

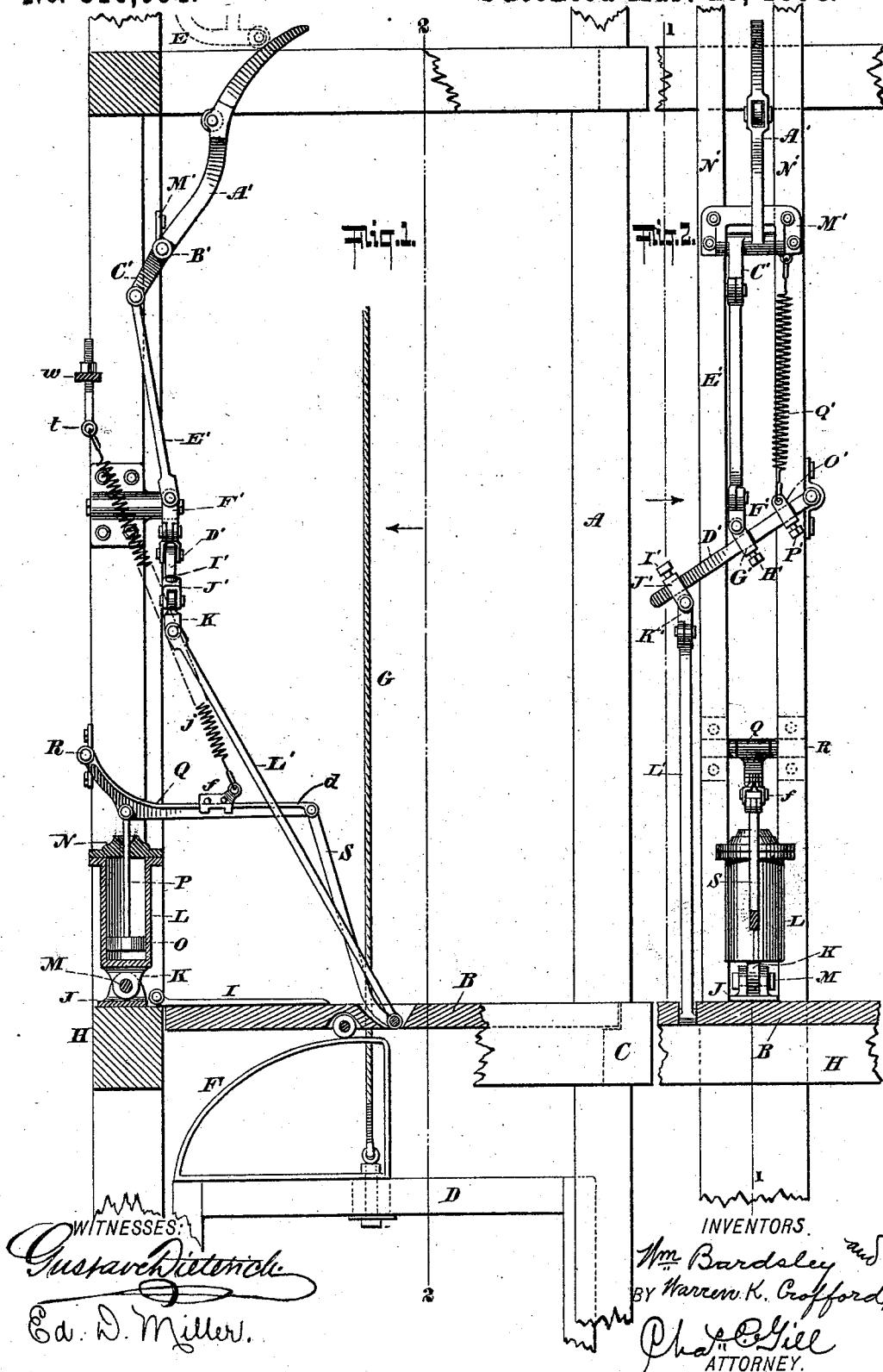
(No Model.)

