

No. 657,597.

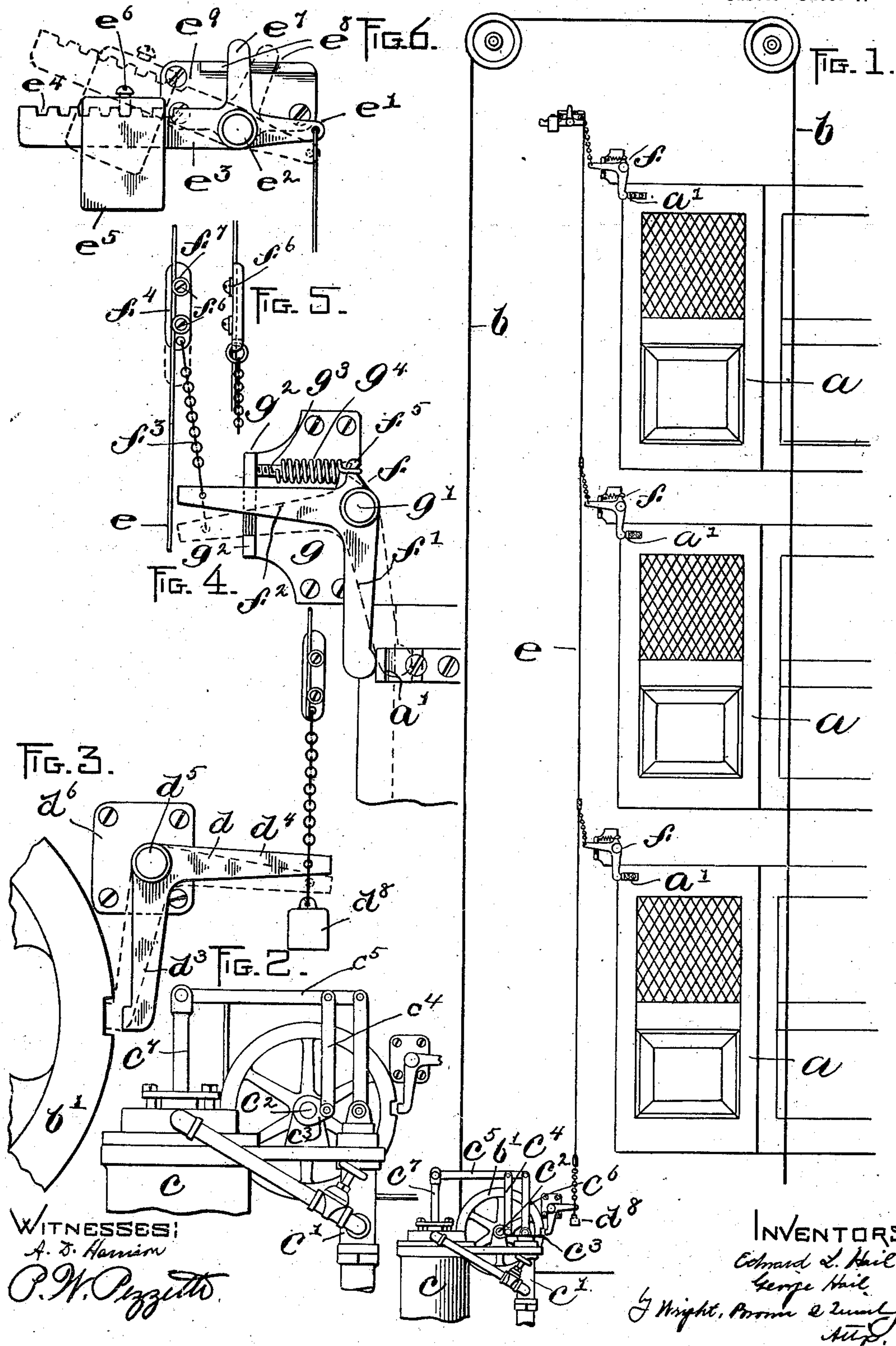
E. L. & G. HAIL.
ELEVATOR.

Patented Sept. 11, 1900.

(Application filed Dec. 27, 1898.)

(No Model.)

3 Sheets—Sheet 1.



WITNESSES:
A. D. Hammon
P. W. Pizzitto

INVENTORS
Edmund L. Hail
George Hail
By Wright, Brown & Smith
Attys.

No. 657,597.

