

(No Model.)

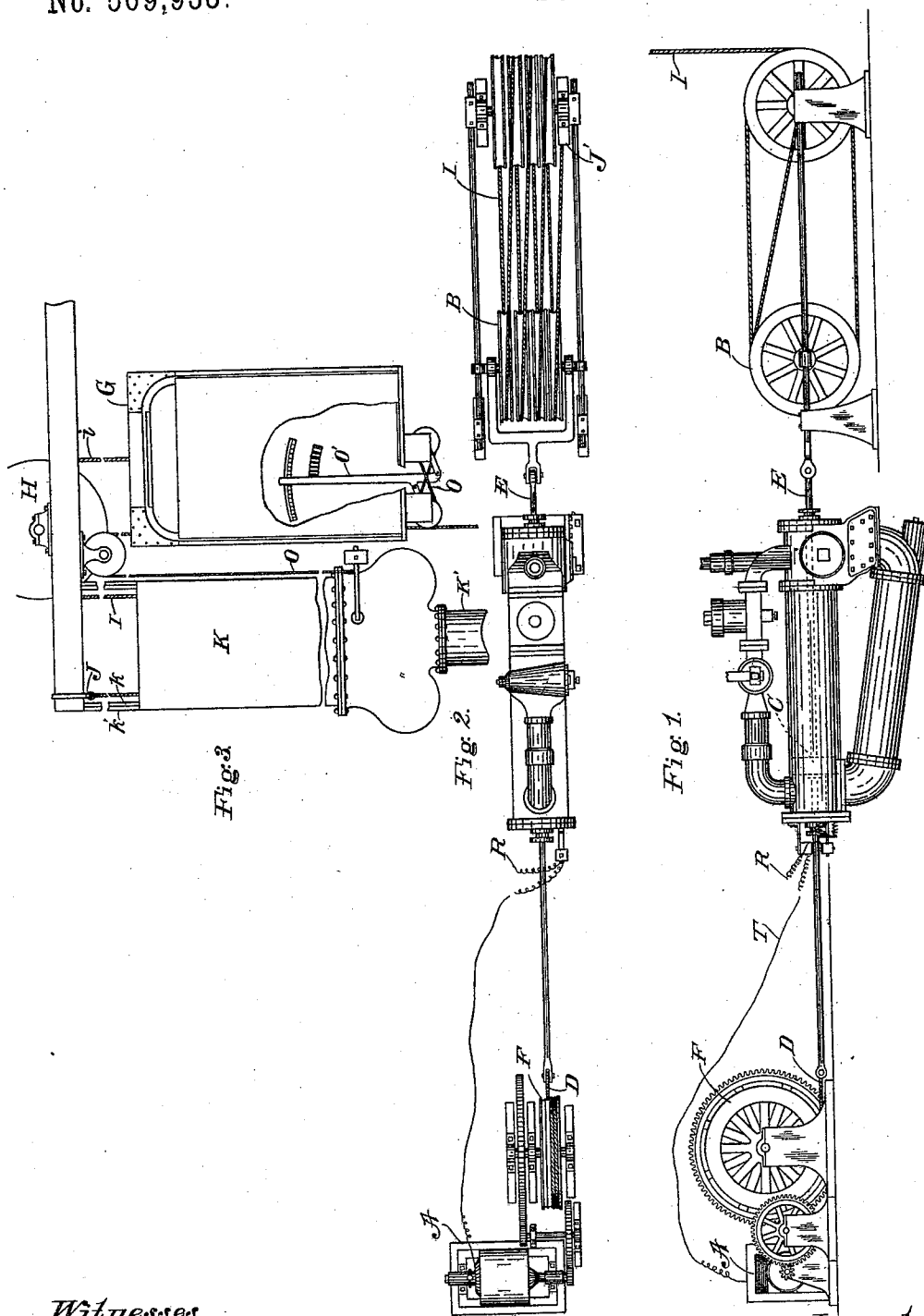
2 Sheets—Sheet 1.

