(No Model.)

F. H. ABEEL.

MEANS FOR OPERATING DOORS OF ELEVATOR SHAFTS.

No. 265,231. Patented Oct. 3, 1882.

Fig. 1.

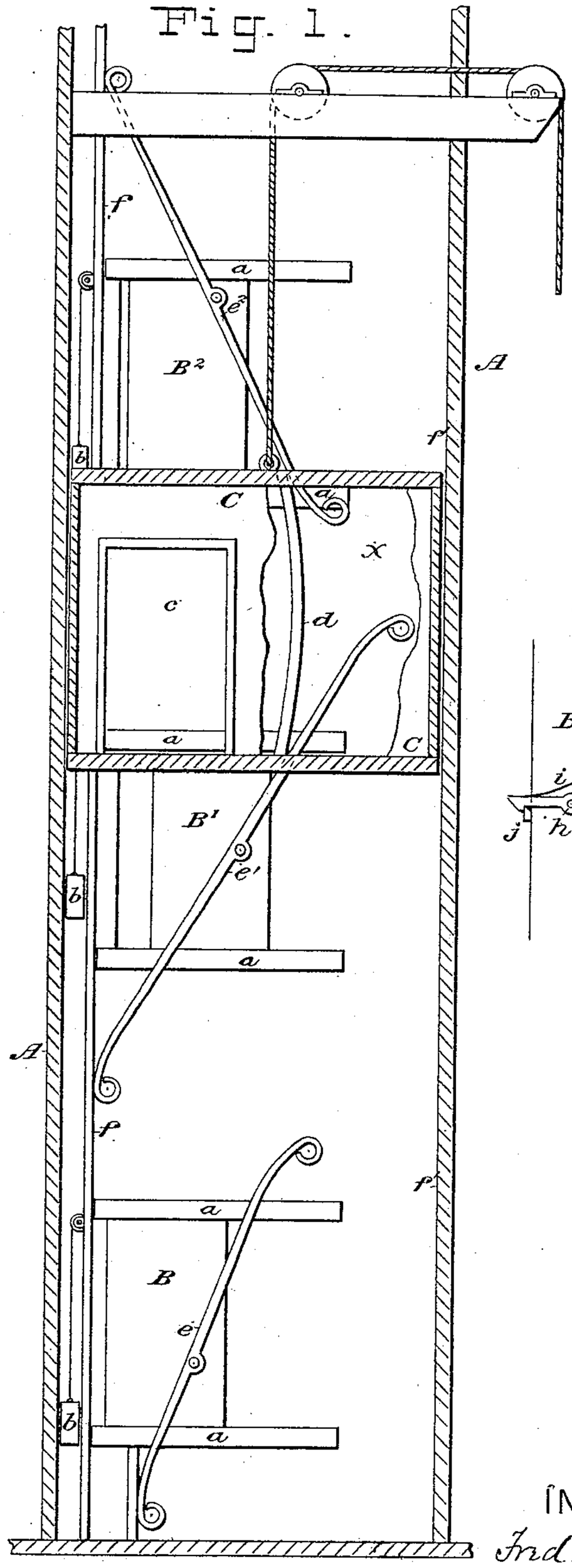


Fig. 2.

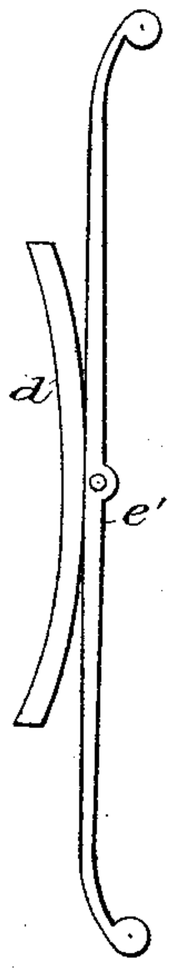


Fig. 3.

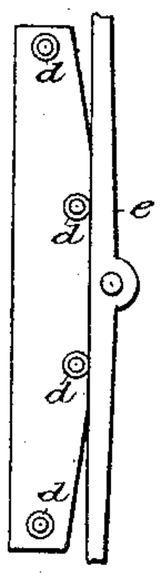
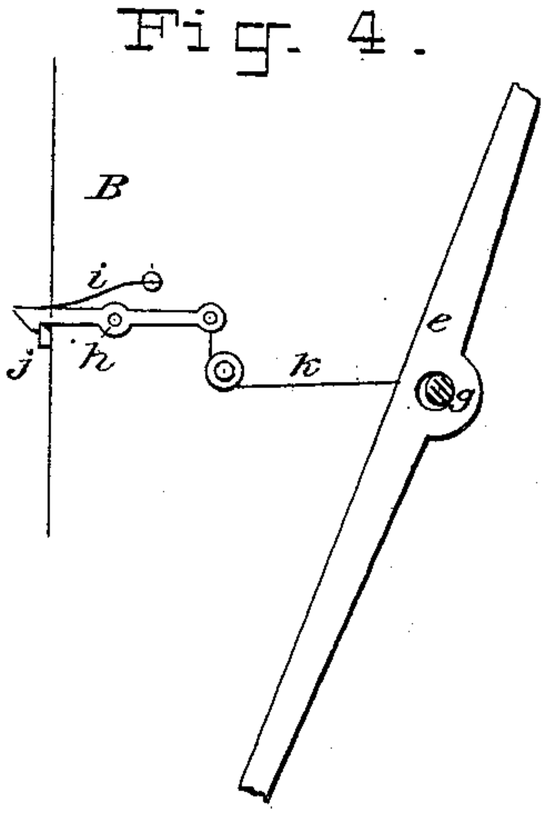


Fig. 4.



