G. F. STEEDMAN.

LOCKING MECHANISM FOR ELEVATORS.

APPLICATION FILED MAR. 1, 1909.

938,520.

Patented Nov. 2, 1909.

2 SHEETS—SHEET 1.

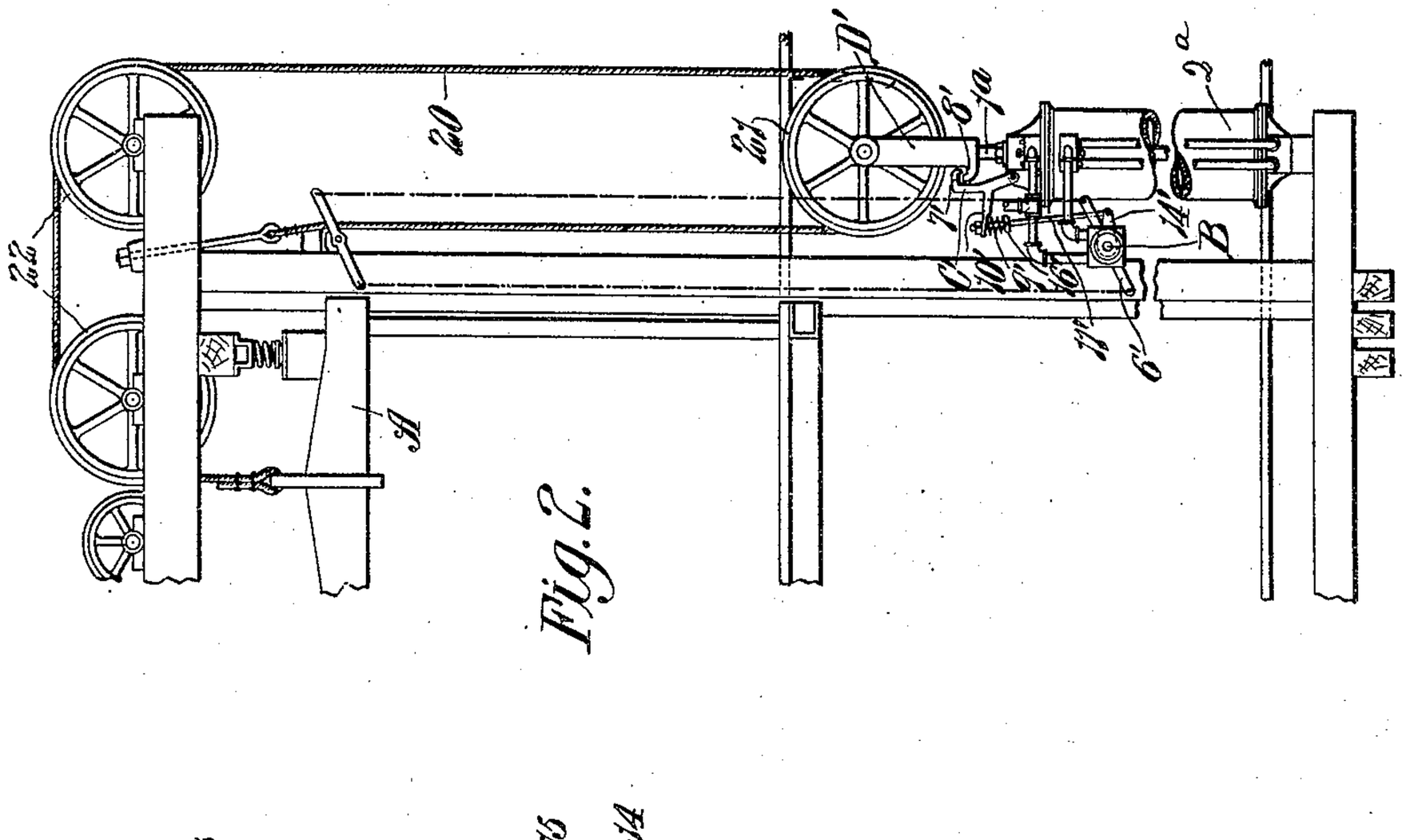

Fig. 2.

