Feb. 21, 1956 W. J. CHESHER 2,735,558

AUTOMATIC LOWERING AND UNLOADING APPARATUS

Filed Jan. 7, 1954 3 Sheets-Sheet 1

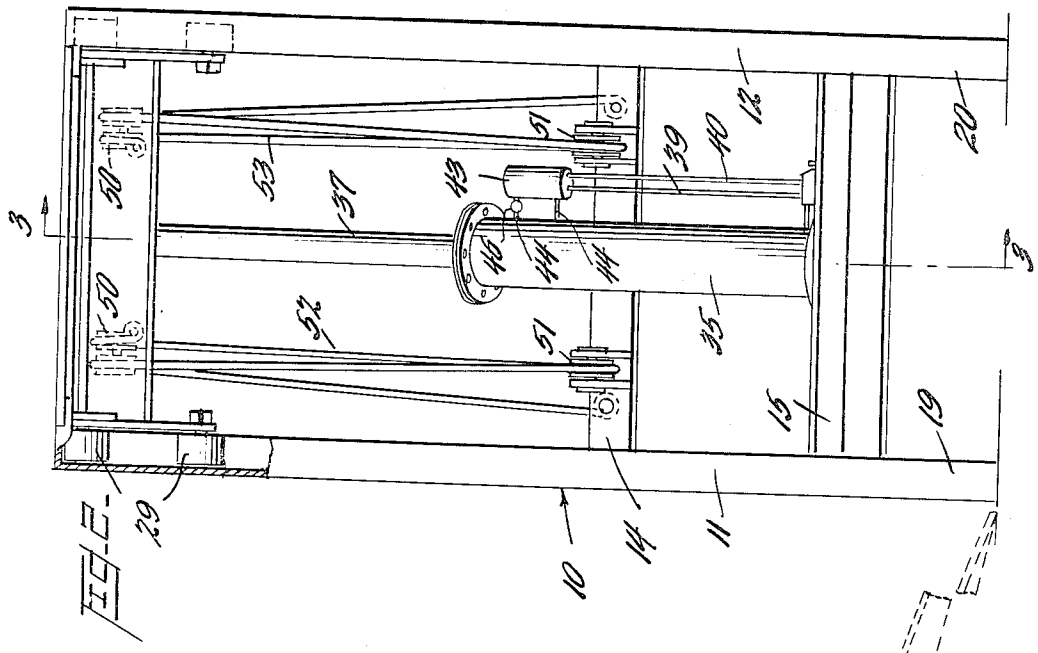


FIG. 2.

