(No Model.) 3 Sheets—Sheet 1.

A. SUNDH.

ELEVATOR.

No. 458,991. Patented Sept. 1, 1891.

Fig. 1.

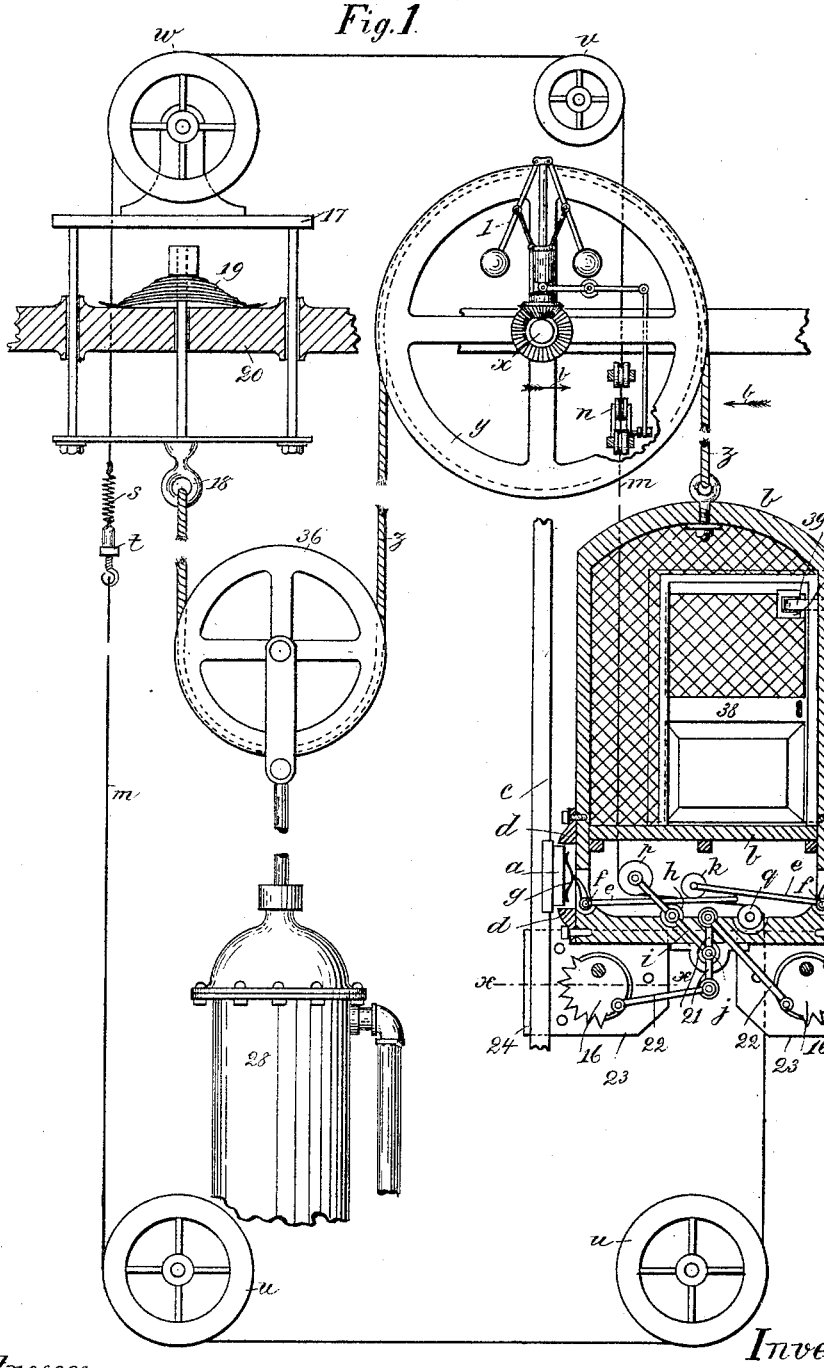
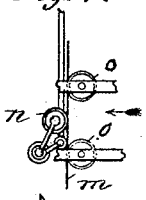


Fig. 7.



