United States Patent [19]

Reeder

[11] **3,905,496**

[45] **Sept. 16, 1975**

[54] **UNLOADER ELEVATOR WITH ENERGY MEANS TO RETURN THE ELEVATOR TO ITS LOADING POSITION**

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[22] Filed: **Sept. 21, 1973**

[21] Appl. No.: **399,730**

[30] **Foreign Application Priority Data**

Oct. 4, 1972 Australia 689/72

[52] **U.S. Cl.** ..... **214/128;** 60/414; 214/95 R; 214/DIG. 4; 214/107; 187/17

[51] **Int. Cl.** **B65g 47/00**

[58] **Field of Search** ..... 214/95 R, DIG. 4, 106, 214/107, 127, 128, 313, 502, 702, 711–712; 187/17, 18; 60/413, 414

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Primary Examiner—Robert J. Spar
Assistant Examiner—R. B. Johnson
Attorney, Agent, or Firm—Stevens, Davis, Miller & Mosher

[57] **ABSTRACT**

Apparatus for lowering a heavy rollable article from one elevation (e.g. the deck of a truck) to a lower elevation (e.g. ground level) comprises a rigid frame, a tray vertically movable on the frame on to which the article to be lowered is rolled for gravity descent to the lower elevation, means to tip the tray when it arrives at the lower level so that the article can roll from it, and pneumatic means which store enough energy during tray descent to re-elevate the tray in readiness to receive another article.

9 Claims, 10 Drawing Figures

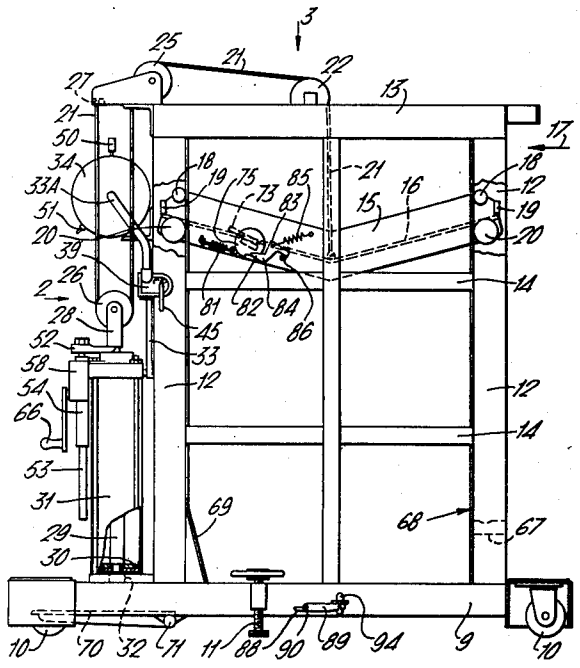


FIG. 1.

