(No Model.)

R. T. CRANE.

ELEVATOR.

No. 464,740. Patented Dec. 8, 1891.

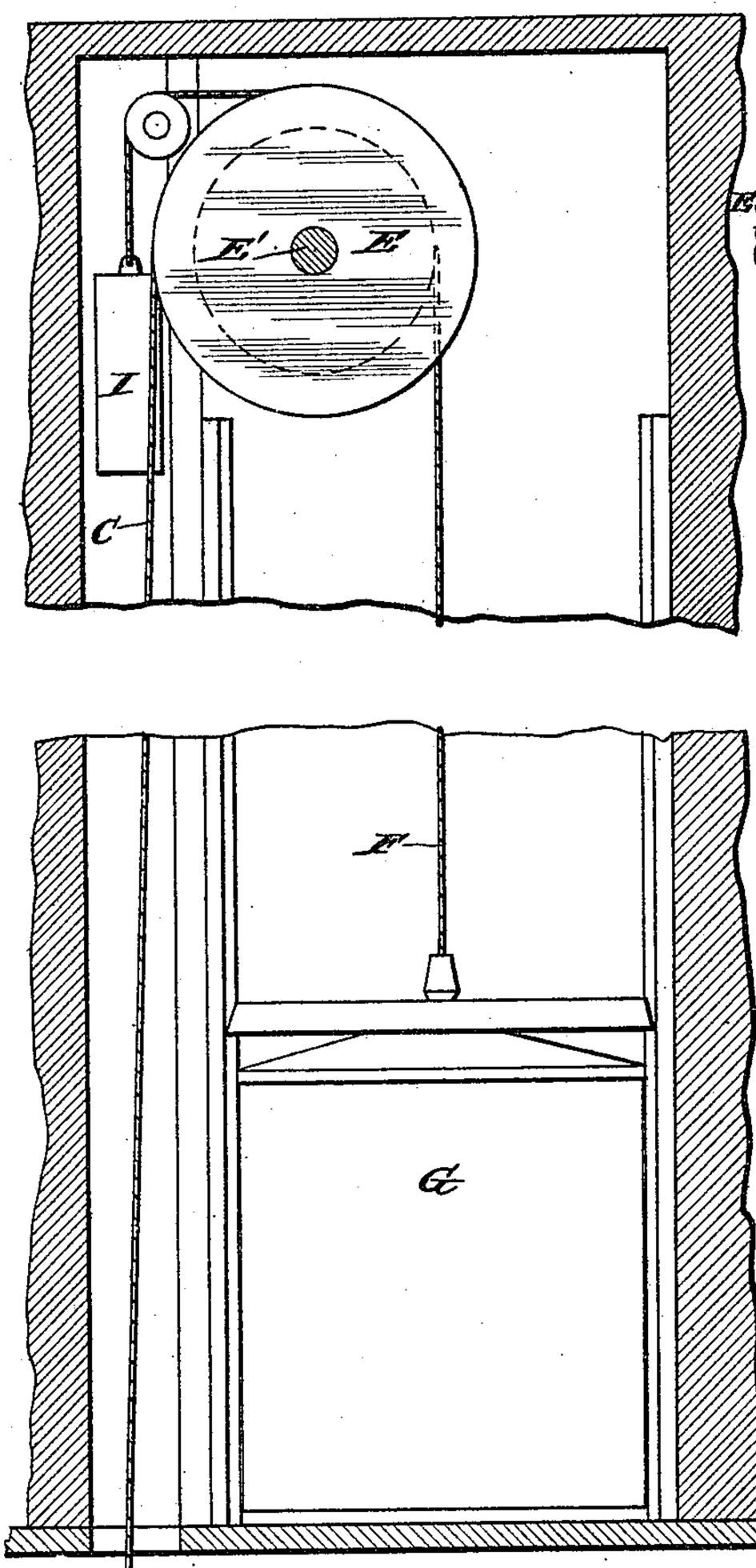


Fig. 1.