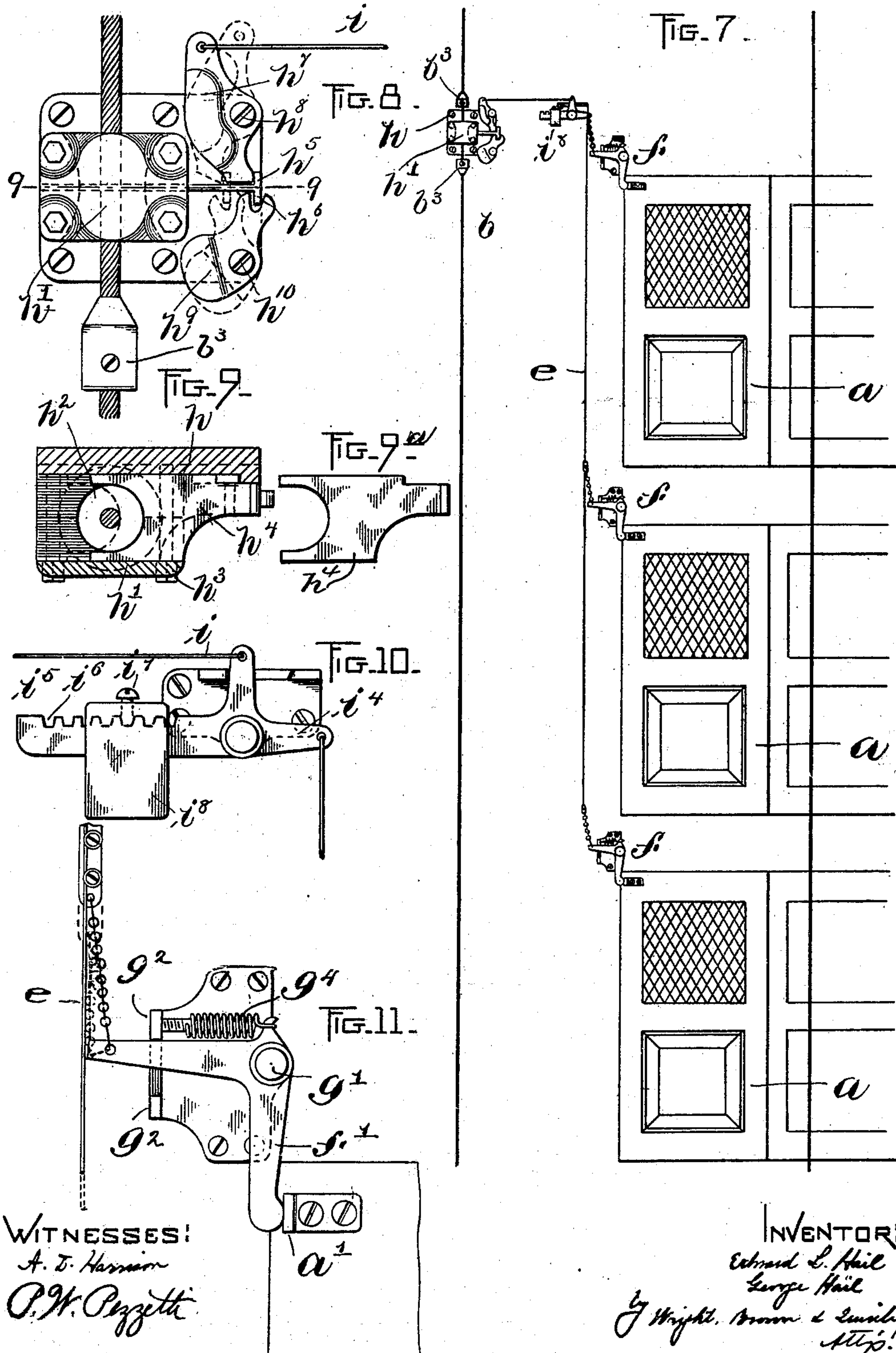
Patented Sept. 11, 1900.

**E. L. & G. HAIL.
ELEVATOR.**

(Application filed Dec. 27, 1898.)

