(No Model.)

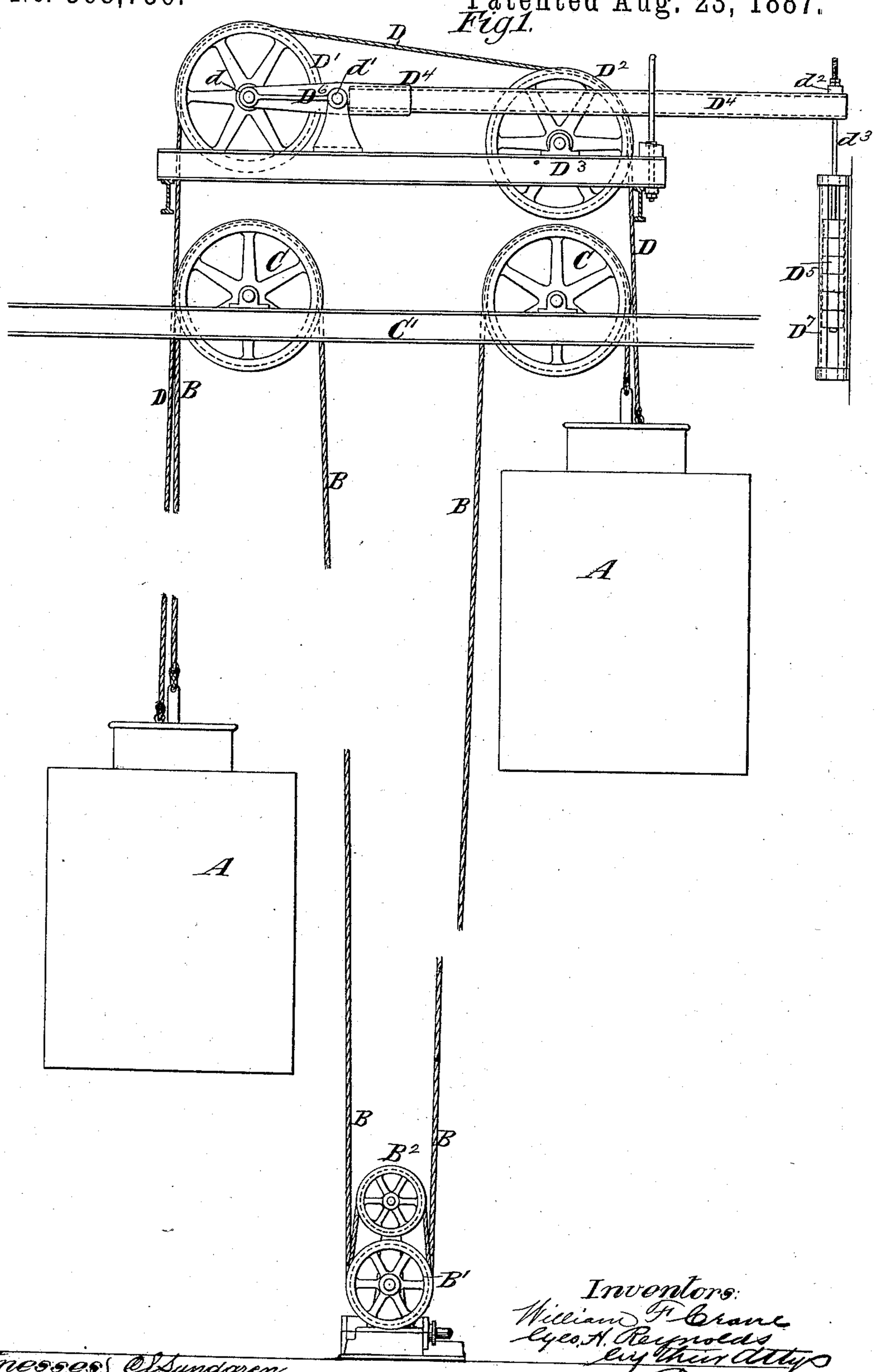
3 Sheets—Sheet 1.