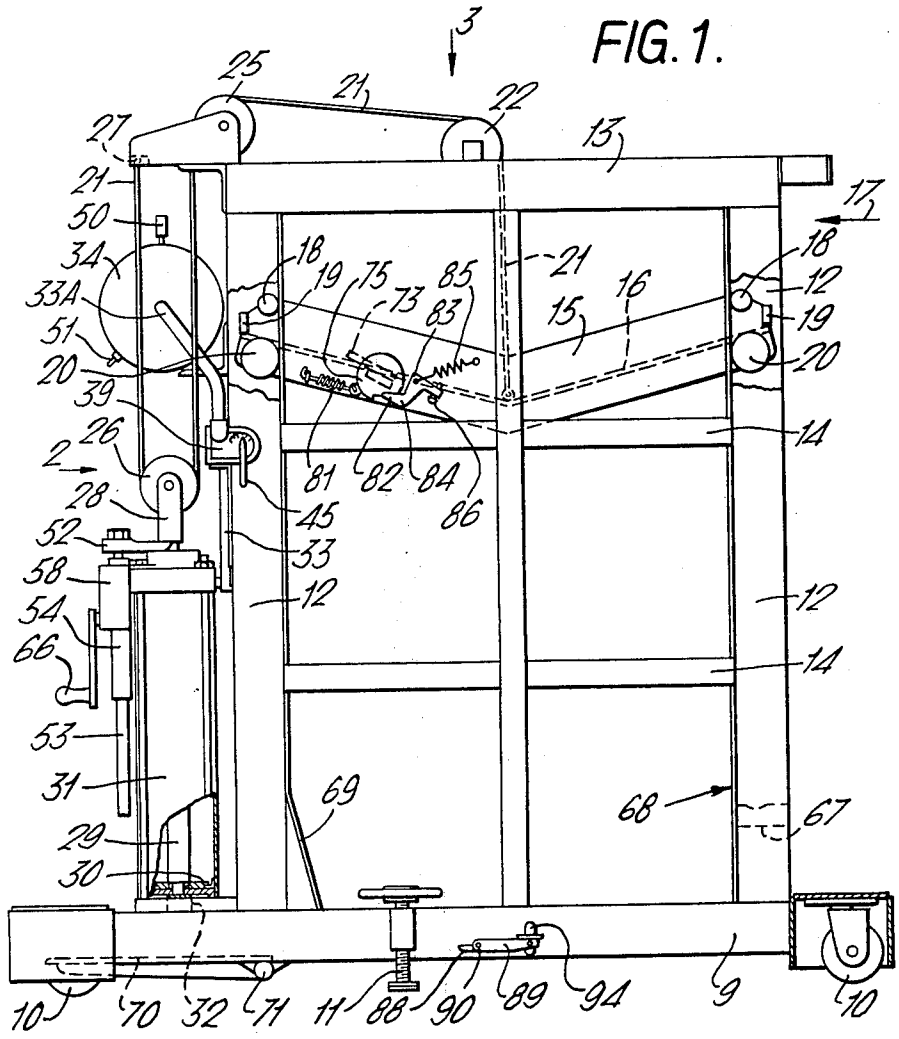

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FIG. 1A.

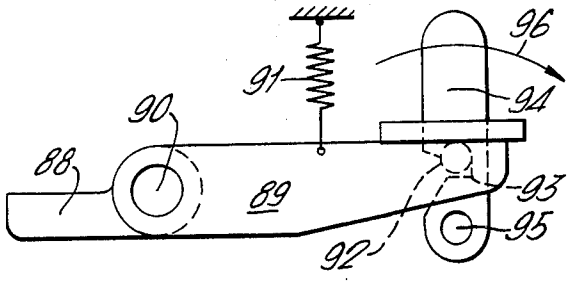

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FIG. 2.

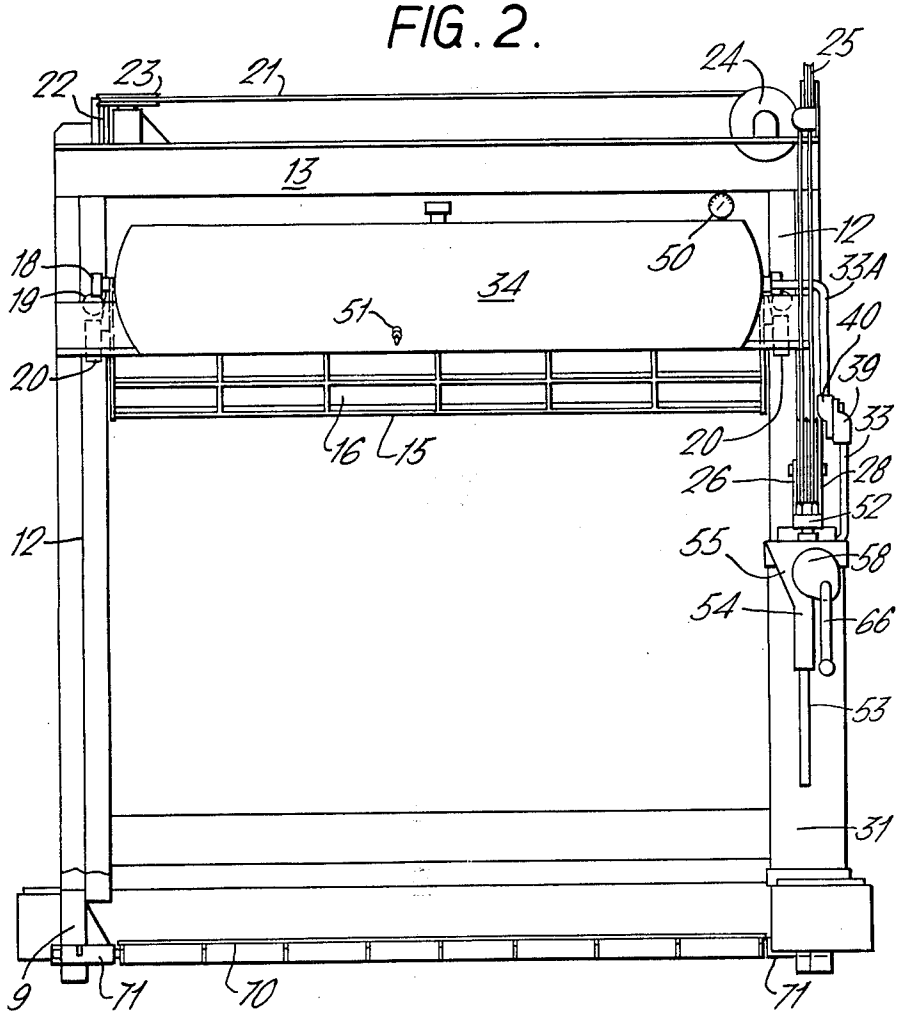

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FIG. 3.