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(No Model.)

3 Sheets—Sheet 2.

A. SUNDH.

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Fig. 2.

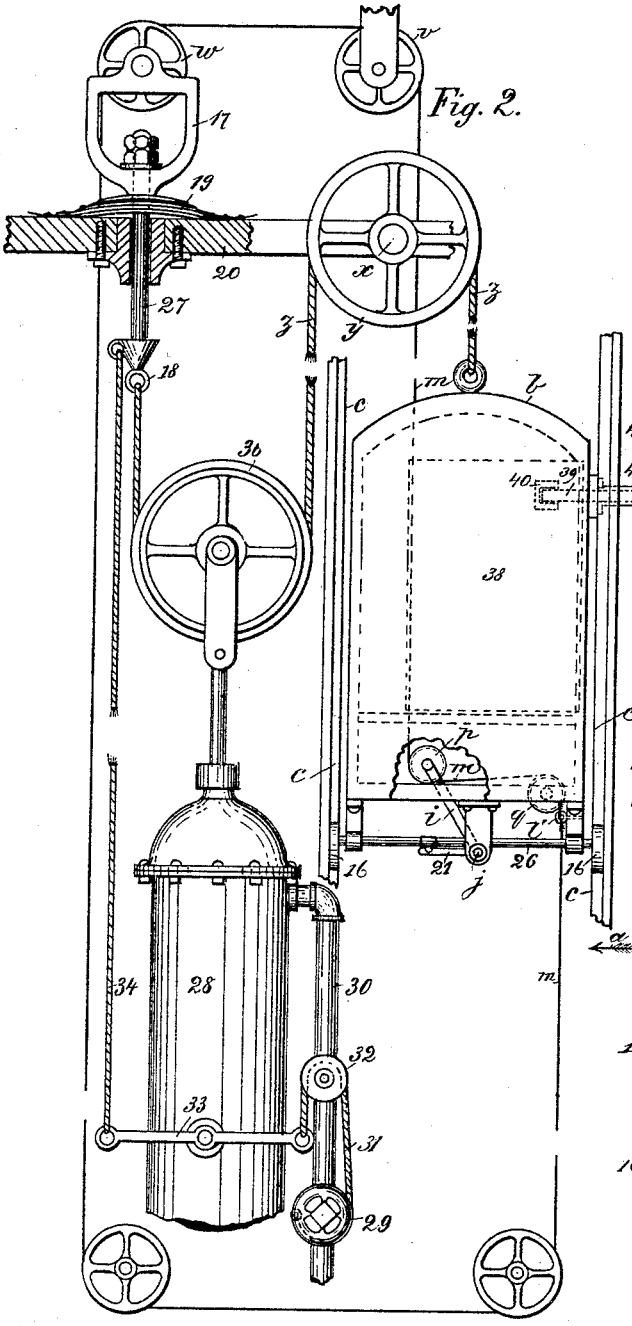


Fig. 3.

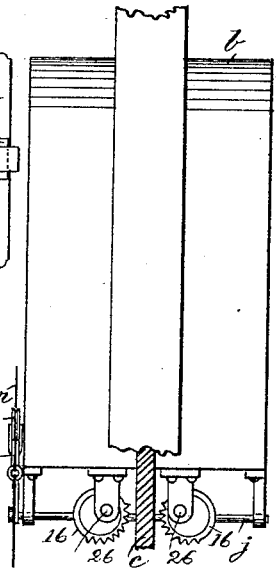
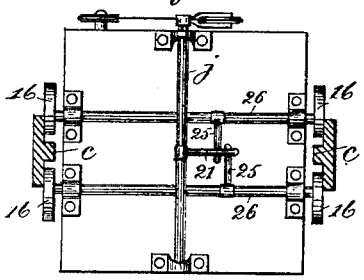


Fig. 4.