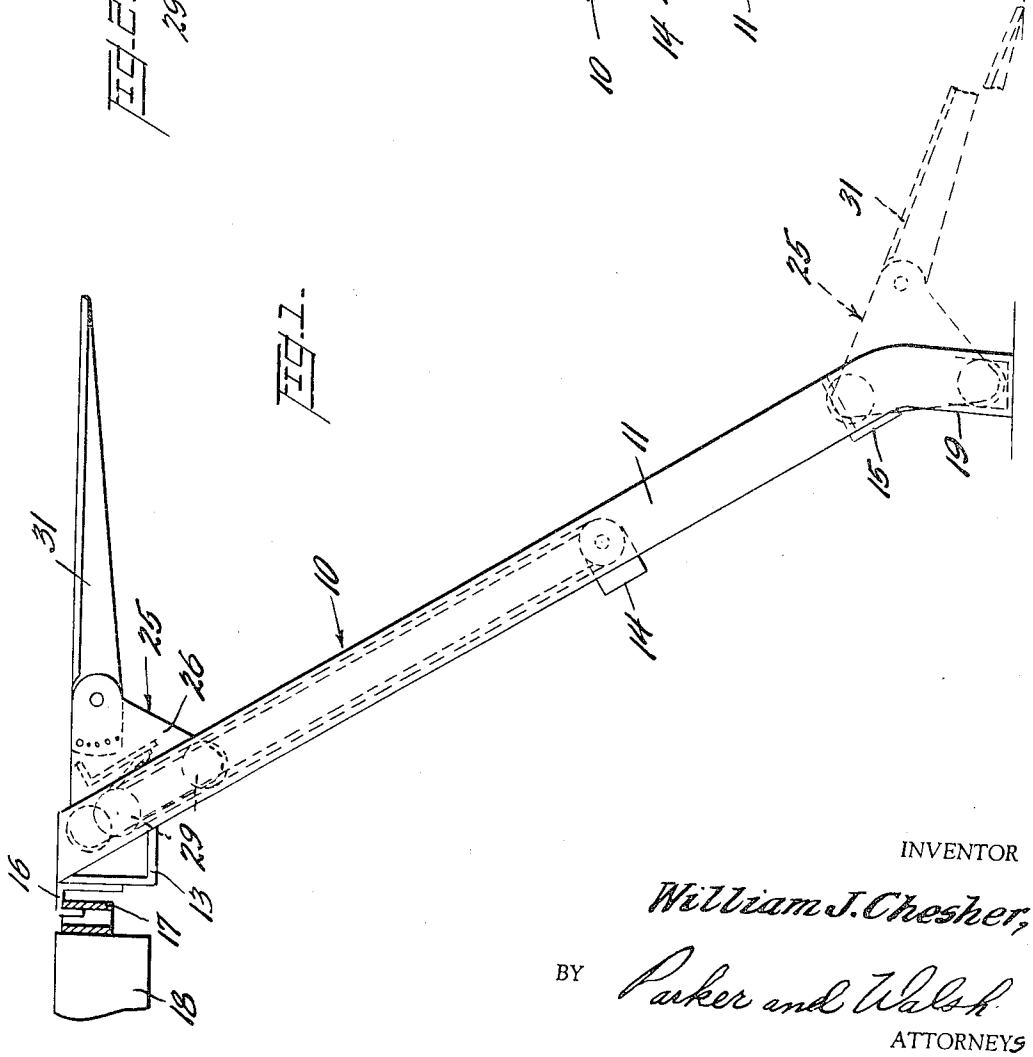


FIG. 1.

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AUTOMATIC LOWERING AND UNLOADING APPARATUS

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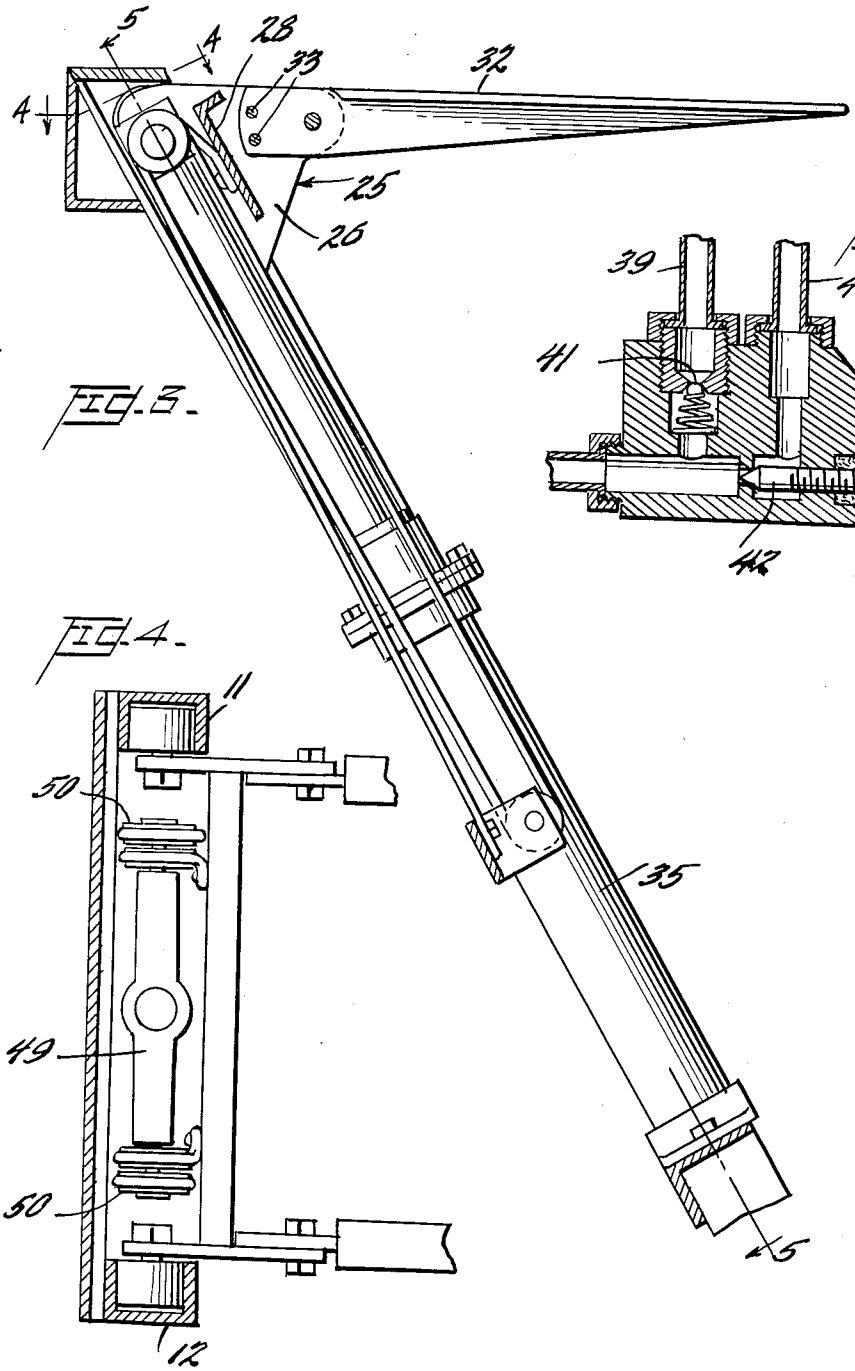