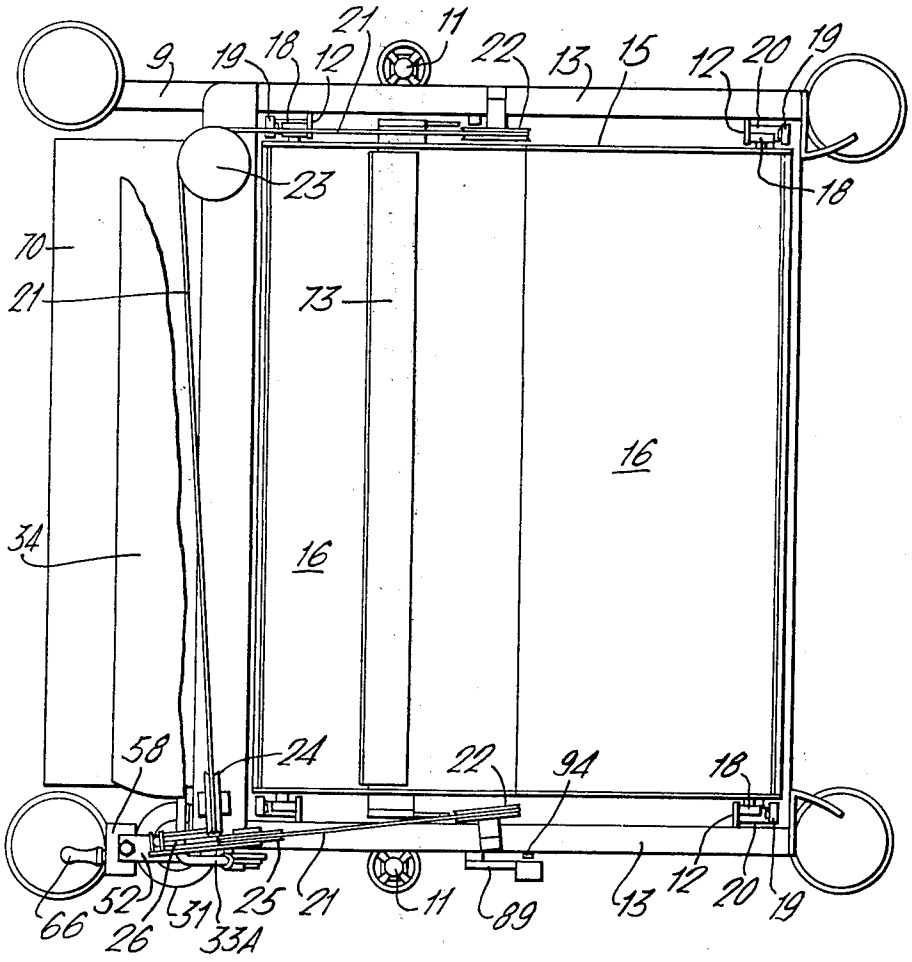

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FIG. 4.

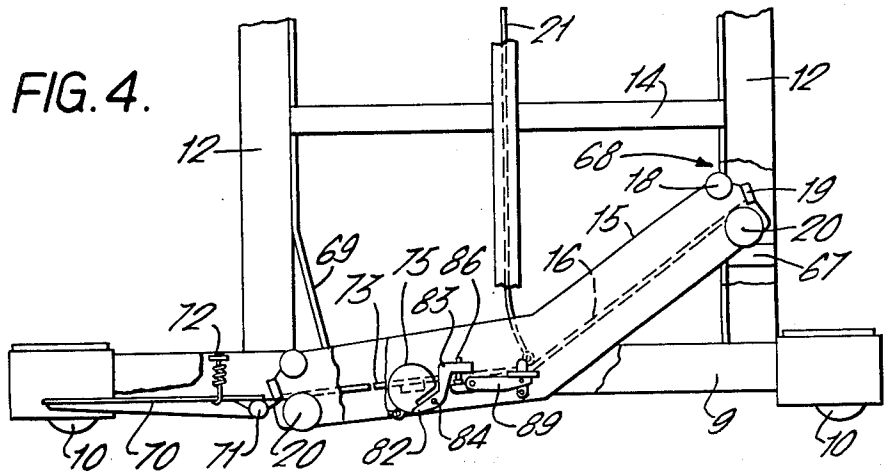


FIG. 5.