2 Sheets—Sheet 1.

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HATCHWAY DOOR MECHANISM.

No. 516,694.

Patented Mar. 20, 1894.



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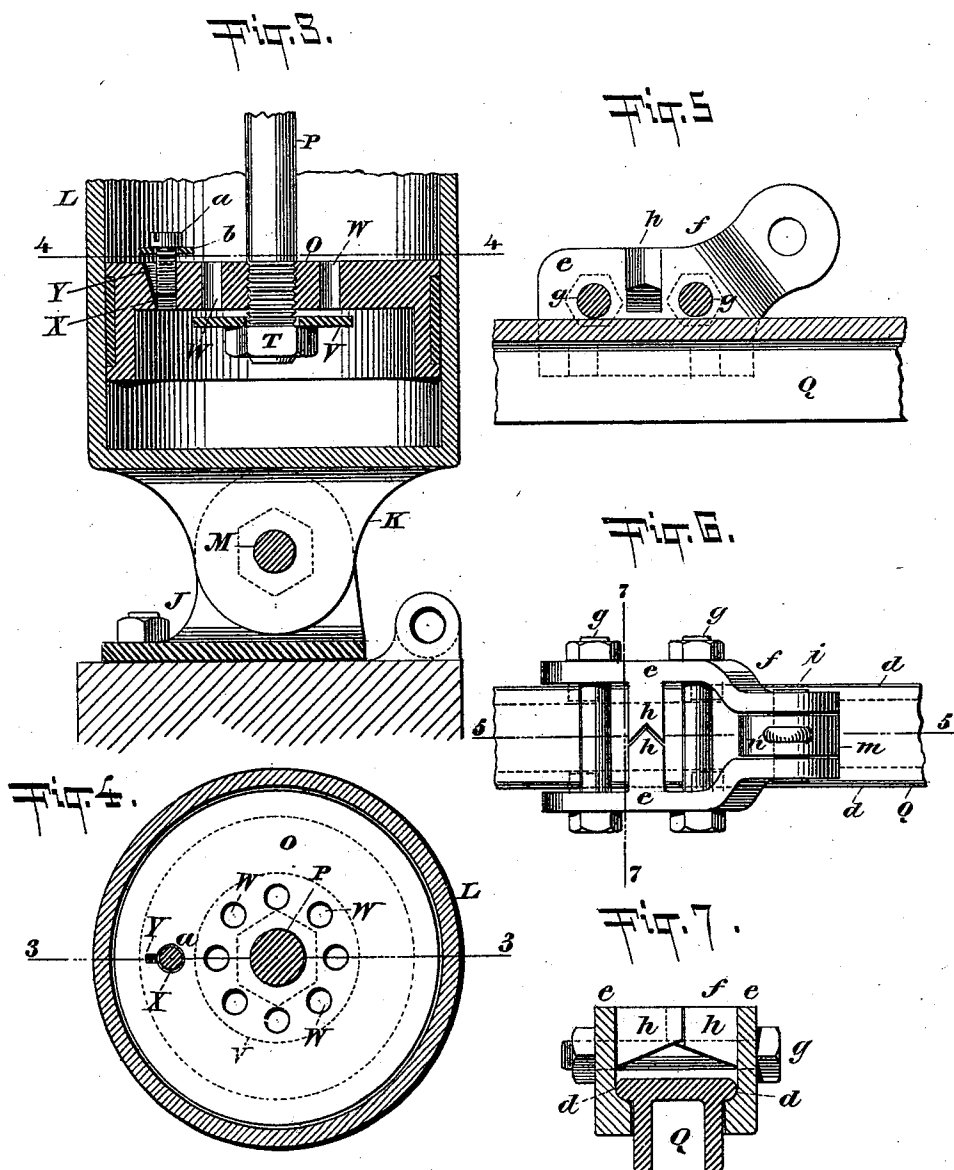
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HATCHWAY-DOOR MECHANISM.

SPECIFICATION forming part of Letters Patent No. 516,694, dated March 20, 1894.