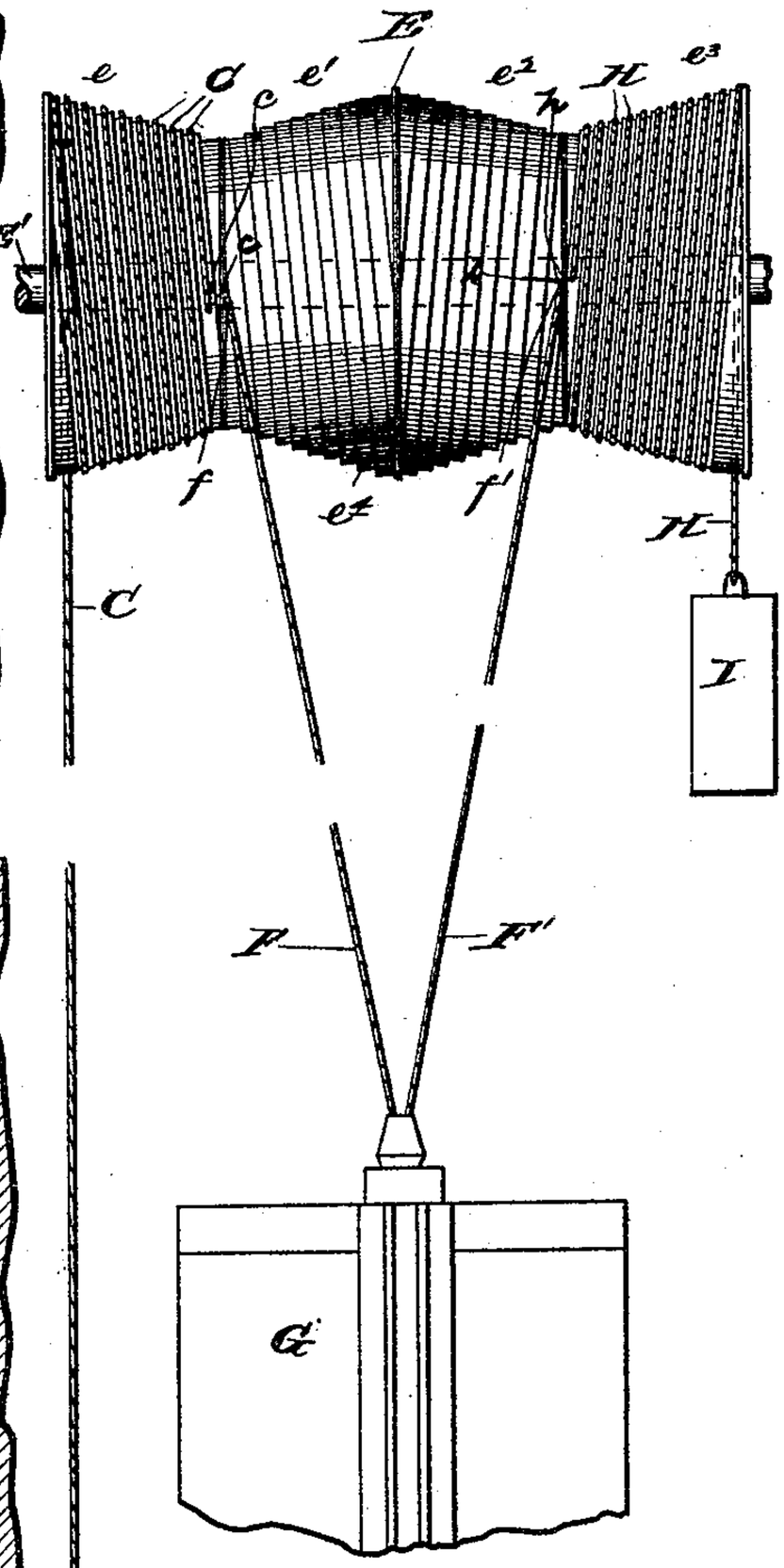
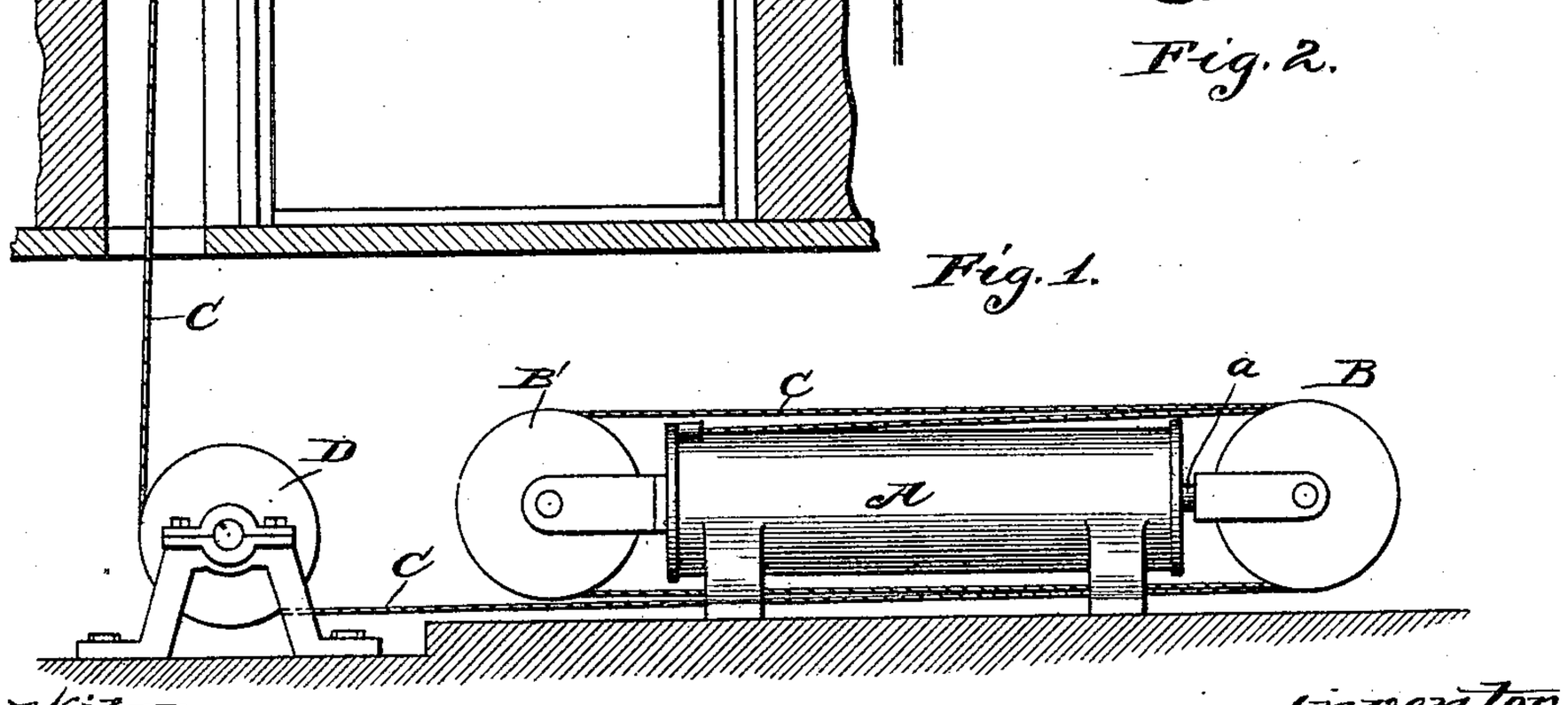


