Nov. 8, 1960 J. VIAL 2,959,304

HOISTING INSTALLATIONS EMPLOYING TRUCKS WITH TIPPING TUBS

Filed Feb. 5, 1958 5 Sheets-Sheet 1

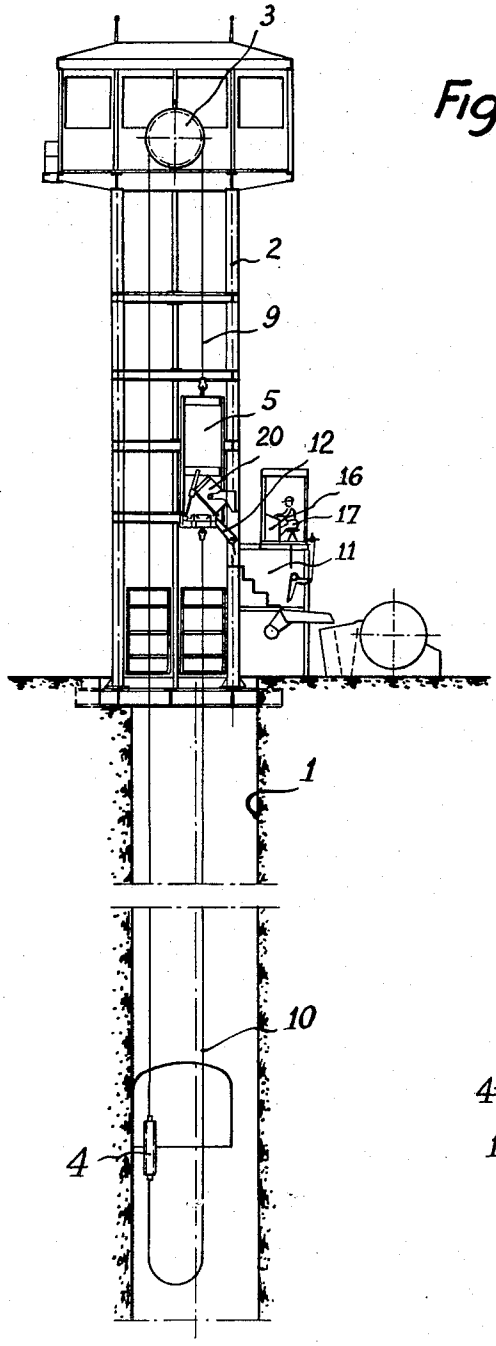


Fig. 1

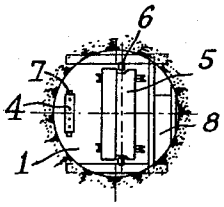
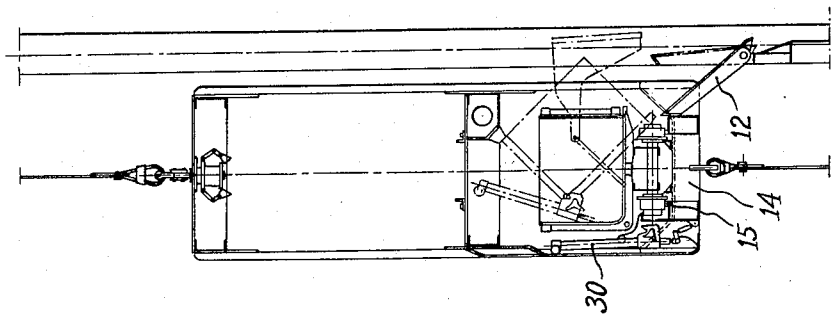