W. F. CRANE & G. H. REYNOLDS.

ELEVATOR.

No. 368,756. Patented Aug. 23, 1887.

Fig 1.



Witnesses: O. Sundgren, Emil Aberton.

Inventors: William F. Crane, Geo. H. Reynolds, by their Attys Brown & Hall

(No Model.) 3 Sheets—Sheet 2.

W. F. CRANE & G. H. REYNOLDS.

ELEVATOR.

No. 368,756. Patented Aug. 23, 1887.

Fig 2.

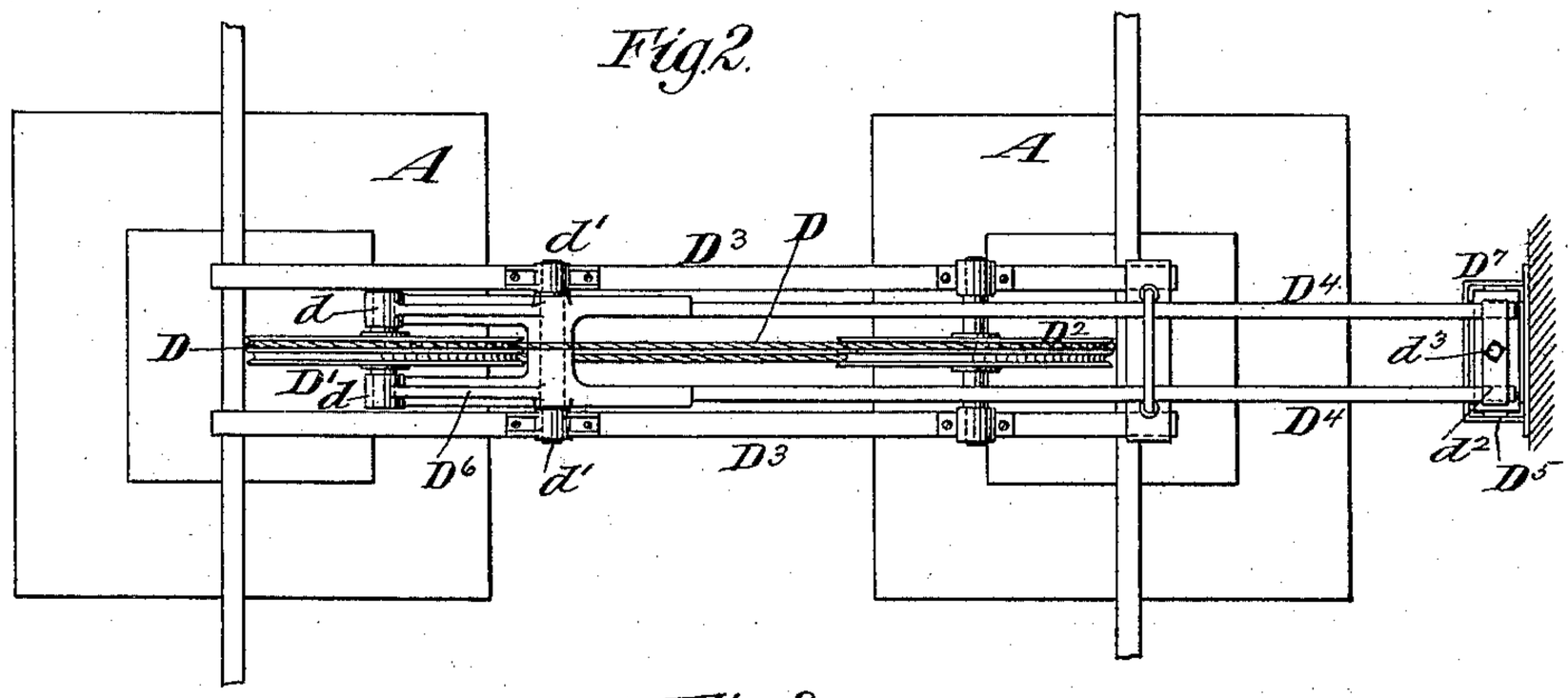


Fig 3.

