No. 807,794. PATENTED DEC. 19, 1905.

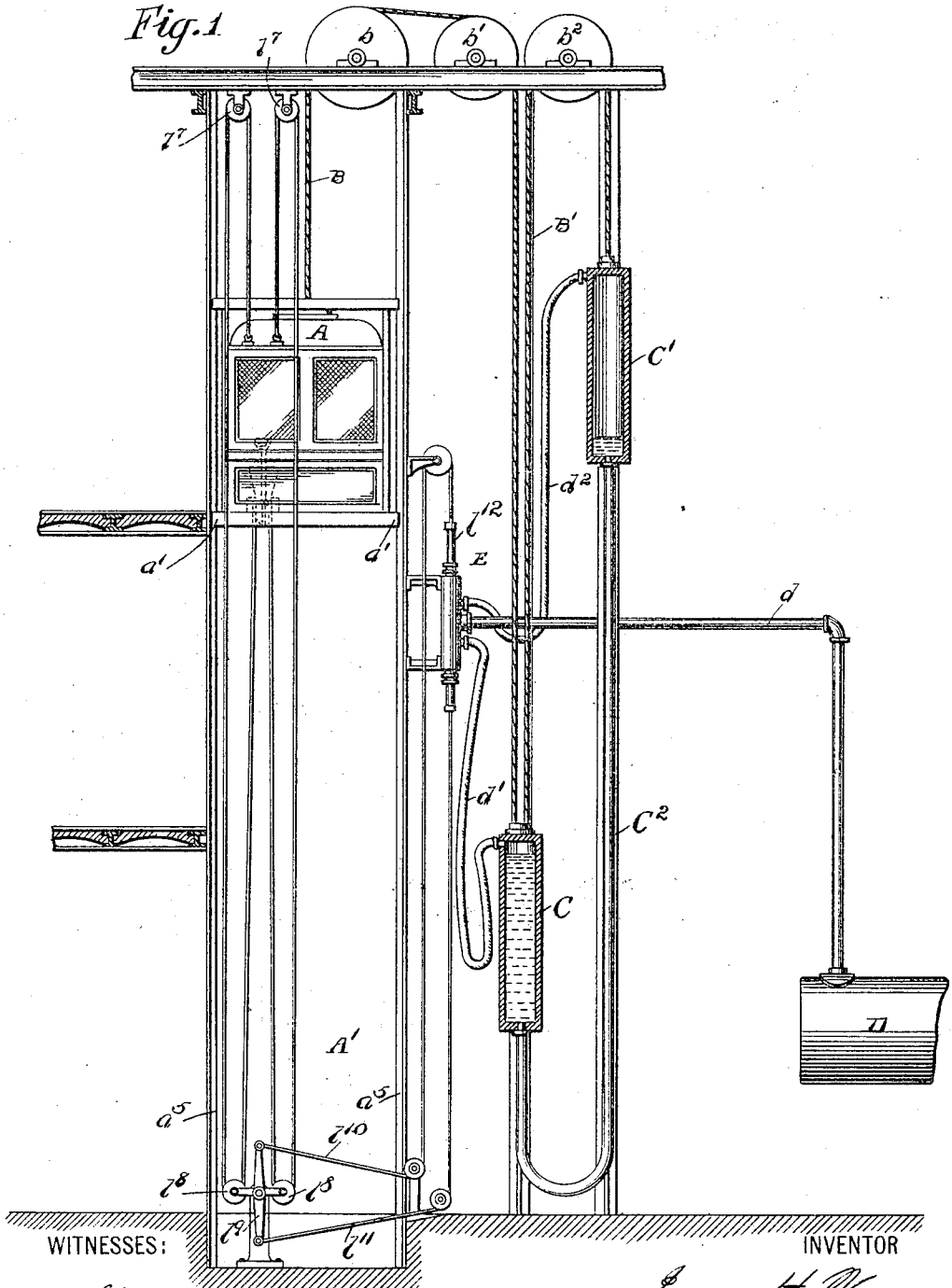
I. H. VENN.

ELEVATOR.

APPLICATION FILED JAN. 30, 1904.

2 SHEETS—SHEET 1.

Fig. 1.