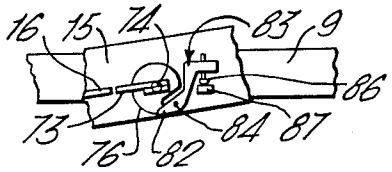


FIG. 5A.

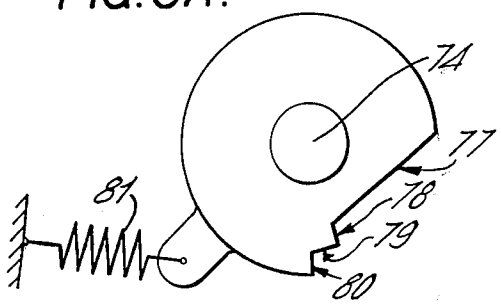


FIG. 6.

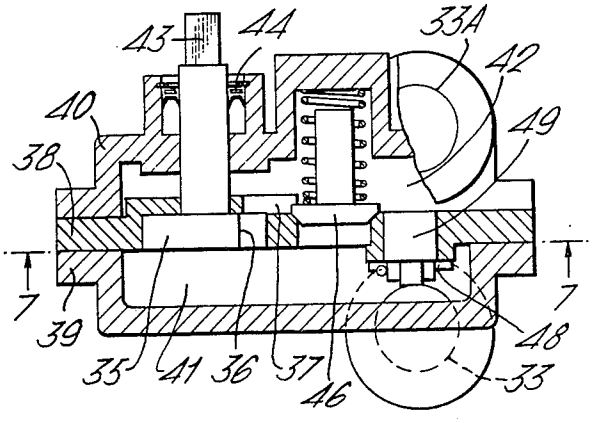


FIG. 8.

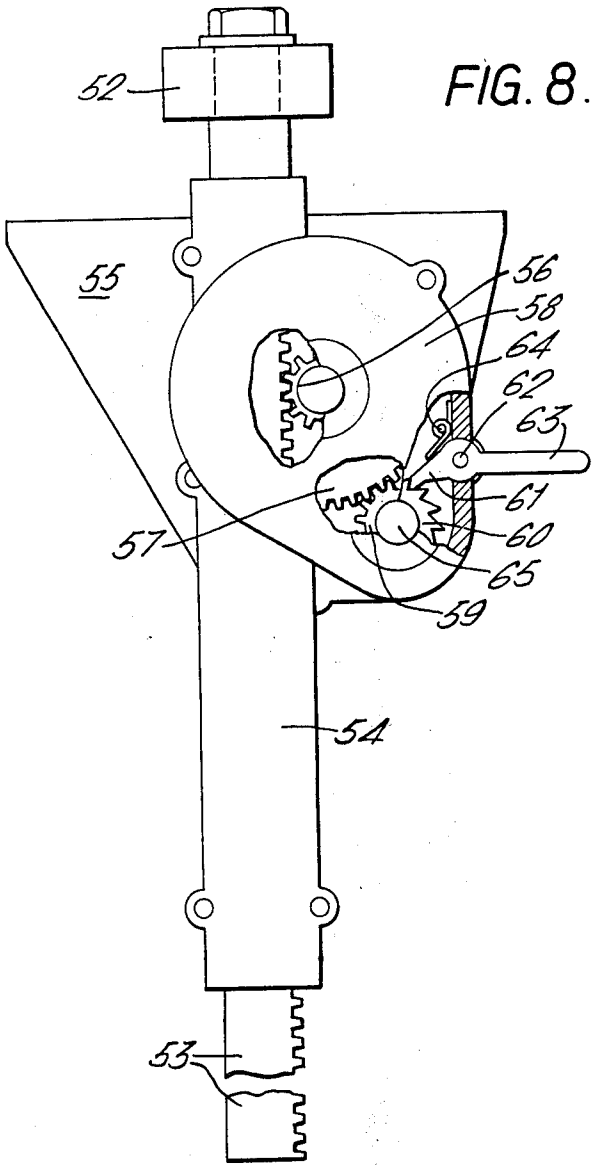
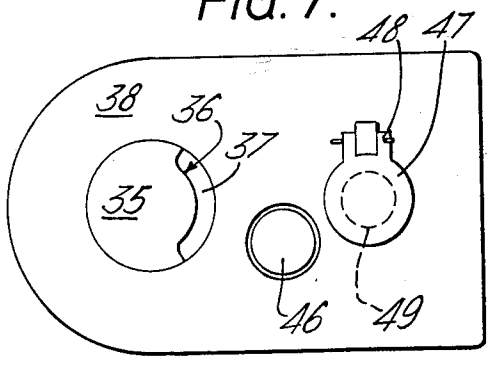


FIG. 7.