Fig. 2

HOISTING INSTALLATIONS EMPLOYING TRUCKS WITH TIPPING TUBS

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Fig.4



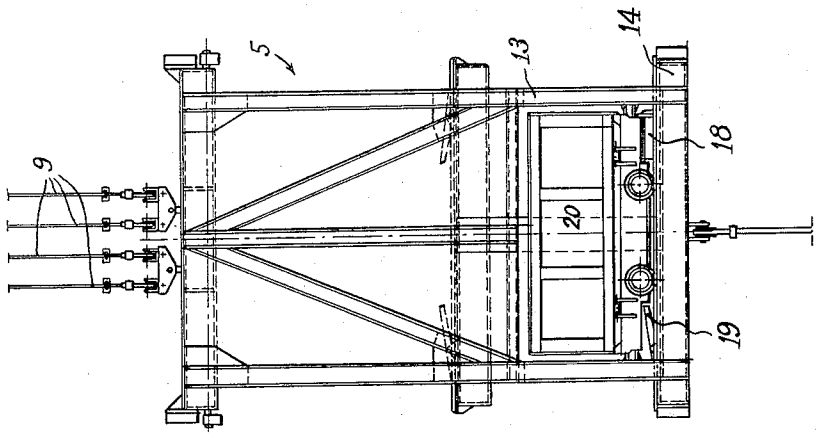


Fig.3