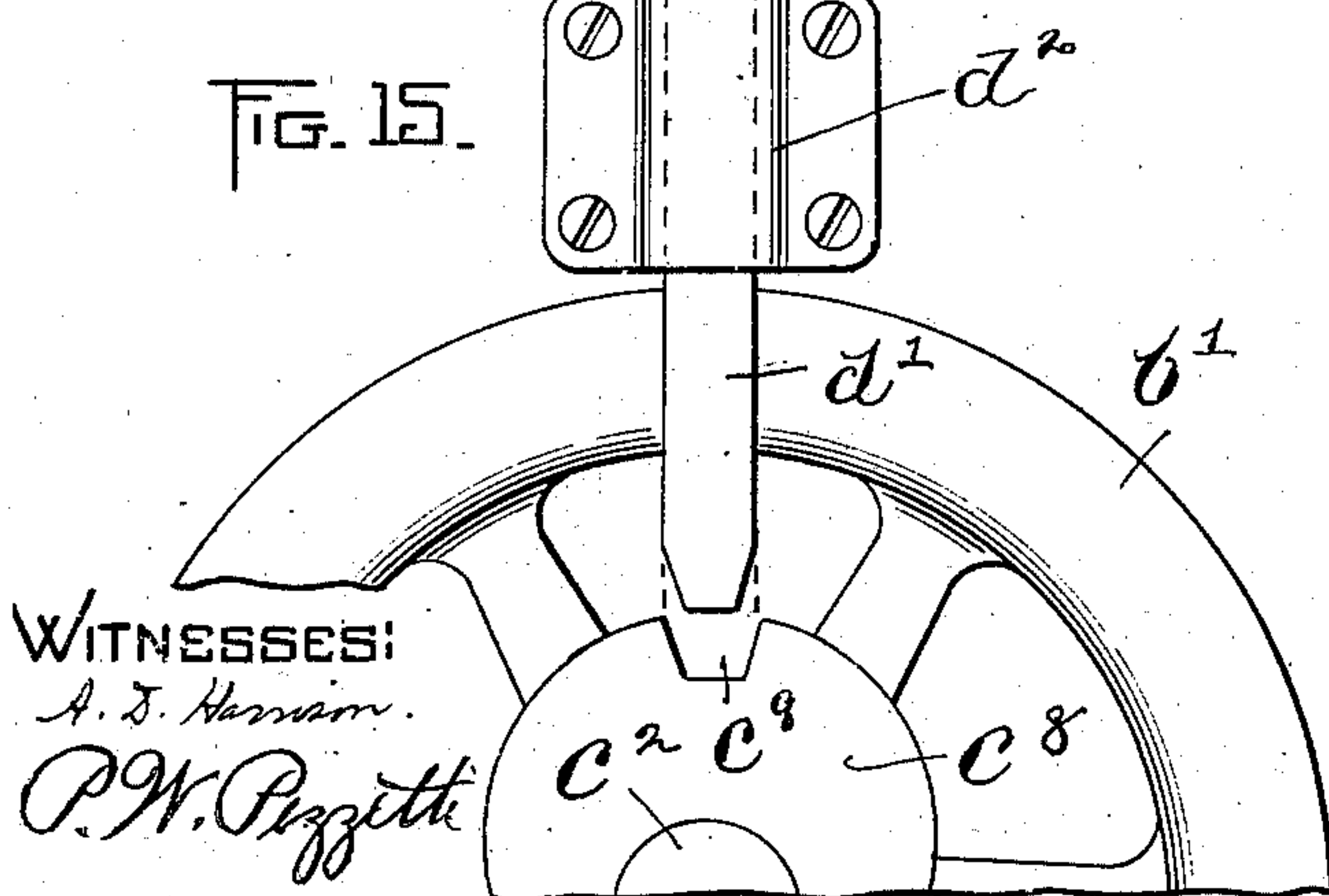
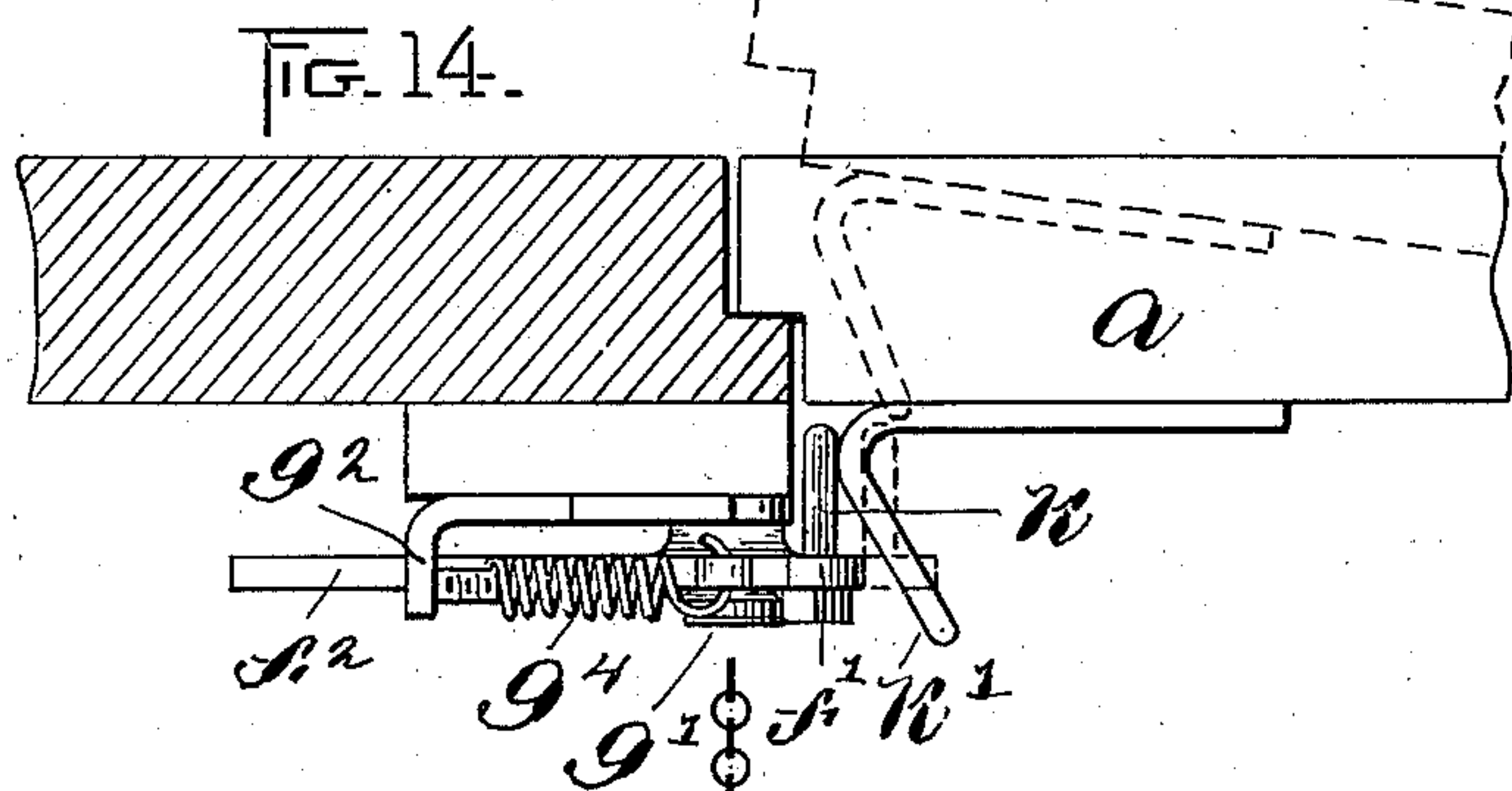