UNLOADER ELEVATOR WITH ENERGY MEANS TO RETURN THE ELEVATOR TO ITS LOADING POSITION

This invention is concerned with the lowering of relatively heavy articles from one elevation (the deck of a truck, for example) to a lower elevation (ground level, factory floor level, or the like).

The term "heavy articles" as used herein, is intended to mean articles which cannot be readily lifted or lowered manually. Examples of such articles are rolls of newsprint, other paper rolls, filled beer kegs, oil drums and the like.

It will be seen that the mentioned articles are all of cylindrical or similar rollable form, and the invention is primarily intended for the handling of such rollable articles although it is usable in the unloading of bales of wool or other heavy articles which are not as readily rollable.

Because the invention is primarily intended for use with rollable articles, it will be described herein mainly in terms of that particular use.

It will be appreciated that when heavy rollable articles arrive at a destination of use, the articles have to be unloaded from a road vehicle deck, a rail truck, or similar vehicle; and to facilitate the unloading operation, it has hitherto been customary to provide factories and other such premises with loading and unloading docks so that the vehicle deck and factory levels are virtually the same, thus, permitting the rollable articles to be simply rolled from one to the other. Any such expedient, while facilitating loading or unloading as just explained, introduces objectionable aspects of its own. For example, if a dock floor is at road level, then the factory floor has to be unnecessarily elevated; or if the factory floor is at ground level, then docks have to be provided by excavation, provision of run-in ramps and the like.

The object of this invention is to overcome the indicated disabilities in a very simple way by the provision of unloading apparatus which, in effect, allows heavy articles simply to be pushed from a vehicle deck or the like and yet gently arrive at the required lower elevation without breakage or other impact impairment of the article.

The invention provides, an unloading apparatus comprising:-

a. a rigid frame which includes, at least, two upright posts,

b. a load-receiver tray guided for free descent from a top position on said posts,

c. tipping means to tilt said tray as it nears a lowermost position on said posts, and

d. pneumatic means for storing sufficient energy generated by descent of a loaded tray to return it to said top position following loss of its load.

An example of the invention is illustrated in the drawings herewith.

FIG. 1 is a side elevation of an unloader.

FIG. 1A repeats a portion of FIG. 1 on an enlarged scale.

FIG. 2 is an end elevation looking in the direction of arrow 2 in FIG. 1.

FIG. 3 is a plan looking in the direction of arrow 3 in FIG. 1.

FIG. 4 repeats a lower portion of FIG. 1, with some parts broken away or omitted, and showing the load-receiving tray in lowered and tilted position.

FIG. 5 is a detail of one end portion of a trip device the other end portion of which is shown in FIG. 4.

FIG. 5A is an enlarged showing of a latching disc of the kind shown in FIG. 4, 5 and other figures of the drawings.

FIG. 6 is a sectional plan of a regulator and by-pass valve assembly also shown (on a smaller scale) in FIGS. 1 and 2.

FIG. 7 is an elevation taken on line 7—7 in FIG. 6

FIG. 8 is a detail of a tray elevation adjustment gearbox also shown (on a smaller scale) in FIGS. 1 and 2.

Referring to the drawings:

The rigid frame includes a base structure with casters 10, or other wheels, to facilitate portability.

The base structure, especially if the structure is furnished with wheels, is preferably also provided with a plurality of jack-screws 11 which permit the base structure to be raised sufficiently for its wheels, or some of its wheels, to be cleared from the ground or floor so to keep the device stationary while in use.

The rigid frame, of which the mentioned base structure forms part, preferably has four upright corner posts 12 rigidly mounted by their lower ends on the base structure. These corner posts, at their upper ends or elsewhere, may be braced and stiffened in any conventional way, for example by top braces 13 and side braces 14. The posts 12 are formed as channels or the like to act as runways for a vertically-movable load-receiver tray 15. This tray is formed as a shallow trough (see FIG. 1) which has a floor 16 on to which a rollable load may be rolled in the direction indicated by arrow 17 in FIG. 1. Because of the tray's trough shape the load will lie centrally of the tray. At its ends, the tray is furnished with guide rollers 18, 19 and 20 which ride in flanges or other runway elements on the posts 12. The tray is supported at each end of its ends by being suspended on a pair of cables 21 which extend upwardly to the top of the frame, whence they run about idler pulleys 22, 23, 24, 25 and twin idler pulley 26 to an anchorage 27 at the top of the frame.

