No. 621,313. Patented Mar. 21, 1899.

L. C. BABCOCK.

SAFETY PROVISION FOR ELEVATORS.

(Application filed May 5, 1898.)

(No Model.) 2 Sheets—Sheet 1.

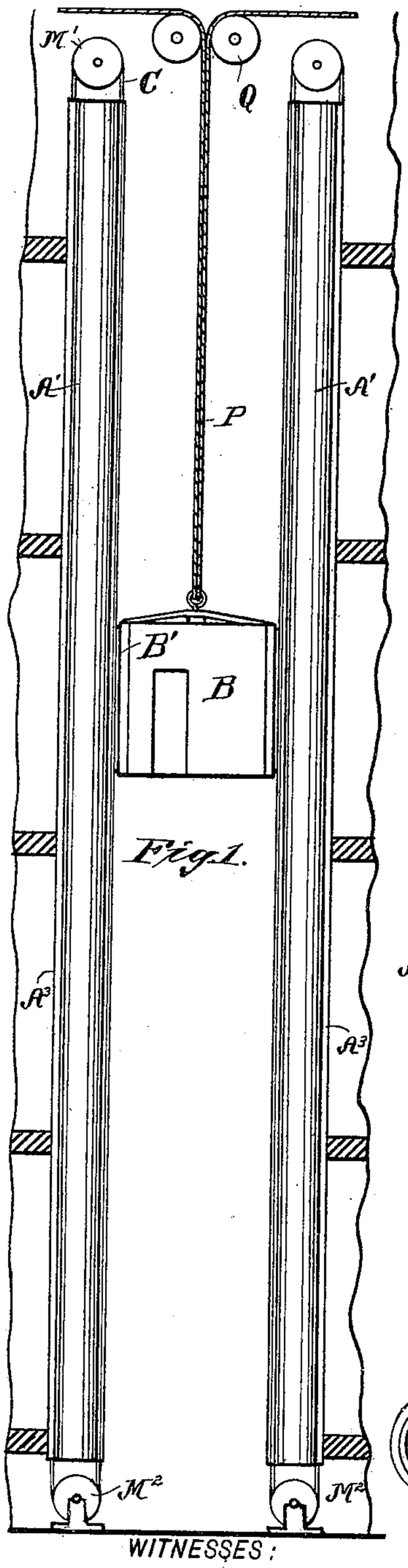

Fig. 1.

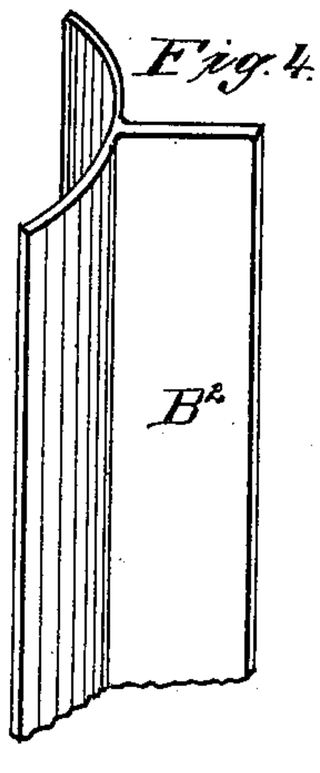

Fig. 4.

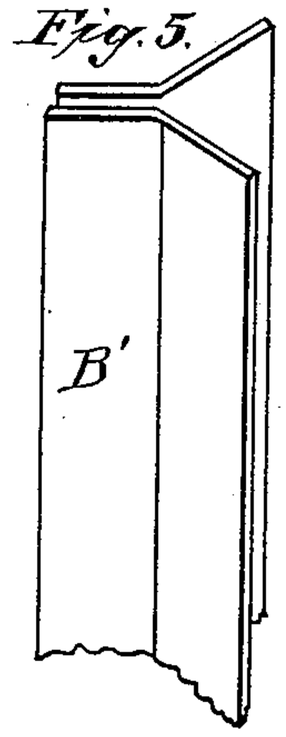

Fig. 5.