J. PARKINSON.

COMBINED ELECTRIC HYDRAULIC ELEVATOR.

No. 569,933.

Patented Oct. 20, 1896.



*Witnesses*

Ferry Kingman.

F. T. Johnson.

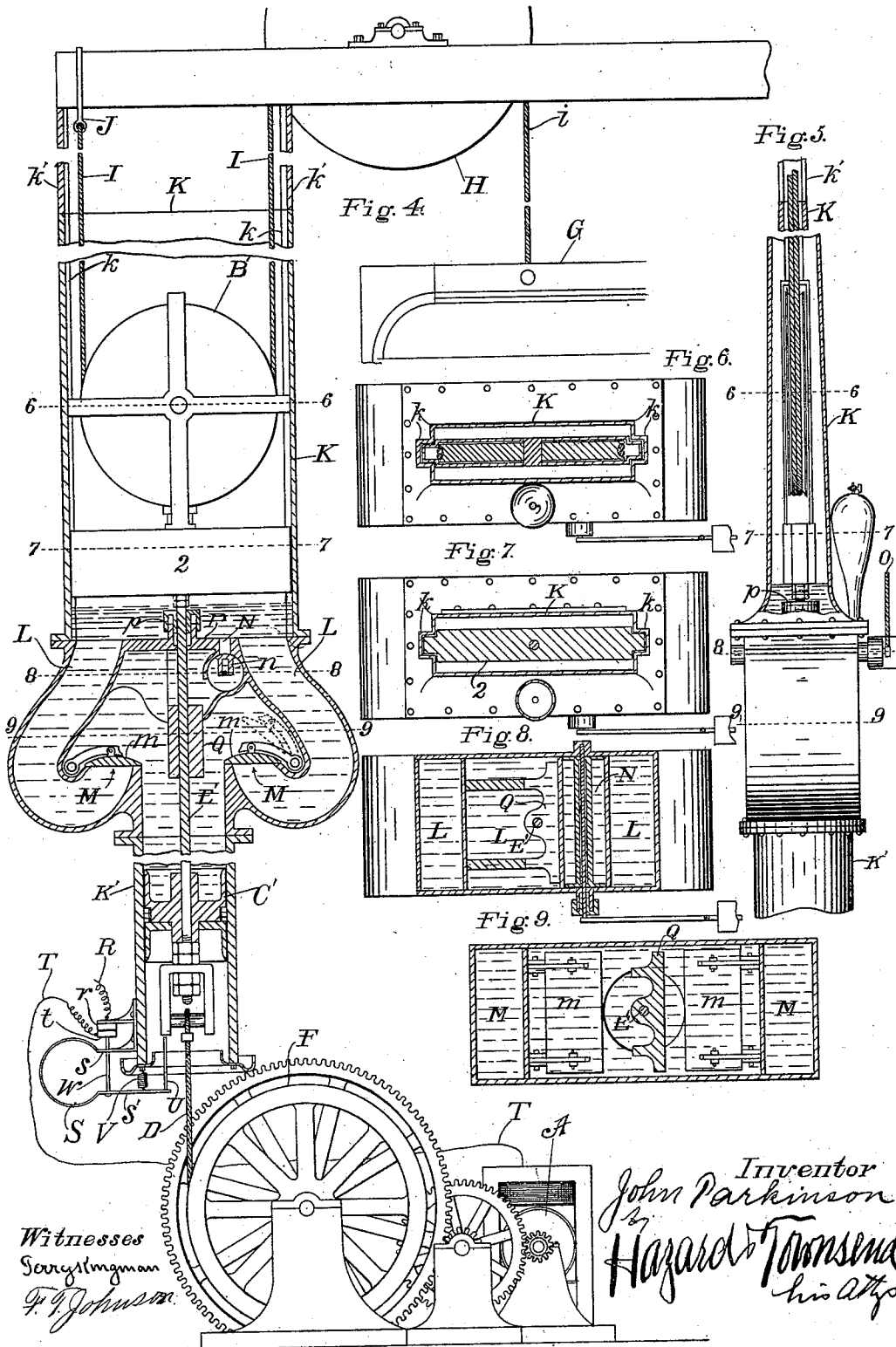
*Inventor*

Inventor  
John Parkinson  
by Hazard Townsend  
his Atty

J. PARKINSON.  
COMBINED ELECTRIC HYDRAULIC ELEVATOR.

No. 569,933.