Twin pulley 26 is freely revolvably-mounted in a clevis 28 on the upper end of a piston rod 29 whereof the lower end carries a bucket piston 30 which works inside an air cylinder 31 having a closed upper end and a port 32 open to atmosphere at its lower end. This air cylinder 31 is mounted on the base structure by its lower end. The closed upper end of the air cylinder 31 has a duct in two parts 33 and 33A extending from it to a compressed air storage reservoir 34.

The duct or pipe connection from the cylinder 31 to the reservoir 34 includes a control-type assembly by which the rate of air flow from the cylinder to the reservoir may be regulated. The control valve may be in the form of a needle valve or the like: but preferably it is in the form of a head 35 having a peripheral gap 36 formed in it which upon selected rotary adjustment of the head is able to vary the effective opening of a port 37. This port is formed in a valve-plate 38 sandwiched between casing portions 39 and 40. Casing portion 39 provides a "high pressure" space 41 open to duct portion 33, and casing portion 40 provides a "low pressure" space 42 open to duct portion 33A which leads to reservoir 34.

Valve head 35 is mounted on a spindle 43, leak-proofed at 44; externally of casing portion 40. The spindle 43 is provided with a hand-piece 45 (see FIG.

1) including a pointer which runs over a scale calibrated in terms of tray-loadings.

The valve assembly shown in FIGS. 6 and 7 preferably includes a spring loaded relief valve 46 which, in the event of head valve 35 being closed (or almost so) relative to port 37 and in the event of an excessively heavy article being placed on tray 15, is able to open so to relieve what otherwise might be a damaging high pressure in the high pressure side of the pneumatic system.

Valve-plate 38 carries a gravity self-closing check valve 47, pivoted at 48, able to close a port 49 thus to prevent flow of air through port 49 from space 41 to space 42 while freely permitting air-flow in the reverse direction.

The reservoir 34 is preferably furnished with a pressure guage 50 and also with an air supply-valve 51 which may be of the spring loaded non-return type employed in motor car tires. This permits a compressed air supply to be coupled to the reservoir 34, and permits the required pressure to be established therein as manifested by the pressure gauge.

When the load-receiver tray 15 is in its topmost position (as shown in FIG. 1) the piston in the air cylinder 31 is disposed at or near the bottom of the cylinder, and if some adjustment of the tray 15 is required so as to level it relative to a vehicle deck or the like, such adjustment may be achieved by elevating the effective bottom-most position of piston 30. This could be achieved by making the cable anchorage 27 height adjustable, but preferably means are provided to limit the amount by which clevis 28 is able to descend relative to cylinder 31. The preferred form of these means is illustrated mainly in FIG. 8.

Referring (primarily) to FIG. 8., an abutment block 52 abuts the underside of clevis 28. Block 52 is fixed on the upper end of a rack 53 vertically slidable within a tubular casing 54 fixed, by bracket 55, to the head structure of cylinder 31.

Rack 53 meshes a pinion 56 co-axially fixed to a gear 57 borne in gear-box 58. Gear 57 meshes a pinion 59 co-axially fixed to a ratchet pinion 60. Pinion 60 is resiliently ridden by a pawl 61, fulcrumed at 62, having hand-release lever 63 and loaded by spring 64.

The ratchet pinion 60 is keyed on a shaft 65 rotatable by crank-handle 66. By turning crank-handle 66 (anticlockwise relative to the showing of FIG. 2) the block 52 will be raised, so lifting clevis 28 and thus setting some selected elevation of tray 15 below its topmost position as shown in FIG. 1.

When a load is to be lowered, it is rolled on to the load-receiver tray 15. The additional weight causes that tray to descend in its runways on the upright posts 12. This descent causes the piston in the air cylinder 31 to be raised so that it sends air into the reservoir 34 through the regulator-valve gap 36. The speed of tray descent will depend on the setting of the regulator-valve through which air is able to bleed from the air cylinder to the reservoir. When the loaded tray reaches the bottom of the upright posts, the tray is tipped to one side (as shown in FIG. 4) so that the load may roll from it. Upon loss of its load, the air pressure generated in the reservoir 34, then suffices to drive the air cylinder piston 30 downwardly so to revert the tray to its topmost position in readiness for receipt of another load.

The mentioned tipping action of the load-receiver tray, when it reaches the bottom of the apparatus, preferably consists in an obstruction in the form of blocks 67, or the like fixed on the runway elements at the load-receiving side of the tray. When the tray nears the bottom of its run, one side of it is held stationary by reason of its rollers 20, at that side, being obstructed by blocks 67 while the tray then descends angularly about the blocks 67 as fulcrum. This tipping of the tray suffices for the load to roll from the tilted tray.

