Nov. 26, 1940. H. RAYMOND 2,222,685

ELEVATOR

Filed April 19, 1939

Fig. 1.

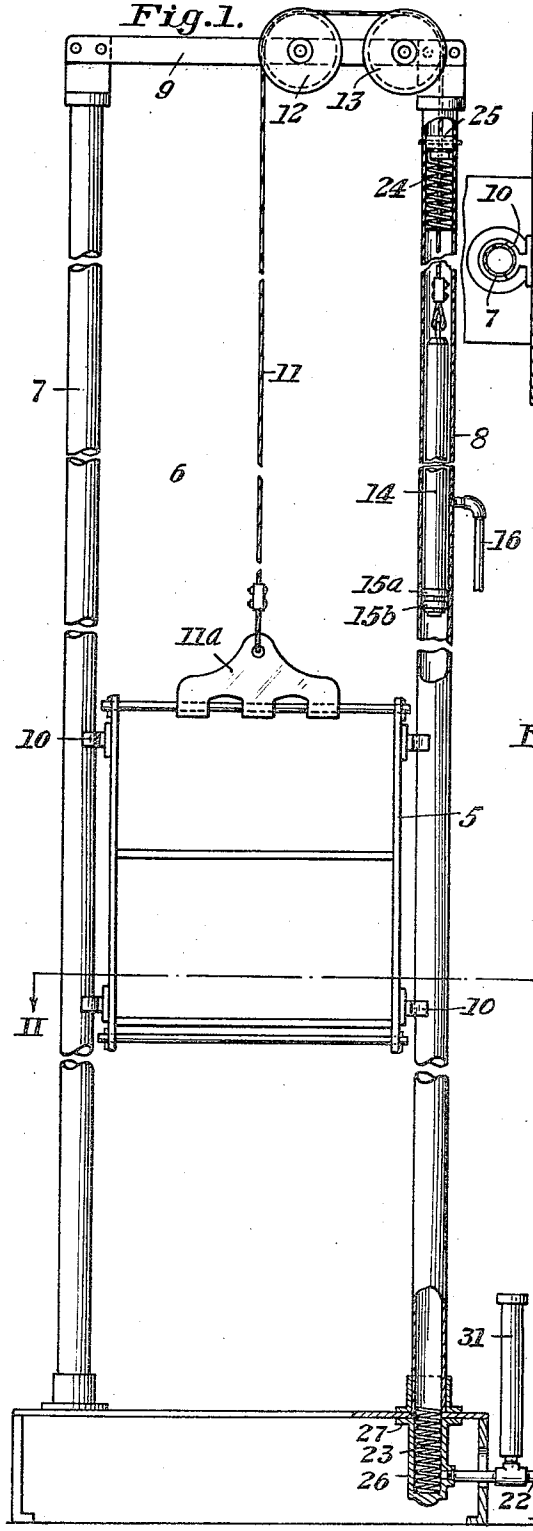


Fig. 2.

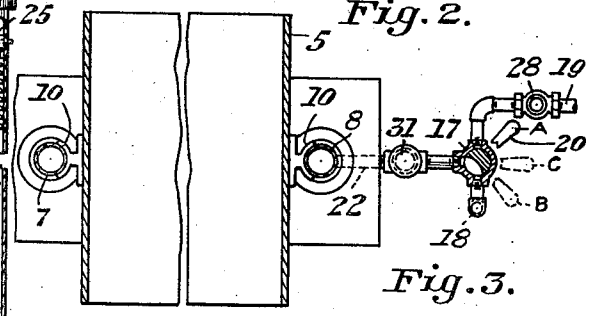


Fig. 3.

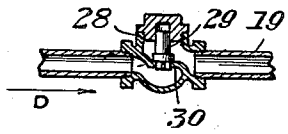
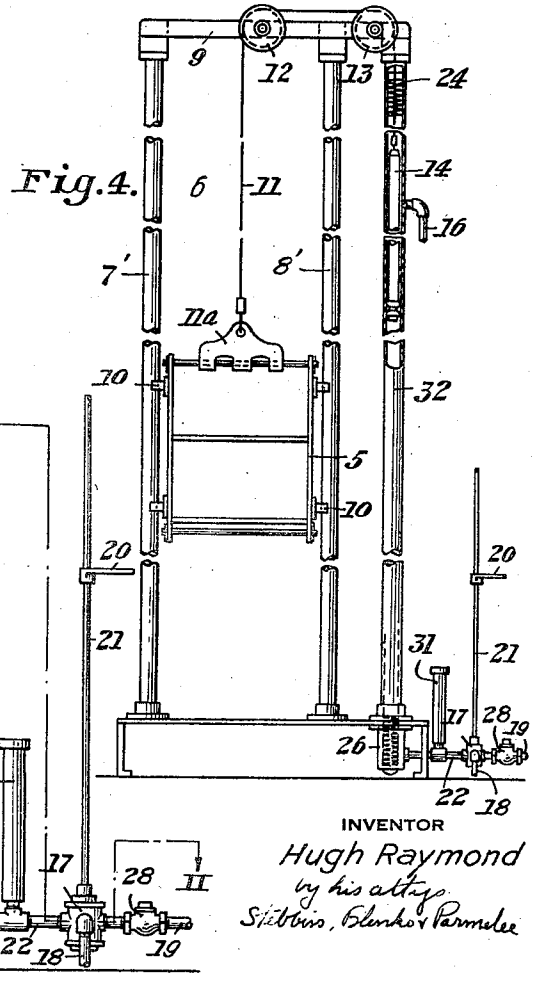


Fig. 4.