WITNESSES:

E. B. Bolton

Geo. Bainton

INVENTOR:

Frd. H. Abeel

By his Attorneys,

Burke, Fraser & Bonnell

UNITED STATES PATENT OFFICE.

FREDERICK H. ABEEL, OF ENGLEWOOD, NEW JERSEY.

MEANS FOR OPERATING DOORS OF ELEVATOR-SHAFTS.

SPECIFICATION forming part of Letters Patent No. 265,231, dated October 3, 1882.

Application filed July 12, 1882. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK H. ABEEL, a citizen of the United States, residing at Englewood, in the county of Bergen and State of New Jersey, have invented certain Improvements in Means for Operating Doors of Elevator-Shafts, of which the following is a specification.

My invention is adapted to all kinds of hoists, lifts, dumb-waiters, &c., where access thereto is had by doors or gates; but I have herein shown it as applied to a passenger-elevator, for which class of hoists it is especially well adapted.

The invention contemplates the opening of the doors leading into the elevator-shaft by the vertical movement of the car, both in ascending and descending, the closure being effected by weights, springs, or the action of gravity on the door itself. The door slides open like the ordinary elevator-door, and pivoted to it is a long lever, against the end of which a cam or cam-plate on the car acts to slide the door to one side. The door in closing shifts the lever, and in its descent the car acts upon the other end of the lever (in the case of the intermediate doors) to open the door, as will be more fully hereinafter explained.

In the drawings which serve to illustrate my invention Figure 1 is a sectional elevation of an elevator-shaft and car arranged to show the operation of the door-opening devices. Fig. 2 is a detached view, showing the relative positions of the lever and cam when the door is fully open. Fig. 3 is a modification of the cam for actuating the levers. Fig. 4 is a detached and enlarged view, illustrating a means of actuating the latch of the door where latches are employed.

Let A represent the casings of an elevator-shaft, extending up to the third floor, and B B′ B^2 the doors opening into said shaft in the usual way at the several floors, B′ being an intermediate door, and B B^2 terminal doors. These doors are hung to slide in keepers *a a*, which may be provided with rollers and tracks, and are arranged to be closed automatically by weights *b b* in a well-known way.

C is the car, which may be of the usual kind and be provided with the usual appurtenances. It has the usual opening, *c*, arranged to coincide with the doors B B′ B^2 at the several landings. In Fig. 1 the front of the car, next the doors, is broken away at *x* to show the door-actuating mechanism.

On the front or face of the car is fixed a cam or cam-plate, *d*, which may be simply a bent or curved strip of any material, of substantially the form shown—that is to say, with a straight or nearly straight central part and curved or beveled ends. When the car moves up or down this cam engages levers *e e′* e^2, pivoted to the doors B B′ B^2, respectively, as shown. As the car does not pass the upper and lower terminal doors, B and B^2, the levers *e* e^2 on these doors may be made of a somewhat different form from those on the intermediate doors, which the car must pass both in ascending and descending; but they are all substantially the same.

I will describe the construction and mounting of the lever *e′* on the intermediate door, B′, which is typical of all. This lever is pivoted at its middle to the door, at about the middle of the vertical height of the door by preference. The ends of the lever are by preference curved or beveled in order that the curved end of the cam on the car may engage them properly, and rounded at their extremities where they impinge against the casing. In pivoting the lever to the door a little friction is necessary at the pivot to prevent the lever from changing its position by gravity.

In Fig. 1 I have shown the car as ascending, and as on the point of opening the upper door, B^2, the intermediate door, B′, being in the act of closing as the car passes. When the car is at rest at the bottom of the shaft the door B stands open, the lever *e* stands vertical, and the flat portion of cam *d* is opposite the lever-pivot. As the car starts to rise from the door B, which has been thus held open by the cam *d*, the said cam is gradually raised above the pivot-point of lever *e*. This permits the weight *b* on the door to gradually close it, the lower end of the lever being drawn over to the left by the movement of the door, while the upper end of said lever is still detained by the cam *d* on the ascending car. When the car has moved up far enough for the door B to close, the lever *e*, pivoted thereon, will be left standing in the oblique position shown in Fig. 1,