FIG. 5.

FIG. 6.

FIG. 4.

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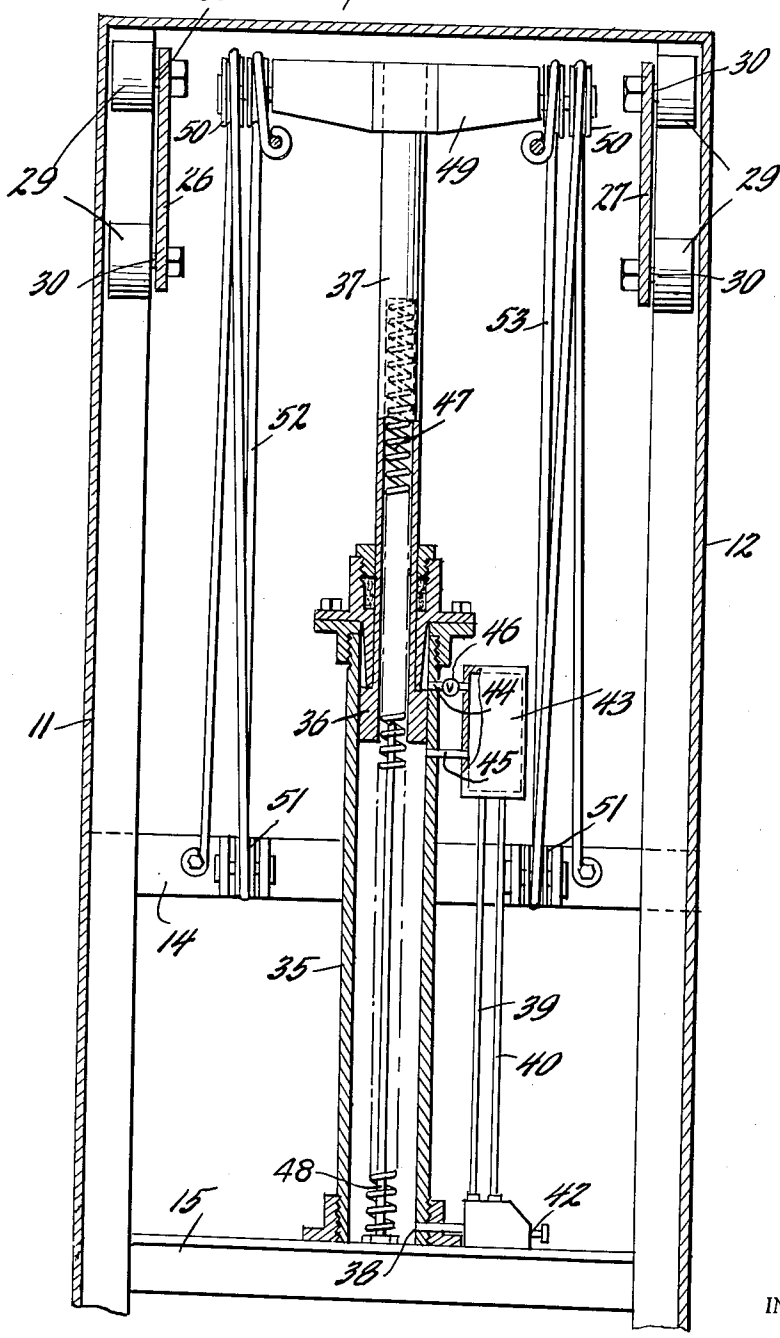
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AUTOMATIC LOWERING AND UNLOADING APPARATUS