HOISTING INSTALLATIONS EMPLOYING TRUCKS WITH TIPPING TUBS

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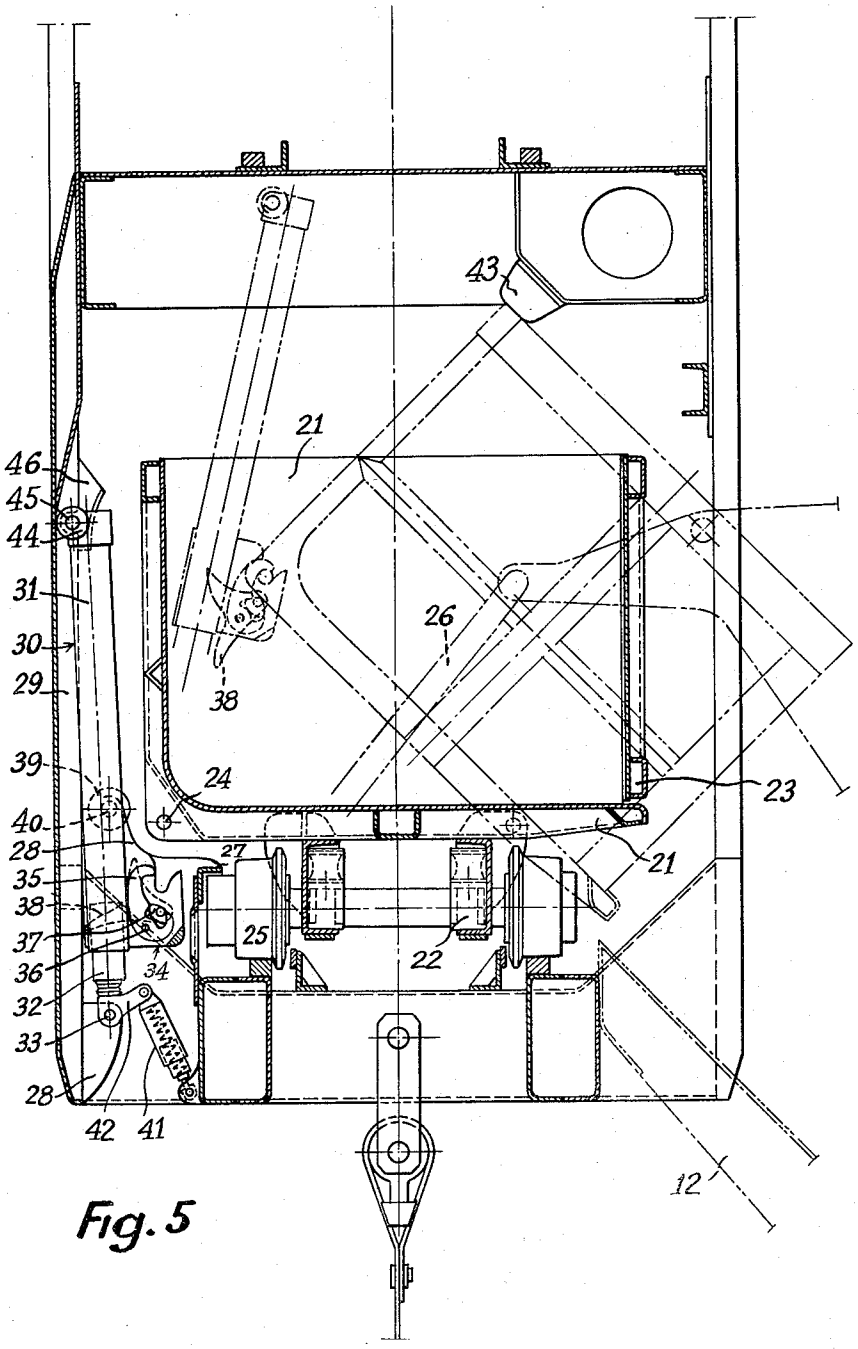
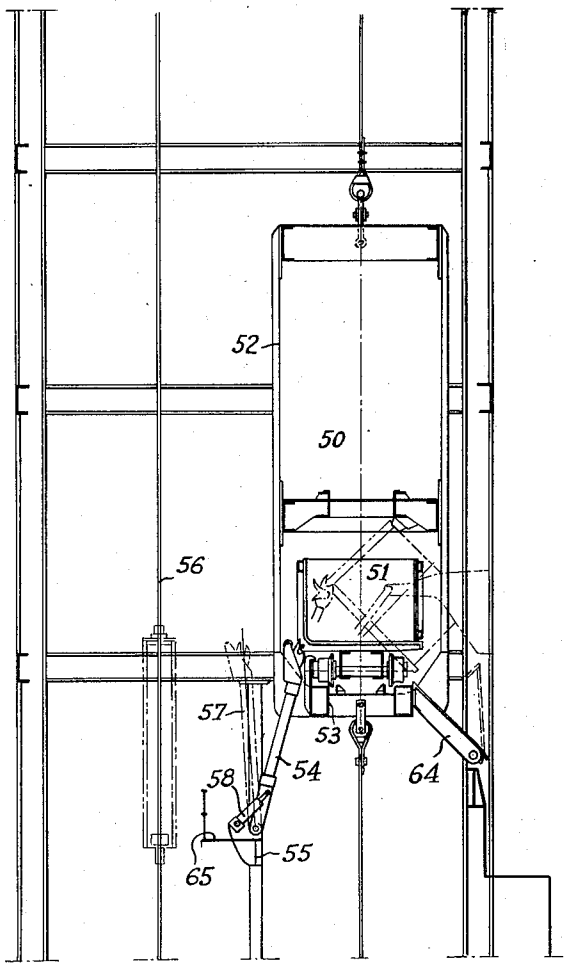