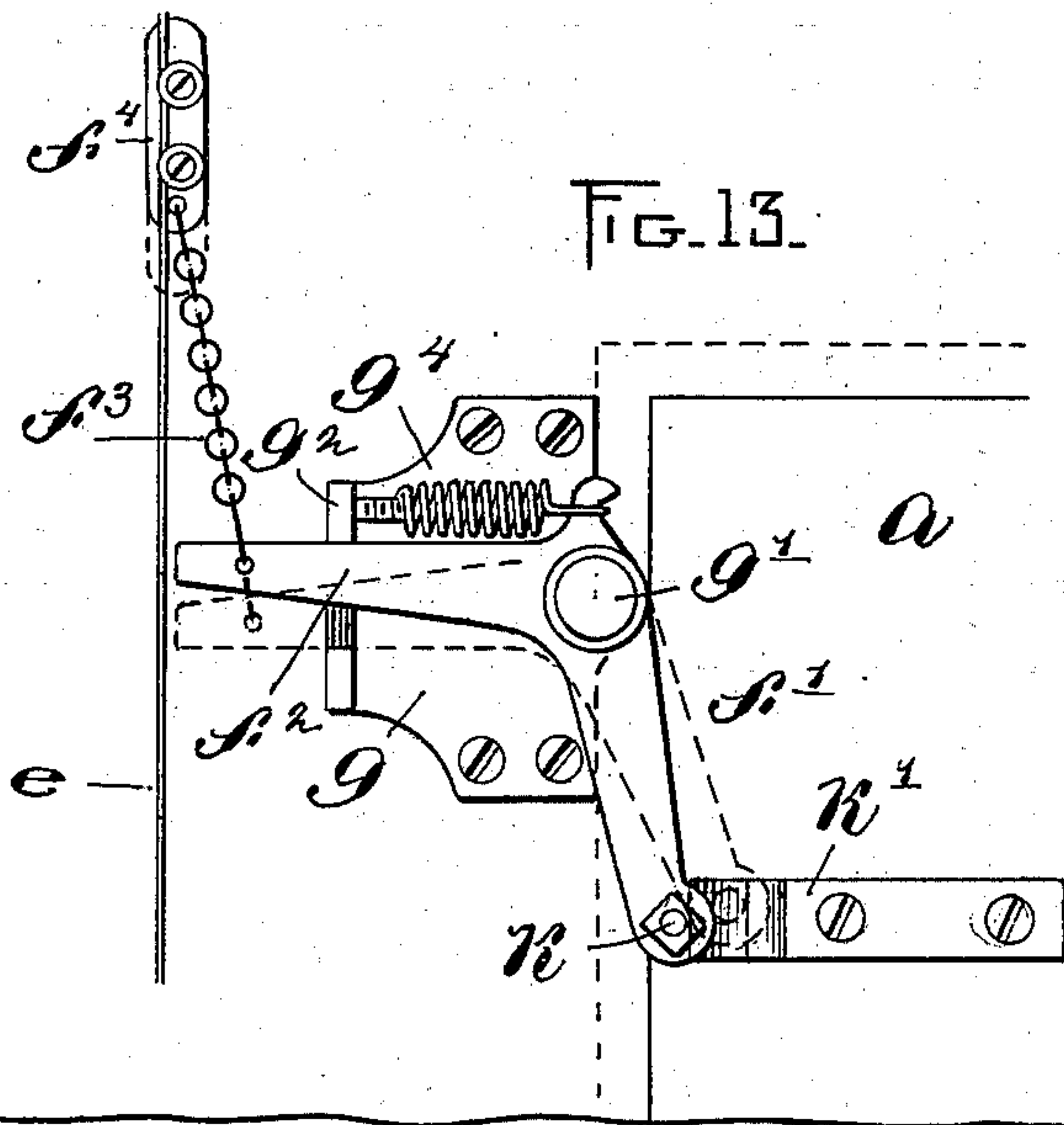
(No Model.)