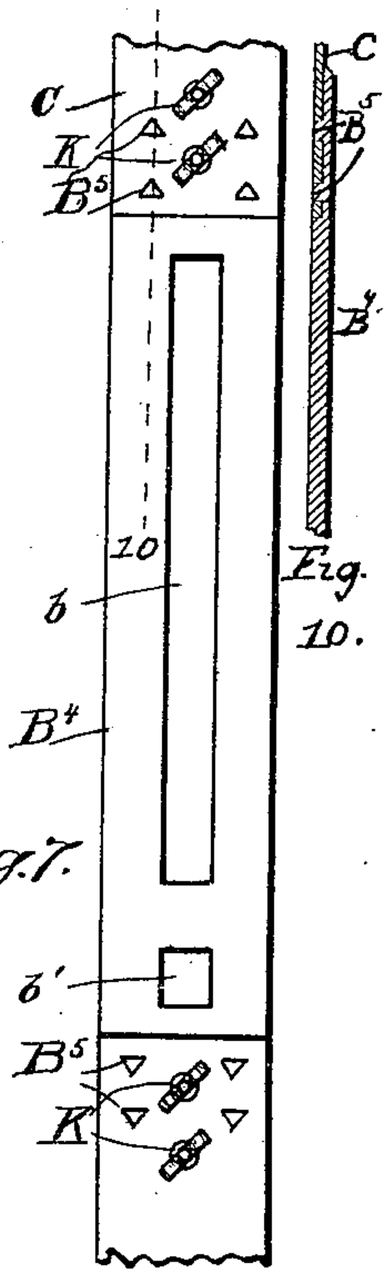

Fig. 10.

Fig. 7.

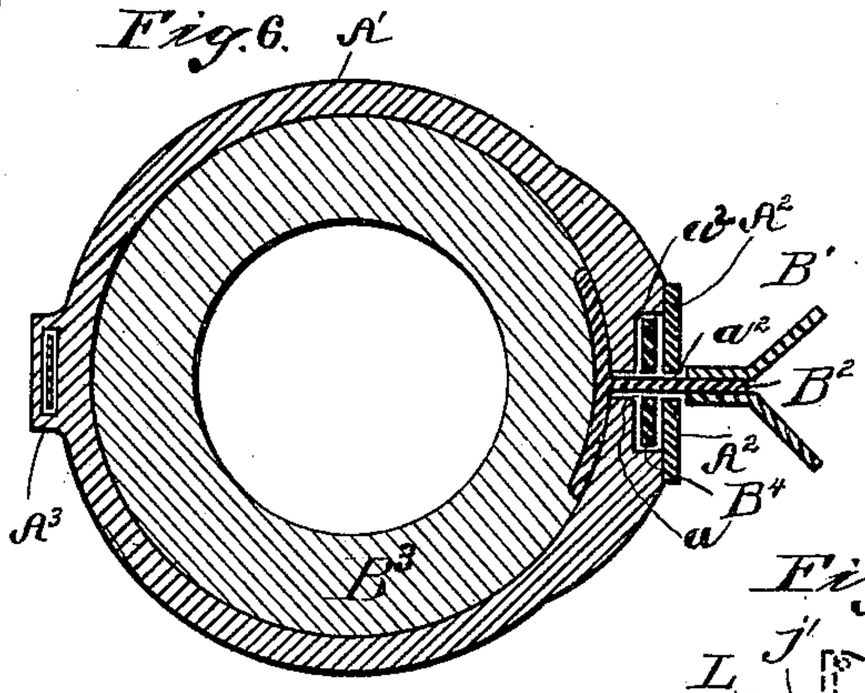

Fig. 6.

Fig. 8.

Fig. 9.

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SAFETY PROVISION FOR ELEVATORS.

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(No Model.) 2 Sheets—Sheet 2.

Fig. 2.