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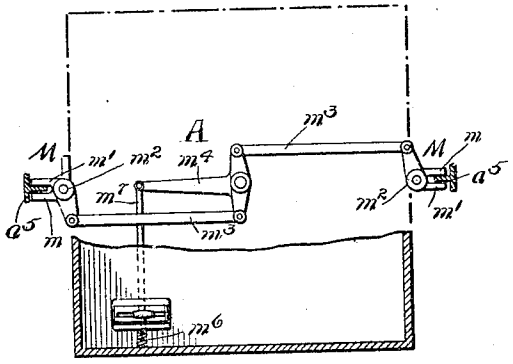
2 SHEETS—SHEET 2.

Fig. 2



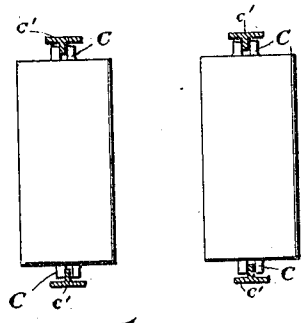
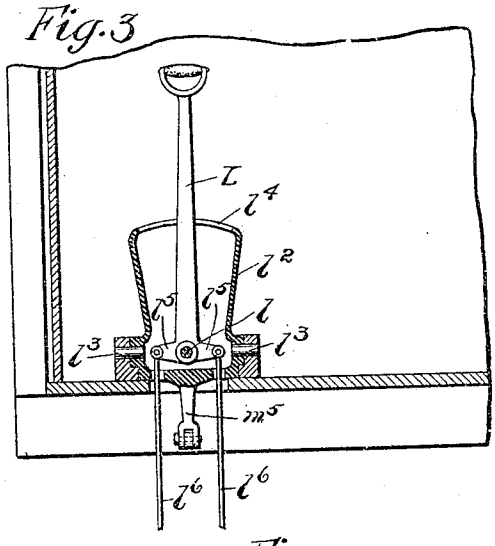


Fig. 4

Fig. 3



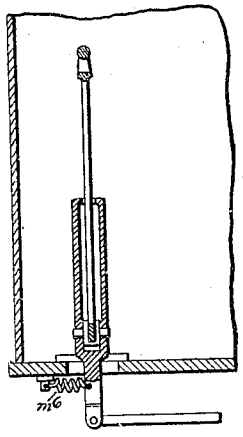
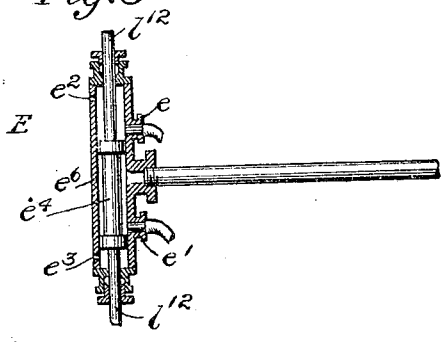


Fig. 5



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UNITED STATES PATENT OFFICE.

ISAAC H. VENN, OF YONKERS, NEW YORK, ASSIGNOR TO OTIS ELEVATOR COMPANY, OF EAST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

ELEVATOR.

No. 807,794. Specification of Letters Patent. Patented Dec. 19, 1905.

Application filed January 30, 1904. Serial No. 191,312.

To all whom it may concern:

Be it known that I, ISAAC H. VENN, a citizen of the United States, residing at Yonkers, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Elevators, of which the following is a specification.

My invention relates to elevators, and particularly to that class of elevators which employ a plurality of counterweights in the form of receptacles, (at least two,) to which receptacles a liquid is supplied and exhausted.

I will describe an elevator embodying my invention and then point out the novel features thereof in claims.

In the accompanying drawings, Figure 1 is a diagrammatic view, partly in elevation and partly in vertical section, of an elevator and appurtenances embodying my invention. Fig. 2 is a view, partly in plan and partly in horizontal section, of a part of the apparatus shown in Fig. 1 and drawn to a larger scale. Fig. 3 is a detail view, partly in vertical section, of a controller-lever embodied in my invention. Fig. 4 is a detail view, partly in vertical section, of the controller-lever shown in Fig. 3, the view and section being in a plane at right angles to plane of view and section of Fig. 3. Fig. 5 is a detail view, in vertical section, of a valve device embodied in my invention.