which is its normal position when the door is closed. The car in its last descent has set the levers on the intermediate doors (all of which are represented by B′ in Fig. 1) with their upper ends resting against a strip, *f*, or some part of the casing, and their lower ends projecting obliquely to the right. In its ascent from the bottom of the shaft, as above described, the upper end of cam *d* engages the lower end of lever *e′*, and it acting as a lever of the first class partially opens the door B′. As the cam moves upward the lower end of lever *e′* is thrown over and impinges upon the opposite side, *f′*, of the casing, thus shifting the fulcrum and forming a lever of second class. The end of the cam *d* is now near the pivotal axis of the lever, and the upper end of the latter is moving to the right away from *f*. On the farther upward movement of the car the cam shifts the lever to a vertical position, as shown in Fig. 2, at the moment the landing is reached, and the door in the car coincides with the door in the shaft. As the car passes on the lever *e′* is shifted in the same manner as lever *e* was shifted, and door B′ closes. All the intermediate doors above are opened and closed in the same manner, the upper door, B^2, being also operated in precisely the same way, except that as the car does not pass it the lever e^2 is never shifted beyond a vertical position, whence it returns to its normal position, substantially as shown in the drawings. In descending the car finds the levers on the intermediate doors shifted to the opposite angle—that is, with their lower ends in contact with *f*—and the lower end of cam *d* engages the upper ends of the levers. Thus the levers on the intermediate doors are shifted each time the car ascends or descends.

In lieu of a curved cam-plate, as shown in Figs. 1 and 2, I may employ several friction-rollers, *d d*, arranged substantially as shown in Fig. 3. These rollers may be mounted directly upon the side of the car or upon a plate affixed to the side of the car. It is not important just how this cam is constructed, so long as it performs the function described. The ends of the levers *e e′*, &c., may also be provided with friction-rollers where they impinge upon the casing at *f f′*.

It will be observed that the cam acts through the lever to open the door in a peculiar manner: first, as a lever in which the weight is between the fulcrum and the power; second, as a lever in which the power is between the weight and the fulcrum; and, third, as a wedge, when both ends of the lever abandon their fulcrums and the lever approaches a vertical position.

I have shown *f′* as the side of the casing itself; but in some cases blocks may be secured to the casing to form fulcrum-points.

In elevator-shafts as commonly constructed the doors are grated and open for the passage of air-currents. This makes a flue out of the shaft in case of fire and prevents all escape by that means from the upper floors. I contemplate making the shaft close and tight and the employment of tight close-fitting doors, which cannot easily be opened from the outside, the doors being plain and smooth and unprovided with knobs.

I have shown no latches or fastenings in Fig. 1, as in case the doors are made tight and smooth fastenings will not be needed; but in some cases—as with grated doors such as are now in use—fastenings will be desirable, and I have shown an automatic latch device in Fig. 4 which will serve the purpose. Referring to this figure, the lever *e* is so pivoted as to have a little lateral play on the pivotal stud *g*. This is done by making the hole in the lever a little larger than the pin. Consequently when the lever is first struck by cam *d* it will be free to move a little before it begins to move the door. On the door B, I pivot a latch *h*, which is normally pressed down by a spring, *i*, and which takes over a catch, *j*, when the door is closed. To the tail of the latch I attach a cord, *k*, pass it around a guide-sheave, and attach its other end to the lever *e*, near the pivot-point and out of the way of the cam on the car. When the cam strikes the lever it is moved back a little before the door begins to open, and this slight movement is sufficient to raise the latch and free the door. The latch being on the inside, it cannot be tampered with from without, and it is impossible to open the door except from the car.

Other devices may be employed for automatically fastening and unfastening the door.

The levers on the doors and the cam *d* on the car may be quite thin, so as to play in a little space left between the front of the car and the casing. They are all of course in the same vertical plane.

Besides the advantages attending the automatic opening and closing of the doors, my construction has also the important advantage of retarding or impeding the descent of the car in case of accident, as the car must open all the doors below it in passing. Should it move too rapidly to effect this, the mechanism will become locked or jammed and stop the car. This inevitable opening of the doors will also afford an opportunity for the occupant to jump out at the door and thus escape the fall—a proceeding that is impossible where the doors are opened by hand.

Having thus described my invention, I claim—

1. As a means of automatically opening the doors of elevators, the combination of the following coacting elements: a door arranged to slide and provided with a weight or its equivalent to close it normally, a lever pivoted near its middle to said door, and the car bearing a cam to engage said lever in the ascent and descent of the car, said lever being arranged to bear against some fixed part of the shaft at its end to form a fulcrum, substantially as set forth.

2. The combination, to form an opening device for a sliding elevator-door, of a lever piv-

oted to said door, with one end arranged to rest against some fixed part of the shaft and the other arranged in the path of a cam on the car, and said cam fixed to the car and arranged to engage said lever and slide open the door horizontally by the vertical movement of the car, substantially as set forth.

3. The combination of the car C, the cam *d*, fixed thereto, the door B′ in the shaft, arranged to slide in keepers and provided with a closing-weight, *b*, the shaft-casing, and the lever *e′*, pivoted to the door at its middle and having curved or beveled ends, said lever being arranged in the track of the cam *d* as the latter is moved up or down, substantially as set forth.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

FREDERICK H. ABEEL.

Witnesses:

HENRY CONNETT,

ARTHUR C. FRASER.