in the cradle. The operator then actuates drum 44 to release cable 38 and drum 47 to take up cable 45. This drags the scraper up the curved surface of the cradle and onto the rails above the tubs of the first material-carrying car, pushing mucked material ahead of it. As the scraper passes over the rails of the first tub, some or all of the material falls between the rails and into the tub. If the first tub is full the material will be carried on to the next tub, and so on. The tubs of the material-carrying cars are sequentially filled by repeated operations of the scraper. As the scraper passes from car to car its flat, straight cutting edge, which is too wide to drop into the narrow openings provided between the rails and plates 83, moves easily from rails to bridging structure, with only a small amount of material falling between the cars.

When all of the tubs have been filled the scraper is moved to the material-loading car, both cables are slacked off and positioned alongside the train, and the train is moved to sequentially place the tubs beneath a vertical shaft intercepting the drift or tunnel. As each tub is moved beneath the vertical shaft the load cable of a crane or other conventional hoisting means is connected to its handles and the tub is raised out of the shaft, dumped, and lowered back to the train. The inclined side

and end walls provide a downwardly tapered tub that one man at the bottom of the shaft can easily guide back into its proper position between the side rails of a material-carrying car. After all of the tubs have been raised, dumped, and lowered, the slack in the cables is taken up, the train is again moved to the advancing face of the tunnel, and a new cycle of operation is begun.

Whereas there is here illustrated and specifically described a certain preferred construction of apparatus which is presently regarded as the best mode of carrying out the invention, it should be understood that various changes may be made and other constructions adopted without departing from the inventive subject matter particularly pointed out and claimed herebelow.

I claim:

1. A material-carrying car for use with a train having a material-loading car, a scraper, and means to move material from said material-loading car throughout the length of the train, said material-carrying car comprising

a frame;

wheel supporting the frame for movement on tracks;

at least one open-topped tub carried by said frame, said tub being adapted to be lifted vertically therefrom and to be repositioned thereon;

slide means extending across the open top of the tub, said slide means comprising two parallel, spaced rails, dimensioned so that material dropped therepast will fall into the tub, the rails extending beyond the open top of the tub and one of the rails extending beyond the corresponding end of the other rail at each of the opposite ends of the tub beyond which the rails extend.

2. A train for underground hauling of material comprising

a material-loading car having guide means extending thereunto;

a control car;

at least one material-carrying car including a frame;

at least one open-topped, vertically removable tub suspended by the frame, said tub having rails thereon extending over the open top of the tub and beyond opposite ends thereof, and side walls extending upwardly above the rails and parallel thereto;

means articulatively connecting each of said car to form a train;

bridge sections supported by the means articulatively interconnecting the cars, said bridge sections forming a slide surface with the rails on the tub and the guide means extending into the material loading car; and

a scraper operable from said control car to be moved back and forth along the slide surface.



3. A tub for use with a material-carrying car, said tub having an open-top defined by parallel end walls connected to parallel side walls;

a flat bottom;

inwardly converging side walls connecting the parallel side walls and the bottom; and

inwardly converging end walls interconnecting the inwardly converging side walls and the parallel end walls with the flat bottom;

extensions on the parallel side walls extending above the rails to serve as guides for a scraper passed over the tub along the rails;

handles extending above the rails to provide lifting means during vertical lifting of the tub; and

slide means extending across the open top of the tub, said slide means comprising two parallel, spaced rails, dimensioned so that material dropped therepast will fall into the tub, the rails extending beyond the open top of the tub and one of the rails extending beyond the corresponding end of the other rail at each of the opposite ends of the tub beyond which the rails extend.

4. A material-carrying car according to claim 1, wherein the sides of the tub extend upwardly beyond the ends of the tub to form sideboards extending parallel to the rails.

5. A material-carrying car according to claim 4, further including means extending above said tub and adapted to be engaged by hoist means to raise said tub from the frame and to reposition it thereon.


**References Cited**

UNITED STATES PATENTS

| | | | |
|---|---|---|---|
| 298,086 | 5/1884 | Henry | 214—38 |
| 1,085,738 | 2/1914 | Kearns | 105—459 |
| 2,587,362 | 2/1952 | Miller | 214—41 |
| 2,873,866 | 2/1959 | Austin et al. | 214—83.3 X |

FOREIGN PATENTS

| | | |
|---|---|---|
| 966,430 | 8/1957 | Germany. |



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