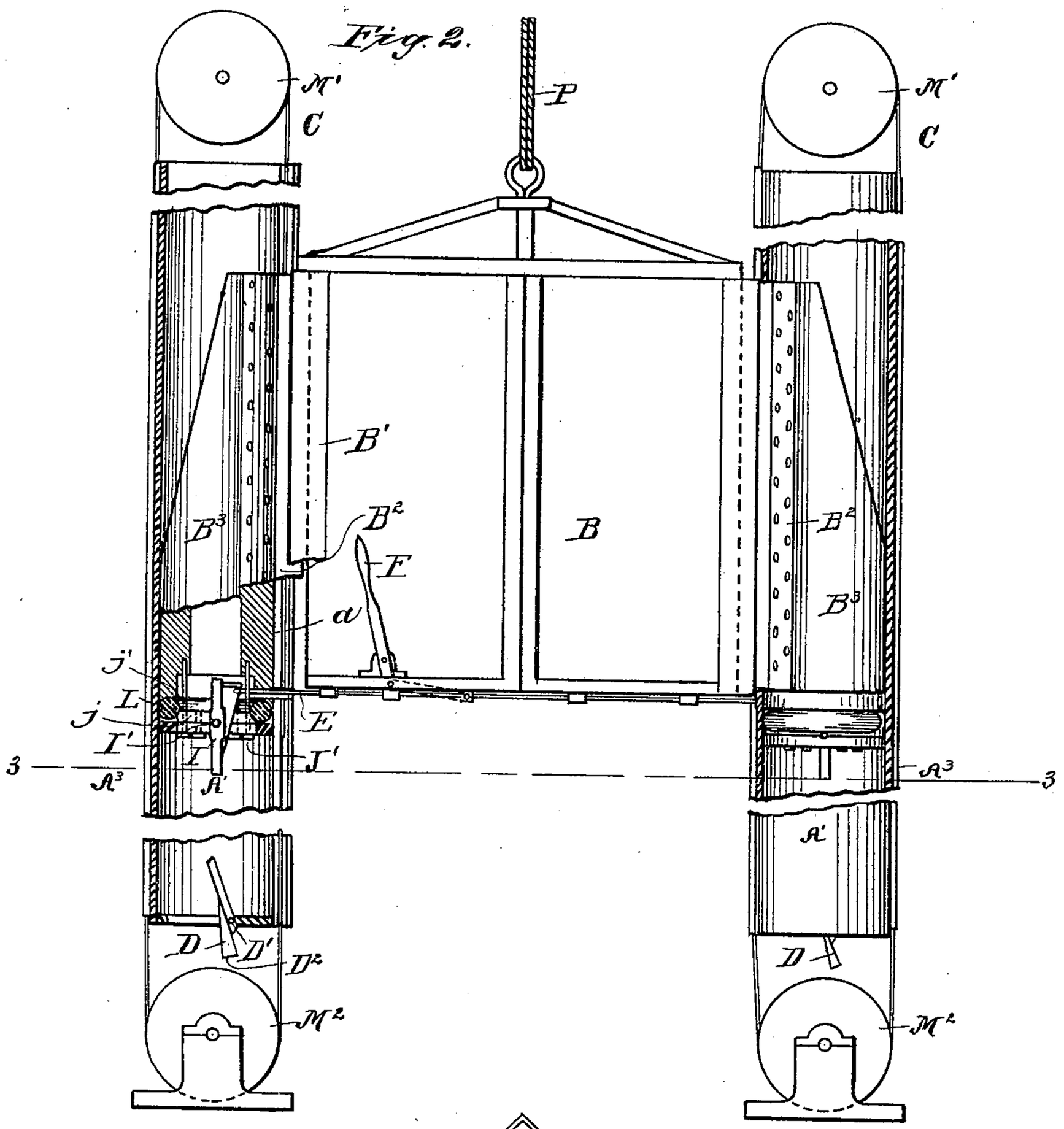