3 Sheets—Sheet 2.

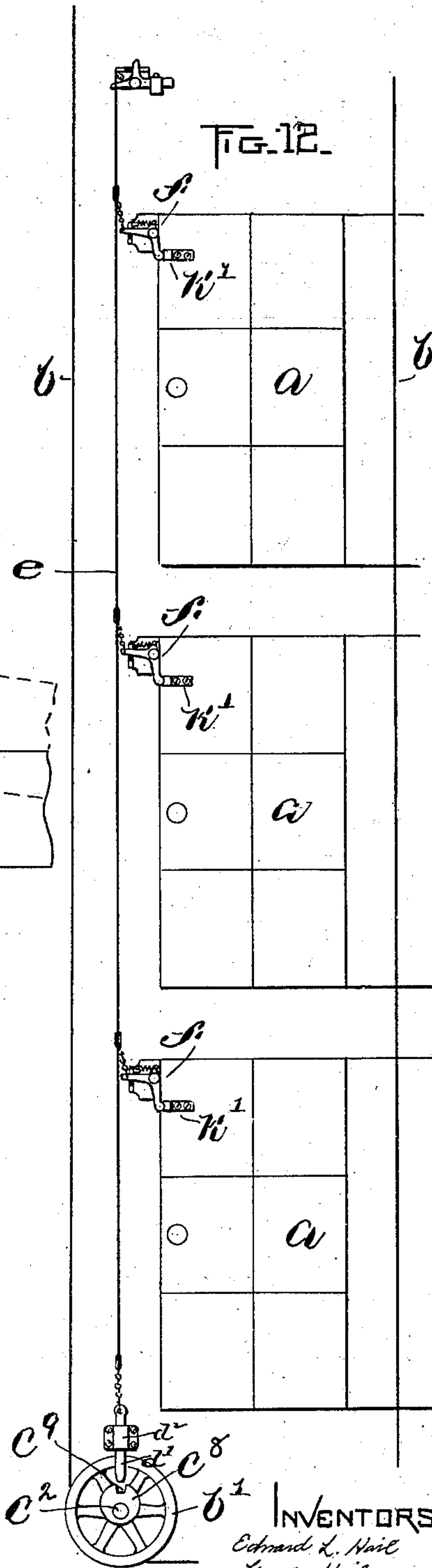


(No Model.)

3 Sheets—Sheet 3.



WITNESSES:
A. J. Harrison.
P. W. Pezzetti



INVENTORS:
Edmund L. Hail
George Hail
By Wright, Brown & Lundy
Attys.

UNITED STATES PATENT OFFICE.

EDWARD L. HAIL AND GEORGE HAIL, OF PROVIDENCE, RHODE ISLAND.

ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 657,597, dated September 11, 1900.

Application filed December 27, 1898. Serial No. 700,363. (No model.)

To all whom it may concern:

Be it known that we, EDWARD L. HAIL and GEORGE HAIL, of Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Elevators, of which the following is a specification.

This invention has relation to elevator safety appliances of the class for preventing movement of the car when a door leading into an elevator-hatchway is partially or entirely open; and it has for its objects the provision of certain improvements in the same for the purpose of rendering the mechanism more simple and more easily installed than heretofore, enhancing the general efficiency of appliances of the character mentioned, and reducing their liability to get out of order.

To attain the various objects of the invention, it consists in a safety appliance or apparatus embodying certain features of construction and relative arrangement of parts, all as illustrated upon the drawings, hereinafter described in detail, and set forth in the appended claims.

