O. Tufts. Sheet 1. 2 Sheets

Elevator.

No. 1437

Patented May 28. 1861.

32441.

Fig. 2.

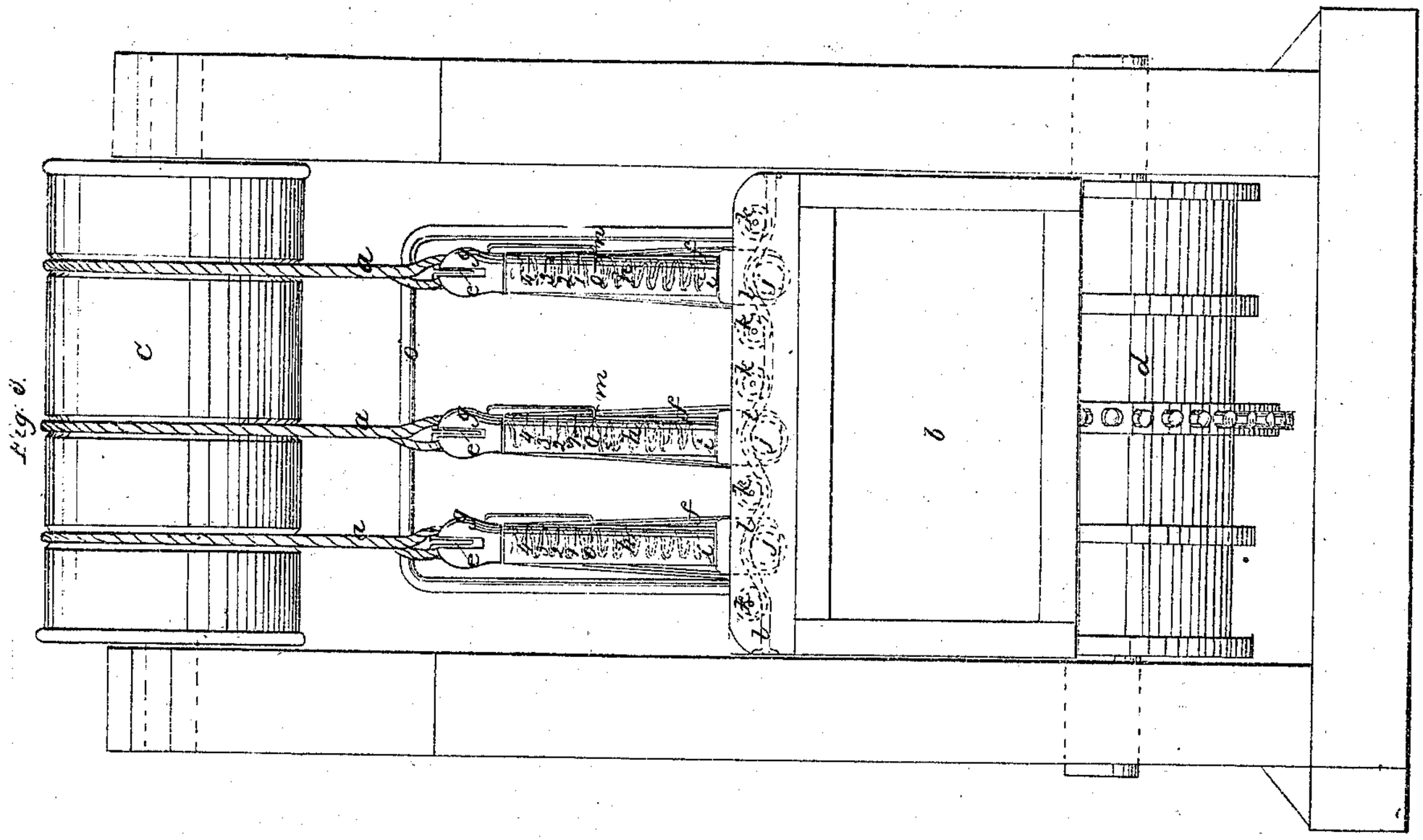
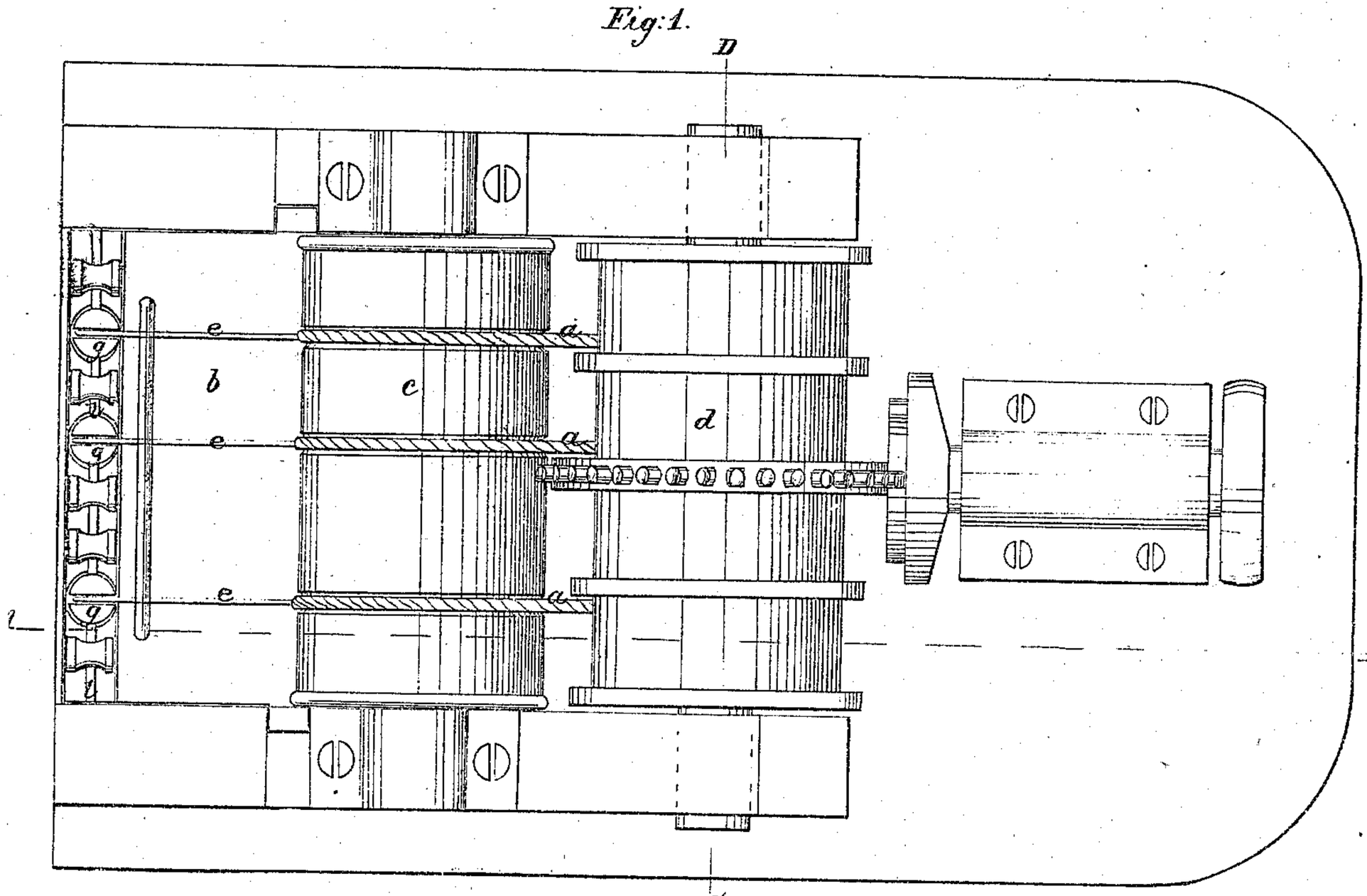


Fig: 1.