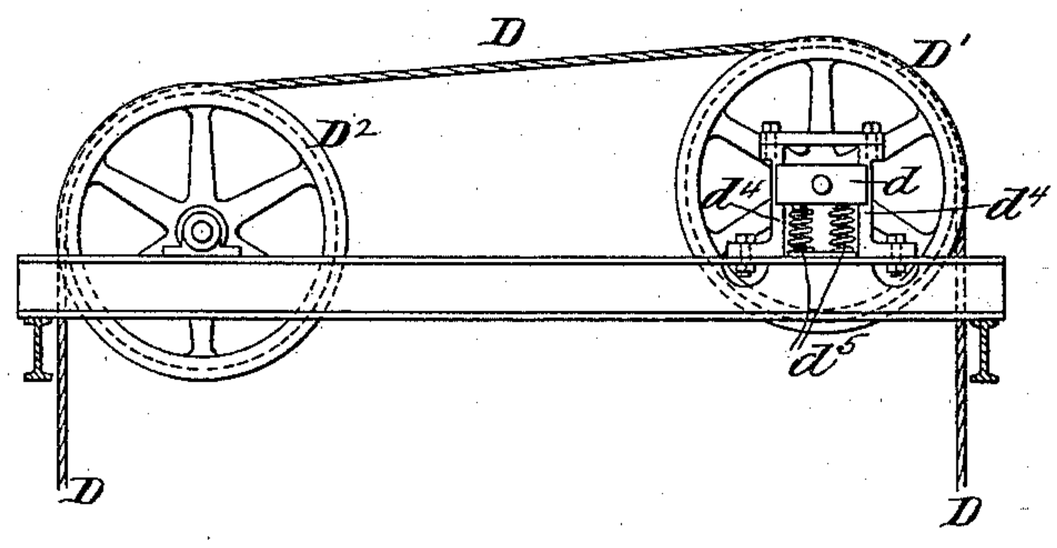


Fig 4.

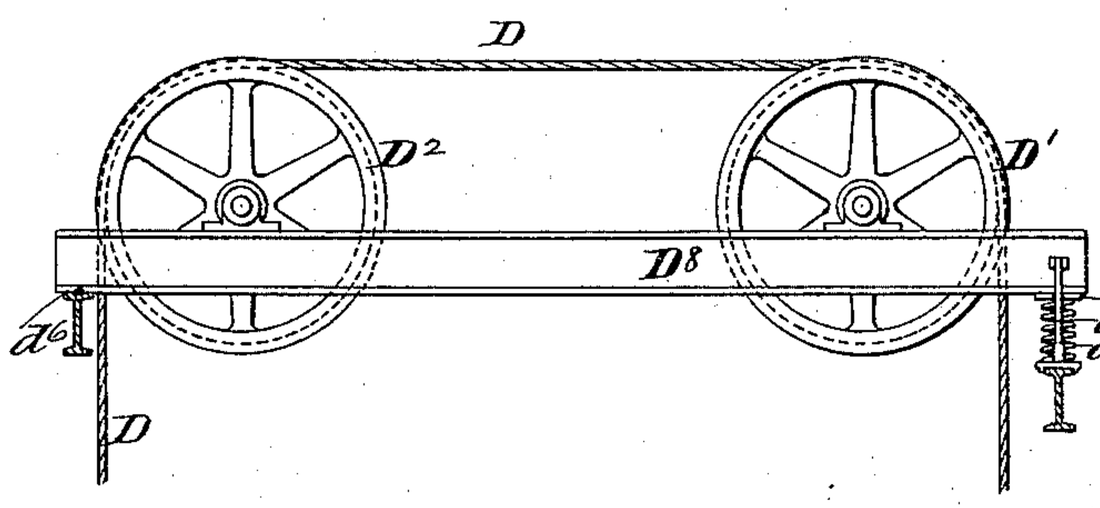
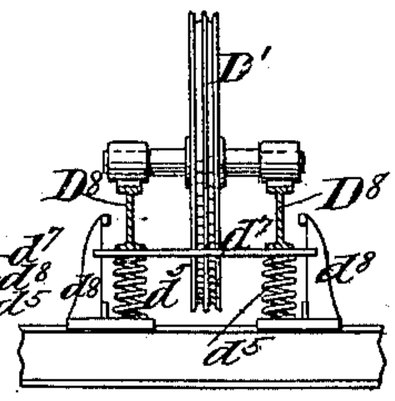


Fig 5.