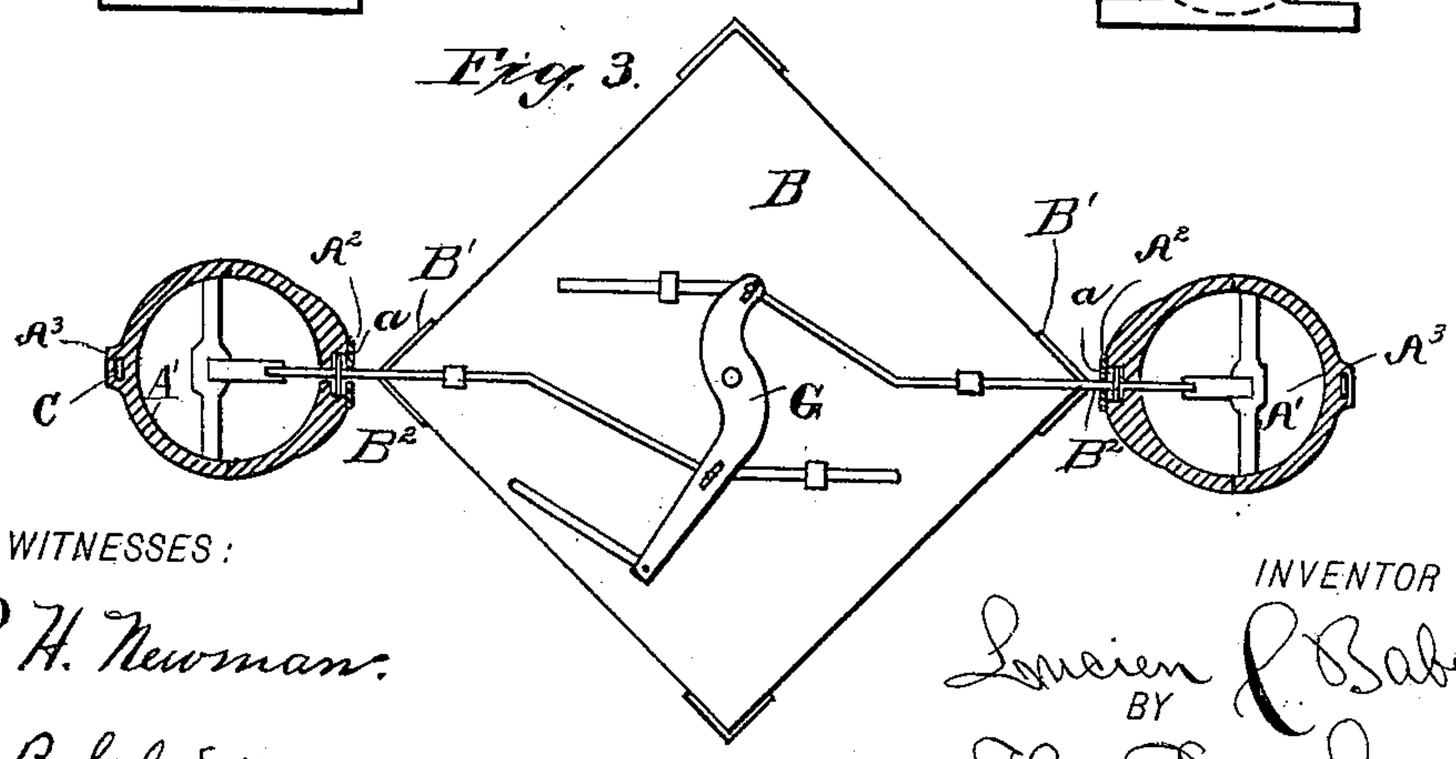