Fig. 2.



Witnesses
W. C. Corlies
Martin H. Olsen

Inventor
Richard T. Crane
By Cobourn & Thacher
Atty's

UNITED STATES PATENT OFFICE.

RICHARD T. CRANE, OF CHICAGO, ILLINOIS.

ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 464,740, dated December 8, 1891.

Application filed June 12, 1891. Serial No. 395,972. (No model.)

To all whom it may concern:

Be it known that I, RICHARD T. CRANE, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Hydraulic Elevators, which is fully set forth in the following specification, reference being had to the accompanying drawings, in which—

Figure 1 represents a vertical section of an elevator-well broken away in the middle, showing the car and hoisting appliances and the hydraulic cylinder in elevation below; and Fig. 2, a front elevation of the hoisting devices and car as arranged in the well, but detached therefrom.

My invention relates to hydraulic elevators of well-known construction, and its purpose is to provide for an equalization or change of the power actually applied to the lifting of the car, whereby the greatest lifting power is obtained at the commencement of the upward movement of the car and is gradually decreased as the car ascends.

In the ordinary use of passenger-elevators the load is usually greatest when the elevator starts at the bottom of the well, for the occupants of the car leave the same at different floors above, thereby lessening the load, and, furthermore, the amount of cable on the car side of the drum is constantly decreasing, thereby lessening the weight of the cable to be lifted with the car.

It is the object of my improvement to take advantage of this circumstance, so that the power actually applied to the lifting of the car may be diminished as the elevator ascends, and so a very considerable saving in expense by the saving of power used may be effected.

I will now describe in detail an apparatus in which I have carried out my invention in one practical way, and will then point out more definitely in claims the particular improvements which I believe to be new and wish to secure by Letters Patent.