Patented Oct. 20, 1896.



Witnesses  
Sergeant  
F. P. Johnson

Inventor  
John Parkinson  
Hazard Townsend  
his atty

# UNITED STATES PATENT OFFICE.

JOHN PARKINSON, OF LOS ANGELES, CALIFORNIA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE PARKINSON ELEVATOR COMPANY, OF SAME PLACE AND PHOENIX, ARIZONA.

## COMBINED ELECTRIC HYDRAULIC ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 569,933, dated October 20, 1896.

Application filed November 14, 1895. Serial No. 568,898. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN PARKINSON, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Combined Electric Hydraulic Elevator, of which the following is a specification.

My present invention employs a principle of hydraulic control which is set forth in my applications for Letters Patent of the United States, Serial No. 536,198, filed January 25, 1895; Serial No. 545,175, filed April 10, 1895, and Serial No. 553,959, filed June 25, 1895, and which consists, essentially, of controlling the downward movement of the elevator-car by a body of liquid arranged to flow from one liquid-containing compartment to another through passages provided with valves which regulate the obstruction which the liquid may present to the operation of the piston. Said applications illustrate a new type of elevator having means for applying power direct from electric motors, and my present invention also applies power directly from an electric motor to raise the car, and employs the weight of the car to cause its descent, so that, as in the other said inventions, the power of the motor is used only to lift the car, thus giving great economy of electricity. With my new type of elevators shown in these several applications the expenditure of power is exactly proportionate to the work done, and that remains true with my present invention.

It is my intention in this application to claim the invention generically, and also to claim specifically certain appliances which I have recently invented to carry out the original idea embodied in my former applications.

An object of my invention is to provide an improved and unobjectionable elevator driven directly by electric power; also, to provide an electrically-driven elevator in which the car is supported at all times during its downward motion by a body of liquid.

Another object of my invention, generically considered, is to secure safety in electric elevators without the use of a worm, and thus avoid the vibration of the car which is attendant upon the operation of all elevators

in which the car is driven by electric power applied through a worm.

Another object of my invention is economy of power, power being applied only to raise the car and load, the descent being wholly by gravity of the load and regulated by the escape of liquid from a compartment of the cylinder to a receptacle or reservoir in which the liquid remains, and when the car rises returns automatically to the cylinder-compartment without waste of power or liquid, so that the loss of liquid or power attendant upon the operation of hydraulic elevators is done away with. By dispensing with the worm of electrically-operated elevators great economy of power is gained by the reduction of friction.

My invention differs from all other elevators in that I combine with an electric motor a piston operated thereby, and provide for perfectly free movement of the piston when the load is being lifted, and provide means to allow, to control, and to prevent the movement of the piston to govern the descent of the car. This gives me the safety and the economy of power heretofore not obtained.

My invention is broadly different from other elevators with which I am acquainted in that my elevator comprises an electric lifting apparatus and a hydraulic supporting and lowering apparatus so arranged in combination that the strain is taken off of the electric motor at all times except when the motor is in operation to raise a load. This enables me to dispense with the worm connection, which, as a safety precaution, has heretofore been employed for transmitting the power from the armature-shaft to the operating-gear.

An object of my present invention is to produce a new elevator-engine by which the power and control appliances are arranged more compactly than in the former devices; also, to secure increased efficiency; also, to simplify and cheapen the machine and to make it more easy to convert the present types of hydraulic machines into electrically-operated machines.

With my present invention I am enabled to conveniently utilize the cylinders and

sheaves of the present hydraulic machines, simply dispensing with the mechanism for applying the hydraulic power and substituting therefor the necessary controlling-valves, the circulating valves and reservoir, and means for applying the electricity, as herein shown.