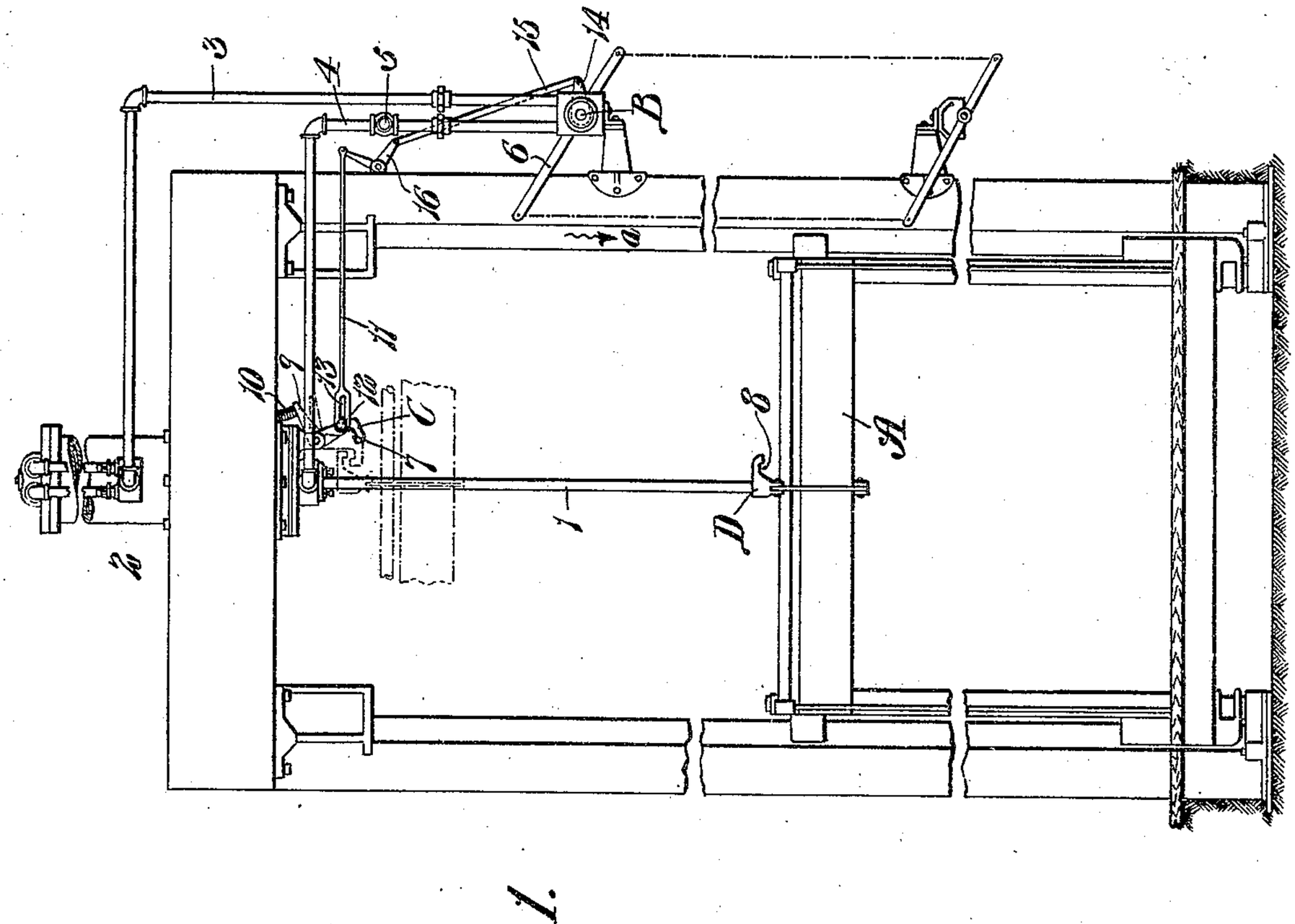

Fig. 1.

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2 SHEETS—SHEET 2.

Fig. 3.