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(No Model.)

3 Sheets—Sheet 3.

W. F. CRANE & G. H. REYNOLDS.

ELEVATOR.

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Fig 7.

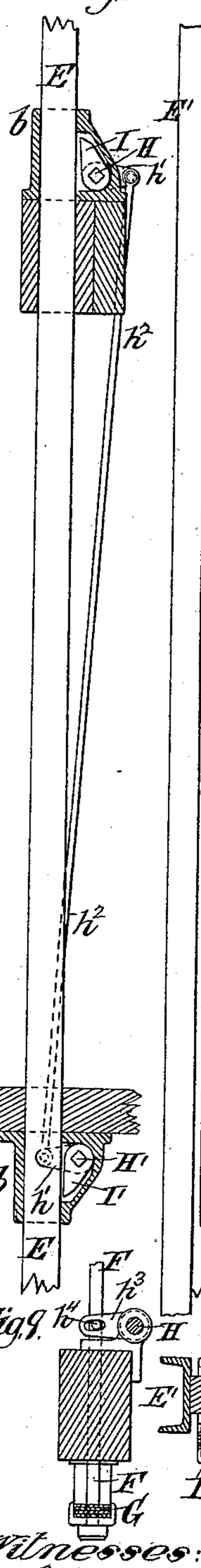

Fig 6

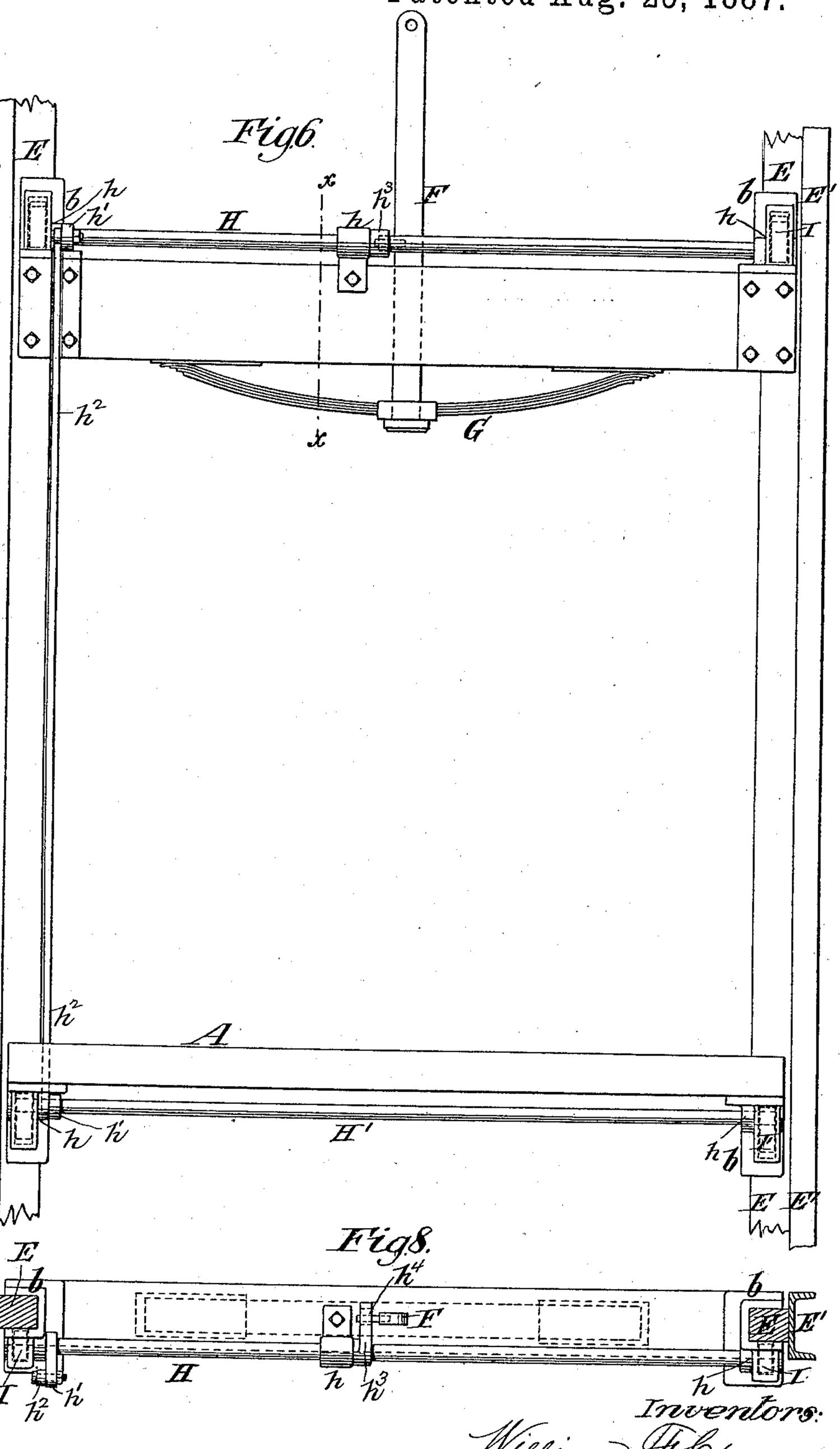

Fig 9.

Fig 8.

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UNITED STATES PATENT OFFICE.

WILLIAM F. CRANE AND GEORGE H. REYNOLDS, OF NEW YORK, N. Y., ASSIGNORS TO THE CRANE ELEVATOR COMPANY, OF CHICAGO, ILLINOIS.

ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 368,756, dated August 23, 1887.

Application filed April 6, 1887. Serial No. 233,861. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM F. CRANE and GEORGE H. REYNOLDS, both of the city and county of New York, in the State of New York, have invented a new and useful Improvement in Elevators, of which the following is a specification.

In United States Letters Patent No. 348,056, granted August 24, 1886, to George H. Reynolds, is shown and described an elevator-car and its counter-weight connected by a hoisting-cable, and a hoisting drum or drums operating in a bight of such cable to raise and lower the car, that arrangement permitting of the elevator-car being counterbalanced beyond its weight when empty and up to the extent of its average load. It is also described in said patent that two elevator-cars may be thus connected and operated, each car serving as a counter-balance for the other.

Our present invention relates more particularly to two elevator-cars, or a car and its counter-weight connected and operated in the manner described in said patent; and the object of our invention is to relieve the main hoisting-cable, which connects the car and its weight, of the normal or constant weight of the car and counterbalance-weight.

To this end we combine with the elevator-car, its counter-balance, and the hoisting-cable connecting the car and counter-balance a hoisting-drum operating in a bight of said cable to raise and lower the car, and a second cable, also connecting the car and counter-balance, and serving to relieve the hoisting-cable of the constant or normal weight of the car and counter-balance. Of the two cables which according to our invention are employed to connect the car and weight, one of them will usually stretch more than the other, and to compensate for any lengthening of either cable we pass the second cable, which connects the car and counter-balance, over a sheave, which is supported in yielding bearings—as, for example, by means of a weighted lever or by springs.

