2 Sheets—Sheet 1.

G. MÜLLER.

Elevator.

No. 214,307. Patented April 15, 1879.

Fig. 1.

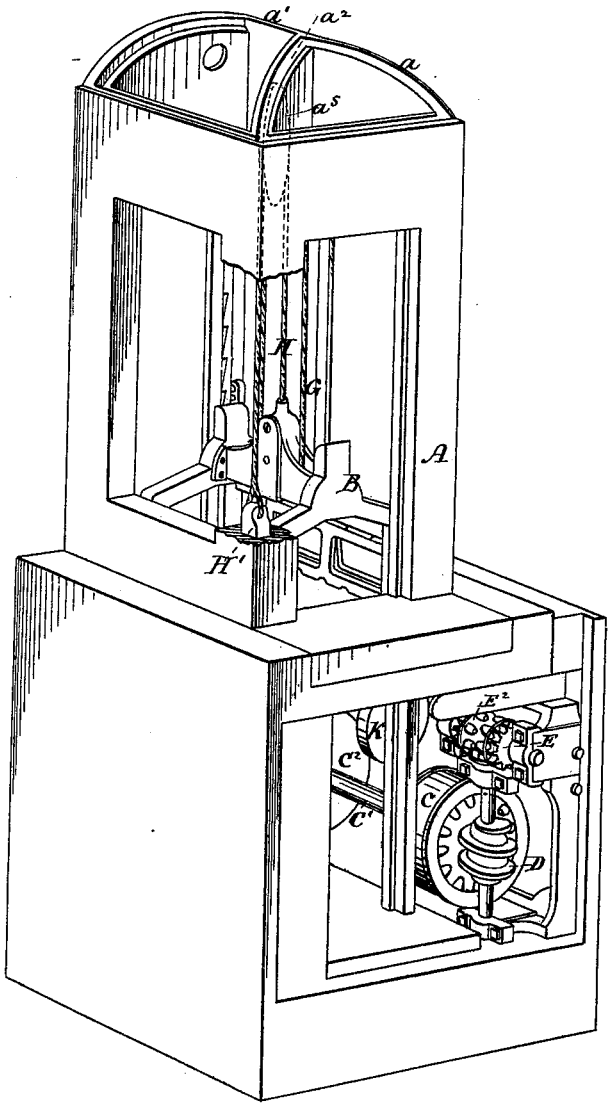


Fig. 4.

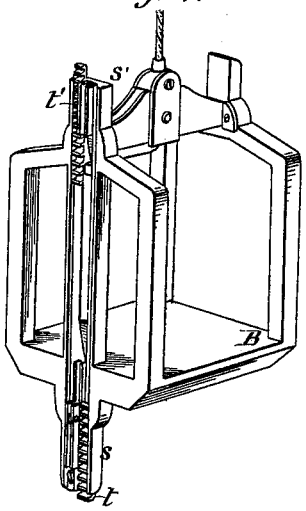


Fig. 7.

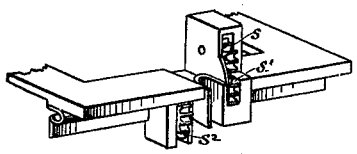


Fig. 8.

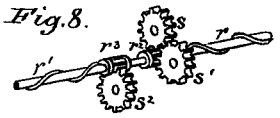


Fig. 6.

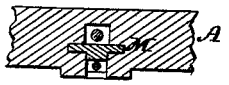
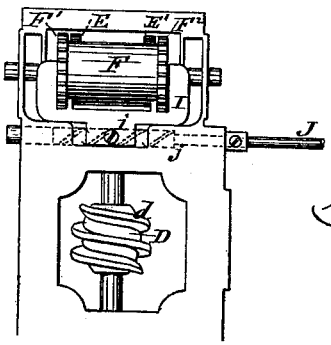


Fig. 5



Witnesses:
E. F. Dick
E. E. Masson

Inventor,
George Müller by
A. Pollok
his attorney.

G. MÜLLER.

Elevator.

2 Sheets—Sheet 2.

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Patented April 15, 1879.

Fig. 2.