Application filed March 20, 1893. Serial No. 466,823. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM BARDSLEY, a resident of Kearney township, New Jersey, and WARREN K. CROFFORD, a resident of the city of New York, in the State of New York, citizens of the United States, have invented certain new and useful Improvements in Hatchway-Door Mechanism, of which the following is a specification.

The invention relates to improvements in hatch-way door mechanism, and consists, first, in novel means connected with hatch-way doors, for rendering the movement of the latter when in use practically noiseless, and, second, in a novel arrangement of levers connected with said door and adapted to be actuated to open the same by the elevator hoist or carriage during its movement through the elevator shaft.

The first portion of our invention comprises the employment of a liquid check having a valve piston and rod, the latter through suitable levers being connected with the hatch-way door. The construction and operation of the liquid check is such that the door is permitted to freely open but on being released is checked by the restraint to which the liquid is subjected on passing from the lower to the upper side of the piston in the checking cylinder.

The first portion of our invention further comprises an adjustable spring connected with the said levers whereby the weight of the door is counter-balanced or partially taken up by the said spring. When the hatch-way door is closed, the said spring will be under a strong tension in its extended condition, and hence will exert an upward pull on the door and facilitate the opening of the latter, the spring gradually contracting as the door opens. During the closing of the hatch-way door the said spring is gradually extended and exerts its force to prevent the too rapid closing of the door. The spring thus aids the liquid check in insuring the closing of the hatch-way door without noise, and aids the automatic lever mechanism in opening the door by exerting its tension to elevate the latter on its hinges.

The second portion of the invention comprises a pivoted main actuating lever whose

longer arm projects into the elevator shaft in position to receive the contact of the descending elevator carriage, while the shorter arm of said lever extends downward and outward from said elevator shaft, and is connected by a link with an auxiliary lever pivoted to move on a vertical plane with the walls of the elevator shaft and having its outer end connected by a rod with the hatch-way door. The descending carriage comes into contact with the first mentioned lever and by depressing the longer arm of same effects the movement of the link, auxiliary lever and connecting rod for the purpose of turning the door upward on its hinges and thus leaving the elevator shaft free and clear for the descending carriage.

The main object of the special arrangement of levers made the subject of the second part of our invention is to obtain a full movement of the door and its connecting rod with the most limited movement in the shorter arm of the main actuating lever, and thus to adapt the automatic lever mechanism for use in connection with the fast running elevators of the present day.

The invention will be more fully understood from the detailed description hereinafter presented, reference being had to the accompanying drawings, in which—

Figure 1 is a side elevation partly in section on the line 1—1 of Fig. 2, of an elevator shaft and hatch-way door provided with mechanism constructed in accordance with and embodying the invention. Fig. 2 is a vertical section of same on the dotted line 2—2 of Fig. 1. Fig. 3 is an enlarged central vertical section of the lower portion of the liquid checking cylinder, the section being on the dotted line 3—3 of Fig. 4. Fig. 4 is a horizontal section of same on the dotted line 4—4 of Fig. 3. Fig. 5 is an enlarged longitudinal section of the lever connected with the piston rod of the liquid checking cylinder, the section being on the dotted line 5—5 of Fig. 6. Fig. 6 is a top view of same and illustrating particularly the adjustable clamp by which the lower end of the coiled spring is connected with the said lever. Fig. 7 is a vertical section of same on the dotted line 7—7 of Fig. 6.

In the drawings A designates the usual guide posts outlining the elevator shaft; B the hatch-way door, and C the frame surrounding said door at each floor of the building.