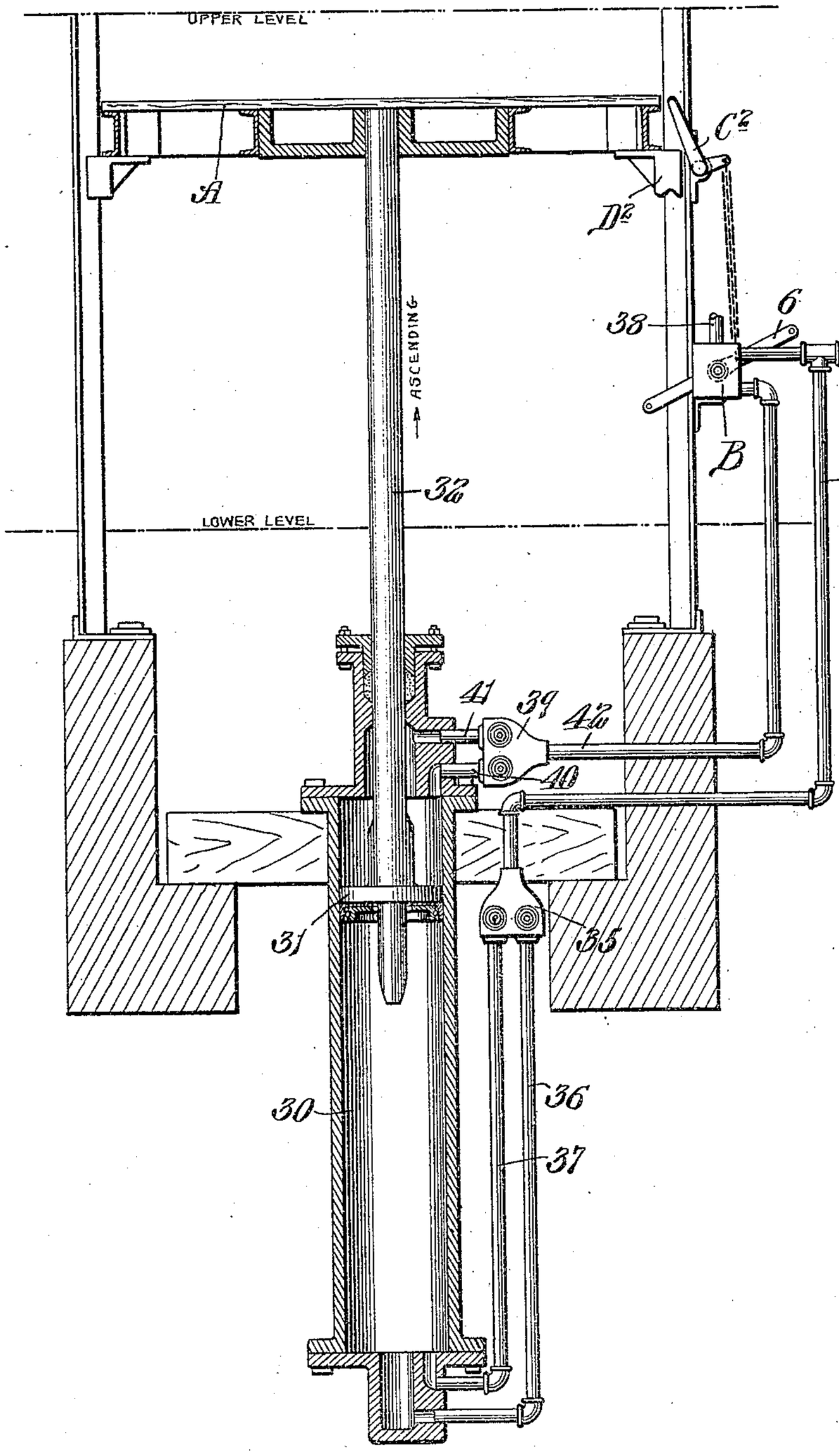
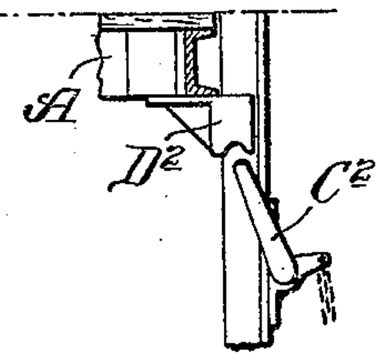


Fig. 4.



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UNITED STATES PATENT OFFICE.

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LOCKING MECHANISM FOR ELEVATORS.

938,520. Specification of Letters Patent. **Patented Nov. 2, 1909.**

Application filed March 1, 1909. Serial No. 480,659.

To all whom it may concern:

Be it known that I, GEORGE F. STEEDMAN, a citizen of the United States, residing at St. Louis, Missouri, have invented a certain new and useful Improvement in Locking Mechanism for Elevators, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same.