Fig. 3.



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SAFETY PROVISION FOR ELEVATORS.

SPECIFICATION forming part of Letters Patent No. 621,313, dated March 21, 1899.

Application filed May 5, 1898. Serial No. 679,757. (No model.)

To all whom it may concern:

Be it known that I, LUCIEN C. BABCOCK, a citizen of the United States, residing in the borough of Brooklyn, in the city and State of New York, have invented a certain new and useful Improvement in Safety Provisions for Elevators, of which the following is a specification.

The invention may be used with elevators in office-buildings, hotels, warehouses, and wherever passenger or freight elevators are required.

I provide vertical tubes the whole length of the elevator-well, one or more on each side thereof, each tube having a narrow aperture or slit extending its whole length on the inner side—that presented toward the elevator-car. An equivalent of a piston is carried in each tube and reliably connected to the car by a plate of steel extending out from the car through the narrow aperture in each tube. This plate may extend vertically the whole height of the car on each side; but its thickness is as little as will afford the requisite strength. I have devised means traversing up and down with the car for guarding the narrow aperture and provide various details of importance, which will be fully described below and be specifically pointed out in the claims.

The accompanying drawings form a part of this specification and represent what I consider the best means of carrying out the invention with two tubes.

Figure 1 is a general side elevation showing all the parts on a small scale as applied to an elevator ascending and descending in a building of only a few stories. Fig. 2 is a corresponding elevation showing certain parts on a larger scale. Fig. 3 is an inverted horizontal section on the line 3 3 in Fig. 2. Figs. 4 to 9, inclusive, show details detached. Fig. 4 is a perspective view of a portion of one of the wings, the portion which is secured to the cylinder. Fig. 5 is a perspective view of another portion of the wing, the portion which is bolted to the car. Fig. 6 is a horizontal section through one of the tubes. Fig. 7 is a face view of one of the collars. Fig. 8 is a side elevation of the valve in the bottom of one of the cylinders. Fig. 9 is an inverted plan view showing a modification. Fig. 10 is a longitudinal section on the line 10 10 in Fig. 7.

Similar letters of reference indicate corresponding parts in all the figures where they appear.

I use the letter A with supernumerals to indicate the stationary parts.

A′ A′ are tubes extending up and down on opposite sides of the elevator-course, each having a narrow opening *a*, extending its whole length on the side presented toward the elevator-car.

B is the car.

B′ are thin vertical webs or wings extending outward from the car, as shown, the whole depth thereof, but of only a little thickness—say one-fourth inch. To each is rigidly connected by a piece B^2 a hollow cylinder B^3, each inclosed within the corresponding tube A′, so that it can move up and down therein, the piece B^2 moving in the aperture *a*. On each side of each slit or narrow aperture *a* is a rabbet, which when covered by a sufficiently-stout plate A^2 provides a groove a^2 in each side of the slit *a* sufficiently deep and wide to receive a long flat slotted piece B^4, which I term a "collar," carried by and somewhat longer than the car. To the upper end of the collar is firmly attached a flexible band C, which extends up through such grooves a^2 above the car, over a pulley M′, turning in fixed bearings in the top of the building, thence extends down the whole depth of the tube on the outside thereof, and thence being led under another pulley M^2, running in fixed bearings at the bottom, extends up through the lower portion of the grooves a^2, and is firmly attached to the lower end of the collar. As the car traverses up and down in performing its duty the collar B^4 runs with it, moving up and down in the grooves, and the band traverses correspondingly first up through the grooves a^2 and down on the outside during the ascent of the car and next in the reverse direction, down through the grooves a^2 and up outside during the descent of the car. The outside run of the band is inclosed in a slight casing A^3, which keeps it in the proper position, even if it is a little slack, and protects it from accumulating dust on its lubricated surfaces.

Ordinary means may be employed for raising and lowering the car. I have represented a single cable or wire rope P, running on pulleys Q in the ordinary manner. It will be understood that four or any other number of ropes and pulleys may be employed with provisions for equalizing the strain thereon, and also balance-weights, ordinary safety devices, &c., arranged and operating in any ordinary or suitable manner. There are ordinary guiding means not shown.

The bottom of each tube A′ is adapted to be closed by the aid of an easily-turning valve D, hung on an axis D′ out of the center and loaded on the narrow side at D^2, so as to nearly balance it. (See Fig. 2.) This valve will open automatically and let the air up, but will close and resist its descent.

The cylinder B^3, which runs pistonwise up and down in the tubes, is provided with a peculiar valve I, to be hereinafter explained.

The collars B^4 have each a narrow aperture or vertical slot *b*, through which the web B′ extends, and by which it takes hold of such web, so as to be carried therewith. Below that slot is a shorter aperture *b*′, (see Fig. 7,) through which a horizontal rod E plays, by which the opening and closing of the valve I in the bottom of each cylinder may be simultaneously and equally promoted by the attendant operating a lever F in the interior of the car. This hand-lever operates a horizontally-vibrating lever G, mounted under the floor of the car and connected to each valve by a rod E. (See Fig. 2.)