Similar letters of reference designate corresponding parts in all of the figures.

A designates a car or carriage which runs or travels up and down in a hatchway A'. The usual guides a^5 are provided at opposite sides of the hatchway, and the usual guide-shoes a' are carried by the car.

C C' designate receptacles which when containing a fluid act as counterweights for the car A. Each receptacle is preferably provided with guide-shoes c, which coact with vertically-arranged guides c'.

B designates a cable or cables connected at one end to the car and passing over pulleys b b', journaled in the top of the hatchway and connected at its other end with the receptacle C.

B' designates a cable which is connected at one end with the receptacle C, passes over a pulley b^2, journaled at the top of the hatchway, and is connected at its other end with the receptacle C'.

The receptacles C C' are used successively or alternately as counterweights—that is, the receptacle C' is used when the car travels down in the hatchway and the receptacle C is used when the car travels up in the hatchway.

C^2 designates a flexible pipe or conduit which is connected with the receptacles C C'.

Any liquid may be employed—as, for example, water or oil. Preferably a liquid will be employed which is not materially affected by changes in temperature. In order that a quick usage of the receptacles may be obtained, I employ a fluid under compression—for example, compressed air—for forcing the liquid from one receptacle to the other.

D designates a storage-tank for the compressed fluid, and d a pipe or conduit leading therefrom to a valve mechanism E, which alternately controls the supply and exhaust of the compressed fluid from the receptacles C C'.

d' d^2 designate flexible pipes or conduits which connect the valve mechanism E with the receptacles C C'. The valve mechanism E (see Fig. 5) may conveniently comprise a casing e^6, having exit-ports e e' and exhaust-ports e^2 e^3. A valve e^4 in the form of a double piston is movable within the casing and is adapted upon a movement in either direction to shut off the supply of fluid-pressure to one receptacle and open it to the other and to open the exhaust for the receptacle from which the fluid-pressure has been cut off. Any other valve mechanism accomplishing this result may be employed.

The valve is operated by a suitable control mechanism, which in turn is operated from the car. As here shown, the control mechanism is in the form of a controller-lever L, located in and carried by the car A. Intermediate means of any desired type is employed between the lever L and the valve mechanism E. The controller-lever L may also be adapted to operate brakes M in order that the car may be stopped at any desired point in the hatchway. The lever L is fixed on a pin l, suitably journaled in a casing l^2, which casing is provided with trunnions l^3, extending and journaled in a plane at right angles to the plane of the pin l. The lever L is movable in a slot l^4 in the casing l^2, and it can be moved back and forth in this slot to move or shift the valve e^4, and when the lever is moved back and forth in a plane at right angles to its plane of movement in the slot it will rock the casing l^2 on its trunnions to op-

erate the brakes M. The brakes M, as shown, each comprises a stationary jaw m and a movable jaw m', both carried by the car A. The movable jaw is in the form of a bell-crank lever and is pivoted on a pin m^2, and the two movable jaws m' are connected by links m^3 with a three-arm lever m^4. The casing l^2 is provided with a projection m^5, which is connected by a link m^7 with an arm of the lever m^4. It will be seen, therefore, that when the lever L is moved to rock the casing l^2 the movable jaws m' will be forced into engagement with the guides a^5. Preferably means which may be in the form of a spring m^6 will be provided to move the casing l^2 in such direction as to have the brakes normally applied to the guides. The means, however, may be provided at any other place to accomplish the same function. With this arrangement to release the car the casing will be moved in one direction, and to apply the brakes and thus stop the car the casing will be moved in the opposite direction.

The lever L is provided with two projections l^5, to which are connected one end of each of two cables l^6. The other ends of the two cables are connected to the car A and the cables intermediate their ends pass over pairs of pulleys l^7 l^8. The pair of pulleys l^8 are carried by a spider-frame l^9, suitably pivoted, and connected with two arms of the spider are cables l^{10} l^{11}, the other ends of which are connected with the stem l^{12} of the valve e^4.