Figure 1 is an elevational view illustrating my locking mechanism applied to one type of pneumatic elevators; Fig. 2 is an elevational view illustrating my locking mechanism applied to a different type of elevator; Fig. 3 is an elevational view illustrating my locking mechanism applied to still another form of elevator; and Fig. 4 is a detail view showing the locking device in its operative position.

This invention relates to pneumatic elevators or hoists, and particularly to that type in which the car or cage travels between two levels and does not come to rest intermediate these points.

The main object of this invention is to provide means for preventing an elevator cage from descending or moving from the upper level in case the load on the cage is greater than the supporting force of the hoist.

Another object is to provide means for preventing the valve that controls the movement of the cage from being operated when the cage is at the upper level and provided with a load of greater weight than the supporting force of the hoist. And still another object is to provide a cage-locking device and means for causing said device to move automatically into an operative position when the air-controlling valve is moved in the direction to cause the cage to move upwardly, said locking device being so designed that the air-controlling valve cannot be moved in the direction to cause the cage to descend whenever the cage is at the upper level and provided with a load in excess of the supporting force of the hoist.

I have herein illustrated the preferred form of my invention in connection with a pneumatic elevator of the balanced type; namely, one in which one side of the piston is in communication at all times with a supply of compressed air, and a valve is provided for connecting the other side of the piston with said supply of compressed air, or a supply of equal pressure, so as to equalize the pressure on the piston and thus cause the cage to move downwardly, said valve being adapted to be operated to exhaust air from one side of the piston and thus cause the cage to ascend.

In Fig. 1 I have illustrated a construction in which the cage A is rigidly connected to the piston rod 1 of a piston that operates in a cylinder 2 arranged above the upper level at which the cage comes to rest, air being introduced into the upper and lower ends of said cylinder by means of pipes 3 and 4, respectively. A pipe 5 that leads from a supply of compressed air is tapped into the pipe 4 that communicates with the lower end of the cylinder 2 so that the air pressure on the lower side of the piston will be constant, and a valve B is arranged between this supply pipe 5 and the pipe 3 that leads to the upper end of the cylinder for admitting air to the upper side of the piston and exhausting it therefrom. A lever 6 is connected to the stem of valve B for operating it, and when said lever is moved in the direction indicated by the arrow *a* in Fig. 1 the air on the upper side of the piston in cylinder 2 will be exhausted through the pipe 3 and thus cause the cage to be moved upwardly by the constant air pressure on the lower side of the piston. When the cage is at the upper level and the lever 6 is moved in the opposite direction back to its normal position, as shown in Fig. 1, communication will be established between the air supply pipe 5 and the pipe 3 so that air can enter the upper end of the cylinder and thus equalize the pressure on the piston, the weight of the cage causing it to descend to the lower level.

Elevators of the type above referred to are designed to carry a certain load and when an excessive load is put on the cage while it is at the upper level an accident is apt to occur. Furthermore, as the cage is maintained in its elevated position, or at the upper level, by the constant air pressure on the lower side of the piston, the cage will start to move downwardly if the pressure in the supply tank falls below a certain degree.

The main object of my invention is to eliminate the possibility of accidents occurring by a drop in the air pressure or overloading the cage when it is at the upper level, and to this end I have provided a locking device that is adapted to prevent the cage from descending, and means for caus-

ing said device to move automatically into an operative position when the air valve is turned to cause the cage to ascend, and into an inoperative position when the air valve is turned in the direction to cause the cage to descend, said means being so designed that the air valve cannot be turned to cause the cage to descend when an excessive load is on the cage. The means shown in Fig. 1 for accomplishing this result consists of a pivotally mounted locking device C arranged in such a position that a tooth 7 thereon extends underneath a coöperating member D on the piston rod 1 when the cage reaches the upper level. The member D is rigidly connected to the piston rod 1 adjacent the upper end of the cage and is provided with a notch 8 into which the tooth 7 on the locking device C is adapted to project but it will, of course, be obvious that the member D could be connected directly to the cage. The pivotally mounted locking device C preferably consists of a bell crank lever having an arm 9 which bears against an expansion spring 10 and an arm to which a rod 11 is connected. The rod 11 has a loose connection with the locking device C so that said device can move independently of the rod, and in the construction shown in Fig. 1 this loose connection is effected by a pin 12 on the locking device that enters an elongated slot 13 in the rod 11. The rod 11 is connected in some suitable manner to an arm 14 on the stem of valve B so that the movements of said valve will be transmitted to the link 11 which controls the position of the locking device. In the construction shown in Fig. 1 the arm 14 is connected to a link 15 whose upper end is connected to a bell crank lever 16 to which the rod 11 is fastened but it will, of course, be obvious that the rod 11 could be connected to the valve B in various other ways without departing from the spirit of my invention.