Another object of my present invention is to provide a graduated or variable counter-balance whereby the proper proportion can be maintained between the increasing and decreasing length of load-suspending rope and the counterbalance therefor.

Some of the features of my present invention are applicable in both the horizontal and vertical type of machine, and I have illustrated in the horizontal type of machine shown in the drawings the form of loop and return-passages which are shown in my said application, filed June 25, 1895, Serial No. 553,959, and in which the piston is arranged to play backward and forward in a straight liquid-containing member or cylinder, the opposite ends of which are connected by a liquid-containing member, receptacle, or reservoir provided with valves to allow the liquid to flow in one direction therethrough, the ends of the straight member being also connected by valve-controlled passages whereby the movement of the piston is free in one direction and under control in the other direction. This appliance differs in specific features from the appliance specifically claimed herein, and is therefore only shown in a general way in Figs. 1 and 2, the specific features of construction being fully described and claimed in said former application, Serial No. 553,959, and an embodiment of the principle involved in said application, Serial No. 553,959, is shown and claimed in said application, Serial No. 545,175.

An object of my invention is to provide absolutely (and without brakes) against any danger of accident to the car by reason of breakage of the worms or gears usually used for operating the rope and to prevent such breakage from interfering with the lowering of the car and the control of the car while descending, so that in case of such breakage the passengers can be at once lowered to any floor which is beneath the car at the time of breakage and there let out and the car be used to take on and let off passengers on its descent just as though no breakage had occurred.

My invention comprises the combination of a cylinder; a piston arranged to move in such cylinder; means connected with the piston to move it in one direction; a receptacle or reservoir; a body of liquid in the cylinder and receptacle, a passage being provided between the receptacle and cylinder; a valve arranged to allow the liquid to flow freely through such passage from the receptacle into the cylinder and prevent its return, a passage being provided to allow liquid to flow from the cylinder into the receptacle; a valve

arranged to control and to prevent the flow of liquid through such passage, and means for operating such valve. It also includes other parts and combinations herein set forth.

The accompanying drawings illustrate my invention.

Figure 1 is a fragmental side elevation illustrating my invention as applied in a horizontal type of machine. Fig. 2 is a plan of the same. These two views show in a general way the return system which is specifically claimed in my said application, Serial No. 553,959, the object being to show the general application of the broad principle of construction which is embodied in my invention. Fig. 3 is a fragmental elevation showing the valve-operating lever connected with the car by suitable means. In this view a fragment of a vertical hydraulic cylinder and receptacle or reservoir is shown, instead of the horizontal form of cylinder and receptacle shown in Figs. 1 and 2. Fig. 4 is a fragmental elevation showing such vertical cylinder and reservoir in vertical mid-section and illustrating the application of my present invention in a vertical type of machine. Fragments of the car and the supports are shown. Fig. 5 is a fragmental elevation, partly in section, viewed at right angles to Fig. 4, looking toward the right. Fig. 6 is a plan section indicated by line 6 6, Figs. 4 and 5. Fig. 7 is a plan section on line 7 7, Figs. 4 and 5. Fig. 8 is a plan section on line 8 8, Figs. 4 and 5. Fig. 9 is a plan section on line 9 9, Figs. 4 and 5.

My present invention comprises the combination of the electric motor A; a load-moving appliance of some suitable character, such, for instance, as the movable sheaves B or B'; a piston C C', arranged between the motor and the load-moving appliance and operatively connected with each by suitable operative means, such, for instance, as the flexible connection D and piston-rod E or E', and means for controlling the movement of the piston. The means which I employ for controlling the piston comprises a body of liquid contained within suitable compartments to engage with the piston and suitable valves arranged to control the flow of liquid from one compartment to the other.

F indicates a drum driven by the motor to wind the flexible connection in one direction. G indicates a car or other load.

H indicates a car or other load-sustaining pulley, and I indicates the rope or other suitable means led over the pulley and connecting the car or other load with the other end of the piston. That is, the end of the piston opposite that to which the motor is connected.

