(No Model.) 2 Sheets—Sheet 1.

C. W. BALDWIN.

ELEVATOR.

No. 499,496. Patented June 13, 1893.

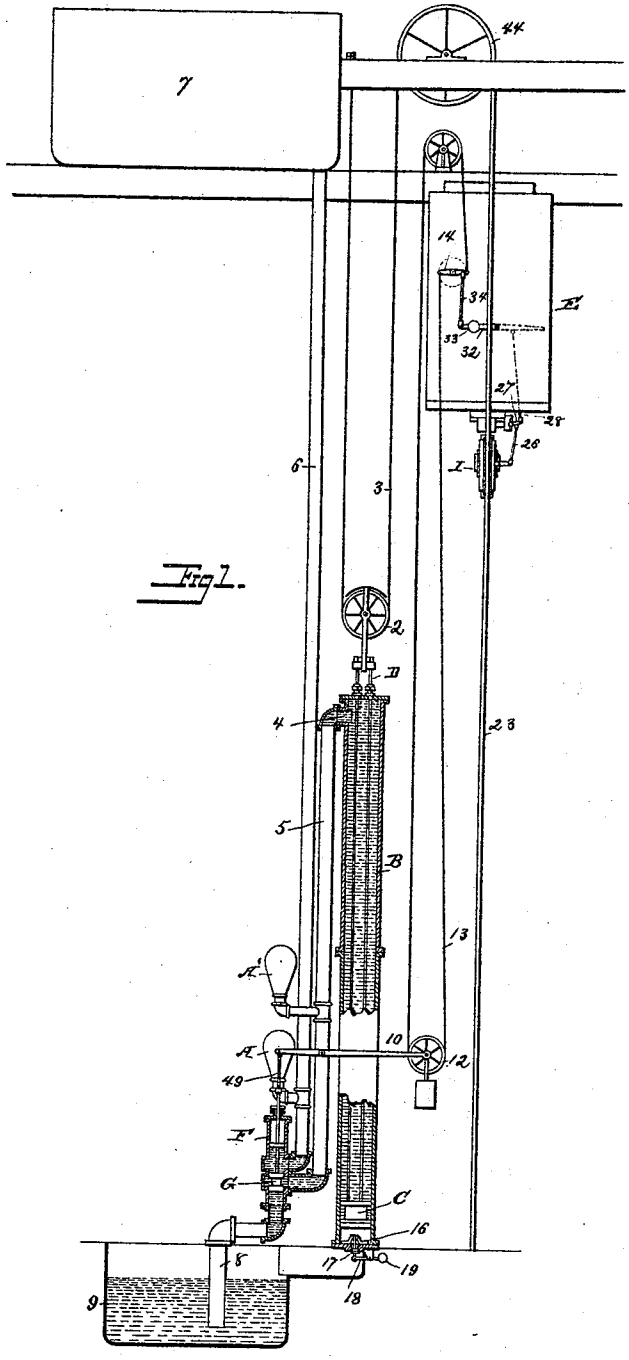

Fig 1.

Witnesses
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(No Model.) 2 Sheets—Sheet 2.

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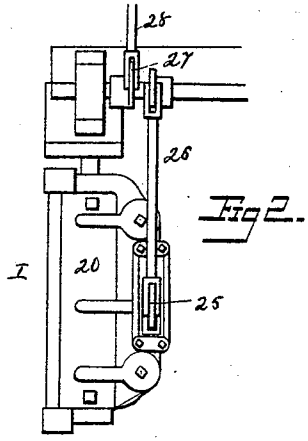


Fig 2.