Inventor;
Otis Tufts

O. Tufts. Sheet 2. 2 Sheets.

Elevator.

No. 1437.

Patented May 28. 1861.

32441.

Fig: 2

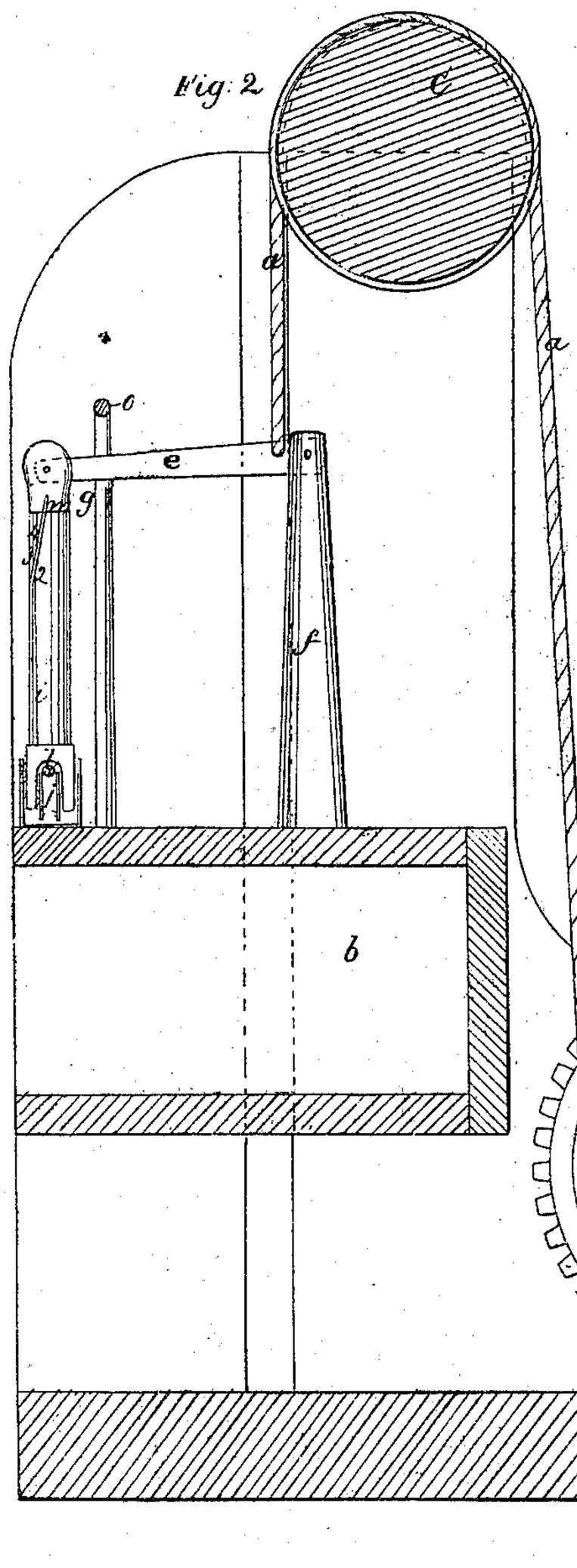