Where two cars are connected by a hoisting-cable in the manner described, or where a counterbalance-weight is employed which more than counterbalances the weight of the car, it is desirable to prevent upward movement of either car, or of the weight, in case of any accident; and our invention also consists in the combination, with an elevator-car and its operating-cable, of a safety-spring and safety-dogs presented in opposite directions and actuated by the spring to prevent upward as well as downward movement of the car and bearings, whereby the dogs are supported when in action. We prefer to arrange pivoted safety-dogs upon the car, and to provide them with arms extending in opposite directions from their pivots and connected together, whereby the safety-spring, in case of the weight on the operating-cable being relieved, will actuate the dogs to prevent upward as well as downward movement of the car. When two cars are connected by a hoisting-cable, the safety-dogs will prevent the upward movement of one car as well as the downward movement of the other car, which has the heaviest load, and this feature of our invention is more particularly intended for use where two cars are connected in the manner above described, so that one counterbalances the other.

The invention will be hereinafter more fully described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is an elevation of two cars connected according to our invention, and in which a sheave over which the second cable passes is supported in a balanced lever. Fig. 2 is a plan of the parts shown in Fig. 1. Fig. 3 illustrates a modification of our invention, in which the movable sheave is journaled in spring-supported bearings. Fig. 4 is an elevation illustrating a modification of our invention, in which the sheaves over which the second cable passes are supported upon beams or girders, which at one end are sustained in position by springs; and Fig. 5 is an end view of the parts shown in Fig. 4. Fig. 6 is an elevation, and Fig. 7 a sectional elevation of Fig. 6, both upon a larger scale, showing, in connection with an elevator-car, pivoted safety-dogs, which act to prevent its upward and downward movement. Fig. 8 is a plan of the parts shown in Fig. 6;

and Fig. 9 is a sectional elevation upon about the plane indicated by the dotted line *x x*, Fig. 6.

Similar letters of reference designate corresponding parts in all the figures.

Referring first to Figs. 1 and 2, A A designate two elevator-cars, which are connected by a hoisting-cable, B, passing over sheaves C, which in this example of the invention are represented as supported upon fixed girders C'. As here represented, the cable B extends downward over each sheave C, and in the bight of the cable thus formed are two hoisting-drums, B' B², which operate on the cable in the manner described in the aforesaid Letters Patent to George H. Reynolds. In this arrangement each car counterbalances the other car, and it will be understood that in referring to the hoisting-cable we desire to include either a single cable or a multiple cable composed of several ropes or members, as is commonly employed in modern elevators.

To relieve the hoisting-cable B of the constant weight of the cars, or a single car and its counter-weight, we provide a second cable, D, connected at its ends with the cars and passing over sheaves D' D², which are independent of the sheaves C, supporting the hoisting-cable B. In this example of our invention the bearings for the sheaves D² are supported on fixed girders D³; but the bearings *d* for the sheave D' are supported at one end of a lever, D⁴, which is counterbalanced by suitable weights, D⁵. The lever D⁴ is fulcrumed at *d'*, and, as best shown in Fig. 2, consists of two parallel beams or members connected at their one end by a casting, D⁶, which supports the fulcrum *d'* of the lever, and connected at their opposite ends by a cross-piece, *d²*, from which hangs a rod, *d³*, carrying the weights D⁵. These weights may be moved in a suitable case or inclosure, D⁷, in a well-understood manner, and the movement of the sheave D' will compensate for any variation in the length of the two cables B D while in use.

In Figs. 3, 4, and 5 we have illustrated modifications of our invention which relate to the manner of supporting the bearings for the movable sheave D', over which the cable D passes. In Fig. 3 we have represented the bearings *d* of this sheave as movable in suitable guides or housings, *d⁴*, and as supported by springs *d⁵*. In Fig. 4 the two sheaves D' D² are represented as supported upon girders D⁸, which have at one end a fixed fulcrum-support, *d⁶*, and at the opposite end are supported on the cross bar or piece *d⁷*, which moves vertically upon guides *d⁸*, and is supported by springs *d⁵*. The bearings of the sheave D' may be supported so as to permit of their yielding downward by either of the arrangements of parts herein described, or by any other suitable combinations of parts.