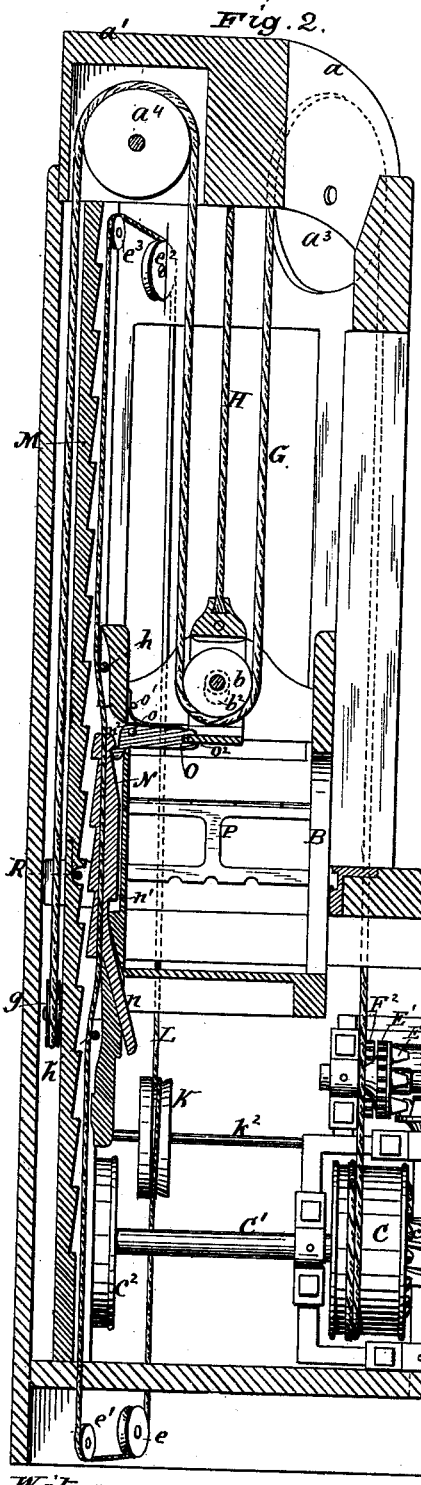


Fig. 3.

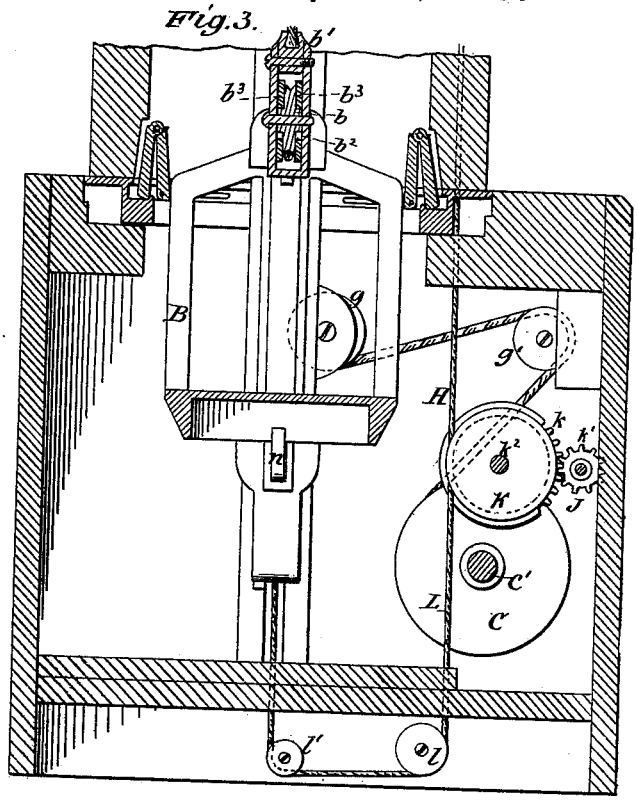


Fig. 9

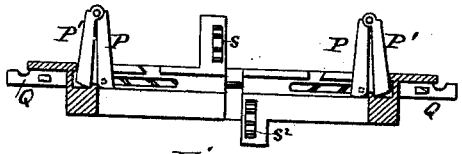
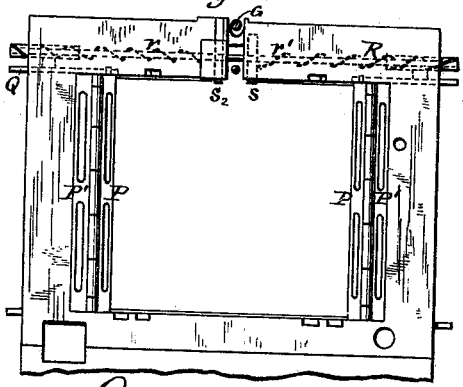


Fig. 10.