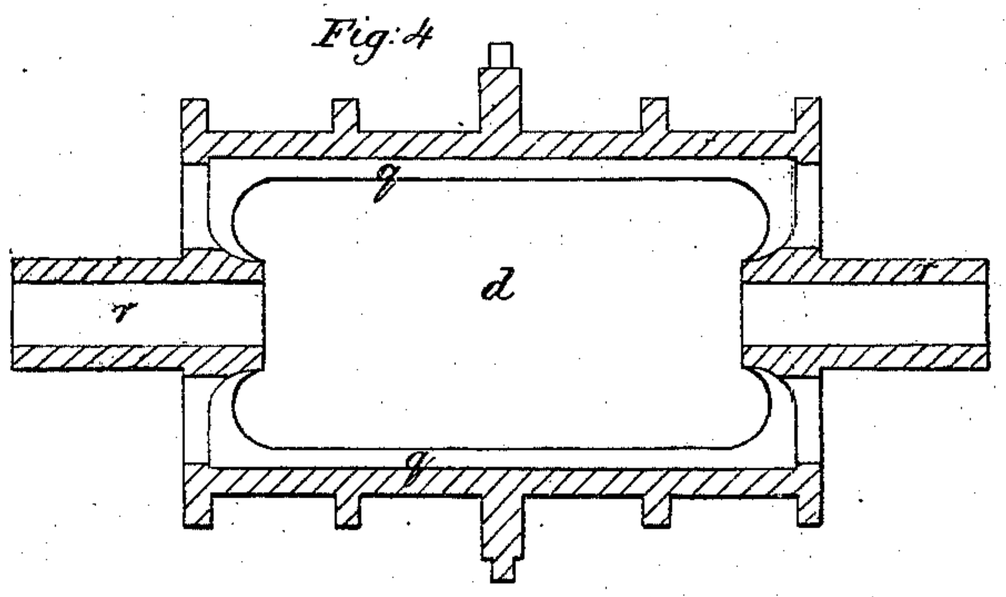
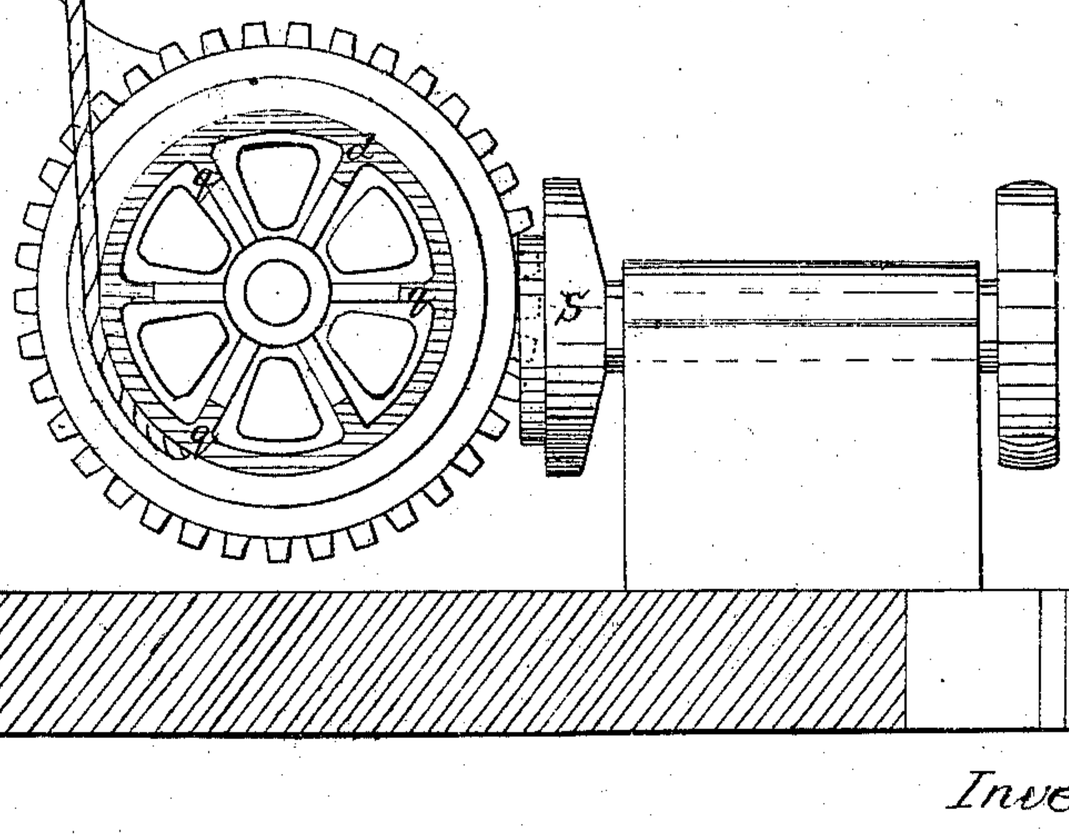


Fig: 4





Inventor;
O. Tufts

UNITED STATES PATENT OFFICE.