My invention also comprises in a multiple-sheave elevator the combination of a piston operatively connected at one end with the movable sheave or sheaves of the machine, such as B' or B, hydraulic means, substantially as herein set forth, for controlling the movement of the piston, and a motor opera-

tively connected with the other end of the piston to move the piston.

My invention also comprises in an elevator the combination of the piston C', arranged to reciprocate vertically and having its upper end operatively connected with the car or other load through suitable means, such as the piston-rod E', the sheave B', and the rope I, fixed to the car at one end, passed thence over the sustaining-pulley H, thence around the movable sheave B', and fastened at its other end to a suitable support J, means for controlling the movement of the piston, and the motor operatively connected with the piston to draw it down.

In the vertical type of machine I provide a compartment or reservoir K, arranged above the cylinder K', and provide a body of liquid L above the piston in the cylinder and reservoir.

M indicates a passage between the reservoir and cylinder. For convenience there are preferably two of these passages. A valve *m* is arranged to allow the liquid to flow freely through such passage from the receptacle or reservoir into the cylinder and prevent its return. Each of the passages M is provided with a like valve.

N indicates a passage to allow liquid to flow from the cylinder into the reservoir, and *n* indicates a cut-off valve arranged to control and to prevent the flow of liquid through such passage. The valve *n* and the passage which it controls constitute means adapted to allow, to control, and to prevent the flow of liquid from the cylinder to the receptacle to allow, to control, and to prevent the movement of the piston in the direction in which the gravity of the car tends to move it. Any suitable means may be provided for operating such valve. The means O, partially and indefinitely shown herein, are fully shown, described, and claimed in my application for United States Letters Patent, Serial No. 545,175; but no description of means for this purpose is necessary in this application because many appliances which can be used to accomplish the result are already well known in the art. These means are preferably connected with the car to be operated by the attendant therein. Any suitable valved opening may be employed between the cylinder and reservoir, and any suitable valves may be arranged which will allow the liquid to flow freely from the reservoir into the cylinder when the piston descends, and which will allow, control, and prevent, as the case may be, the flow of liquid from the cylinder into the reservoir. The reservoir K is preferably vertical and extends to a considerable height and is arranged vertically above the cylinder.

P indicates a partition between the cylinder and the reservoir. The piston-rod E' is fastened to the piston and extends through the partition into the reservoir. Means for sustaining the car G or other load connect

the load either immediately or through intermediate means with the piston-rod to draw the piston-rod up.

*p* indicates a stuffing-box to prevent leakage through the partition around the piston-rod. With the reservoir thus vertically arranged the movable sheave B' is in the reservoir and operatively connected with the piston-rod. Suitable guideways *k* are arranged for the sheave in the reservoir. *k'* indicates extensions of such guides above the reservoir.

Q indicates a cut-off valve fastened to the piston and arranged to close the valved passage N at the final upward movement of the piston, so that the movement of the piston is automatically stopped by the liquid when the car has reached the bottom of its movement, thus to prevent jamming any solid parts.

A difficulty to be overcome with elevators is that the load-suspending portion *i* of the rope (that is, the portion of the rope between the load and the sustaining-pulley) increases in weight as the car descends, and the portion of the rope which is on the other side of the sustaining-pulley decreases proportionally, so that the counterbalance which is sufficient when the car is at the top of the shaft will not be sufficient when the car is at the bottom of the shaft. In consequence when the car is at the top it is hard to start it down, and when the car is at the bottom it is hard to start it up, there being a difference of balance in proportion to the amount of rope. With steel ropes in use this difference may amount to a ton. I propose to avoid this difficulty by providing as a counterbalance for the rope a hydraulic column decreasing in capacity toward the top. This column can be made of any desired size and proportion to accomplish the result.