The operation of an elevator having my invention applied thereto is as follows: Assuming that the car A is at the top of the hatchway and is about to descend, the operator first moves the lever L in such direction as to shift the valve e^4 to admit fluid-pressure from the tank D into the receptacle C. This will cause the liquid from the receptacle C to flow into receptacle C'. As soon as enough of this liquid has been transferred from the receptacle C into the receptacle C' to make the receptacle C', together with the car A and its load, heavier than the receptacle C the car will have a tendency to descend. The amount of fluid-pressure admitted to the receptacle C will vary with the load of the car. As soon as enough of the liquid has been transferred the operator brings the lever back to its central position and controls the movement of the car during the rest of its downward travel by means of the brake. The operator next moves the lever and casing to release the brakes from the guides, and thus allow the car to descend. If desired, the two operations above described may be reversed, or they may both take place at the same time. The movement of the lever to its middle position operates the valve mechanism E to shut off the supply of fluid-pressure to the receptacle C and to close the exhaust from the receptacle C'. As the car descends the receptacle C rises to the top of the hatchway and carries with it the pipe C^2, the receptacle C' meanwhile traveling to the bottom of the hatchway. The pipe C^2 serves as a counterweight for the weight of the cable B, brought into the hatchway due to the descent of the car. The car may be stopped at any point of its run by the application of brakes M. Whenever the operator desires to reverse the direction of travel of the car, the lever L may be operated to shift the position of the valve e^4, and thus admit the fluid-pressure to the receptacle C' to discharge the fluid therefrom into receptacle C, so that the car will be ready for its run up the hatchway. The amount of liquid shifted from one of the receptacles to the other is at the will of the operator, so that he has in this system complete control of the speed as well as the direction of the car travel, and he may shift more or less of the liquid in the receptacles, according to the load which he desires to raise or lower on the car.

It will be understood that wherever I use the term "counterweight" or "counterbalance" in the specification or claims I mean an overbalance.

What I claim as my invention is—

1. The combination with an elevator-car, of a plurality of receptacles flexibly connected therewith and to each other and each adapted to contain a liquid and to serve as a counterbalance for the car, a source of gaseous pressure, means for controlling the supply of gaseous pressure to each of said receptacles, and means operable from the car for actuating said controlling means.

2. The combination with an elevator-car, of a plurality of receptacles connected therewith and each adapted to contain a liquid and to serve as a counterbalance for the car, a flexible connection between said receptacles, a source of gaseous pressure, means for controlling the supply of gaseous pressure to each of said receptacles, and a device operated from the car for controlling said means.

3. The combination with an elevator-car, of a plurality of receptacles connected therewith and each adapted to act as a counterweight when supplied with a liquid, a lever carried by said car for controlling the supply of liquid to each of the receptacles, and brakes carried by the car for stopping it in any position of its travel and operated by said lever.

4. The combination with an elevator-car, of a plurality of counterweights adapted to be successively used, brakes carried by the car for stopping it in any position of its travel, and a lever for operating said brakes and for controlling the use of said counterweights.

5. The combination with an elevator-car, of a plurality of counterweights adapted to be successively used, brakes carried by the car for stopping it in any position of its travel, and a lever for operating said brakes and for controlling the use of said counterweights, said lever adapted to move in one direction to con-

trol the brakes and in another direction to control the counterweights.

6. The combination with an elevator-car, of two receptacles each adapted when containing liquid to act as a counterweight for the car, a flexible connection between the said receptacles through which the liquid passes from one receptacle to the other, gaseous-pressure mechanism for forcing the liquid from one receptacle to the other, means for controlling the supply of gaseous pressure to the receptacles and a controlling mechanism operated from the elevator-car for operating said means.

7. The combination with an elevator-car, of two receptacles each adapted when containing a liquid to act as a counterweight for the car, a flexible connection between the two receptacles through which the liquid passes from one receptacle to the other, gaseous-pressure mechanism and means controlling the same for forcing the liquid from one receptacle to the other, and a controller-lever carried by the car for operating said means.