Where the guide elements on the tray are in the form of rollers (as shown) the riding flanges on the posts 12 which carry blocks 67 may be laterally gapped at 68 (see FIG. 4.) so to provide clearance for the rollers 18 when the tray is tilted; similarily, the lower ends of the runway flanges at the "roll-off" side of the apparatus are bent inwardly at their lower ends, as indicated at 69 so that the guide rollers 18 and 20 on that side of the tray may run freely downwardly but radially relative to the tilt hinge point established by the rollers 20 resting on the blocks 67.

If desired, the mentioned base structure may be furnished with a run-off ramp 70 with which the lower end of the tray comes into alignment when the tray is tilted. This ramp is preferably pivoted at 71 and lightly spring loaded as indicated at 72 (see FIG. 4) so that when it is unloaded it will be raised clear of the floor, so as not to dig into the floor when the apparatus is being wheeled about.

In the illustrated embodiment of the invention, the load receiver tray 15 has a lateral hinged flap 73 which projects upwardly from the floor of the tray so that when the load is rolled onto the tray, the up-standing flap will provide sageguard against the load being rolled too far on to the tray. The flap 73 is fixed on a shaft 74 (see FIG. 5) rotatable in bearings (not shown) at the sides of the tray and on its respective ends shaft 74 has two latching discs 75 and 76 keyed on it.

The latching disc shown in FIG. 5A may be regarded as representative of either of the discs 75 and 76 in that they are both of the same form. Each has a gap in its periphery defined by a first flat 77, a first step 78, a second flat 79 and a second step 80. Each of these discs is loaded by a spring, such as tension spring indicated at 81, which influences the flap 83 to remain uptilted, and hence obstructive, as shown in FIG. 1.

Each of the discs 75 and 76 is engaged by the nose 82 of a trip lever 83, fulcrumed at 84 on the tray 15. The two trip levers are each spring-loaded for example by a spring as indicated at 85 in FIG. 1, so that the noses 82 are influenced to remain in riding contact on discs 75 or 76. When a nose 82 is engaged with the flat 77 and step 78 of its disc 75 (or 76) as shown in FIG. 1, the two discs are prevented from turning and the flap 73 remains obstructive relative to a rollable article on tray 15.

When the tray 15 reaches its lowermost and tilted position, as shown in FIG. 4, it is obviously desirable for the flap 73 to be depressed so that the load may freely roll from the tray. For this purpose, each of the levers 83 has a tailpiece 86 able to ride against one of two tripping obstruction lugs. These lugs are indicated at 87 in FIG. 5 and 88 in FIG. 1 and 1A. Lug 87 is fixed on the base structure and lug 88 is in the form of a spur on a treadle lever 89 fulcrumed on the base structure 9 at 90.

Lug 88 could be a fixed lug the same as lug 87. In that case the flap 73 would be automatically tripped into its release position, as shown in FIG. 5, immediately when

the tray reached its bottom tilted position. In some cases this may be desirable, but in others it may be preferable for the rollable article to remain paused on the descended tray. For example, until the way has been cleared into which it is going to roll.

To enable the article to be paused, as just indicated, lug **88** is preferably part of treadle lever (**89**) as shown (particularly) in FIG. **1A**.

Treadle lever **89** is loaded by a tension spring **91** and has a locking stub **92** fixed on its. When the spur **88** is to be used as a fixed obstruction (the same as lug **87**) the stub **92** is engaged within a notch **93** in a locking lever **94** fulcrumed on the base structure **9** at **95.** When loads on the descended tray are to be paused before rolling from it, lever **94** is swung clear of the stub **92** by turning it in the direction indicated by arrow **96** so that spur **88** is then unobstructive relative to the tail-piece **86** of the related trip lever **83,** and when, under these circumstances, flap **73** is to be freed so that it can easily be depressed by the load, foot pressure applied to the treadle will cause the spur to elevate the related tail-piece **86** so that the flap **73** then becomes readily depressible by the rolling off load.

It will be appreciated that when the loaded tray settles into its lowermost and tilted position, levers **83** are tripped so that their noses **82** then disengage from flats **77** and **78** of the discs **75** and **76.** Thus flap **73** is then depressible by the article waiting to roll from the tray **15.** When the flap is depressed the noses **82** then engage flats **79** and steps **80** of the discs **75** and **76** thus fixing the depressed position of flap **73** and flush with the tray floor **16** as shown in FIGS. **4** and **5.**

It will be understood that the preferred form for the apparatus frame is one, as illustrated, having four upright posts such as **12.** It will be clear, however, that as few as two posts could be provided; in which case, the runner elements for the tray could be in the form of shoes which grasp the runways while being freely slidable thereon, in much the same way as is usual with ordinary passenger elevators in multi-story buildings.