INVENTOR

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UNITED STATES PATENT OFFICE

2,222,685

ELEVATOR

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Application April 19, 1939, Serial No. 268,677

3 Claims. (Cl. 187—17)

This invention relates to dumb waiters or elevators of the type shown in United States Patent No. 855,074 in which a load carrying car is suspended by a pulley and cable arrangement and is counterweighted by a piston or plunger which, in turn, is actuated in a cylinder by fluid pressure. The plunger has a weight greater than the car plus its maximum load so that the car is raised by the action of gravity on the plunger. The car is lowered when the plunger is raised by fluid pressure.

I have developed improvements in this type of dumb waiter which provide a smoother car operation than has heretofore been possible and thus eliminate severe strains on the moving parts, particularly on the cable and the cable connections. In addition, the operation of the dumb waiter is made more safe.

In the accompanying drawing I have illustrated certain present preferred embodiments of my invention. In the drawing:

Figure 1 is a broken elevation view of my elevator with parts broken away to better illustrate the mechanism thereof;

Figure 2 is a section along the lines II—II of Figure 1;

Figure 3 is a vertical section of a valve which is used with my elevator; and

Figure 4 is a broken elevation view of a modification of my elevator.

In Figure 1 I have shown an elevator having a car 5 which is raised and lowered in a shaft 6 being guided therein by guides 7 and 8. The guides 7 and 8 extend the entire length of the shaft and are secured at their upper ends to a beam 9. The car 5 carries shoes 10 which engage the guides 7 and 8 and hold the car in position.

The car 5 is supported by a cable 11 fastened to a yoke 11*a* which is secured to the top of the car 5. The cable 11 passes over two pulleys 12 and 13, rotatably mounted on the beam 9, and passes down inside the tubular guide 8 where it is secured to a plunger 14 reciprocable in the guide. The plunger 14 is so designed that its weight exceeds the combined weight of the car 5 and the maximum load which it is intended shall be carried in the car.

Since the weight 14 is heavier than the car 5 and its load, the car is raised by the action of gravity alone. To lower the car I admit a suitable fluid, preferably water, under pressure into the tubular guide beneath the plunger 14. The fluid under pressure will raise the plunger 14 and thus lower the car.

To insure a tight contact between the plunger 14 and the interior of the tubular guide 8, the lower end of the plunger 14 carries leather cups 15*a* and 15*b*. The cup 15*a* opens upwardly to prevent air from passing the plunger when it is raised in the tubular guide. The cup 15*b* opens downwardly to seal off the water which is admitted into the tubular guide to raise the plunger. A drain pipe 16 is provided in the upper portion of the guide 8 to carry off any water which may leak past the leather cups 15.

Figure 2 illustrates a form of three-way valve which may be used to control the admission of fluid under pressure into the guide 8. By means of the valve 17, the guide 8 may be connected to a source of water pressure by the inlet pipe 18 or to a waste line by an outlet pipe 19. The valve 17 is turned by a handle 20 mounted on a vertical rod 21. The rod 21 may be made any suitable length and any number of handles 20 may be placed thereon so that the movement of the car 5 can be controlled from as many positions as desired. In Figure 2 the handle is shown as turned to the position marked A, thereby permitting water under pressure to flow from the inlet pipe 18 through the pipe 22 into the lower end of the guide 8. The water raises the plunger and therefore the car will descend. When the handle 20 is turned to the position marked B the pipe 22 is connected to the outlet pipe 19 and the plunger 14 will descend, raising the car 5 and forcing water out of the guide 8. When the handle 20 is in the position marked C the pipe 22 is cut off from both the inlet pipe 18 and the outlet pipe 19 and the car 5 will remain stationary.

As shown in Figure 1 the guide 8 contains two springs 23 and 24 which are designed to stop the plunger 14 at each end of its path of travel. The spring 24 is held in the upper end of the guide 8 by a limit block 25. The spring 23 is held in a spring chamber 26 bolted to the bottom of the guide 8 by means of flanges 27. When the plunger 14 approaches the top or the bottom of the guide 8 it engages the spring 23 or the spring 24 and compresses the spring by reason of its kinetic energy. As the springs are compressed, resistance to further compression increases so that the plunger is gradually decelerated until it stops. Sudden stops are avoided thus eliminating bouncing of the car and severe strains on the cable and the cable connections. This feature is of special importance in dumb waiters where it is desirable to keep the cost of construction and maintenance

as low as possible and to therefore use only one cable for supporting the car.