8. The combination with an elevator-car, of two receptacles each adapted when containing a liquid to act as a counterweight for the car, a flexible connection between the two receptacles through which the liquid passes from one receptacle to the other, a fluid-pressure mechanism and means controlling the same for forcing the liquid from one receptacle to the other, brakes carried by the car, and a controller-lever carried by the car for operating the said means and the brakes.

9. The combination with an elevator-car, of a plurality of receptacles each adapted when containing a liquid to act as a counterweight for the car, a connection between said receptacles for the passage of liquid from one receptacle to the other, and gaseous-pressure mechanism and means for controlling the same for forcing the liquid from one receptacle to the other.

10. The combination with an elevator-car, of a plurality of receptacles each adapted when containing a liquid to act as a counterweight for the elevator-car, guides for each of said receptacles, a cable between the elevator-car and one receptacle and a cable between the two receptacles, a flexible connection between the two said receptacles through which the liquid passes from one receptacle to the other, a fluid-pressure mechanism and means for controlling the same for forcing the liquid from one receptacle to the other, and a controller mechanism operated from the car for operating the said means controlling the fluid-pressure mechanism.

11. The combination with an elevator-car, means for controlling the movement of the car, brakes carried by the car, a lever also carried by the car, and adapted when moved in one direction to operate the brakes, and when moved in another direction to operate the controlling means.

12. The combination with an elevator-car, of means for controlling the movement of said car, brakes carried by the car, and a single device for operating said controlling means and said brakes.

13. The combination with an elevator-car, of means for moving the same, means for controlling said moving means, brakes carried by the car, and a lever carried by the car for simultaneously actuating said brakes and operating said controlling means.

14. The combination with an elevator-car, of means for controlling the movement of said car, brakes carried by the car, a lever for operating said controlling means, and means engaged by said lever to actuate said brakes.

15. The combination with an elevator-car, of means for controlling the movement of said car, brakes carried by the car, a lever for operating said controlling means, and means movable at right angles to the movement of said lever and coacting therewith for actuating said brakes.

16. The combination with an elevator-car, of means for controlling the movement of said car, a lever for operating said controlling means, brakes carried by the car, and an additional lever coacting with said first-named lever for actuating said brakes.

17. The combination with an elevator-car, of means for controlling the movement thereof, brakes carried by the car, brake-applying means, a trunnioned lever operatively connected to said brake-applying means, and an additional lever for operating said controlling means, said additional lever being pivoted to said first-named lever to have a movement at right angles to its movement in a guiding-slot therein.

18. The combination with an elevator-car, of two receptacles each adapted when containing liquids to act as a counterweight for the car, a flexible connection between the said receptacles through which the liquid passes from one receptacle directly to the other, fluid-pressure mechanism for forcing the liquid from one receptacle to the other, means for controlling the supply of fluid-pressure to the receptacles, and the controlling mechanism operated from the elevator-car for operating said means.

19. The combination with an elevator-car, of two receptacles, each adapted when containing a liquid to act as a counterweight for the car, a flexible connection between the two receptacles through which the liquid passes from one receptacle directly to the other, fluid-pressure mechanism and means controlling the same for forcing the liquid from one receptacle to the other, and a controlling-lever carried by the car for operating said means.

20. The combination with the elevator-car, of a plurality of receptacles, each adapted when containing a liquid, to act as a counterweight

for the car, a connection between said receptacles for the passage of liquid from one receptacle directly to the other, and fluid-pressure mechanism and means for controlling the same for forcing the liquid from one receptacle to the other.

21. The combination with a car or platform, of a plurality of receptacles connected therewith and each adapted to contain a liquid and to serve as a counterbalance for the car, a flexible connection between said receptacles, a source of fluid-pressure separate from said flexible connection, and means for controlling the supply of fluid-pressure to each of said receptacles, and a device operated from the car for controlling said means.

22. The combination with an elevator-car, of a plurality of receptacles connected therewith and each adapted to contain a liquid and to serve as a counterbalance for the car, a flexible connection affording direct communication between said receptacles, a source of fluid-pressure, means for controlling the supply of fluid-pressure to each of said receptacles, and means for actuating said controlling means.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ISAAC H. VENN.

Witnesses:
ERNEST W. MARSHALL,
EDWARD R. BOWDISH.