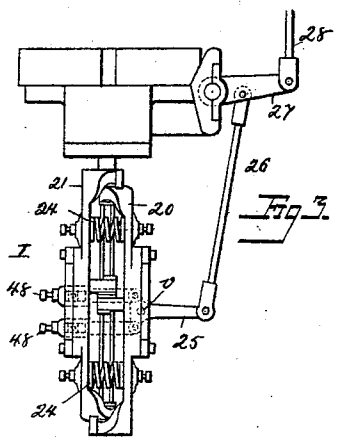
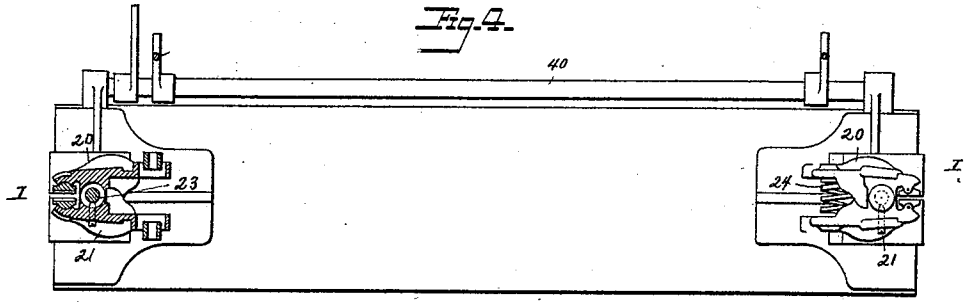


Fig 3.

Fig 4.



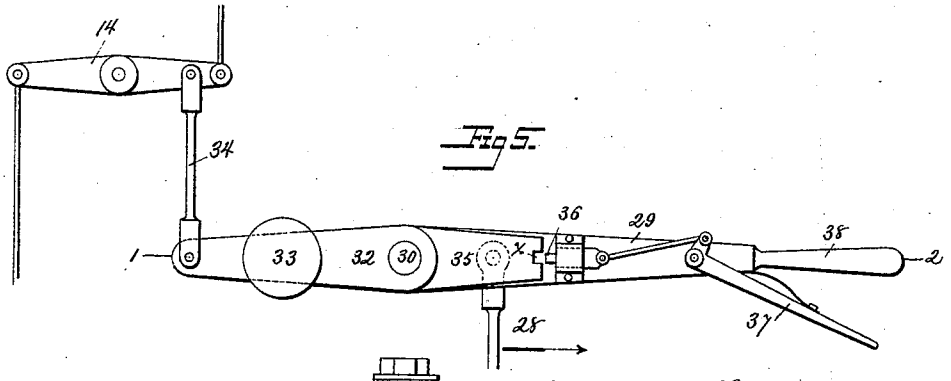


Fig 5.

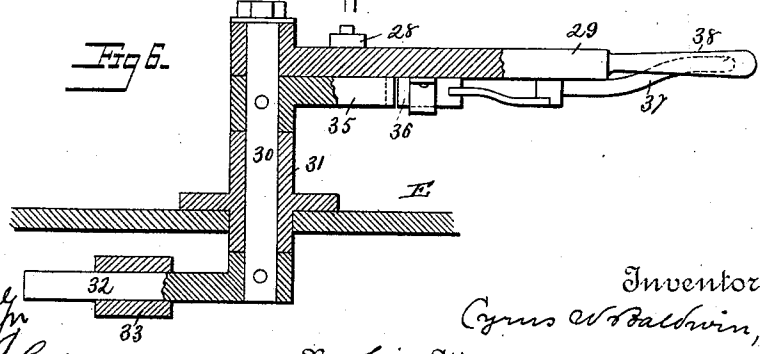


Fig 6.

Witnesses
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UNITED STATES PATENT OFFICE.

CYRUS W. BALDWIN, OF YONKERS, NEW YORK, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE NATIONAL COMPANY, OF ILLINOIS.

ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 499,496, dated June 13, 1893.

Application filed April 19, 1887. Serial No. 235,383. (No model.)

To all whom it may concern:

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

My invention relates to elevators, and more especially to that class of elevators in which a piston, connected to the cage, is moved in a cylinder in one direction by a liquid under pressure; and my invention consists in certain improvements fully set forth hereinafter whereby to secure a uniform action of the operating engine, prevent jolts and jars in stopping and starting at high rates of speed and to facilitate the operations of the apparatus, and secure a complete control of the same by the attendant within the cage.

In the accompanying drawings: Figure 1 is an elevation, in part section, of an elevator illustrating my improvements. Figs. 2, 3 and 4 are detached enlarged views illustrating the construction of the brake device. Fig. 4 is part section. Fig. 5 is an enlarged side view of the brake and valve controlling device carried by the cage. Fig. 6 is a sectional plan on the line 1—2, Fig. 5.