It will be appreciated that the apparatus subject hereof, instead of being furnished with wheels or casters, could be made as a fixed installation; also, the apparatus could be incorporated with a truck or other vehicle as a more-or-less permanent part thereof, so to enable rollable articles to be rolled onto the tray of the apparatus, at vehicle deck level for discharge at ground level.

What is claimed is:

1. Unloading apparatus comprising:

a rigid frame including spaced upright posts,

a laterally troughed load-receiver tray guided for free descent within the space between said posts from an elevated position within said space adjacent an upper portion of said frame, said tray having a load-receiving end at one side of said space and a load-departure end at the opposite side of said space, said tray including a floor and a lateral hinged flap,

said tray being suspended by a pair of cables each having one end attached to said tray and its other end attached to said frame adjacent said upper portion thereof, each of said cables defining a pendent looped portion,

an obstruction block on one of said posts for stopping the descent of only the load-receiving end of said tray at an elevation adjacent a lower portion of said frame so that the load-departure end of said tray may descend to an elevation lower than said elevation whereby said tray is tilted for unloading, and

means for holding said flap elevated relative to the floor of said tray, and means to render said flap flush with said floor when said load-departure end of said tray descends to said lower elevation,

pneumatic means for storing sufficient energy generated by descent of said tray when loaded to return it to said elevated position within said space upon loss of its load,

said pneumatic means comprising:

a cylinder,

a piston in said cylinder,

a piston rod having said piston on one end thereof,

a pair of idler pulleys mounted on the other end of said piston rod, each idler pulley being suspended by the pendent looped portion of a respective one of said pair of cables,

a compressed air reservoir, and

a pipe connection between one end of said cylinder and said compressed air reservoir, said pipe connection including a regulator valve through which air proceeds from said cylinder to said reservoir and a self closing valve through which air may proceed freely from said reservoir to said cylinder.

2. Apparatus according to claim **1** wherein said pair of pulleys are mounted on said piston rod by a clevis, an abutment block on which said clevis rests, and means for adjusting the height of said abutment block whereby said abutment block is height-adjustable and retainable in selected adjustment.

3. Apparatus according to claim **1** wherein the means for holding said flap elevated and to render said flap flush relative to the tray floor comprise:

a rotatable shaft which extends laterally of said tray which has said flap mounted thereon,

a latching disc respectively mounted on each end of said shaft, each latching disc having a stepped and flattened peripheral gap formation,

resilient loading means for biasing said discs to keep said flap elevated,

a pair of trip levers fulcrumed on said tray, each trip lever having a nose portion engageable with said peripheral gap formation of a respective one of said latching discs,

resilient loading means for biasing said nose portions into engagement with said gap formations, and

a pair of obstruction lugs on said frame for displacing said trip levers when said tray descends to said lower elevation.

4. Apparatus according to claim **3** wherein one of said obstruction lugs comprises a spur forming part of a treadle lever fulcrumed on said frame, and said treadle lever is connected to a resilient loading means for biasing said spur into a depressed position, and a locking lever for holding said treadle lever stationary relative to said frame.

5. Unloading apparatus as claimed in claim **1** wherein:

said ports comprise four upright posts spaced to define a rectangular space therebetween through any horizontal cross-section of the frame.

6. Unloading apparatus as claimed in claim **1** further comprising:

a pair of obstruction blocks including said block, each one of said pair of blocks being mounted on a respective one of a pair of said posts, and said blocks being mounted on said posts at substantially the same elevation.

7. Unloading apparatus as claimed in claim **6** wherein:

said cylinder and said piston rod extend substantially vertically, said piston is on the lower end of said piston rod, and said pipe connection is between the upper end of said cylinder and said compressed air reservoir.

8. Unloading apparatus as claimed in claim **1** further comprising:

flanges on said posts, guide rollers mounted on said frame adjacent each of said ends thereof, said rollers being adapted to ride in said flanges to guide said tray for free descent.

9. Unloading apparatus as claimed in claim **8** wherein:

one of the guide rollers on the load-receiving end of said tray is engageable with said obstruction block for stopping the descent of the load-receiving end whereby when said roller engages said obstruction block said tray tilts about a tilt hinge point formed by said roller and said block engaged therewith.

* * * * *