The valve I is hung out of center with the largest half, below the axis I′. When descending, the operator opens these valves more or less, according to the load in the car and the speed required, and when thus partially opened the pressure of air has a tendency to close the valves, which are held in check by the operator. Should the hoisting-cables give way or give any indication of failure, the operator may work the lever intentionally to promote the closing, or if the emergency is too sudden or too great and he simply relaxes his grasp upon the lever the valves will close automatically. In either case the car stops not with a sudden jar, but gently, by the compression of the air in each tube below its now tightly-closed cylinder serving as a piston. The tendency to automatic closing of each valve I in such case is due to the unequal division of the valve in its turning on the axis I′. There is also a horizontal web I^3 on the valve at the portion which is highest when the valve is open, so presented to the air that if the valve should by any chance stand wide open when a failure of the hoisting and supporting means occurs the resistance of the air to its too rapid descent would tend to cause the valve to be thrown into an inclined position, and so soon as this is attained the eccentric mounting of the valve asserts itself, and the superior resistance of the air against the large part below the axis of the valve completes its closing motion and shuts it tightly. This imprisons the air below and causes it to rapidly increase its resistance to the descent until the car is effectually stopped.

I may repeat that the rods E, attached to the valves I, allow the attendant to apply his strength to aid to throw the valve into the closed position or even to instantly effect such closing by his strength alone when there are any indications of trouble, and thus to prevent any starting of the car to fall, and also allows him to aid the closing motion after the fall has actually commenced.

The attachment of the thin ribbon or band C to the thicker collar B^4 requires to be strong, while maintaining only the proper thickness at the junctions, so that the attaching portion, as well as the remainder of the collar, will move freely up and down in the thin grooves a^2. I effect this by making a portion at each end of the collar B^4 mainly of reduced thickness, but with lugs B^5, (see Fig. 7,) in which the metal is allowed to remain of the full thickness. I punch near each end of the band C exactly corresponding holes and engage them by applying together, holding each end of the band engaged on its proper lugs at the upper and lower ends of the collar, respectively, by the aid of screw-bolts K and nuts thereon, shown as thumb-nuts. It will be observed that the heads of these screw-bolts and the nuts may run up and down in the aperture or slit *a* in the tube A′, so that there is ample room for them.

One advantage follows from the use of my invention in addition to its serving at rare intervals to prevent accidents. This advantage attends its use under all conditions. It is the ventilation of the cellar or lower portion of the building which it insures. Every time the car ascends it draws out from the cellar the quantity of air required to fill each tube. When the car descends, the return of the air is arrested by the automatic closing of the bottom valves D, and the valves I in the cylinders being held open or partially open the air rises, or, rather, maintains its position and allows the cylinders to descend without serious resistance. The flexible ribbon or band C stops the flow of air through the passage. It is drawn inward by the slight vacuum and rubs against the inner side of the grooves a^2 or simply hangs loosely in those grooves sufficiently to serve the ventilating purpose. The band should be of sufficient stiffness to withstand a considerable outward pressure when it is forced strongly outward against the plates A^2, which cover the grooves a^2 in the important cases when it serves to arrest or prevent the falling of the car.

The flexible ribbon or band C should be reasonably taut to prevent buckling in the groove. Provision is made to regulate the tension in wheel-bearings both above and below.

Each valve I is mounted on an axis I′, set

considerably one side of the center, which rests in bearings in a circular frame J, presenting lower and upper ring members *j j'*, bolted together. The member *j'* has its upper marginal corner cut away to furnish a partial bearing for a ring L of elastic material, which may be simply of rubber or armored with a surfacing material unaffected by oil. This ring is interposed between the bottom of cylinder B^3 and the frame J, the latter being normally suspended in position by resting on the heads of inverted bolts, (not shown,) which pass loosely through the frame and have their threaded upper ends engaged in openings therefor tapped in the bottom of the cylinder.

Should the hoisting-cables break, the valves D and I being closed, the body of air in the lower portions of the cylinders would exert a force against the under sides of the frames J and their valves and lift them to expand the rings L beyond the diameter of the cylinders B^3 to bear tightly against the interior of the tubes A', thus effectually cutting off the escape of air between each cylinder and tube and supporting the car on the columns of confined air.

In beginning the ascent from the lower floor the operator closes the valves I in the cylinders, and as the air rises the vacuum tendency within the lower part of the tubes will open the valves D at the bases of the tubes and permit the desired incursion of air.

When the car is supported upon the columns of confined air, as above described, its gradual and gentle descent may be effected by opening the valve I to a greater or less extent by the lever appliances on the car. Turning the upright lever F by hand swings the horizontal lever G, and this through the rods E (see Fig. 3) turns the valves I.