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FIG. 5.



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AUTOMATIC LOWERING AND UNLOADING APPARATUS

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Application January 7, 1954, Serial No. 402,765

10 Claims. (Cl. 214—103)

This invention relates to apparatus for unloading barrels, rolls of newsprint paper, and other relatively heavy rollable items.

A principal object of the invention is the provision of apparatus of the indicated type which will simplify, speed up, and render safer, the unloading of relatively heavy rollable items of the character mentioned.

Another object of the invention is the provision of a unitary apparatus of the indicated type which can be set up for operation easily and quickly and without the use of special tools or equipment.

A further object of the invention is the provision of apparatus of the indicated type having means automatically operable by the weight of an article placed thereon to lower the same from an upper to a lower level at a controlled rate of movement, to automatically discharge the article at the lower level, and to automatically return to the upper level at an accelerated rate of movement after the article has been discharged.

A still further object of the invention is the provision of apparatus of the indicated type which is rugged, durable and highly efficient in use.

These and other objects and advantages of the invention will become more apparent from the following detailed description, taken with the accompanying drawings, wherein:

Figure 1 is a side elevational view of the apparatus of the invention operatively positioned for unloading a vehicle;

Figure 2 is a plan view of the apparatus shown in Figure 1;

Figure 3 is a cross-sectional view of the apparatus taken on the line 3—3 of Figure 2;

Figure 4 is a cross-sectional view of the apparatus taken on the line 4—4 of Figure 3;

Figure 5 is a cross-sectional view of the apparatus taken on the line 5—5 of Figure 3; and

Figure 6 is an enlarged cross-sectional view of a portion of the apparatus for controlling the hydraulic piston and cylinder mechanism.

In general, the apparatus of the invention comprises a frame adapted to be operatively disposed in an inclined position, and a carriage mounted on the frame for movement therealong between an upper article receiving position and a lower article discharging position. The carriage is adapted to be moved downwardly from article receiving to article discharging position by the weight of an article placed thereon, and to be returned to article receiving position, by spring action, when the article has been discharged therefrom. Fluid operated means are provided for controlling the rate of movement of the carriage, such means functioning to permit a desired slow rate of downward movement of the carriage, when loaded, and an accelerated rate of upward movement of the carriage after the load has been discharged.

Referring to the drawings, the numeral 10 generally designates the frame of the apparatus which may desirably be formed of horizontally spaced side frame members 11 and 12 suitably connected and held in spaced relation by transverse frame members 13, 14 and 15. These side frame members 11 and 12 are preferably of channel shape to serve as guides or tracks for the carriage hereinafter described.

At its upper end, the frame 10 has secured thereto a hook shaped member 16 adapted for cooperative engagement with brackets 17, for positioning and supporting the upper end thereof. Brackets 17 are secured to the body of a vehicle 18, such as a truck, railway car and the like, or other structure, from which articles are to be unloaded.

At the lower end of the frame, the side frame members, tracks or guides 11 and 12, have terminal portions 19 and 20 arranged at angles of inclination different from the main body portions of the members 11 and 12 for a purpose to be described. In accordance with the invention, satisfactory results have been obtained when the portions 19 and 20 are substantially vertical and the remainder of the members 11 and 12 disposed at an angle of inclination to the horizontal of around 60 degrees. It will be apparent that the lower ends of the terminal portions 19 and 20 are adapted to rest on the ground, or other supporting surface, to support the lower end of the apparatus.