Fig. 5

HOISTING INSTALLATIONS EMPLOYING TRUCKS WITH TIPPING TUBS

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Fig. 6

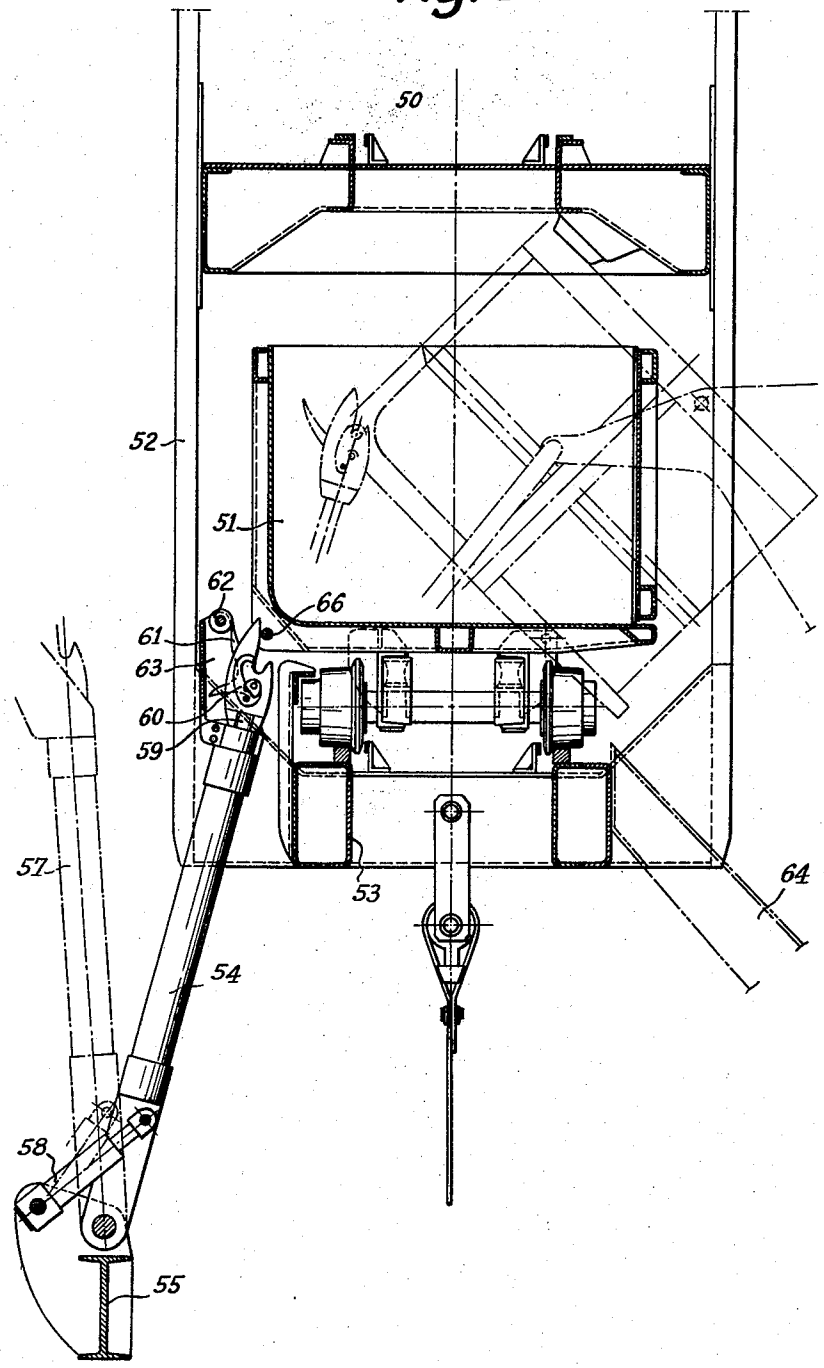


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HOISTING INSTALLATIONS EMPLOYING TRUCKS WITH TIPPING TUBS

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Fig. 7



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HOISTING INSTALLATIONS EMPLOYING TRUCKS WITH TIPPING TUBS

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3 Claims. (Cl. 214—64)

The present invention relates to improvements in hoisting installations comprising one or more guided cages conveying trucks having tipping tubs which are emptied without the truck leaving the cage at the emptying station.

It has for an object to provide installations which are simpler and more economic than hitherto proposed arrangements, and which eliminate at the surface, as in the hoisting techinque using skips, the handling or marshalling of trucks and the apparatus equipping the landings, whilst retaining underground the simplicity and economy of landings served by cages.

It consists essentially in utilising, in conjunction with a cage comprising one or several lower decks reserved for hoisting the products and constituted by a simple flooring provided with a rail track supporting the truck, a mechanical remotely controlled device which is installed either at the side of the track at each deck in the cage, or at a fixed emptying station in the pit-head frame and possibly at other positions along the pit shaft. When the cage is stopped at an emptying station the truck provided with a tipping tub is emptied in the hopper for receiving the products. The cage may also comprise an upper deck arranged in a known manner in order to transport staff, working equipment, implements and various materials.

The invention also includes various other features which are preferably employed and which will be more fully described hereinafter.

The invention will be more fully understood, by reference to the following description in conjunction with the accompanying drawings, given by way of example, and in which:

Figures 1 and 2 show schematically in elevation and in plan a complete hoisting installation comprising a single cage and counterweight constructed according to the invention and in which the tipping device is placed in the cage.

Figures 3 and 4 show respectively an elevational view and an end view of the hoisting cage.

Figure 5 shows the hydraulic jack having an automatic locking finger which ensures the tipping of the tub of the truck and possibly its shaking in the tipped position when the products extracted are particularly muddy or sticky.

Figure 6 shows an elevational view of a cage at an emptying station in the case where the tipping device is placed at a fixed station in the shaft of the pit.

Figure 7 shows constructional details of the hydraulic jack of Figure 6.

Referring to Figures 1 to 5, the installation shown comprises, in a manner known, a shaft **1** having a ladder section **8** and a hoisting section in which travels a cage **5** having rigid guiding means **6** and a counterweight **4** which is guided by two cables **7**.