When the plunger 14 is stopped by the spring 23 at the bottom of the guide 8, the car will automatically come to rest at the top of the shaft. It will not be necessary for the operator to turn the valve 17 into the neutral position. In such case, if the car 5 is loaded to such an extent that the weight of the car plus the weight of the load which is placed in it exceeds the weight of the plunger 14, the car will descend. The plunger 14 will rise and suck water and air through the pipe 22 and outlet pipe 19 into the tubular guide 8. To prevent the car from descending independently of the will of the operator I connect a check valve 28 into the fluid outlet pipe 19. As shown in Figure 3, the valve 28 may be of the type in which a valve stem 29 is seated and held on a valve seat 30 by its own weight. When the plunger 14 descends in the guide 8 water flows through the pipe 19 in the direction shown by the arrow marked D in Figure 3. The flow of water raises the valve stem 29 to permit the water to flow through the check valve 28. If the car 5 is overloaded when at the top of the shaft 6, the plunger 14 will rise. Since the valve 28 is normally closed a vacuum will be created in the guide 8 beneath the plunger 14 and since the guide 8 is open to the atmosphere at its upper end the vacuum created in the guide 8 beneath the plunger 14 will prevent the weight from rising and will hold the car 5 at the top of the shaft.

As above described, when the plunger 14 descends in the guide 8 and strikes the spring 23 its kinetic energy will compress the spring 23 until this energy is absorbed. The spring 23 will then expand and raise the plunger 14 a slight distance. Because of the check valve 28 a partial vacuum will be created in the spring chamber 26. When the valve 17 is turned to admit water under pressure into the pipe 22 to raise the plunger 14 a "water hammer" will result because of the vacuum created in the spring chamber 26 when the plunger 14 was raised by the spring 23. To eliminate this water hammer I connect an air chamber 31 into the pipe 22 between the spring chamber 26 and the valve 17. When water is forced out of the guide 8 by a downward movement of the plunger 14 a certain amount of water will be forced into the air chamber 31 and the air therein will be compressed. When the plunger 14 is raised by the spring 23 the water and compressed air in the chamber 31 will flow into the spring chamber 26 and thus prevent a water hammer when water under pressure is admitted into the spring chamber 26.

Figure 4 shows a modification of my elevator which is similar to the elevator shown in Figure 1 except that the plunger 14 reciprocates in a cylinder 32 separate from the guides 7' and 8'. The cylinder 32 is mounted vertically and is preferably adjacent the shaft in which the elevator car travels.

By virtue of the improvements which I have described above, a dumb waiter driven by fluid pressure may be operated with greater safety and with greater smoothness of movement, particularly when the car is at the ends of its path of travel. The limit springs in the cylinder in which the plunger moves provide a gradual deceleration of the plunger when it reaches the top or bottom of the cylinder and thus prevent a sudden jarring stop which will make the car bounce and impose severe strains on the cable and cable connections.

The check valve in the fluid outlet pipe prevents the car from descending if it is overloaded when at the top of the shaft and the air chamber prevents a water hammer when fluid under pressure is admitted into the cylinder to raise the plunger from the bottom of the shaft.

While I have described certain present preferred embodiments of my invention it is to be distinctly understood that it may be otherwise variously embodied and practiced within the scope of the following claims.

I claim:

1. An elevator comprising a vertically movable car, a plunger, a pulley and cable suspension for said car, one end of said cable being attached to the car and the other end being attached to the plunger, a cylinder in which the plunger reciprocates, means for controlling the admission of fluid under pressure to the cylinder to raise the plunger and permit the car to descend, means at each end of the cylinder to decelerate the motion of the plunger before it reaches the upper and lower limits of its path of travel therein, safety means for preventing the car from descending if it is overloaded when at rest at the upper limit of its path of travel, and an air chamber in communication with said cylinder between said cylinder and safety means.

2. An elevator comprising a vertically movable car, a plunger, a pulley and cable suspension for the car, one end of the cable being attached to the car, the other end being attached to the plunger, a cylinder in which the plunger reciprocates, means connected to fluid inlet and fluid outlet pipes for controlling the flow of fluid under pressure into and out of said cylinder whereby the admission of fluid under pressure raises said plunger and permits the car to descend, and a check valve in the fluid outlet pipe for preventing backflow through the pipe into said cylinder.

3. An elevator comprising a vertically movable car, a plunger, a pulley and cable suspension for the car, one end of the cable being attached to the car, the other end being attached to the plunger, a cylinder in which the plunger reciprocates, means connected to fluid inlet and fluid outlet pipes for controlling the flow of fluid under pressure into and out of said cylinder whereby the admission of fluid under pressure raises said plunger and permits the car to descend, springs at each end of the cylinder to decelerate the motion of the plunger before it reaches the upper and lower limits of its path of travel in the cylinder, a valve in the fluid outlet pipe for preventing backflow through the pipe into said cylinder, and an air chamber in communication with the cylinder between the cylinder and the valve in the fluid outlet pipe.

HUGH RAYMOND.