A carriage 25 is mounted on the frame 10 for movement therealong, such carriage preferably comprising side plate members 26 and 27 suitably connected by a transverse angle member 28 to provide a unitary structure. Rollers 29, rotatably mounted on axles 30, carried by the side plate members 26 and 27, cooperate with the tracks or guides 11 and 12 to rollably support the carriage for movement along the frame.

Article supporting arms 31 and 32 are secured to the side plate members 26 and 27 in any suitable manner as by bolts 33. The arms 31 and 32 extend outwardly from the carriage substantially horizontally, the upper surfaces thereof preferably sloping upwardly slightly in a direction toward their ends to prevent premature accidental discharge of an article therefrom while it is being lowered to discharge position.

The carriage is controlled in its movement along the frame by a fluid operated mechanism comprising a hydraulic cylinder 35 and a piston 36 having a piston rod 37 projecting from the cylinder. The hydraulic cylinder 35 is mounted on the transverse supporting member 15 and secured thereto in any suitable manner as by bolts and nuts, or the like. Adjacent the lower end thereof, the cylinder 35 is provided with a port 38 adapted to communicate with conduits 39 and 40, communication with the conduit 39 being controlled by a check valve 41, and communication with the conduit 40 being controlled by a needle valve 42. The conduits 39 and 40, in turn, communicate at their upper ends with a fluid tank 43, adapted to hold a supply of fluid as, for example, oil.

The tank 43 communicates with the upper end of the hydraulic cylinder 35 through spaced conduits 44 and 45, constructed and arranged to cushion the upward movement of the piston 36 as it approaches its upper limit of travel. Thus it will be noted that the conduit 44 is positioned above the upper limit of travel of the piston while the conduit 45 is positioned below this point. Moreover, the conduit 44 has a metered valve 46 therein which restricts the flow of fluid therethrough between the tank 43 and the hydraulic cylinder 35.

With the described arrangement, it will be apparent that as the piston moves downwardly in the cylinder, fluid will be forced initially from the lower end thereof through the port 38, conduit 40, tank 43, and conduit 44, into the upper end of the cylinder. At this point, the rate of flow of the fluid, and hence the speed of travel of the piston, is determined either by the needle valve 42,

or the metered valve 46, depending on which one offers the greatest restriction to flow. However, as the piston continues its downward movement and passes the conduit 45 fluid may then flow through the conduit 45 as well as the conduit 44. From this point on, therefore, the rate of flow is controlled solely by the needle valve 42 and if this valve is set to offer less restriction to flow then the metered valve 46, the rate of flow, and hence the rate of movement of the piston, will increase. On the other hand, if the needle valve 42 and the metered valve 46 offer substantially the same restriction to flow, the rate of downward movement of the piston will not change and hence will be substantially uniform. During such downward movement of the piston no fluid will flow through the conduit 39 since, under these conditions, the check valve 41 will be in closed position.

When the piston starts its upward movement, under the influence of a spring hereinafter described, fluid will be forced from the upper end of the cylinder through the conduits 44 and 45 and returned to the lower end of the cylinder through the conduits 39 and 40. During this phase of the operation the check valve 41 will be open to provide, in effect, a by-pass for the fluid thereby permitting the piston to move upwardly at a greatly accelerated speed of movement, as compared to its downward movement. However, as the piston approaches its upper limit of travel, it blanks off the conduit 45 so that the entire flow of fluid from the upper portion of the cylinder must pass through the conduit 44 and the metered valve 46. As will be apparent, this results in a substantial reduction in the rate of flow of fluid from the upper portion of the cylinder, thereby sharply reducing the rate of movement of the piston and serving to cushion the final stages of movement thereof.

The piston 36 is urged upwardly in the cylinder 35 by a coiled spring 47. The spring 47 extends upwardly into the piston rod 37, which is made hollow for this purpose, and is guided at its lower end by a rod 48.