The shaft is surmounted by a hoisting tower **2** at the head of which is installed a winch having a Koepe pulley

3 having a large rim and a small diameter which accommodates a layer of four cables **9** supporting on one side the cage **5** and on the other side the counterweight **4**.

A balancing cable **10** is suspended at one of its ends to the lower floor of the cage and at the other end to the lower part of the counterweight.

The hopper **11** for receiving the coal or ores which rests against the tower framework **2** above the ladder compartment **8** carries at the upper part of its rear face and as an extension of the latter, a shutter **12** for the sliding of the coal or ores, which is hinged about a horizontal axis in the manner of a movable bridge.

A suitable mechanical device, for example a pneumatic jack, not shown on the drawings, enables the movable shutter to be turned back towards the interior of the hoisting tower when the cage is stopped at the desired level, in such a manner that the free end of the shutter rests against the lower floor **14** of the cage in the position shown on Figures 1 and 4.

Approximately at the level of the hinging axis of the movable shutter **12** is arranged a platform, secured to the tower framework **2**, and on which is arranged the control cabin for the hoist at a position from which the engine-man **17** behind his control desk **16** can see perfectly the truck **20** to be tipped at the lower deck of the cage, the movable shutter **12** and the hopper **11** for receiving the coal or ores.

In the embodiment illustrated in Figures 3 and 4, the cage comprises an upper deck arranged in a known manner, from which is suspended by means of four rigid legs **13** the lower deck comprising a simple floor **14** on which the track **15** is placed.

The full truck **20** caged by a known process at one of the bottom landings is maintained in the cage by means of stop-blocks **18** and dogs **19** arranged so as effectively to restrain any displacement of the caged truck.

A holding device preventing tilting of the truck is constituted by an angle-iron **27** (Figure 5) welded on brackets **28** fixed on the floor (**14**) of the lower deck of the cage, which retains the frame **22** of the truck, during the tipping of the tub **21**, thus preventing the lifting up of the hubs of the two wheels **25** situated on the side opposite to the door of the truck.

The truck **20** is a wagon of the Granby type with a tub tipping laterally which does not comprise a tipping roller but a simple handling shaft **24** mounted in the manner of a basket handle in the central part of the lower edge of the tub **21**.

The lateral door **23** hinged on the tub opens automatically, according to a known method, when the latter tips, through the effect of two links **26** which are also hinged, on one hand on the frame and on the other hand at the end of the lateral panels of the door.

In the installation schematically shown in Figures 1 to 5, the tipping apparatus for the tub of the truck is constituted by a single-acting hydraulic jack **30** whose cylinder **31** is placed towards its top, the lower end of the rod **32** of the piston being hinged on the brackets **28** which are rigidly fixed to the lower floor of the cage, by means of a horizontal shaft **33** parallel to the track.

At the low part of the cylinder is fixed a hand **34** which is suitably cut out in order to hook on to the handling shaft **24** of the tub of the truck in the course of the lifting movement of the jack.

Inside this hand is mounted, hinged about the axis **36**, a hook-shaped finger **35** of which a cam **37** adapted to move about an axis parallel to the preceding one, causes the engagement or the release in order to lock together or unlock the hand **34** and the handling shaft **24** of the tub of the truck.

A lever **38** keyed on the axis of the cam **37** causes its

rotation and consequently the tipping of the locking finger 35, its carp-tail-shaped free end being operated during the movements of the jack, by a roller 39 mounted loosely on a shaft 40 integral with the median cross-piece 29 of the lower deck of the cage.

The hydraulic pump having an electric motor actuating the jack and its oil tank, which are not shown on the drawings, are located in the thickness of the intermediate floor of the cage, the current supply being ensured by simple contacts (also not represented on the drawings) which are respectively mounted on the external side of the lower floor of the cage and on the upper portion of the movable nose for the sliding of the coal or ores.

By means of an additional lever which is suitably arranged at the right hand side of the control desk 15 of the hoist, the engine-man causes the movable shutter 12 for the sliding of the coal or ore to be turned against the lower floor 14 of the cage; by pushing this lever to its maximum he actuates the tipping jack of the truck which is lifted up, on condition however that the movable shutter has in fact reached the end of its travel, and come into contact with the cage.