Witnesses

E. E. Masson

C. A. Dick

Inventor:

George Müller by

A. Pollok

his attorney

UNITED STATES PATENT OFFICE.

GEORGE MÜLLER, OF NEW YORK, N. Y.

IMPROVEMENT IN ELEVATORS.

Specification forming part of Letters Patent No. **214,307**, dated April 15, 1879; application filed February 3, 1879.

To all whom it may concern:

Be it known that I, GEORGE MÜLLER, of the city, county, and State of New York, have invented a new and useful Improvement in Elevators, which improvement is fully set forth in the following specification.

In the construction of elevators many efforts have been made to overcome the liability to accident. In spite of these attempts, many of them involving important and valuable improvements, there is always danger of accidents happening from the breaking of the hoisting or supporting ropes, the failure of hatch-doors to properly operate, and the breaking of other parts of the machinery.

The object of my invention is to render elevators more safe in use, and at the same time make them to be operated more efficiently and readily with less friction, power, and wear.

The invention consists in the mechanism for operating the winding-drums for raising and lowering the car by the hoisting-rope; also, in the construction and arrangement of radiating arms containing the pulleys over which the hoisting and balancing ropes pass, to form a skylight at the top of the guides or way in which the elevator moves; also, in the construction and arrangement of the permanent safety-ratchet in the elevator-frame; also, in the mechanism for operating the hatch-doors, and the combination of the same with other parts of the elevator; also, in the construction and combination of the safety devices carried by the elevator-car, and in the construction and combination of various parts, as hereinafter more fully set forth.

The following description will enable those skilled in the art to make and use my invention.

In the accompanying drawings, Figure 1 represents a perspective view of the elevator, one of the supporting-posts being partly cut away; Fig. 2, a view in central vertical section and elevation; Fig. 3, a view, in central vertical section and elevation, of lower part, the section being at right angles to that in Fig. 1; Fig. 4, a view of the elevator-car detached; Fig. 5, a back view of the screw for moving the hoisting-drum and the mechanism for shifting the power; Fig. 6, a view in cross-section, showing the manner of securing the permanent ratchet in position; Figs. 7, 8, 9, and 10, detail views of the hatch-door-operating mechanism and surrounding parts.

A represents the frame of the elevator. The two supporting-posts in front are made hollow, and the back, in which the permanent rack is secured, is recessed, as hereinafter explained. At the upper part of this frame are hollow arms a a^1 a^2, radiating, as shown, so as to form the frame for a skylight.

B is the elevator-car. This car moves in a way or between guides in the frame. It is raised or lowered by means of two drums, C C^2, connected by a shaft, C^1, and on them the hoisting-rope G is wound. This rope passes around the pulley b on the car, and then over the pulleys a^3 a^4, which turn in the hollow arms a a^1. One end thereof is carried directly through one of the hollow posts above mentioned to the winding-drum C. The other end is passed through the recess in the back of the frame, over the pulleys g g', to the winding-drum C^2.

A balance-rope, H, attached to the supporting-piece b^1 of the car, passes over the pulley a^5, Fig. 1, and is connected to a counterpoise, H′, which is free to move in the hollow of the supporting-post.

The winding-drums are operated by means of an endless screw, D, the thread d of which is of peculiar form, in order to gear with the pins c, attached to the inner periphery of the drum C. These pins c, are provided with conical rollers, which turn thereon by contact with the thread of the screw.

The screw-thread d, as will be readily perceived by inspection of the drawings, does not make always the same angle with the axis of the screw, but it is inclined in opposite direction as it approaches the ends from a central line. The thread is formed on the surface of an ellipsoid, and not of a cylinder.

By the formation of the thread as explained, the screw bears equally against the pins c as long as they remain in contact.

The pitch or distance apart of the turns of the screw-thread is determined by the distance between the pins c. The strain also in hoist

ing is not borne by one pin only, but by two or three pins, which are at the same time engaged by the screw-thread.

The friction and wear in worm-gearing heretofore used, due to the constantly-changing velocity relative to each other of the gears, are avoided. I am also enabled to more evenly distribute the weight upon a number of pins by the gearing described.

The shaft of the screw D turns in bearings attached to the frame, and at one end is secured a bevel-gear, D^1.