When the lever 6, which controls the valve B, is moved in the direction indicated by the arrow *a* in Fig. 1, the rod 11 will be moved inwardly and thus permit the spring 10 to expand and force the locking device C into its operative position, as shown in broken lines in Fig. 1. The movement of the valve B in this direction causes the cage to ascend, and when the cage reaches the upper level the member D on the piston rod 1 will project over the tooth 7 on the locking device, the slot and pin connection between the rod 11 and locking device C permitting said device to yield enough to enable the member D to pass the tooth 7 thereon. If a load of greater weight than that which the cage is designed to carry is put on the cage when it is at the upper level the cage will drop slightly until the tooth 7 on the locking device enters the notch 8 in the member D, the locking device preventing further downward movement of the cage. The device C thus securely locks the cage in its elevated position and so long as the tooth 7 on said device remains in the notch 8 in the member D it will be impossible for the operator to turn the valve B in the direction to cause the cage to descend for the locking device is positively connected to the arm 14 on the stem of said valve. Consequently, it will be impossible for the cage to leave the upper level when it is overloaded for the operator cannot turn the valve B. When the operator discovers that the cage is overloaded he removes some of the load therefrom and the cage will then return to its normal elevated position, thus disengaging the member D from the tooth on the locking device and releasing said locking device so that the valve B can be turned in the proper direction, the movement of the valve, of course, operating to shift the locking device into an inoperative position so that it will be out of the path of the member D.

In Fig. 2 I have illustrated the same idea applied to an elevator in which the movement of the piston in the operating cylinder 2^a is transmitted to the cage A by a cable 20 connected at one end to a stationary support and passing under a pulley 21 connected to the piston rod 1^a of the piston in said cylinder, thence over pulleys 22 on said stationary support and having its end connected to the cage. In this type of elevator air is admitted to the lower side of the piston to cause the cage to descend and air is exhausted from the lower side of said piston to cause the cage to ascend, the pressure on the upper side of the piston being constant. The operating cylinder 2^a is arranged adjacent the lower level at which the cage comes to rest, and the locking device C′ is provided with a tooth 7′ that coöperates with an upturned lug 8′ on a member D′ connected to the piston rod 1^a so as to prevent the piston from moving upwardly, or in a direction to cause the cage to descend. The locking device C′ has an arm 10′ that is connected to the arm 14′ on the air-controlling valve by means of a rod 11′ and said rod and locking device are connected together in such a manner that the locking device can yield without imparting movement to the rod 11′ so as to enable the member D′ on the piston rod to travel past the tooth 7′ on said locking device. In the construction shown in Fig. 2 the upper end of the rod 11′ passes freely through an opening in the arm 10′ on the locking device, and a coiled expansion spring 9′ is interposed between the lower side of said arm and a stop 16′ on the rod to move the locking device into its operative position when the valve-operating lever 6′ is moved in the direction that causes the cage to ascend. The operation of the construction illustrated in Fig. 2 is the same as that illustrated in Fig.

1 so that a further description of same is not necessary.