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ELEVATOR.

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Fig. 6.

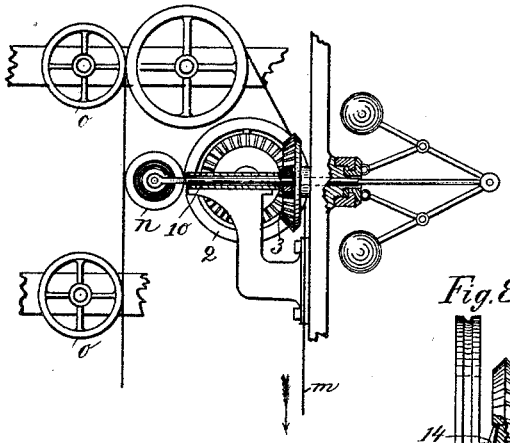


Fig. 8.

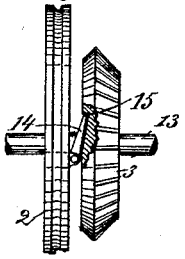


Fig. 5.

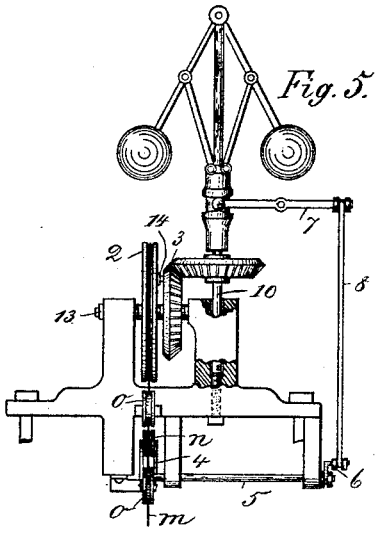
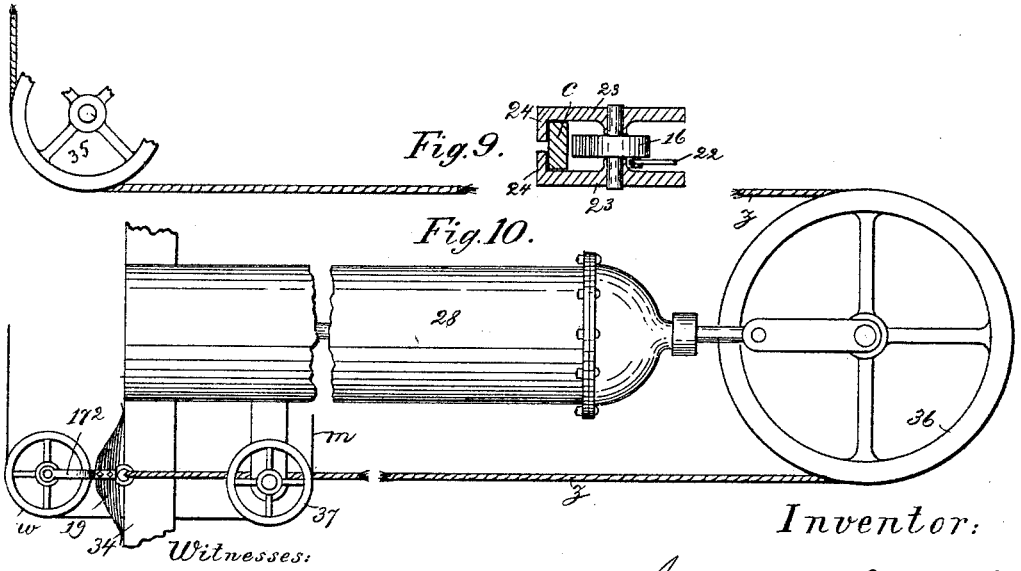


Fig. 9.

Fig. 10.



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UNITED STATES PATENT OFFICE.

AUGUST SUNDH, OF YONKERS, NEW YORK, ASSIGNOR OF ONE-HALF TO ERNST BOENING, OF SAME PLACE.

ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 458,991, dated September 1, 1891.

Application filed September 25, 1890. Serial No. 366,084. (No model.)

To all whom it may concern:

Be it known that I, AUGUST SUNDH, a citizen of the United States, and a resident of Yonkers, county of Westchester, State of New York, have invented new and useful Improvements in Elevators, of which the following is a specification.

My invention relates to elevators for carrying passengers or freight up and down in buildings; and it consists in improved appliances for automatically controlling the speed by means of friction-brakes; also, in automatic safety-cam devices to catch and hold the car when the rope breaks, all as hereinafter fully described, reference being made to the accompanying drawings, in which—

Figure 1 is an elevation of elevator apparatus and a section of the car, illustrating my improved speed-regulator and safety-cam devices. Fig. 2 is a similar view showing the safety-cam apparatus in modified arrangements. Fig. 3 is an elevation with a part in section of part of the apparatus of Fig. 2 as seen in the direction indicated by the arrow *a*. Fig. 4 is a plan of the bottom of the car of Figs. 2 and 3 inverted and section of the guideways for the car. Figs. 5 and 6 represent, mostly in elevation, different arrangements in which the governor for the friction-brake may be employed. Fig. 7 is a detail of the apparatus of Fig. 1 in side view, as indicated by arrow *b*. Fig. 8 is a detail of Fig. 5, partly in plan view and partly in horizontal section. Fig. 9 is a detail of Fig. 1 in horizontal section on line *x x*. Fig. 10 is a diagram indicating the application of the cam-actuating devices in an elevator in which the ram is arranged horizontally.

I propose to provide friction brake-shoes *a*, also cams 16, on the carriage *b* and in suitable relation to the guideways *c*, together with automatic contrivances whereby the brakes are to be made to press against said ways when the car is going too fast, particularly when going downward, to check the speed of the car, and both the brakes and the cam will take effect to stop the car when its suspending-rope breaks. The brake-shoes *a* are lodged between brackets *d*, attached to the sides of the car in suitable proximity to the guideways *c* for so acting on them, and they are so lodged suitably for moving laterally to bind on or slack off from the guides. For so actuating the brake-shoes the short arm of an elbow-lever *e*, pivoted at *f*, is made to bear against each shoe through an interposed spring *g*, provided for affording more elastic or yielding action than a positive connection would give. One lever *e* rests about midway of its long arm on the roller *h* of a lever *i*, pivoted at *j*, and the other lever *e* has a roller *k* at its free end resting on said first-mentioned lever, to be lifted by it when it is lifted by lever *i*, so that both brake-shoes will be made to act on the guideways alike and at the same time. The lever *i* is to be controlled by the rope *m*, which, for graduating the action of the brakes, is subject to the governor *l*, by which the rope *m* is made to draw when the speed is too high by the swinging pulley *n*, which is made to thrust the rope between the two pulleys *o* on fixed pivots, so that as said rope passes under the pulley *p* in the end of lever *i*, and thence laterally to and over guide-pulley *q*, mounted on a fixed pivot on the car, said lever *i* will be lifted suitably for working the brake-shoes. The rope *m* passes over the carrying-pulleys *u* at the bottom of the elevator-way and pulleys *v* and *w* at the top, and is coupled together at the ends by a spring *s*, and a swivel *t* also, when desired, to take up the slack and keep the rope taut. It will be seen that, owing to the lateral direction of the rope *m* between pulleys *p* and *q*, whatever lengthwise shift of the rope is produced by its deflection between pulleys *o* by the pulley *n*, actuated by the change of the governor through higher speed, will be compensated by the swinging of pulley *p* toward pulley *q*, so that the roller *h* on lever *i* will raise the brake-levers *e* and press the brake-shoes against the sides of the guides *c* with such effect that the undue speed of the car will be checked and the rope *m* will be slacked again by the return of pulley *n*, which will allow lever *i* to return to its normal position and slack off the brake-shoes.