On the shaft E^2, at right angles to the screw-shaft, are secured two spur-gears, E E^1, and two bevel-gears, E^2 E^3, which latter engage with the bevel-gear D′ at opposite sides.

The above-mentioned bevel-gears are preferably formed of a number of pins provided with conical rollers to relieve friction, and are so shown in the drawings.

F is the belt-pulley, on which the band for driving the elevator works. It is mounted on a shaft which is free to turn in bearings, and also to slide longitudinally therein, so as to bring one or the other of the spur-pinions F^1 F^2 into engagement with one of the pinions E E^1.

I is the shifting-frame, operated by the screw on the shifting-rod J, acting on the nut *j*, attached to the projection *i* on the shifting-frame. The driving-belt is retained in position on the face of the pulley by small projections of the frame, which extend on both sides of said belt.

The shifting-rod J is operated by the pinion k^1, Fig. 2, which gears with the partial gear or circular rack *k*, attached to the shifting-pulley K on the shaft k^2, which is free to move in bearings.

The endless shifting-rope L is wound entirely around the shifting-pulley. It passes over the pulleys *e* e^1 at the bottom, and e^2 e^3 at the top, of the frame.

To operate the shifting-rope a rod surrounding the rope, or to which it is attached, so that it practically forms a part of said rope, is ordinarily employed. The reason for using this rod is, that the attendant may move quickly and certainly grasp it and operate the shifting mechanism.

M is the permanent safety-ratchet. It is provided with flanges which rest in grooves in the sides of a recess in the back of the frame, at a suitable distance from the back, thereby forming a passage for the hoisting-rope G. The groove is also at such a distance from the inner surface of the back of the frame that a channel is formed for the shifting-rope L.

The disposition of parts is clearly shown in Fig. 10.

The safety-key N is a toothed bar, extending nearly the entire height of the car, retained in position by means of the inclined projection *n* at its lower end, and the undercut projection n^2 at its upper end. There is also a shoulder formed on the inside of the bar at n^1.

The outer end of lever O, pivoted at *o*, supports the key N by the projection n^2. A spring, o^1, bears against the long arm of the lever. The lower edge of the supporting-piece b^1 takes into the notch o^2 at the end of the lever O. Cross-beams b^3, attached to the car-frame, pass through this supporting-piece b^1, and the pulley *b* turns in slots b^2 therein. When, therefore, the supporting-ropes break, the supporting-piece b^1 is allowed to drop downward enough to cause the engagement of the key or toothed bar N with the permanent ratchet, the spring *o* assisting.

To secure the more perfect operation of the safety-key under all conditions, I attach a rope to its upper end, and conduct this rope over pulleys to one of the winding-drums, so that on occasion the said key will be released and caused to engage with the ratchet instantaneously by this additional rope, which is wound upon the drum.

To keep the shifting-rope from between the ratchet and safety-key, it is passed through a central perforation in the latter. It moves over rollers *h* as it enters and leaves the aperture.

Referring to Fig. 4, it will be seen that on each side of the recess in the car in which the safety-key is placed, but at opposite ends of the car, are racks *t t′*. As the car ascends and descends these racks engage with the pinions *s* s^2, which turn on pins at the back of the elevator-frame, one on one and the other on the opposite side of the permanent ratchet. The pinion *s* gears with the pinion s^1, of equal size, and the pinions s^1 s^2 gear with smaller pinions, r^2 r^3. The pinions r^2 r^3 are attached to the spindle R, which turns in suitable bearings. A recess, Fig. 2, is cut in the safety-ratchet for the reception of this spindle. Right and left handed screw-threads *r* r^1, Figs. 8, 9, and 10, on this spindle operate the slides Q in opposite directions by means of the screw-nuts attached thereto.

To the slides Q the hatch-doors P are attached by pins, so as to be opened and closed according to the motion of these slides by the revolution of the spindle R. I may employ folding doors P P′, as represented, or single sliding doors may be employed. I secure by the arrangement described quick and perfect action, although the hatch-doors may themselves become bent downward through sinking of the building or other cause.