Reference is to be had to the accompanying drawings, and to the letters marked thereon, forming apart of this specification, the same letters designating the same parts or features, as the case may be, wherever they occur.

Of the drawings, Figure 1 represents an elevator plant equipped with our invention. In this figure there is shown a series of corridor-doors leading into the elevator hatchway or well and a portion of the controlling device for a hoisting mechanism, the same consisting of a pilot-valve and a main valve and means controlled by the door for locking the pilot-valve when one of the doors is open. Fig. 2 represents an enlarged view of the valve and the pilot-valve. Fig. 3 shows in detail the door-controlled lock for a movable member of the pilot-valve. Fig. 4 represents a lock-controlling wire and one of the door-controlled levers which is connected to the wire by a clip and a chain. Fig. 5 shows in detail the clip to which one end of the chain is connected. Fig. 6 represents a balance-lever from one arm of which the line depends. Fig. 7 represents the invention as being arranged to lock the motor-controlling line. Figs. 8, 9, and 9^a represent in detail the lock

for the controlling-line. Fig. 10 illustrates a counterbalancing-lever as provided with an arm to control the lock for the motor-controlling means. Fig. 11 illustrates the door-actuated lever shown in Fig. 4, with the line dropped a little to show the action of the flexible connection between the lever and the said line at such time. Fig. 12 represents another embodiment of the invention especially adapted for use in connection with swinging doors. Figs. 13 and 14 show the action of the door upon the door-actuated levers. Fig. 15 shows the lock in position to engage a locking member on the pilot-valve.

Referring to the drawings, the doors which lead into the hatchway at the landings are indicated at *a*, those shown in Figs. 1 and 7 being arranged to slide across the openings and those in Fig. 12 being adapted to swing, the doors of this latter class being usually fireproof doors in factories, warehouses, and other similar buildings. The elevator-car is not shown, but it travels up and down the hatchway past the doors in the ordinary way, being generally suspended from one or more cables, which pass over sheaves at the top of the hatchway and are attached to counterbalancing-weights which travel in guides.

The car, so far as some features of the invention are concerned, may be raised or lowered by a motor of any suitable kind—such as those operated by steam, hydraulics, or electricity—the motor-controlling means comprising any suitable mechanism, such as one or more lines *b*, and a movable member, such as a tip-lever or a wheel *b'*, arranged to govern the movements of the motor. In Fig. 1 the motor is shown as being controlled by a main valve *c*, which is regulated by a pilot-valve *c'*. The wheel *b'* is rigidly secured to a rock-shaft *c²*, on which there is a crank *c³*, connected by a rod *c⁴* with a transverse lever *c⁵*. One end of the last-mentioned lever is connected by a rod *c⁶* with the piston of the pilot-valve; but its other end is connected with the piston-rod *c⁷* of the main valve. By rotating the wheel *b'* and rocking the shaft *c²* in one direction or the other fluid is admitted to either end of the main hydraulic cylinder or is cut off therefrom to raise or lower the car or bring it to a state of rest. The parts are so arranged, however, that when the car

is at rest the shaft or wheel b' is always in the same position. A notch is cut in the periphery of the shaft or wheel b' , which thus constitutes what may be termed a "locking member" for the pilot-valve, and a lock is placed in such position as to enter said notch and prevent the wheel from rotating when one of the doors is open. Although, as shown in Fig. 1, the lock may directly engage the rope-wheel, yet, if desired, we may secure a supplemental locking member c^8 to the rock-shaft c^2 , as shown in Figs. 12 and 15, in which event the locking member may be a segment or may be a small arm having a notch c^9 to receive the lock d' , which in this case is a bolt movable in a guide d^2 . In Figs. 1 and 3, however, the lock for the pilot-valve consists of a bell-crank lever d , having one arm d^3 arranged to enter the notch in the wheel b' and having its other arm d^4 apertured at its end to be connected to the end of a line e , which extends up the elevator shaft or hatchway, as will be subsequently described. The bell-crank d is fulcrumed on a pivot-stud d^5 , projecting from a plate d^6 , having provisions for permitting its attachment to a suitable support. A flexible chain connects the end of the bell-crank to the wire or line, being secured to the latter by a clip, which will be subsequently described. A weight d^8 is hung from the bell-crank, and its tendency is to draw the bent end of the arm d^3 into the notch in the locking member of the pilot-valve, this action being prevented so long as the doors a are closed by the line e , previously referred to. This line extends up the shaft or hatchway, and it consists of a wire whose upper end is connected to one arm e' of a lever fulcrumed on a pivot-stud e^2 , extending out from a plate e^9 and having its other arm e^3 extended and provided with notches e^4 in its upper edge. An adjustable weight e^5 is supported upon the arm e^3 and is provided with a set-screw e^6 to enter any one of the notches e^4 and hold the weight immovable. The weight e^5 is sufficient to slightly more than counterbalance the weight of the wire e and the parts supported by it and the tension of the weight d^8 . The lever has a third arm e^7 , which plays between two lugs or stops e^8 on the plate e^9 . Arranged in the path of each door a there is a bell-crank lever f , each having an arm f' , projecting downwardly to be engaged by a stud, projection, or bracket a' on the door at the last of its closing movement and moved into the position shown in full lines in Fig. 4. These door-controlled levers each have an arm f^2 , which is connected by a flexible connection f^3 with a clip f^4 , adjustably and detachably secured to the wire e . A plate g is provided with a pivot-stud g' , on which the lever f' is fulcrumed, said plate having two lugs or stops g^2, g^2 , between which the arm f^2 lies and which limit the movements thereof, as shown in Fig. 4. In each of the lugs there is an aperture (not shown) to receive a detachable screw g^3 , to which a spring g^4 is at-