The piston rod 37 carries at its upper projecting end a cross arm 49 on which are rotatably mounted double sheaves or pulleys 50. Single pulleys 51 are mounted on the transverse member 14 and connected with the pulleys 50 by cables 52 and 53, the terminal ends of the cables being secured respectively to the carriage 25 and to the transverse supporting member 14. Thus, as the carriage moves downwardly along the frame, the terminal ends of the cables 52 and 53, secured to the carriage 25, are pulled downwardly over the pulleys 50 thereby causing the cross arm 49, piston rod 37 and piston 36 to likewise move downwardly. With the cable and pulley arrangement shown, however, it will be apparent that the extent of movement of the cross arm 49, piston rod 37 and piston 36, will be considerably less than that of the carriage. This permits the desired movement of the carriage from the upper loading position to the lower discharging position within the limits of movement of the fluid operated mechanism.

Operation

The apparatus is very quickly and easily placed in operative position by engaging the hook shaped member 16 with the brackets 17 of a vehicle or other supporting structure, from which it is desired to unload articles. When so positioned, the frame is inclined at an angle of approximately 60 degrees, more or less, with the lower end thereof resting on and supported by the ground or other supporting surface. An article is then rolled from the body of the vehicle onto the arms 31 of the carriage whereupon the weight of the article overcomes the resistance of the spring and causes the carriage to move downwardly along the frame 10. This, in turn, causes the piston 36 to move downwardly in the cylinder 35 forcing the fluid to flow from the lower to the upper end of the cylinder through the port 38, needle valve 42, conduit 40, tank 43 and conduits 44 and 45. As the rate of flow of the fluid is controlled by the needle valve 42, the rate of movement of the piston and the carriage will depend on this rate of flow. It will thus be seen that downward movement of the carriage may be controlled, as desired, merely by adjusting the needle valve 42.

As the carriage approaches the lower end of the frame 10 the rollers thereon engage the substantially vertical portions 19 and 20 of the guides or frame members 11 and 12, whereupon the arms 31 tilt downwardly, as shown in dotted lines in Figure 1, to effect discharge of the article. As soon as the article is discharged, the spring 47 urges the piston 36 upwardly in the cylinder 35 to return the carriage to its article loading position. During such upward movement of the piston the fluid is forced from the upper end of the cylinder through the conduits 44 and 45 into the tank 43, from which it is returned to the lower end of the cylinder through the conduits 39 and 40. Since the rate of flow of the fluid during upward movement of the piston is considerably greater than the rate of flow during the downward movement of the piston the carriage moves upwardly at a considerably accelerated rate of speed until the piston covers the conduit 45. At this point, flow through the conduit 45 is cut off so that the entire flow from the upper end of the cylinder must pass through the conduit 44 and the metered valve 46. This greatly reduces the rate of flow and hence the speed of the piston thus serving to cushion the piston as it approaches its upper limit of movement.

The apparatus is entirely automatic in operation once the article is rolled onto the arms 31. Thus, from this point on, the article is automatically moved downwardly at a controlled rate of speed, discharged on the ground or other supporting surface, and the carriage then returned to its load receiving position. Moreover, the device is sturdy, durable and highly efficient in operation, and requires a minimum of skill to operate.

While a preferred embodiment of the invention has been disclosed, the invention should not be construed as limited to the specific details illustrated and described, except as included in the following claims.

I claim:

1. Unloading apparatus comprising an inclined supporting frame, an article supporting carriage mounted on the frame for movement therealong between an upper article receiving position and a lower article discharging position, said carriage being movable downwardly from article receiving to article discharging position by the weight of an article placed thereon, resilient means connected between the carriage and frame for returning the carriage to article receiving position when an article is discharged therefrom, and closed fluid circuit means connected between the frame and carriage for controlling the rate of movement of the carriage said controlling means including means for establishing a maximum rate of movement of the piston near the limits of its travel and additional means for setting an adjustable rate of movement intermediate of its travel.

2. Unloading apparatus comprising a frame adapted to be operatively disposed in an inclined position adjacent a structure to be unloaded, means for temporarily securing the apparatus in engagement with the structure to be unloaded, a carriage mounted on the frame for movement therealong between an upper article receiving position and a lower article discharging position, a closed circuit fluid operated piston and cylinder mechanism mounted on the frame, means connecting said piston with said carriage whereby movement of one effects movement of the other, and valve controlled means connecting the upper and lower ends of said cylinder above and below said piston to control its rate of movement in the cylinder and thereby control the rate of movement of said carriage.