The elevator carriage or hoist is designated by the letter D and will be of any suitable construction. The carriage or hoist D is provided usually on its lower end with a cam E, shown by dotted lines in Fig. 1, and upon its upper end with a cam F, also illustrated in Fig. 1, the purpose of the cam E being during the descent of the carriage to come into contact with and actuate the automatic lever mechanism for opening the hatch-way door B, while the purpose of the cam F is during the ascent of the said carriage to come into contact with the lower side of the hatch-way door and open the same preparatory for the farther ascent of the elevator carriage, which in the customary manner will be elevated by a cable G. In the drawings we have illustrated but one hatch-way door B, but it will be understood that at each floor of the building there will be provided a door B and also the automatic lever mechanism hereinafter described for opening the same. The door B is horizontal and hinged at one edge to the beam H, the hinges being of any suitable construction and one of which is designated by the letter I, as illustrated in Fig. 1. The door B may be of any suitable construction and size. Upon the beam H is bolted the knuckle J whose ears or lugs extend upward upon opposite sides of the ear K formed upon the lower end of the cylinder L which is secured to the knuckle J by and adapted to have an oscillating movement upon the bolt M. The upper end of the cylinder L is provided with a suitable cap N, and within the cylinder is provided the piston O and piston rod P, the latter being pivotally secured at its upper end to the lever Q, which at one end is pivotally secured on the rod R and at its other end is pivotally connected with the rod S extending downward and being secured at its lower end to the hatch-way door B, as indicated in Fig. 1. The lower end of the piston rod P is threaded and passes through an internally threaded aperture in the vertical center of the piston O, the said rod carrying upon its lower end a nut T which loosely supports the disk or valve V, the latter being adapted to have a limited movement between the lower surface of the piston O and the upper horizontal surface of the nut T, as indicated more clearly in Fig. 3.

The piston O contains above the plate valve V the series of apertures W, all of which are within the line of the circle described by the said valve V and are adapted to be closed by said valve during the descent of the piston within the cylinder L. At one side of the piston O there is provided the threaded aperture X and tapered slot Y, the latter being wider at its upper end and gradually tapering toward and finally into the aperture X

at the lower end of the latter. The slot Y is less in width than the diameter of the aperture X and along its vertical open side communicates with the said aperture. Within the threaded aperture X is the screw *a* carrying the valve disk or washer *b* and adapted to be adjusted in the said aperture X for the purpose of regulating the exposure of the tapered slot Y. In Fig. 3 the position of the screw *a* is such that only a small portion of the lower end of the slot Y is exposed, and it will be evident from an inspection of Figs. 3 and 4 that by elevating the screw *a* a larger extent of the slot Y may be exposed and that by working the screw *a* downward the slot Y may be closed altogether, if desired. The disk or valve *b* is loose on the screw *a* and during the elevation of the piston O rests upon the upper end of the same closing the slot Y. During the use of the mechanism the piston O has a direct reciprocating movement in the cylinder L, which will contain a liquid of suitable character, such as oil or glycerine; and during the ascent of the piston O in said cylinder the liquid will pass downward through the series of apertures W and escape into the lower end of the cylinder, but during the descent of the said piston O the pressure of the liquid in the lower end of the cylinder will cause the valve V to close all of the apertures W and at such time the only passage for the liquid from the lower to the upper side of the piston will be the slot Y, and hence it will be noticed that the piston O may ascend quite freely but will be checked on its descent by the restricted passage Y through which the liquid must pass. The opening of the door B will thus be rendered free and easy, while its closing will be retarded owing to the restraint of the liquid in the lower end of the cylinder L. The screw *a* will be adjusted in its aperture X in accordance with the size and weight of the door B and other circumstances in order that only sufficient space may be left in the slot Y for the passage of the liquid consistent with the speed with which the door is to be closed and the weight of the door.