During the extension of the jack, the hand 34 mounted on the lower part of the cylinder couples on to the handling shaft 24 of the tub of the truck and causes it to tip.

During this first phase of the movement, the lower branch of the carp-tailed lever 38 which is operated by the roller 39 causes the rotation of the cam 37 which turns the locking finger 35 down on to the handling shaft 24 of the truck, effectively imprisoning it, as inside a closed hand, owing to the shape of the cam which ensures that the movement is irreversible.

If the coal or ore is a normal product, which does not adhere much to the sides of the tub, the engine-man can release the lever controlling the tipping of the truck, the jack finishes its complete travel corresponding to an inclination of the bottom of the tub of the order of 50°. and comes back rearwardly automatically, bringing the tub back to its normal position.

During the first part of this return travel, the upper branch of the carp-tailed lever 38 meets the roller 39 and tips and drives in its movement the cam 37 which pushes back the locking finger 35.

The handling shaft 24 of the tub of the truck being thus freed, the jack completes its return travel and draws aside laterally against the median cross-piece 29 of the lower deck of the cage against which it rests by the action of a spring 41 fixed on the lower floor of the cage and whose free end pushes back a heel 42 which is integral with the hinge joint of the jack.

The jack is kept in a positive manner in its withdraw position by two loose rollers 44 mounted on shaft 45 integral with the jack, which engage behind two cheeks integral with the median cross-piece 29 during the return travel of the jack.

The movable nose 12 of the hopper for receiving the coal or ore is then automatically lifted up and the freed cage is ready for movement up or down its shaft as controlled by the engine-man.

Suitably disposed locking mechanisms, which are not shown on the drawings, do not allow the raising of the movable nose 12 before the tub 21 of the truck has returned to the normal position and also prevent a starting of the hoist if the movable nose of the hopper is not completely raised.

If the contents of the truck is constituted by abnormally thin and moist coal or ore sticking to the bottom of the tub, the engine-man keeps in hand the tipping lever of the truck and by alternate operations of this lever causes a real shaking of the tub of the truck in the inclined and open position against rubber stops 43 suitably disposed under the intermediate floor of the cage.

In this embodiment the jack is placed above the track, it could have been underneath. The arrangement in which

the jack is completely above might advantageously be utilised in order to tip trucks in any desired point of the track without it being necessary to hollow out the platform.

Figures 6 and 7 show by way of modification the case when the tipping device is arranged at a fixed station in the shaft framework.

The cage 50 is shown stopped at the top landing, the shutter for the sliding of the coal or ore resting against the lower floor 53 of the cage.

The tipping device consists in a double-acting jack whose cylinder 54 is hinged at its lower part on the horizontal beam 55 which forms a part of the shaft framework.

The guiding cables 56 and the counterweight of the cage leave enough space so that the jack in the sideways position 57 may be housed. A gangway 65 may be arranged in order to facilitate the maintenance of the installation.

A small double-acting jack 58 enables the tipping jack to go over from the sideways position 57 to the working position 54.

At the end of the piston 59 of the tipping jack is situated the coupling 60 which is similar to that of the preceding case, the locking of the finger being this time controlled by the action of the roller 62 on the carp-tailed-shaped cam 61, this roller being mounted on the cheeks 63 which are integral with the upper bottom of the cylinder 54.

The operation is as follows: As soon as the cage stops at the top landing, the engine-man presses on the controlling tipping lever, which simultaneously causes the movable shutter 64 for the sliding of the coal or ore to turn down and causes the tipping jack to tip from its sideways position 57 to its working position 54 this position being defined by the stop of the hand 60 on the handling shaft 66.

By pressing to the maximum on this same lever, the engine-man causes the rising of the piston 59 of the tipping jack whose hand 60 lifts up the truck. Soon after the beginning of the tipping of the tub, the cam 61 meets the roller 62 which causes the locking of the hand. During the tipping movement of the tub the small jack 58 remains floating.

The other operations proceed as in the preceding case. The cage can only start again when suitably disposed contacts have ensured that the tipping jack has gone back to its sideways position and that the shutter for the sliding of the coal or ore has freed the passage of the cage.