3. Unloading apparatus comprising a frame adapted to be operatively disposed in an inclined position, a car-

riage mounted on the frame for movement therealong between an upper article receiving position and a lower article discharging position, a closed hydraulic circuit piston and cylinder mechanism mounted on the frame, means connecting said piston and carriage whereby movement of one effects movement of the other, a spring associated with the piston and acting to urge same in a direction such as to effect movement of the carriage toward its article receiving position, and passageways connecting the upper and lower ends of the cylinder for the passage of liquid therebetween during movement of the piston, one of said passageways having valve means therein adapted to prevent the flow of fluid therethrough when the piston is moving in one direction and to permit the flow of fluid therethrough when the piston is moving in the opposite direction, the other of said passageways having valve means therein adapted to control the flow of fluid therethrough when the piston is moving in said one direction.

4. Unloading apparatus comprising a frame adapted to be operatively disposed in an inclined position, a carriage mounted on the frame for movement therealong between an upper article receiving position and a lower article discharging position, a closed hydraulic circuit piston and cylinder mechanism mounted on the frame, a pulley carried by the piston, a pulley carried by the frame, a cable connecting the pulleys and having its ends secured respectively to the carriage and to the frame, resilient means associated with the hydraulic piston and cylinder mechanism for urging the piston in one direction, and means for controlling the rate of movement of the piston in the cylinder said controlling means including means for establishing a maximum rate of movement of the piston near the limits of its travel and additional means for setting an adjustable rate of movement intermediate of its travel.

5. Unloading apparatus comprising a frame having a pair of spaced guide members, a carriage supported by said guide members for movement therealong between an upper article receiving position and a lower article discharging position, a hydraulic cylinder mounted on the frame, a piston in the cylinder, a pulley connected to the piston for movement therewith, a pulley secured to the frame, a cable interconnecting said pulleys and having its ends secured respectively to the carriage and to the frame, a spring mounted in the cylinder and urging said piston in one direction therein, passageways connecting the upper and lower ends of said cylinder for the passage of fluid therebetween during movement of the piston, one of said passageways having a check valve therein movable to open position when the piston moves in one direction and movable to closed position when the piston moves in the opposite direction, and the other of said passageways having adjustable valve means therein for controlling the flow of fluid therethrough during movement of the piston in either direction, said cylinder and passageways forming a closed hydraulic circuit.

6. Unloading apparatus of the type set forth in claim 5 wherein the lower portions of said guide members have

different angles of inclination from the remaining portions thereof whereby when said carriage approaches the lower ends of said guide members, it is tilted to effect discharge of an article carried thereby.

7. Unloading apparatus comprising a frame adapted to be operatively disposed in an inclined position, a carriage mounted on the frame for movement therealong between an upper article receiving position and a lower article discharging position, resilient means urging the carriage to article receiving position and adapted to be overcome by the weight of an article on the carriage to move the carriage to article discharging position, and fluid controlled means carried by the frame for regulating the rate of movement of the carriage, said means comprising a closed circuit hydraulic piston and cylinder mechanism connected to the carriage, conduit means connecting opposite ends of said cylinder for the passage of fluid therebetween during movement of the piston, and valve means in said conduit means permitting a predetermined rate of fluid flow when the piston moves in one direction and a higher rate of fluid flow when the piston moves in the opposite direction, whereby the speed of said carriage in moving from article discharging to article receiving position will be greater than when it is moving from article receiving to article discharging position.

8. Apparatus of the type set forth in claim 7 including means for reducing the speed of the piston as it approaches its limit of movement in said opposite direction.

9. Apparatus of the type set forth in claim 8 wherein said speed reducing means comprises spaced conduits forming a part of said conduit means, one of said conduits being positioned so that it will be closed off as said piston approaches its limit of movement in said opposite direction, thereby causing the entire flow of fluid from this end of the cylinder to pass through the other of said conduits.

10. Apparatus of the type set forth in claim 9 wherein said other conduit has a valve therein for restricting the flow of fluid therethrough.

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