The lever Q has along its opposite upper edges the lateral flanges *d* which receive the opposite halves *e, e*, of the clamp *f*, the latter being illustrated more clearly in Figs. 5, 6 and 7. The two halves of the clamp *f* correspond with each other and are secured upon the lever Q at any desired point by means of the transverse bolts *g*, which pass through the halves *e, e*, above the lever Q. The halves of the clamp *f* are provided above the lever Q with the lugs *h* which bear against each other and resist the strain of the bolts *g*. The upper forward portion of the halves *e, e*, constitute ears which approach each other above the lever Q and receive the bolt *i* upon which is mounted the disk *m* having the eye *n* into which the lower end of the spring *j* is hooked. When the door B is closed the lever

Q is in substantially a horizontal position and the connecting rod S intermediate the said lever Q and the door is in substantially a vertical position. The spring *j* extends from the clamp *f* upward to an eye-bolt *t* which is adjustable in the plate *w* in order that the tension of the spring *j* may be regulated not only by the adjustment of the clamp *f* on the lever Q but also by that of the eye-bolt *t* in its retaining plate *w*. When the door B is closed the spring *j* is under a strong tension drawing upward on the lever Q and through said lever upon the rod S and door B. The strength of the spring *j* will of course vary with the weight of the door B, and should at all times be such that the door B no matter how heavy it may be, may be easily opened without material exertion either by hand or by lever power or by the elevator carriage D.

In the employment of the lever Q, rod S, checking cylinder L and spring *j* the door is provided with means which will permit it to be opened quickly and with the greatest facility and ease, and which when the door is released will check the same to such an extent that there will be no banging or jarring when the door meets its surrounding frame C. During the opening of the door B the rod S will move the lever Q upward on its bearing R and the lever Q will through the piston rod P draw the piston O upward within the cylinder L, the liquid in the latter in the meantime passing downward through the circle of apertures W and finding its way in the lower end of the cylinder. The spring *j* also during the opening of the door B draws upward on the outer portion of the lever Q and thus greatly aids the opening of the door. After the door has been opened and released its weight will be sufficient to cause it to descend, extending the spring *j* and moving the piston O downward through the cylinder L, the valve V at such time closing the apertures W and the liquid passing upward through the contracted slot Y to the upper side of the piston, thus retarding the closing of the door and insuring its being closed gradually and without noise.

When the cylinder L with its connections is applied to hatch-way doors where it is desired to use automatic means operable by the elevator carriage for opening the hatch-way doors, additional lever mechanism will be employed, and to this end we provide at a suitable point above the hatch-way door the main actuating lever A' pivoted at B' and having its longer arm extending upward and inward into the elevator shaft in position to be met by the cam E secured to the lower side of the elevator carriage D during the descent of the latter. The lever A' is provided beyond its bearing B' with the short arm C' which has an oscillating movement during the operation of the lever and extends outward toward the wall of the elevator shaft. Below the main actuating lever A' is secured the pivotally mounted auxiliary lever D', and

intermediate this lever and the short arm C' is provided the link or connecting rod E' which is pivotally secured at each end, the lower end of the connecting rod E' having the knuckle F' directly pivoted to the slide G' mounted upon said auxiliary lever D'. The slide G' is adjustable on the lever D' and provided with a set screw H' by which it may be secured in any desired position on said lever. Upon the lever D' is also adjustably secured by means of a set screw I' the slide J', to which is pivoted the knuckle K' secured in a pivotal manner to the upper end of the connecting rod L', which extends downward and is pivotally secured to the door B. The rod B', which serves as a bearing for the main actuating lever A', is mounted in the casting M' secured to the standards N', N', as shown more clearly in Fig. 2. The auxiliary lever D' is provided with an adjustable slide O' having the set screw P' and receiving the lower end of the coiled spring Q' whose upper end is secured to an eye in convenient relation to the casting M' as shown in Fig. 2. The spring Q' exerts a firm upward tension on the lever D' and facilitates the upward movement of the latter when the lever mechanism is set in motion by the contact therewith of the descending elevator carriage D. During the descent of the carriage D the cam E, or any other suitable form of cam that may be employed, will come into contact with the upper portion of and ride down the lever A', depressing the longer arm of the latter and causing the shorter arm C' thereof to move upward on its bearing B', and, through the connecting rod E', draw the lever D' upward on its bearing, the latter lever being thereby caused to draw its connecting rod L' upward and open the door B. It will be observed that the auxiliary lever D' has a movement parallel with the wall of the elevator shaft and that the short arm C' of the lever A' has a movement toward the said wall, and this difference in the movements of the levers renders it expedient to employ the pivoted knuckles F', K', in order that there may be no strain on the parts.