Viewing the liquid simply as a counterbalance all of the liquid which is above the piston serves for counterbalance, and the cylinder in which the piston plays forms a part of the hydraulic column, and the lower part K' of such column is therefore uniform in its capacity throughout the extent of the stroke of the piston; but above the portion through which the piston moves the column will reduce in capacity toward the top, so that the column of liquid will rapidly increase in its height as the piston ascends, thus increasing the pressure upon the piston in any desired ratio. That is to say, the pressure per square inch of the area of the piston-head will be proportional to the height of the column regardless of the cross-sectional area of the column above the piston, and by properly tapering the column K (see Fig. 5) such pressure can be accurately adjusted to maintain a true balance.

I have shown a newly-invented appliance for cutting off the electricity when the car has reached the top. This is comprised in the combination of the electric motor; the power-wire R, connected with the electrical

contact-point *r*; a U-spring *S*, having one arm *s* fixed and the other arm *s'* free; an electrical contact-point *l*, connected with the motor by a conductor *T* and mounted on the free arm *s'* of the spring and arranged to be forced by the spring into contact with the other contact-point, and means, such as the rod *U*, carried by the free end of the spring and extending into the lower end of the path of the piston or its extension.

*V* indicates an auxiliary spring to assist in holding the points in contact.

*W* indicates a rod connected with the free arm *s'* of the spring and extending upward therefrom to carry the contact-point *l* into engagement with the contact-point *r*.

In practical operation, the car being at the bottom of the shaft, the attendant will turn on the current of electricity, thus driving the motor to pull down the piston. The liquid *L* will flow freely through the large passages *M* and allow the piston to ascend practically without any obstruction from the liquid. To stop the ascent of the car, the current is cut off by the attendant, and immediately the car has stopped the valves *m* prevent the return of the liquid from the cylinder, and the piston is thus held to support the load. To lower the load, the valve *n* is opened to allow the liquid to flow up into the reservoir, and the weight of the load will draw the piston up, thus forcing the liquid into the reservoir. By wholly or partially closing the valve *n* the descent of the car is stopped or controlled, as may be desired.

2 indicates an ordinary metal car-balancing counterweight working in the guides in which the sheave *B'* works. The quantity of liquid supplied to the cylinder is preferably such that it never reaches the metal counterweight or the sheave. When the liquid rises or falls in the column or reservoir by reason of the operation of the piston, the sheave and the metal counterweight also rise and fall, thus keeping out of the liquid. Oil or water or any other suitable liquid may be used.

Now, having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination of the cylinder; the piston arranged to move in the cylinder; a receptacle communicating with the cylinder; a body of liquid in the cylinder and receptacle; means adapted to allow, to control, and to prevent the flow of liquid from the cylinder to the receptacle to allow, to control, and to prevent the movement of the piston in one direction; a passage being provided between the receptacle and the cylinder; and an independent automatic check-valve arranged to allow a practically free and unobstructed flow of the liquid through the said passage from the receptacle into the cylinder, and prevent its return.

2. The combination of the cylinder; the piston arranged to work in the cylinder; a receptacle communicating with the cylinder; a

body of liquid in the cylinder and receptacle, means adapted to allow, to control, and to prevent the flow of liquid from the cylinder to the receptacle to allow, to control, and to prevent the movement of the piston in one direction; the elevator-car operatively connected with the piston to move it in such direction; an electric motor operatively connected with the piston to move it in the other direction; a passage being provided between the receptacle and the cylinder; and an independent automatic check-valve arranged to allow a practically free and unobstructed flow of the liquid through the said passage from the receptacle into the cylinder, and prevent its return.

3. The combination of a cylinder; a piston arranged to move in such cylinder; means connected with the piston to move it in one direction; a receptacle: a body of liquid in the cylinder and receptacle; a passage being provided between the receptacle and cylinder; a valve arranged to allow the liquid to flow freely through such passage from the receptacle into the cylinder and prevent its return; a passage being provided to allow liquid to flow from the cylinder into the receptacle; a valve arranged to control and to prevent the flow of liquid through such passage; and means for operating such valve.