OTIS TUFTS, OF BOSTON, MASSACHUSETTS.

ELEVATOR.

Specification of Letters Patent No. 32,441, dated May 28, 1861.

To all whom it may concern:

Be it known that I, OTIS TUFTS, of Boston, county of Suffolk, and State of Massachusetts, mechanical engineer, have invented certain new and useful Improvements in Elevators or Hoisting-Machines; and I declare that the following description and the accompanying drawings form a full, clear, and exact specification thereof.

The accompanying drawings represent a machine, embracing my present improvements and are referred to, by figures and letters in this specification.

Figure 1, is a top view. Fig. 2, is a vertical section, on line A. B. of Fig. 1. Fig. 3, is a front view of a portion of the machine, some of the obscured parts being represented by dotted lines. Fig. 4, is a longitudinal section of the hoisting drum,—on line C. D. of Fig. 1.

Although I have long maintained the superior safety of methods of elevating based on principles of fixed and rigid supports, as peculiarly embodied in my vertical railway elevator, patented, Aug. 9th, 1859 over the principle of "suspension," on which, as far as I am acquainted, all other elevators are constructed. Yet, inasmuch, as suspension elevators, from their simplicity and economy, must probably, long, and perhaps always occupy a large field in the public use, I have therefore turned my attention to methods, whereby their utility, convenience and economy, and more especially their safety may be greatly enhanced. In all elevators of this class known to me, the weight, or car, is suspended by a single rope or chain the estimated strength of which, though it may be largely beyond the weight to be suspended, it is yet liable to give way from accidents or causes, sometimes the most incalculable and paradoxical. And it is a well known fact, that ropes or chains, which have carried far greater weights, hundreds of times over the same heights have sometimes given way, under what was deemed very inferior loads, and in many instances the most disastrous consequences have been experienced. Such is the great and appalling risk of depending upon a single rope or chain, for an elevator, especially when persons are to be carried—whatever may be the comparative strength of the rope or chain, in proportion to the weight suspended. In such machines it is usual to load the rope or chain, to an amount not exceeding one third of its estimated breaking weight.

In my improved machine, to diminish the chances of breaking to the degree of almost certain safety, instead of one hoisting rope, or chain I make use of a series of such ropes or chains (*a*,) two, four, six, eight, ten, or even more in number, each of which, is independently attached, to the hoisting car (*b*,) and also after passing up, over the roller (*c*,) to the hoisting barrel or drum (*d*,) on which they simultaneously wind, either of which ropes or chains being sufficient to sustain the load put upon the machine—with the usual margin to spare. I have resorted to the consideration of different formulas and theories, to estimate their comparative safety as compared with a single rope or chain, and in my caveat, preparatory to this application, I stated that I estimated such comparative safety, not in proportion to the number of the ropes, nor as the square of the number, nor as the cube of the number, but as the whole number of permutations of the component units, multiplied by the number of ropes, but further investigation and consideration has convinced me, that even that, was far too low an estimate of the comparative safety, acquired by additional independent supports. The truth being that it is a compound ratio between the chance of accident happening to any particular rope, on any particular trip of the machine, or in any particular space of time, and the chance of its simultaneously happening to the entire series in the same space of time, which will give a greatly increased ratio of comparative safety beyond what I then stated. Nor are these advantages at all to be obtained by using one rope or chain of larger size, as might appear at first view, for in case of a chain the chance of accident is in a flaw, or other imperfection, which may pertain to a single one, of whatever size, and in ropes, and particularly wire ropes, which are now mostly used—one of extra large size, is much more weakened by frequent bending over sheaves and drums, on account of the different lengths of the outside and inside of the ropes, besides that the strands being all combined and as it were, blended in to one structure, the chance of accident or uncalculated imperfections, does in a degree pertain to a rope as to a chain.