One of the main objects of the arrangement of the lever mechanism above described is to render a very short movement of the arm C' sufficient for the full opening of the door B', and this object is fully accomplished by the interposition of the auxiliary lever D' and connecting rods E', L'. A short movement of the arm C' is necessary, owing to the fact that in the majority of instances only a very limited space can be occupied by the lever mechanism; frequently the lack of space in elevator shafts is a matter of serious consequence. The arrangement of lever mechanism above described, however, permits the full opening of the door without cutting the wall and with a minimum travel in the shorter arm of the main actuating lever A'. The movement of the arm C' is sufficient to elevate the lever D' on its bearing, and this le-

ver through the connecting rod L' and having an extended movement in itself is fully capable of opening the door B' with ease and within a very limited space. After the carriage has passed downward through the opening left by the open door B, the latter will gradually close and the levers A', D', will be restored to their former position. In order that the carriage may be enabled to easily operate the lever mechanism without jarring the car and without noise, the spring Q' is provided, the tendency of the latter being to draw the lever D' upward under the lightest pressure of the carriage D upon the upper end of the lever A'. The spring Q' also facilitates the closing of the door B without noise and the return of the levers and connecting rods to their normal position without jar or noise, since the descent of the lever D' operates to extend the spring Q' and the restraint of the latter is exerted on the former until the door B and the lever mechanism have assumed their normal position at rest. The automatic lever mechanism freely opens the door B, as above specified, without strain, jar or noise and at a speed appropriate for fast running elevators, and when open and after the passage of the elevator carriage the door may be quickly released, since the checking cylinder will hold it in restraint from the moment the weight of the door is brought to bear on the piston O and permit the door during its full movement to close gradually and softly.

35 The invention is not confined to the precise details of construction above described, and these may be varied at will within the scope of the invention as claimed.

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

1. The hatchway and the horizontal door for same, combined with the checking cylinder, the piston therein having the openings and oppositely acting valves, the adjusting screw for the smaller of said openings, and intermediate connections whereby the movement of the door is transmitted to said piston; substantially as and for the purposes set forth.

2. The hatchway and the horizontal door for same, combined with the liquid checking cylinder, the piston therein, passages from one

side to the other of said piston, the pivoted lever connected with the piston rod, the connecting rod intermediate said lever and said door, the clamp on said lever, and the coiled spring secured to said clamp and having a tension upward on the door; substantially as and for the purposes set forth.

3. The hatchway and the horizontal door therefor, combined with the checking cylinder, the piston therein, passages from one side to the other of said piston, the pivoted lever Q connected with the piston rod and having lateral flanges d, the divided clamp f adjustable on said lever, the coiled spring j secured to said clamp; and the rod intermediate said lever and said door; substantially as and for the purposes set forth.

4. The hatchway and the horizontal door therefor, combined with the checking cylinder, the piston therein having the apertures W valve V aperture X tapered slot Y and screw a, and intermediate connections whereby the movement of the door is transmitted to said piston; substantially as and for the purposes set forth.

5. In hatchway door mechanism the main actuating lever whose longer arm projects into the shaft at an angle to the wall adjacent to which it is pivoted, combined with the auxiliary lever pivoted to move on a plane parallel with the wall, the rod intermediate said levers, and the rod intermediate said auxiliary lever and the door; substantially as and for the purposes set forth.

6. In hatchway door mechanism, the main actuating lever whose longer arm projects into the shaft, combined with the auxiliary lever pivoted to move on a plane parallel with the wall, the rod intermediate said levers, the rod intermediate said auxiliary levers and the door, and the coiled spring exerting a tension upward on said auxiliary lever; substantially as and for the purposes set forth.

Signed at New York city this 17th day of March, 1893.

WILLIAM BARDSLEY.
WARREN K. CROFFORD.

Witnesses:

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