In Fig. 3 I have illustrated the same idea applied to an elevator in which the cylinder 30 and its piston 31 are underneath the cage A and the piston rod 32 is directly connected to the underside of the cage. The pipe 33, which leads from a source of compressed air supply, is provided with a branch 34 that leads directly to the speed box 35 of well-known construction, said speed box communicating with an exhaust pipe 36 that leads from the lower end of the cylinder and also with an admission pipe 37 that leads to the lower end of the cylinder. The casing of the controlling valve B communicates with the compressed air supply pipe 33 and said casing is provided with an exhaust pipe 38. The speed box 39 that is located adjacent the upper end of the cylinder, communicates with an admission pipe 40 that leads to the upper end of the cylinder and with an exhaust pipe 41 that leads from the upper end of the cylinder, said speed box 39 being connected to the casing of the controlling valve B by means of a pipe 42. Compressed air is admitted to or exhausted from the upper end of the cylinder by means of the valve B, and the lower end of the cylinder is directly connected to the source of compressed air and is constantly under full pressure. The compressed air is exhausted from the upper side of the piston to cause the cage to travel upward and is admitted to the upper side of the piston to cause the cage to descend, the cage and piston rod being so designed that the weight of same is sufficient to overcome the existing upward pressure in the cylinder. In this embodiment of my invention, the cage A is provided on its under side with a device D^2 that coöperates with a pivotally mounted locking device C^2 which is connected to the operating mechanism 6 for the valve B. When the valve B is turned to permit the cage to ascend, the locking device C^2 drops automatically into an operative position, as shown in Fig. 4, the device D^2 on the cage moving past said locking device as the cage approaches its upper level. Just as the cage reaches its upper limit of travel the locking device C^2 falls back into operative position underneath the coöperating device D^2 on the cage. As the function and operation of this locking device C^2 is the same as those shown in the constructions illustrated in Figs. 1 and 2, further description of same is not necessary.

While I have herein illustrated my invention applied to only two types of pneumatic elevators, it will, of course, be obvious that it could be used with various other types of elevators and therefore I do not wish it to be understood that my broad idea is limited to the constructions herein shown.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In an elevator, a device for controlling the medium that actuates the cage or car of the elevator, and means for preventing said device from being manipulated to cause the cage to descend from its upper level when said cage contains an excessive load.

2. In an elevator, a device that locks the cage or car of the elevator when it reaches its upper level, and means for preventing said device from releasing said cage when it contains an excessive load.

3. In an elevator, mechanism for locking the cage or car of the elevator when it reaches its upper level, a device for controlling a medium that actuates said cage, a connection between said device and mechanism, and means for preventing said device from being operated to cause the cage to descend when said cage carries an excessive load.

4. A locking mechanism for pneumatic elevators, comprising a member that travels with the cage of the elevator, and a device coöperating with said member to prevent the cage from descending from its upper level, one of said parts being so constructed that said parts cannot be disengaged from each other when the cage contains an excessive load, or when the pneumatic pressure that sustains the cage in its elevated position drops below a certain degree; substantially as described.

5. A locking mechanism for elevators, consisting of a pivotally mounted device that is adapted to move into an operative position when the cage of the elevator ascends, and a member traveling with the cage and adapted to coöperate with said locking device to prevent the cage from descending until said locking device is moved into an inoperative position, said device being provided with means which prevents it from being moved into an inoperative position when the cage contains an excessive load; substantially as described.

6. In a pneumatic elevator, a valve for controlling the air that causes the cage of the elevator to move, and means for preventing said valve from being turned into a position to cause the cage to descend from its upper level when said cage contains an excessive load; substantially as described.

7. In a pneumatic elevator, a member which travels with the cage of the elevator, a device coöperating with said member to prevent the cage from descending from its upper level, a valve for controlling the air which causes the cage to move, and a connection between said locking device and valve for causing said device to move into an operative position when the valve is shifted in

one direction and into an inoperative position when the valve is shifted in the opposite direction; substantially as described.

8. In a pneumatic elevator, a cage, a piston operating in a cylinder and adapted to move said cage upwardly and downwardly, a valve for controlling the air that is introduced into said cylinder for actuating said piston, a device coöperating with a member connected to said piston for arresting the movement of said piston in one direction, and a connection between said device and said valve that prevents said valve from being moved to cause the cage to descend from its upper level when the cage contains an excessive load; substantially as described.

9. A pneumatic elevator provided with a locking device, a member connected with the piston of the elevator and adapted to move into position to be engaged by said locking device when the cage reaches its upper level, and means on said device that coöperates with said member to prevent the cage from descending from its upper level when the pneumatic medium which sustains the cage in its elevated position falls below a certain degree.

10. In a hoisting apparatus, a cylinder, a piston arranged in said cylinder and provided with a piston rod that is connected to a member which is to be moved, a valve for controlling the admission of air into said cylinder, a device coöperating with a member that is connected to said piston for arresting the movement of the piston in one direction, and means for preventing the air valve from being turned when said member and locking device are in engagement with each other; substantially as described.