In the arrangement of Fig. 1 I have represented the governor as geared with the shaft *x* of the wheel *v*, over which the car-suspending rope *z* works for speeding the governor, and the rope *m* may be left free to remain at

rest; but I will in some cases prefer to connect the rope to the car, which may be done in any approved way where the rope passes through the top or bottom of the car, as by tying it to the eye-stud l' as in Fig. 2, so as to be moved by it and then utilize it for speeding the governor instead of so gearing it with the shaft x. This may be done in various ways, as in Fig. 5, wherein it is represented as running over the pulley 2, which is made to drive the governor by the bevel-wheels 3, the governor being set upright and made to thrust the swinging pulley n between pulleys o, same as in Fig. 1, said pulley n being carried between the free ends of arms 4 of a rock-shaft 5, having a crank 6, to which the governor-lever 7 is connected by the rod 8. In Fig. 6 I represent said rope m also geared with the governor by the pulley 2 and bevel-wheels 3; but the governor-spindle 10 is arranged horizontally, so that the balls swing in a vertical plane, and so that the spindle slides to effect the thrust of pulley n with the said pulley mounted in the forked end of spindle 10, arranged to thrust the rope m between pulleys o, and which is thrust back by the stress of the rope m when the thrust of the governor slacks. As it is only in the downward run of the car that it is liable to overrun the normal speed, it is unnecessary to have the governor work while the car is ascending. Wherefore I have fitted the pulley 2 loosely on its shaft 13 with a pawl 14, that engages the bevel-wheel 3 on said shaft 13 when said pulley 2 turns in the direction which the downward run of the car effects, but when turning the other way runs idly and leaves the governor at rest, said pawl being pivoted on the side of pulley 2, so as to swing outward and engage in the notch 15 in the side of wheel 3, when the car runs downward and pulls the rope in the direction indicated by the arrow in Fig. 6; but for causing more powerful thrust of the brakes and for actuating the cams to stop the car when its suspending-rope z breaks I have mounted the carrying-pulley w for said rope m on the top of the yoke 17, from which said main rope z is suspended at 18, said yoke being suspended from the spring 19 on the beam 20, on which the yoke is capable of rising and falling to the extent of the range of the spring. The weight of the car holds the spring down flat, or nearly so. When the rope z breaks, the recoil of the spring thrusts the yoke and the pulley w upward violently, which thrusts lever i to the right to a greater extent than it is moved in the same direction by the governor to apply the brake-shoes in their normal action for merely checking the speed of the car. When the cams 16 are to thrust against the faces of the guideways c, as indicated in Fig. 1, I arrange the oppositely-projecting arms 21 on the axis j of lever i and connect them to the cams 16, respectively, by rods 22, gaging them so that the cams will not swing so far toward the guideways by the play of lever i, caused by the governor, as to engage them, but to come into contact with them suitably for stopping the car through the greater movement of the lever caused by the thrust of the pulley w when said main rope breaks. To prevent the guideways c from spreading under the thrusts of the cams when arranged as in Fig. 1, the housings 23 are provided with strong hook-stays 24, reaching behind the edges of said guideways directly opposite to the points where the cams take effect, as represented in Fig. 9. If the cams 16 are to be made to grip the guideways c on opposite sides, as in Figs. 2, 3, and 4, a single arm 21 of said axis j will be made to act on the arms 25 of the shafts 26, carrying two pairs of said cams. (See Fig. 4.)