This modification has the advantage of lightening the cage which no longer contains the tipping jack, the pump and its engine. Thereby its maintenance is rendered easier. Lastly, in the case when the cage raises several trucks, a single jack replaces the different jacks situated at the various decks of the cage.

The description of the installations which use our invention and the analysis of their operation, as has been stated above, emphasize the advantages deriving from the simplicity, the effectiveness, the safety and economy—in materials as well as with respect to staff—of this hoisting technique.

It will be understood that the invention is in no way limited to the specific embodiments described, and that various modifications may be made. For example the installation may have two identical cages, or the trucks may run on sloping planes. Furthermore, the trucks may have a lateral tipping, and run singly or in convoy, on sloping planes or in galleries and are tipped by means of a mechanism similar to that described above, after stopping at the landing.

What I claim is:

1. A hoisting and dumping installation comprising a vertical shaft and a cage vertically movable in said shaft, said cage being adapted to receive at least one side-dumping car having a tiltable load-carrying tub, a dumping

hopper adjacent said shaft, a pivoted chute adapted to bridge the gap between said hopper and the tub of the car carried by said cage when said car is in position for dumping the contents of the tub into said hopper, and a dumping device actuatable when said cage is stationary in said shaft to discharge the load carried by said car without removing the car from the cage, said dumping device being effective to grip the car tub to effect dumping of said load and to effect positive guiding of said tub from its initial position to a tipped position and back to its initial position, said dumping device comprising a hydraulic jack equipped with a hand-member which can lock on to the tub of the car at the beginning of the extension of the jack and unlock therefrom upon completion of the return travel of the jack, the hand-member being provided with a hook-shaped locking finger which is automatically actuated during the movement of the jack to lock on to the tub, the hydraulic jack being provided with a roller and being provided with a cam suitably cut to cause an irreversible displacement and automatically actuated during the movement of the jack by a lever having a carp-tailed shaped end which engages with the roller mounted on the jack, whereby said locking finger engages with the tub at the beginning of the lifting travel of the jack, thus achieving a safe connection between said jack and the tub.

2. A hoisting and dumping installation comprising a vertical shaft and a cage vertically movable in said shaft, said cage being adapted to receive at least one side-dumping car having a tiltable load-carrying tub, a dumping hopper adjacent said shaft, a pivoted chute adapted to bridge the gap between said hopper and the tub of the car carried by said cage when said car is in position for dumping the contents of the tub into said hopper, and a dumping device actuatable when said cage is stationary in said shaft to discharge the load carried by said car without removing the car from the cage, said dumping device being effective to grip the car tub to effect dumping of said load and to effect positive guiding of said tub from its initial position to a tipped position and back to its initial position, said dumping device being disposed outside the path in which the cage travels, and an auxiliary jack

inclining said dumping device into working position to reach the tub of the car.

3. A hoisting and dumping installation comprising a vertical shaft and a cage vertically movable in said shaft, said cage being adapted to receive at least one side-dumping car having a tiltable load-carrying tub, a dumping hopper adjacent said shaft, a pivoted chute adapted to bridge the gap between said hopper and the tub of the car carried by said cage when said car is in position for dumping the contents of the tub into said hopper, and a dumping device actuatable when said cage is stationary in said shaft to discharge the load carried by said car without removing the car from the cage, said dumping device being effective to grip the car tub to effect dumping of said load and to effect positive guiding of said tub from its initial position to a tipped position and back to its initial position, said dumping device comprising a hydraulic jack equipped with a hand-member which can lock on to the tub of the car at the beginning of the extension of the jack and unlock therefrom upon completion of the return travel of the jack, the hand-member being provided with a hook-shaped locking finger which is automatically actuated during the movement of the jack to lock on to the tub, the hydraulic jack being provided with a roller and being provided with a cam suitably cut to cause an irreversible displacement and automatically actuated during the movement of the jack by a lever having a carp-tailed shaped end which engages with the roller mounted on the jack, whereby said locking finger engages with the tub at the beginning of the lifting travel of the jack, thus achieving a safe connection between said jack and the tub, said dumping device being disposed outside the path in which the cage travels, and an auxiliary jack inclining said dumping device into working position to reach the tub of the car.

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