tached, said spring having its free end engaging a finger f^5 on the bell-crank lever. Each spring g^4 is strong enough to overbalance the weight e^5 and permit the weight d^8 to throw the lock into engagement with the locking member of the pilot-valve when the door is opened. This construction and arrangement of parts permits the lever to be reversed and the spring to be attached to either of the lugs. The flexible connection f^3 consists of a chain formed with a series of connected links, and it is attached to the clip f^4 , which, as shown in Fig. 5, is formed with a groove to receive the wire e , said wire being held in the groove by screws f^6 and washers f^7 . In this form of the invention just described the door-controlled levers, the line e , and the lock may be said to constitute means for directly engaging and locking a movable element or locking member of the pilot-valve or for locking the controlling rock-shaft c^2 , by means of which the pilot-valve is governed, said door-controlled levers and the said line e constituting door-controlling devices for the lock. The operation of this device hardly requires explanation, for it will readily be seen that when the doors are all closed, as shown in Fig. 1, the weight e^5 is sufficient to draw the lock out of engagement with the locking member of the pilot-valve. When one of the doors is opened the lever f which is engaged therewith follows it under the tension of the spring g^4 , and the arm f^2 draws upon the flexible connection f^3 to pull the line e downward against the tension exerted by the weight e^5 to permit the weight d^8 to cause the engagement of the lock with the locking member of the pilot-valve. As the line e moves downward the chains f^3 do not exert pressure upon the other door-controlled levers, but become loose and slack, as shown in Fig. 11.

In Figs. 7 to 10, inclusive, we have shown another embodiment of the invention, in which the motor-controlling means is locked by the opening of one of the doors. In this case the controlling-line b is provided with a pair of stops b^3, b^3 , which are conical at one end, said conical ends pointing in opposite directions. At some point in the hatchway, preferably near the top, we secure a casing consisting of a plate h , having a cap h' , there being between the plate and the cap an aperture h^2 , adequate to permit the passage of the clips or stops b^3 . The cap is held in place by a series of bolts or screws h^3 . A groove is formed in the plate and cap to receive a locking-plate h^4 , (shown in Fig. 9,) which is adapted to partially close the aperture h^2 , and thereby prevent the passage of the movable stops b^3 , and consequently prevent the operation of the motor-controlling means. This plate h^4 is formed with a semicircular aperture in its inner end and at its outer end is provided with transversely-extending lugs h^5, h^6 . The weight h^7 is fulcrumed at h^8 on the plate h in such way as to engage the lug h^5 and normally hold the locking-plate in the

position shown in full lines in Fig. 9, and to throw the plate inward there is another weight h^9 , fulcrumed at h^{10} below the locking-plate and engaging the lug h^6 . The weight h^7 is heavier than that at h^9 , so that it more than counterbalances the latter and holds the locking-plate outward. In this construction the opening of the door draws downward upon the line e , and the weight h^7 is drawn into the position shown in dotted lines in Fig. 8 to permit the other weight to operate and cause the locking-plate to be thrown into position to engage the stops on the motor-controlling line. In case one of the doors should be opened while the car is traveling and the locking-plate be thrown into the dotted-line position in Fig. 9 on stopping the car by shifting the valve-controlling means to a neutral position the conical end of the stop will force back the locking-plate and permit it to pass through, although the plate will immediately move back again into locking position, so as to prevent the other stop from passing through or the first-mentioned stop from returning.

It is evident that the invention may be employed in connection with swinging doors instead of those that slide horizontally, as shown in Fig. 13, the only change required being that a pin k is attached to each one of the door-controlling levers and a lug or bracket k' is secured to one of the doors to engage said pin, as shown in Fig. 14. It is also evident that various parts of this safety appliance may be employed separately, and consequently it will be understood that we are not limited to employing them all together. We may also employ electrical means between the door and lock for locking the controlling device, such means being now well known.