I furthermore arrange in combination with the series of ropes or chains, above described, a series of levers or balances, so that while the principle of independent attachment of each rope or chain is maintained, the weight or strain is equalized on each rope or chain. The manner in which I accomplish these objects, and make the machine perfectly self adjusting is by attaching the end next the car of each rope or chain (*a*,) to a lever, or steel-yard beam (*e*,) the short arm of which, is fixed in a standard (*f*) on the top of the car, while the longer or extended arm, is attached to a connecting rod (*g*,) which extends down, and takes hold of a spiral spring (*h*) which is coiled within the tubular cylinder (*i*,) to the lower end of which, is fixed, the sheave (*j*,). On the top of the car, are also fixed the sheaves or rollers (*k*,) and the cord or chain (*l*,) being firmly secured at each end, to some stationary part of the car, is inserted or woven under the sheaves (*k*) and over the sheaves (*j*,) and is left with some "slack" as it is termed. All of which is shown by dotted lines in Fig. 3. And the operation clearly appears, that by the "slack" of the cord or chain (*l*,) through the combined mechanism, just described, enables the machine to accommodate or adjust itself to any inequality in the lengths of the hoisting ropes (*a*,) and should one of the hoisting ropes break, the rope, or chain (*l*,) immediately draws tight across the space occupied by the sheave connected with the broken rope and the strain is at once, equally distributed on the remaining ropes; the scales at once indicate the increased strain on each rope, and the whole machine performs its office as before.

The spiral springs (*h*,) being combined as described and represented, and accurately constructed, also form a complete system of spring balance, indicating by the index point (*m*) and the scale (*n*,) both the equality and the amount of strain, upon the hoisting ropes, or chains (*a*,) which principle may also be availed of, when required, as a perfect set of scales to note the weight of all or any articles, carried on the elevator.

It must further be observed that the spiral spring (*h*,) and tube (*i*,) may be wholly dispensed with, and the sheave (*j*,) inserted directly in the lower end of the connecting rod (*g*,) and still the machine perfectly perform its office of adjusting the strain equally on the suspension ropes. The spring balances, described being merely to indicate the equality and amount of strain on each. Should the cord, or chain (*l*,) give way from any cause— which however is not likely to occur, on account of the limited amount of strain brought upon it, the levers (*e*,) would merely rise up till they struck the safety cross bar (*o*,) and no further accident or evil consequences, can ensue to the machine.

I do not confine myself to the precise method herein described, of effecting the automatic adjustment of the strain upon the hoisting ropes, as I sometimes accomplish the same by a rocking lever when two ropes are used, or by a system of such levers, when a greater number is used, or it may be accomplished in a degree, by springs attached either to the car, or the hoisting drum, or some intermediate point, in the rope or chain.

By inspection of the sectional view of the hoisting drum, in Figs. 1 and 2, the peculiar manner in which I construct the hoisting drums of elevators or hoisting machines, will be observed. The cylindrical shell of the drum, being strengthened by the interior stays, or ribs (*q*,) and the projecting gudgeons, or bearings (*r*,) being cast with the rest of the drum, whereby economy of construction is greatly promoted, and a separate shaft, that is wedged or otherwise fastened in to the drum may be dispensed with; and the power is applied in any convenient manner to the periphery of the hoisting drum itself.

In the machine represented in the drawings accompanying herewith, the hoisting drum is actuated by one of my voluted disks (*s*).

Claims—

1. Constructing an elevator or hoisting apparatus, with a series of two or more hoisting ropes or chains, having independent attachments, and winding simultaneously upon the hoisting drum, for greater safety, substantially as described.

2. Equalizing the strain upon the series of ropes or chains of my improved elevator, or hoisting machine, by automatic adjustment, substantially as described.

3. In combination with the hoisting apparatus, the spring balances for indicating the strain upon the series of ropes or chains employed, substantially as described.

OTIS TUFTS.

Witnesses:

LUTHER BRIGGS, Jr.,

BENJAMIN P. CHANDLER.