The operation of the apparatus is as follows: Let us suppose the elevator at the lowest point, ready to ascend. Power is applied through a suitable belt to the pulley F, and communicated, through the spur-gears F^1 E, bevel-gears E^2 D′, and screw D, to the winding-drums C C^2. As the car ascends, the rack *t′* engages with the pinion s^2, causes the revolution of the spindle R, and opens the hatch-doors P P′. After the car has passed through the hatch, the rack *t* closes the doors by engagement with the pinion *s*, and causes the revolution of the spindle R in the opposite direction. To cause the car to descend, the shifting-rope L is operated, the shifting-rod J revolves rapidly, and

the spur-gears E F^1 are thrown out of engagement, and the spur-gears E^1 F^2 are caused to mesh with each other. The power is now communicated to the drums C C^2 in a reverse direction through the bevel-gears E^3 D′ and screw D. As the car descends, the racks *t* and *t′* engage with the pinions *s* and s^2, and open and close the hatch-doors P P′.

If, from any cause, by breaking of ropes or otherwise, the car should be unsupported, the safety-key N is caused to engage with the permanent ratchet M by the movement of the lever O, or by the additional or safety rope attached to the key.

Although I regard the mechanism and apparatus described as the best method of carrying out my invention, it is evident that modifications might be made therein without departing from the spirit thereof. Instead of making the screw symmetrical on both sides of a central line, the thread may be longer on one side than on the other, and other mechanical details may also be varied.

Having thus fully described my invention, and the manner in which the same is or may be carried into effect, what I claim, and desire to secure by Letters Patent, is as follows:

1. The combination, with an elevator-car and hoisting-rope, of the winding-drum provided with a series of pins arranged on its inner periphery, and an operating-screw with thread of peculiar form arranged upon the periphery of an ellipsoid or body generated by the revolution of a curve corresponding to the curvature of the winding-drum, substantially as described.

2. The combination, with the drum, its operating-screw, and bevel-gear on the shaft of said screw, of shifting and driving mechanism composed of two bevel-gears mounted on one shaft and engaging with aforesaid bevel-gear, two spur-pinions, also mounted on said shaft, a belt-pulley provided with two spur-pinions, and means for shifting said pulley, and causing the engagement of the one or the other pair of spur-pinions, substantially as set forth.

3. The combination, with the shifting-pulleys having partial gear, of the multiplying-pinion and shaft, and sliding belt-pulley operated by a screw-thread on aforesaid shaft, substantially as described.

4. In an elevator, the pulley-frame and skylight composed of the hollow radiating arms, substantially as described.

5. The combination, with the frame of an elevator, the elevator-car, and the hoisting and counterbalance ropes, of the pulley-frame and skylight composed of the three hollow arms, relatively arranged as shown, and the pulleys located in said arms, substantially as set forth.

6. In an elevator, the stationary safety-ratchet, secured in a long recess in the frame by flanges fitting in a groove at some distance from the back of a recess in the elevator-frame, thereby forming a passage for one of the hoisting-ropes, and also at a distance from the front of said recess, thereby forming a chamber for the shifting-rope, substantially as described.

7. The combination, with the elevator-car and the safety-key formed of a toothed bar, provided at one end with an oblique or inclined projection, and at the other with a notched projection, of a hinged supporting-lever, one end of which engages with the notch at the upper end of the toothed bar, substantially as described.

8. The combination, in an elevator, of the following elements: first, an elevator-car; second, a supporting-piece free to move within a slight distance; third, a hoisting-rope passing over a pulley in said supporting-piece; fourth, a toothed bar or safety-key; fifth, a lever pivoted on the car-frame, and engaging at one end with a projection on the toothed bar, and at the other with the aforesaid supporting-piece; and, sixth, a spring pressing against one arm of said lever, substantially as described.

9. In an elevator, the combination, with the hatch-doors, of the revolving spindle with right-and-left screws and spur-gears, substantially as described.

10. The combination, with the elevator-car and the two toothed racks thereon, of the hatch-doors, spindle with right-and-left screw, and a double set of gearing arranged to revolve the said spindle in opposite directions as the one set or the other is engaged by one or the other of aforesaid racks, substantially as described.

11. In an elevator, the combination, with the elevator-car, toothed bar or safety-key, and toothed racks on said car, the said racks being arranged on opposite sides of said safety-key, of the permanent ratchet arranged on one side of the elevator-frame, the spindle passing through a recess in said ratchet, gear fixed on said spindle on both sides of aforesaid ratchet, and hatch-doors operated by right and left handed screw-threads on said spindle, substantially as set forth.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

GEORGE MÜLLER.

Witnesses:
E. A. DICK,
C. J. HEDRICK.