It will be understood that in case of the hoisting-cable B parting or being relieved of weight the accidental or dangerous movement of the elevator-cars will be avoided by preventing the upward movement of either car, as well as the downward movement of the other car. In other words, the car which is loaded will move downward, and by our invention we desire to prevent such downward movement, and to also prevent the upward movement of the other or lighter car. To this end we provide upon each car safety-dogs which are arranged to prevent the downward movement of the car, and other dogs which are arranged to prevent the upward movement of the car. This part of our invention will be best understood from Figs. 6 to 9, inclusive. The car A has slides *b*, which are fitted to slide along safety-strips E, of wood, secured to upright guides E', as best shown in Figs. 6 to 8. The hoisting-cable B is connected with a draw-bar, F, upon each car, and the weight of the car is sustained by a safety-spring, G, as is usual. When the hoisting-cable B is intact, the weight of the car rests upon this spring G, and in case of the weight on the table being relieved by breakage or otherwise the spring acts in a well-understood manner.

At the top of the car A we have represented a cross-shaft, H, supported in suitable bearings, *h*, and having at the ends safety-dogs I, which are pointed upward, and at the bottom of the car we have represented a similar shaft, H', supported in suitable bearings, *h*, and having safety-dogs I', which are pointed downward. The shafts H H' constitute the pivotal points of the safety-dogs I I', and from these shafts arms *h'* extend in opposite directions and are connected by a rod, *h²*. The shaft H also has a third arm, *h³*, having a pin-and-slot connection, *h⁴*, with the draw-bar F, as is best shown in Fig. 9. As long as the cable B remains intact or in operative condition the draw-bar F holds the safety-dogs I I' out of action; but upon the breakage of the cable the draw-bar F is thrown down by the spring G, and by such automatic action the dogs I are thrown against the safety-strips E, and through the cross-connection *h²* the dogs I' are likewise thrown against the safety-strips. Both sets of dogs being pressed against the safety-strips E, that pair of dogs will act which are pointed in the direction in which the car is moving. If the car tends to move downward, the lower set of dogs, I', will dig into the strips E, and if upward the upper set of dogs will act in the same manner.

It will be understood from the above description that if both elevator-cars A are provided with a double system of safety-dogs, as described, not only will the heavier car be prevented from downward movement in case of the rope breaking, but the lighter car will be held against upward movement, and consequently the operation of either set of safety-dogs will prevent accident, and double security is afforded.

What we claim as our invention, and desire to secure by Letters Patent, is—

1. The combination, with an elevator-car and its counter-balance and a hoisting-cable

connecting the car and counter-balance, of a hoisting-drum operating in a bight of said cable to raise and lower the car, and a second cable, also connecting the car and counter-balance and serving to relieve the hoisting-cable of their constant weight, substantially as herein described.

2. The combination, with an elevator-car and its counter-balance and a hoisting-cable connecting them, of a hoisting-drum operating in a bight of said cable to raise and lower the car, a second cable connecting the car and counter-balance and serving to relieve the hoisting-cable of their constant weight, and a sheave over which the last said cable moves and which is supported in yielding bearings, substantially as herein described.

3. The combination, with an elevator-car and counter-balance and a hoisting-cable connecting them, of a hoisting-drum operating in a bight of the cable to raise and lower the car, a second cable connecting the car and counter-balance and serving to relieve the hoisting-cable of their constant weight, the sheave D′, over which said second cable passes, and the weighted or balanced lever D^4, supporting the bearings for said sheave, substantially as herein described.

4. The combination, with an elevator-car and its operating-cable, of a safety-spring, connecting mechanism, and safety-dogs actuated by said spring and presented in opposite directions, and bearings for supporting said safety-dogs when in action to prevent upward as well as downward movement of the car, substantially as herein described.

5. The combination, with two elevator-cars connected by a cable which is continuous between the cars, so that each counterbalances the other, of a hoisting-drum operating in a bight of the cable, safety-springs upon the cars, and safety-dogs presented and supported against movement in opposite directions, and which when thrown into operation serve to prevent the upward movement of one car as well as the downward movement of the other car, substantially as herein described.

W. F. CRANE.
GEO. H. REYNOLDS.

Witnesses:
C. HALL,
FREDK. HAYNES.