The cylinder B of the elevator engine is arranged vertically, the piston C being connected with the rods D carrying a cross head supporting a pulley 2, under which pass the flexible suspensories 3, supporting the elevator cage E. At the upper or outer end of the cylinder B is a port 4, with which communicates a pipe 5 constituting both the inlet and discharge pipe of the cylinder extending to nearly the opposite or lower end of the cylinder and there communicating with the casing F, of a controlling valve G, the permanent supply pipe 6 from an upper reservoir 7 or other source of supply, also communicating with the valve casing, which has a discharge port at the lower end communicating with a discharge pipe 8 extending into a discharge tank 9, the discharge pipe constituting a practical continuation of the pipe 5. The pipes 5, 6 are provided with air vessels A, A'.

In Fig. 1, the valve is shown with usual connections for operating it mechanically from the cage, but I may prefer to employ electrical operating means.

In Fig. 1 the valve stem 49 is connected with a lever 10, counterweighted and carrying a pulley 12 round which passes the valve operating cable 13. The cable also passes over an upper guide pulley 44, and is connected at both ends to a lever or pulley 14 carried by the cage, and the vibration of which will either extend or contract the bight of the cable at any time whether the cage be stationary or traveling. By thus extending and contracting the cable the lever 10 is vibrated and the position of the valve is altered at the will of the operator in the cage, to stop or start the cage.

At the lower end of the cylinder is an outlet port 16 closed by a nicely balanced valve 17 opening outward and supported by a lever 18 carrying a weight 19, which may be adjusted so as to keep the valve closed to prevent the air from entering, but permit its opening readily for the escape of any water that may leak from the space above the piston. When the main valve G is operated to close the discharge and open a communication between the supply pipe and the end of the cylinder B, the pressure of the water upon the upper or outer face of the piston will cause the piston to descend to its position shown in Fig. 1, thereby elevating the cage E. When the piston is in its lowest position and the connection with the supply is closed and the discharge open the column of water in the pipe 5 and valve casing unconfined at the lower end and fully equaling in length the column within the cylinder, will counterbalance the latter so that there is no hydraulic pressure tending to force downward the piston. The piston is therefore free to rise under the weight of the cage and its contents, and as it rises the air in the closed space below the piston becomes gradually rarefied, until as the piston approaches the limit of its upward movement, at thirty feet from the limit of its downward movement, there will be very nearly a vacuum beneath the piston, or practically a working pressure upon the top of the piston of nearly fifteen pounds to the square inch. The effect of this

gradual rarefication of the air in the closed chamber beneath the piston and accumulating pressure or resistance on the top of the piston will be to compensate for the shortening of the water column above the piston, there being practically stored up a power to assist in starting the cage on its upward travel, and secure a more regular and uniform movement throughout the travel of the cage. Should any air leak into the cylinder on the upward movement of the piston, so that on reaching the lowest position the air might if confined exceed atmosphere pressure, the valve 17 will yield and permit the surplus air to escape and equalize the air pressure outside and inside the cylinder.

In the absence of a body of water beneath the piston, the sudden descent of the latter, as well as the momentum of the upwardly moving cage when running at a high rate of speed, is apt to result in a continued movement of the piston for an instant after the flow of water is arrested for the purpose of stopping the cage, and at the high rate of speed at which elevator cars are now frequently run, the same continued action from momentum is apt to occur in other elevators of other characters, so that the sudden stoppage of the car is accompanied by jolts and strains. This is more apt to occur in the elevators where air instead of water is below the piston. In order to prevent this result I combine with the valve and operating connections a brake of a suitable character so arranged as to be applied as the water is cut off from the cylinder, whereby the cage is clamped in its position by the time the valve is completely closed, so that it cannot be disturbed by the action of momentum or other source of power.