11. In a hoisting apparatus, a pneumatically operated piston, a locking device for arresting the movement of said piston in one direction, a valve for controlling the pneumatic means which moves said piston, and a connection between said locking device and said valve whereby the locking device is moved into an operative position when the valve is turned in one direction and into an inoperative position when the valve is turned in a different direction; substantially as described.

12. In a pneumatic elevator, a valve for controlling the pneumatic means that causes the cage of the elevator to move, a locking device, a member that coöperates with said device to prevent the cage from descending from its upper level when it contains an excessive load, and a connection between said locking device and said valve for causing said locking device to become operative or inoperative, depending upon the position of said valve; substantially as described.

13. In a hoisting apparatus, a cylinder, a piston arranged in said cylinder and provided with a piston rod that is adapted to move a load, a valve for controlling the fluid that actuates said piston, a movable locking device provided with a projection, a member connected with the piston rod and provided with a coöperating projection, means for causing said locking device to assume such a position that the projection thereon will be engaged by the projection on said coöperating member when the piston reaches its limit of movement in one direction and then starts on its return stroke, and a connection between said controlling valve and said locking device; substantially as described.

14. In a hoisting apparatus, a cylinder, a piston arranged in said cylinder and provided with a piston rod that moves a load, a member connected with said piston rod, a pivotally mounted bell crank shaped locking device adapted to coöperate with said member to arrest the movement of the piston when it reaches its limit of movement in one direction and then starts on its return stroke, yielding means for holding said locking device in the path of movement of said member, a valve for controlling the fluid that actuates said piston, and a connection between said valve and locking device whereby said valve is prevented from being moved whenever the locking device and the member with which it coöperates are in engagement with each other; substantially as described.

15. An elevator provided with an air hoist cylinder for operating the cage, and means for preventing the cage from moving from its upper level when the load on the cage is greater than the supporting force of the hoisting cylinder.

16. An elevator provided with a cage, pneumatic means for operating said cage, and means for holding the cage at its upper level and also locking the valve that controls said pneumatic means when the load on the cage is greater than the supporting force of said pneumatic means; substantially as described.

17. An elevator provided with a cage and an air hoist cylinder, an operating valve, and an over-load safety device adapted to be thrown into operative position by the valve-operating mechanism when the valve is turned to cause the cage to ascend and be withdrawn from operative position when the valve is turned to cause the cage to descend; substantially as described.

18. In an elevator provided with an air hoist cylinder for operating the cage, an operating valve, mechanism for actuating said valve, and a safety device adapted to be moved by the valve-actuating mechanism and be thrown into position to catch the cage at the upper level in case the cage settles before said operating valve is turned to permit the cage to descend; substantially as described.

19. In an elevator wherein the cage is operated by an air hoist cylinder, an operating valve, a valve-operating means, a safety device for preventing the cage from settling or moving from the upper level when the load is greater than the sustaining force of the hoist, and means coöperating with the safety device and with the valve-operating means for preventing movement of the valve when the safety device supports the load.

20. In an elevator wherein the cage is operated by an air hoist cylinder, an operating valve, a valve-operating means, a hook-shaped member hinged to the cylinder of the air host and adapted to be moved by the valve-operating means, and a catch part on the hoist piston rod adapted to be engaged by said hook-shaped member in case the piston rod is drawn from its inward position by an external force; substantially as described.

21. An elevator comprising a cage, an air hoist cylinder provided with a piston which moves said cage, a controlling valve, a valve-operating means, a hook-shaped member pivotally connected to the head of the cylinder and connected to the valve-operating means, and a catch part on the piston rod arranged in such a position that if said rod is withdrawn from its inward position by an abnormal external force said hook-shaped member will engage it and prevent the valve from being operated; substantially as described.

22. In an elevator wherein the cage is operated by an air hoist cylinder, an operating valve, a valve-operating means, a safety device for sustaining the cage at its upper level in case the load is greater than the sustaining force of the hoist, and means coöperating with the safety device and the valve-operating means for preventing the movement of the valve when the safety device supports the load; substantially as described.

In testimony whereof I hereunto affix my signature in the presence of two witnesses, this 25th day of February 1909.

GEORGE F. STEEDMAN.

Witnesses:
RAEBERN H. POST,
GEO. E. HOFFMANN.