The yoke 17 may be carried on the single rod 27, as in Fig. 2, instead of the arrangement of Fig. 1, if preferred. I also propose to utilize this yoke for shutting off the liquid from the ram-cylinder 28 by its upward movement when the rope z breaks to stop the piston and prevent damage to the head of the ram-cylinder, and for this purpose I provide a stop-cock 29 in the stand-pipe 30 with a cord 31, attached to its wheel and passing over guide-pulley 32 to the lever 33, connected by the cord 34 to the rod 27, so that it will turn the cock and shut off the water when it rises. Substantially the same yoke device and spring may be utilized for applying the safety-cams in like manner when the ram is arranged horizontally, as indicated in Fig. 10, in which the car-suspending rope z has its end fastened to the yoke 17^2, attached to the spring 19, suitably placed against the abutment 34 to receive said end of the rope at the base of the ram-cylinder 28 after passing under guide-pulley 35 and around the pulley 36 in the head of the ram, the rope m being passed around the pulley 37 in fixed supports and the pulley w carried by the yoke, said pulleys being at the bottom of the elevator-way instead of at the top, as in the other arrangements.

I claim—

1. The combination, with the car and the brake and cam actuating lever on said car, of the rope actuating said lever arranged on the guide-pulleys and in the angular relation to the guide-pulley on said actuating-lever, the spring supporting and thrusting device for one of said guide-pulleys, and the car-suspending rope attached to said thrusting device, substantially as described.

2. The combination, with the car and its guideway, of the brakes on the car acting on the guideways, the lever on the car and the rope controlling it to actuate the brakes, the governor for controlling the rope, and the thrusting guide-pulley for said rope subject to the stress of the car-suspending rope to augment the force of the brake when the car-suspending rope breaks, substantially as described.

3. The combination, with the car and its guideways, of the brakes on the car acting on the guideways, the lever on the car and the rope controlling it to actuate the brakes, the governor controlling the rope, the thrusting guide-pulley for said rope subject to the stress of the car-suspending-rope, and the cams connected to said brake-actuating lever to augment the car-stopping power when the suspending-rope breaks, substantially as described.

4. The combination, with the car and guideways, of the brake-shoes acting on said guideways, the elbow brake-levers actuating said shoes, the lever actuating the brake-levers, and the cord controlled by the governor, said brake-levers overlapping each other and resting on a stud of the lever actuating them, and said cord arranged on the guide-roll in the end of the lever actuated by it and on the laterally-placed guide-roll of the car, substantially as described.

5. The combination, with the car and the guideways, of the governor, the rope subject to the action of the governor, the lever pivoted on the car and subject to the thrust of said rope, and the brake-shoes and brake-levers controlled by the said lever, which is subject to the rope, said brake-levers connected with the brake-shoes and springs intermediate them and said shoes and transmitting the thrust of the levers, substantially as described.

6. The combination, with the car and the guideways, of the governor, the rope subject to the action of the governor, the lever pivoted on the car and subject to the thrust of said rope, the brake-levers controlled by the said lever, which is subject to the rope, and the brake-shoes controlled by the brake-levers, one of said brake-levers resting on the roller of the lever controlled by the rope and supporting the other brake-lever having a roller at its free end, substantially as described.

7. The combination, with the car and the guideways, of the governor, the rope subject to the action of the governor, the lever pivoted on the car and subject to the thrust of said rope, the brake-levers controlled by the lever subject to the thrust of the rope, and the brake-shoe, said shoe lodged between the brackets of the car and connected to the brake-lever by the springs, substantially as described.

8. The combination, with the car and the guideways, of the governor, the rope subject to the action of the governor, the lever pivoted on the car and subject to the thrust of said rope, the brake-lever controlled by the lever subject to the thrust of the rope, and the brake-shoes, said rope being connected with and movable by the car and geared with the governor by the pulley, pawl, and gear-wheel driving it in one direction only, substantially as described.

9. The combination, with the car, guideways for the car, the lever on the car subject to the thrust of the rope, as *m*, said rope, the governor controlling said rope, the spring having the car-suspending rope attached to it, a guide-pulley for the thrust-rope mounted on said spring, and the eccentric cams on the car connected with the arms of said thrust-lever, substantially as described.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 5th day of September, 1890.

AUGUST SUNDH.

Witnesses:
W. J. MORGAN,
W. B. EARLL.