We have employed the term "door" as meaning an obstruction of any kind to prevent passage through a doorway and intend to include therein gates, bars, extensile and contractile gratings, and other similar forms.

Parts of this invention are applicable to elevator systems in which the hoisting mechanism consists of an electric motor, so that the lock engages a movable controlling member of the motor to cut off the current or to hold the said member in a neutral position.

Having thus explained the nature of the invention and described a way of constructing and using the same, though without attempting to set forth all of the forms in which it may be made or all of the modes of its use, we declare that what we claim is—

1. In an elevator, a plurality of doors, a motor-controlling line having stops, a lock for said line having a sliding locking-plate, a lever having one arm connected to said plate, a line connected to said lever, and a lever co-acting with each door and flexibly connected with said last-mentioned line.

2. In an elevator, a plurality of doors, a motor-controlling line having stops, a lock for

said line having a sliding locking member, a three-armed lever having one arm weighted, and a second arm connected with the said member, a line connected to the third arm of said lever, and a plurality of door-controlled levers flexibly connected with the last-mentioned line.

3. In an elevator, a plurality of laterally-sliding doors, a valve for governing the motive force, a plurality of door-controlled levers adapted to directly engage said doors, a wire extending from the top to the bottom of the elevator-well and connected to said levers, to move downward when any one of said levers is actuated by the opening of the door adjacent thereto, means independent of said levers for overbalancing said wire when the doors are closed, and a lock connected to the wire and adapted to lock a movable member of the valve.

4. In an elevator, a plurality of laterally-sliding doors, a valve for governing the motive force, a plurality of spring-tensioned elbow-levers engaging said doors, a wire extending from the top to the bottom of the elevator-well and connected to said levers, a lock connected to said wire to lock a movable member of the valve against movement when any one of the doors is opened, and a weighted lever for yieldingly supporting the said wire and permitting it to be pulled downward by any one of said levers.

5. In an elevator, a plurality of laterally-sliding doors, a valve for governing the motive force, a plurality of door-controlled levers adapted to directly engage said doors, a wire extending from the top to the bottom of the elevator-well and adapted to be pulled downward by any one of said levers, a lock for said valve connected to said wire, yielding means independent of the levers for supporting the said wire, and flexible connections between said levers and said wire.

6. In an elevator, a plurality of laterally-sliding doors, motor-controlling means, a lock for said controlling means, a wire extending past said doors and arranged to control said lock, a plurality of clips adjustably attached to said wire, a plurality of door-controlled levers, and yielding means connecting each lever with one of said clips.

7. In an elevator, a pilot-valve for controlling the main valve of the hoisting mechanism, a locking member connected to a movable part of said pilot-valve, a lock arranged to engage said locking member, a line connected to said lock to hold it out of engagement with said member, a counterbalance for said line and said lock, a plurality of elbow-levers, connections between said levers and said line, and a plurality of laterally-sliding doors directly engaging said levers.

8. An attachment constituting part of a safety appliance for elevators, the same consisting of a plate having a pivot-stud, and two lugs or stops, a lever fulcrumed on said stud and having an arm lying between said lugs

or stops, and a spring detachably secured to one of said lugs and to said lever, said parts being constructed and arranged whereby said lever can be reversed and the spring attached
5 to the other of said lugs.

9. In an elevator safety appliance, a lock for the motor-controlling means, a line for controlling said lock and governed by the doors, a two-armed lever from one arm of which the
10 line depends, and a weight adjustably secured to the other arm, which is notched to receive it.

10. A locking device for a motor-controlling line having stops, the same consisting of a casing having an aperture adequate to permit the passage of said stops, a yielding-
15 operated locking-plate adapted to close said aperture and engage one of said stops, and means for operating said plate, said means consisting of two oppositely-acting weights.

20 11. In an elevator the combination with a line having stops, a casing having an aperture adequate to permit the passage of said stops, a yieldingly-operated locking member

adapted to partially close the said aperture, a weight for moving said member to operative
25 position, and a superiorly-weighted device controlled by the door, for holding the member in inoperative position.

12. A locking device for a motor-controlling line having stops, the same consisting of
30 a casing having an aperture adequate to permit the passage of said stops, a yieldingly-operated locking-plate adapted to partially close said aperture and engage one of said stops, and means for operating said plate,
35 said means consisting of two oppositely-acting weights, each being pivotally mounted and engaging said plate, one of said weights being greater than the other.

In testimony whereof we have affixed our
40 signatures in presence of two witnesses.

EDWARD L. HAIL.

GEORGE HAIL.

Witnesses:

CHARLES A. HARKNESS,
GILMAN E. JOPP.