Different forms of brakes and operating means may be employed. In the drawings I have shown a brake corresponding in many features to that set forth in Letters Patent No. 358,322, granted to me February 22, 1887, but differing therefrom in operating when the cage is ascending and descending. The said brake I (see Figs. 2, 3 and 4) consists of two jaws or clamps 20, 21, the latter fastened to a vertical rod 22, attached to the car, and the jaw 20 swinging on said rod. The jaws 20, 21, receive between them one of the usual guides 23 at the side of the well, springs 24 swinging the jaws so as to bring them forcibly against and make them clamp the guide, and a T-lever 25 pivoted to the jaw 20 at *v* and connected by slotted links 48, 48, with pins on the jaw 21, when tilted draws the inner edges of the jaws toward each other, so as to move their outer edges from and unclamp the guide. The lever 25 is connected by a rod 26 with a lever 27 connected by a rod 28 to a hand lever 29 hung loosely on a rock shaft 30, extending through a bearing 31 fastened to the side of the car E, the shaft 30, (when a mechanical connection with the controlling valve is used) carrying at its outer end an arm 32 provided with a balance weight 33, and being connected by a rod 34 with the lever 14, for operating the traveling valve operating cable. To the rock shaft 30 is secured an arm 35 with a notch *x* at the end adapted to receive a bolt 36 carried by the hand lever 29 and connected with an operating handle 37 arranged in proximity to the handle 38 of the lever 29 so that both may be simultaneously grasped, thus locking the arm 35 to the lever 29 in such manner that the vibration of the clamp lever to apply the clamp also results in locking the lever 14 to operate the valve. The arrangement described, however, permits the hand lever to be moved to apply the clamp to retard the movement of the car without necessarily moving the valve, the handle 38 in such case being grasped without grasping the handle 37 of the locking device. With the parts arranged as shown the movement of the handle 38 after the hand lever is locked to the arm 35, will result first in bringing the clamping jaws to the brake against the guides 23 so that by the time that the valve is fully closed the brake will tightly clamp the guide preventing any reaction that would affect the position of the car, the movement of which is thus arrested quickly but without any jolt, shock or rebound. Preferably two brakes are used, one to clamp each of the guides 23, and the two levers 27 are connected to a single shaft 40. The same action may be secured when the valve is operated from the cage by electrical connections, and the use of the brake to prevent the rebound or effect of momentum is effective in connection with hydraulic and pneumatic elevators where the air is compressed by the piston and acts expansively. Such electrical connections, and devices for controlling an electric motor from the cage for operating the engine valve, form the subject matter of a divisional application filed by me on or about the 12th day of September, 1888, Serial No. 285,200.

I am aware that an elevator cylinder has been provided with means for admitting and discharging water on one side of the piston and having a normally open air chamber on the other side provided with a balanced valve that permits the air to flow freely in and out of said chamber when the piston moves normally, but which closes by external atmospheric pressure when the piston moves suddenly in case of accident and permits the formation of a vacuum in the chamber, and I do not claim the same as my invention differs materially therefrom, in that during every normal movement of the piston the condition of the air in the chamber is changed, and the air co-operates with the water column upon the other side of the piston in controlling its movements instead of merely acting as a safety catch in case of accident.

Without limiting myself to the precise construction and arrangement of parts shown, I claim—

1. An elevator provided with a vertical cylinder, piston normally closed, air chamber below the piston, inlet and discharge pipe communicating with the piston only at the upper end and connected with a supply pipe near its lower end extending downward to a tank, and a valve arranged to open and close the communication between the said inlet and discharge pipe and the supply pipe and the tank, substantially as described.

2. The combination with an elevator cage and operating engine having a vertical cylinder, piston and flexible suspensories, of a valve device arranged near the lower end of the cylinder and connections between the valve and the cage, and a pipe extending from said valve device to the top of the cylinder and to a discharge tank and below the bottom of the cylinder and containing a column of water extending below and counterbalancing that in the cylinder, and constituting the inlet and discharge pipe of the cylinder, substantially as described.

3. The combination in an elevator, of a cylinder having a piston and normally closed air chamber below the piston, and port and outlet valve, a water valve device arranged near the lower end of the cylinder, a supply pipe communicating with said device, and an inlet and discharge pipe communicating with said device and with a discharge tank and extending to the upper end of the cylinder, substantially as set forth.

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

CYRUS W. BALDWIN.

Witnesses:
W. H. SWENY,
ADOLPH HAHMLETORP.