Modifications may be made without departing from the principle or sacrificing the advantages of the invention. The size of the tubes should have a relation to the strain which the car is to impose on the piston-like parts therein when loaded, but the diameter may be varied considerably without defeating the objects of the invention. It is essential that the cylinder B^3 or an equivalent part attached to the car and moving with it shall move pistonwise in its tube, but the fit need not be absolutely tight. The width and thickness of the band C may be varied within considerable limits. If much thickness is given to this part, larger pulleys M' and M^2 should be employed, around which it shall bend at the top and bottom, than would be necessary with a thin band.

The angle at which the valve I is held when in the partly-opened condition may be varied. It is only essential that it shall be so adjusted that it will not close at ordinary speeds, but will be certain to do so promptly if the car is detached and falls.

I can use four instead of two of the tubes and accompanying parts. Fig. 9 shows such an arrangement. In this construction A* designates the cylinders; B*, the movable cylinders; E*, the valve-operating rods; G*, the ring communicating motion thereto, and I* the inner cylinder-valves. Four valve-operating rods E* are employed, said rods being alternately located on opposite sides of the ring G*, which communicates the required motion. The dotted lines indicate those portions of the rods E* which pass between the ring and the car. The turning of the ring through the medium of the hand-lever and connection will effect the projection or retraction of the rods E* and consequent movements of the valves.

Tubes may be made in lengths extending from floor to floor or, if desired, modified or extended and joined together by flanges on each side (similar to steam-fitting) with a gasket between joints. Strengthening-flanges may be cast or placed intermediate, if necessary.

I claim as my invention—

1. As a safety device for elevators, a tube A' extending up and down the course, a rigid connection from the car to a device B^3 loosely inclosed and adapted to move up and down pistonwise in such tube, an elastic ring L and a compressing-frame J, and means for moving the latter to expand such ring, arranged to confine and compress air below in case of accident and thereby contribute to delay the descent of the car, all substantially as herein specified.

2. In a safety device for elevators, the combination with the car B, of a tube A' extending the length of the elevator-shaft and having a slit *a*, a cylinder B^3 in said tube, a web or wing B' extending through the said slit and connecting the car to said cylinder, and a valve in said cylinder, substantially as described.

3. As a safety device for elevators, a tube A' extending up and down the length of the course, a connection from the car extending through the slit *a*, to a device B^3 loosely inclosed and adapted to move up and down pistonwise in such tube, and the flexible band or ribbon C moved with the car and adapted to close the slit below, all combined and arranged to serve substantially as herein specified.

4. As a safety device for elevators, a tube A' extending up and down the length of the course, having a slit *a*, a web or wing B' extending from the car B through such slit, and a hollow device or cylinder B^3 in such tube attached to the car by such web, in combination with means as a valve in such cylinder to compel the air to move with it or not, as required, and an automatic valve D in the bottom of such tube, adapted to permit the air to enter but forbid its escape, the said valve I in such cylinder being adapted to strongly confine the air below and cause it to delay the descent of the car in case of accident and thus contribute to safety, and also lift the air as the cylinder rises and allow the

air to stand still while it descends, and thus contribute to ventilate the building by drawing out air from the lower portion at each traverse of the car, all substantially as herein specified.

5. As a safety device for elevators, two tubes A′, A′ extending up and down on opposite sides of the length of the course, each having a slit *a*, the webs or wings B′ extending outward from the car B through such slits, and a hollow device or cylinder B^3 in each tube attached to the car by one of such webs, in combination with each other and with means as a valve I in each to compel the air to move with it or not as required, all arranged to serve substantially as herein specified.

6. As a safety device for elevators, the two tubes A′, A′, extending up and down on opposite sides of the course, each having a slit *a*, the webs or wings B′ extending outward from the car B through such slits, and a hollow device or cylinder B^3 in each tube attached to the car by one of such webs, in combination with each other and with means as a valve I in each to compel the air to move with it or not as required, the rods E attached to such valve, and provisions for operating such rods to allow the attendant to aid the working of the valve or valves, all combined and arranged for joint operation substantially as herein specified.

In testimony that I claim the invention above set forth I affix my signature in presence of two witnesses.

LUCIEN C. BABCOCK.

Witnesses:

THOS. H. WILLIAMS,

HOMER L. BARTLETT.