4. The combination of an electric motor; a load-moving appliance; a piston arranged between the motor and the load-moving appliance and operatively connected with each by suitable operative means respectively; such means; a cylinder in which the piston works; a receptacle communicating with such cylinder; a body of liquid in the cylinder and receptacle; means adapted to allow, to control, and to prevent the flow of liquid from the cylinder to the receptacle to allow, to control, and to prevent the movement of the piston in one direction; a passage being provided between the receptacle and the cylinder; and an independent automatic check-valve arranged to allow a practically free and unobstructed flow of the liquid through the said passage from the receptacle into the cylinder, and prevent its return.

5. In an elevator the combination of an electric motor; a piston; a cylinder in which the piston works; a receptacle communicating with the cylinder; a body of liquid in the cylinder and receptacle; means adapted to allow, to control and to prevent the flow of liquid from the cylinder to the receptacle to allow, to control and to prevent the movement of the piston in one direction; a passage being provided between the receptacle and the cylinder; an independent automatic check-valve arranged to allow a practically free and unobstructed flow of the liquid through the said passage from the receptacle into the cylinder and prevent its return; a drum driven by the motor; a flexible connection between the drum and one end of the piston and operatively connecting them; a car; a car-sus-

taining pulley; and suitable means led over the pulley and connecting the car with the other end of the piston.

6. In a multiple-sheave elevator, the combination of the piston operatively connected at one end with the movable sheave to move the same to lift the car; means to allow, to control and to prevent the movement of the piston in one direction to allow, to control and to prevent the descent of the car; means adapted and arranged to allow the free movement of the piston in the other direction at the ascent of the car; and an electric motor operatively connected with the other end of the piston to move the piston to raise the car.

7. In an elevator, the combination of a piston arranged to reciprocate vertically and having its upper end operatively connected with the car; means adapted to allow, to control and to prevent the movement of the piston in one direction to allow, to control and to prevent the descent of the car; means adapted and arranged to allow the free movement of the piston in the other direction when the car ascends; and an electric motor operatively connected with the piston to move it in such other direction.

8. In an elevator, the combination of an electric motor; a piston; suitable means adapted to allow, to control and to prevent the movement of the piston in one direction; means adapted and arranged to allow a free and unobstructed movement of the piston in the other direction; a drum driven by the motor; flexible connection between the drum and the piston operatively connecting them; the movable sheave connected with the other end of the piston; the car; the car-sustaining pulley; and suitable flexible means fastened at one end to the car and led over the pulley and around the sheave and having its other end fixed, substantially as set forth.

9. In an elevator, the combination of a cylinder; a piston arranged to move in such cylinder; means connected with the piston to move it in one direction; a reservoir connected with the cylinder; a body of liquid in the cylinder and reservoir; a valve arranged to allow the liquid to flow freely through such passage from the reservoir into the cylinder and prevent its return; a passage being provided to allow liquid to flow from the cylinder into the reservoir; a valve arranged to allow, to control and to prevent the flow of liquid through such passage; and means for operating such valve.

10. In an elevator, the combination of a vertical cylinder; a piston arranged to move in such cylinder; means connected with the piston to move it down; a reservoir arranged above the cylinder; a body of liquid above the piston in the cylinder and reservoir; a passage being provided between the reservoir and cylinder; a valve arranged to allow the liquid to flow freely through such passage from the reservoir into the cylinder and prevent its return; a passage being provided to

allow liquid to flow from the cylinder into the reservoir; a valve arranged to control and to prevent the flow of liquid through such passage; and means for operating such valve.

11. In an elevator, the combination of a vertical cylinder; a piston arranged in such cylinder; a drum; a flexible connection fastened to the lower end of the piston and wound around the drum; means for rotating the drum to wind the flexible connection and pull down the piston; a reservoir arranged above the cylinder and communicating therewith through a suitable valved opening; a body of liquid above the piston in the cylinder and reservoir; suitable connections operatively connecting the elevator-car with the upper end of the piston; and valves arranged to allow the liquid to flow freely from the reservoir into the cylinder when the piston descends, and to allow, to control, and to prevent the flow of liquid from the cylinder into the reservoir.