In the drawings, A represents the main or hydraulic cylinder of the elevator, which may be of any ordinary construction. As shown in the drawings, it is arranged horizontally—a very common position with large elevators. The cylinder is provided with a piston, as usual, and the piston-rod *a* has mounted at its outer end one of the cable-pulleys B, and the other pulley B′ is mounted at the other end of the cylinder upon a suitable fixed bracket-support. The hoisting-cable C is rigged upon these pulleys in the usual way, and thence passes to a pulley D, arranged below and at one side of the well, so that the cable can be carried thence up into and through the well at one side thereof to the hoisting-drum E, mounted at the upper end thereof. The pulley D is therefore simply an idler or guiding pulley. The hoisting-drum E is of peculiar construction. Taken as a whole it consists of four sections, each of which is a kind of cone-pulley. These sections are designated in the drawings by the letters *e*, *e′*, e^2, and e^3. The section *e*, as indicated in the drawings, is the first at the left hand of Fig. 2 and has its inclination inward. The section *e′*, adjacent to the first, is constructed with its inclination in the opposite direction, so that the smaller diameters of these two sections will be practically in the same plane. The next section e^2 is arranged with its inclination opposite to that of *e′*, so that the larger diameter of these two sections will be practically in the same plane, and the section e^3 has its inclination opposite to that of e^2, so that the smaller diameters of e^2 and e^3 will be practically in the same plane. These sections may be made all in one drum, or they may be made separate; but all are fastened to the same shaft E′, which is suitably mounted at the top of the well. Preferably these inclined faces of the drums are stepped, the step e^4 running around each conical face spirally, as seen in Fig. 2 of the drawings. The cables F F′, which are connected directly to the car G, are fastened at their upper ends to the respective cones *e′* e^2 at points *f f′*, located, respectively, at the outer edges or smallest portion of these sections of the drum and on the inside thereof when substantially unwound, as seen in Fig. 2. The hoisting-cable C is attached at its upper end to the section *e* at a point *c* on its smallest circumference, as seen in Fig. 2, and the cable is arranged to wind upon this section of the drum in an opposite direction to that of the car-cables F F′. The cable H of the counterpoise I is attached to the drum-

section e^3 at a point h on the smallest circumference of this section, as also seen in Fig. 2, and this cable is arranged to wind upon the drum opposite to that of the car-cables F F′. It will be seen then that in the operation of the car the hoisting-cable C and counterpoise-cable H will be unwound from their respective drums as the car ascends, while at the same time the car-cables F F′ will be wound upon their respective drums, and vice versa. It will be seen that the winding of these cables upon their respective drums commences at the smallest circumference of each and proceeds thence to the largest circumference as they are gradually wound up. The winding of the car-cables F F′ commences, of course, when the car is at the bottom of the well, and so at starting the winding will be upon the smallest circumference of the drums, and therefore with the smallest leverage and so requiring the least power. At the same time the cables C and H commence to unwind and act upon the largest circumference of their drums where the leverage is the greatest, and consequently they exert their greatest power. Hence the car starts with the application of the greatest power through these cables to the hoisting-drum and with the lowest power required to lift the car, so that there is the most economical use of power at the point where the greatest force is required. As the car ascends and the weight is changed by persons leaving at different floors, the car-cables wind upon larger circumferences, while the cables C and H unwind from smaller circumferences, thus regulating the use of power according to the changes in the weight to be raised. This weight is also changed gradually by the winding up of the car-cables, which of course constantly decreases the weight of the latter as they depend from their drums, and at the same time the weight of cable, pulling down on the other side of the drums, is constantly increasing by the unwinding of the counterpoise-cable Compensation for all these changes is effected by the changes in leverage, explained above, so that in the operation of the elevator I am enabled to effect a very large saving in the expenditure of power, which is a very important point in the practical use of elevators.

The precise details of construction and arrangement specified above may be modified in some respects without materially departing from the nature of my invention, and these changes I contemplate in the application of the improvement to elevators in different locations. The results mentioned above may also be obtained in greater or less degree by using less than all four of the cone-drums. For instance, the car-cables may be wound upon a plain cylindrical drum, while the cone-drums e and e^3 are retained, or the latter may be cylindrical, while the cone-drums e' and e^2 retain their conical form, or either the cone-drum e or the cone-drum e^3 may be retained alone with the car-cables winding upon a cylindrical drum. In these modifications, however, the pitch should be changed to suit the work to be performed.

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

1. In a hydraulic elevator, the car G, in combination with the car-cables F F′, the cone-shaped drums e' e^2, arranged at the top of the well and having said car-cables attached, respectively, to their smallest circumference, the cone-drum e, the hoisting-cable C, attached to the smallest circumference of said drum and winding opposite to the car-cables, the cone-drum e^3, and the counterpoise I, having its cable connected to the drum e^3 at its smallest circumference and also winding opposite to the said car-cables, substantially as described.

2. In a hydraulic elevator, the car G, in combination with the car-cables F F′ and the cone-shaped drums e' e^2, arranged at the top of the well and having said cables attached, respectively, to their smallest circumference, substantially as described.

3. In a hydraulic elevator, the hoisting-cable C, in combination with the cone-drum e, to which it is attached at its smallest circumference, the counterpoise-cable H, and the cone-drum e^3, to which it is attached also at its smallest circumference, the car-cables and their drum being mounted on the same shaft as said cone-drums, substantially as described.

RICHARD T. CRANE.

Witnesses:
CARRIE FEIGEL,
A. M. BEST.