12. The combination of the vertical cylinder; the piston therein; means for pulling the piston down; a vertical reservoir arranged vertically above the cylinder; a partition between the cylinder and the reservoir; a piston-rod fastened to the piston and extending through the partition into the reservoir; a passage being provided communicating between the reservoir and the cylinder; a valve to allow liquid to flow through such passage from the reservoir into the cylinder and prevent its return; a passage being provided to allow liquid to flow from the cylinder into the reservoir; a valve to control and to prevent such flow; the body of liquid in the cylinder and reservoir, above the piston; the load; and means for connecting the load with the piston-rod to draw the piston up.

13. The combination of the vertical cylinder; the piston therein; means for pulling the piston down; a vertical reservoir arranged vertically above the cylinder; a partition between the cylinder and the reservoir; a piston-rod fastened to the piston and extending through the partition into the reservoir; a passage being provided communicating between the reservoir and the cylinder; a valve to allow liquid to flow from the reservoir into the cylinder and prevent its return; a passage being provided to allow liquid to flow from the cylinder into the reservoir; a valve to control and to prevent such flow; a body of liquid in the cylinder and reservoir above the piston; a movable sheave in the reservoir operatively connected with the piston-rod; the load; the load-sustaining pulley; and the flexible connection fastened at one end to the load, passed thence over the sustaining-pulley and under the movable sheave and thence up and fastened to a support.

14. In an elevator, the combination of the vertical cylinder; a piston therein; means to pull the piston down; a vertical reservoir arranged vertically above the cylinder; suitably-valved passages being provided communicat-

ing between the reservoir and the cylinder; a body of liquid in the reservoir and cylinder above the piston; a piston-rod connected with the piston and extending vertically therefrom into the reservoir; the movable sheave connected with the end of the piston-rod; guide-ways for the sheave in the reservoir; the load; the load-sustaining pulley; and flexible connections passed over such pulley and operatively connected with the movable sheave so that the descent of the load will draw up such sheave, substantially as set forth.

15. The combination of the cylinder; the piston working in such cylinder; a reservoir above the cylinder; a valved passage being provided to allow liquid to flow from the reservoir into the cylinder and prevent its return; a body of liquid in the cylinder and reservoir above the piston; the piston-rod fastened to the piston; the load connected with the piston to move it; a passage being provided to allow liquid to flow from the cylinder into the reservoir; a valve to control the flow of liquid through such passage; and a cut-off valve fastened to the piston and arranged to close such passage at the final movement of the piston.

16. In an elevator, the combination of a piston working in a cylinder; the load; the sustaining-pulley; the rope connected with the load and passed over the sustaining-pulley and operatively connected with the piston; a reservoir reducing in capacity toward the top and communicating at its lower end with the cylinder above the piston; and a body of liquid in the cylinder and of sufficient quantity to

be forced into the contracted portion of the reservoir at the upward movement of the piston whereby the proper proportion can be maintained between the increasing or decreasing length of load-sustaining rope and the counterbalance therefor.

17. In a counterbalance for an elevator, the combination of the car, piston, and connections between the car and the piston and a liquid-holding column reducing in capacity toward the top, and arranged to apply a varying pressure to said piston substantially as and for the purpose set forth.

18. In a counterbalance for an elevator, the combination of the car and car-sustaining rope and a liquid-holding column uniform in capacity throughout an extent of its lower portion and reducing in capacity toward the top; and a piston operatively connected with the car-sustaining rope and arranged to reciprocate in the uniform lower portion of such column.

19. In an elevator, the combination of a cylinder; a piston operating therein; a reservoir arranged above the cylinder and communicating therewith; a body of liquid in the reservoir and cylinder to apply pressure to one side only of the piston; and means to allow, to control, and to prevent the movement of the liquid from the cylinder into the reservoir, and vice versa.

JOHN PARKINSON.

Witnesses:

JAMES R. TOWNSEND,  
ALFRED I. TOWNSEND.