(No Model.) 2 Sheets—Sheet 1.

W. K. CROFFORD & W. BARDSLEY.

HATCHWAY DOOR MECHANISM.

No. 494,550. Patented Apr. 4, 1893.

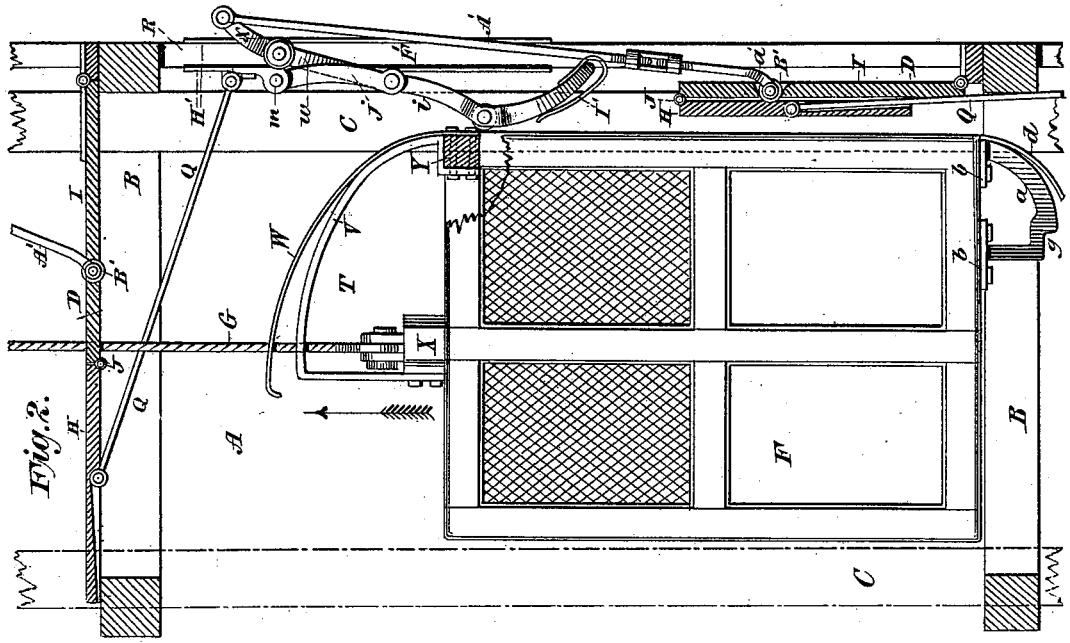

Fig. 2.

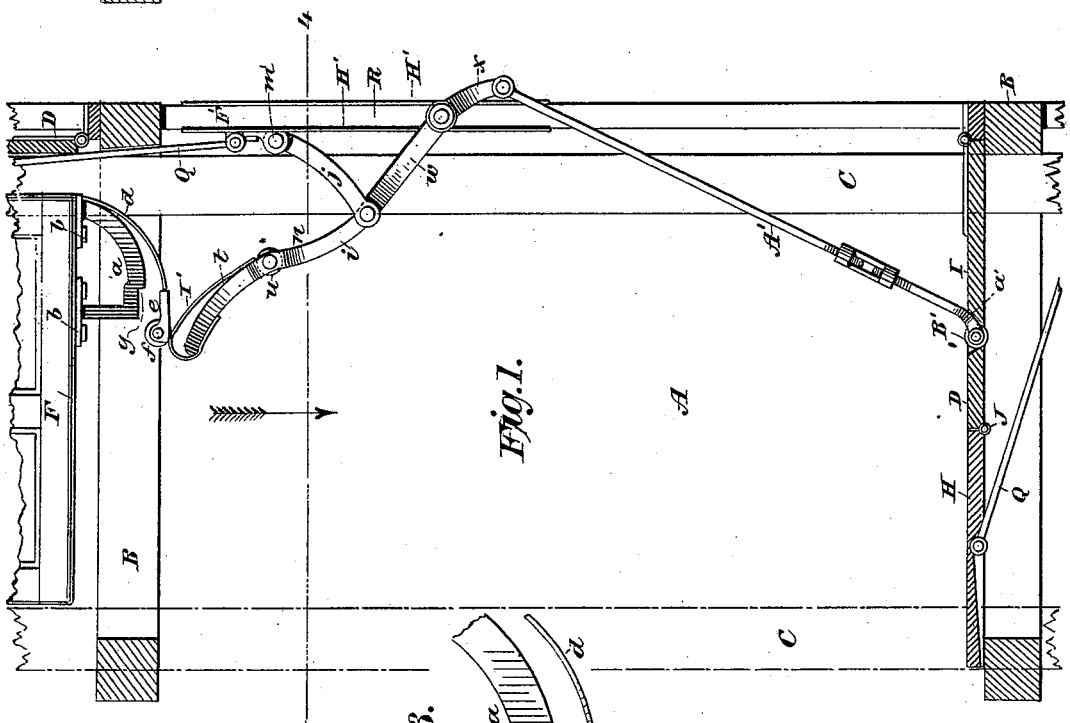

Fig. 1.

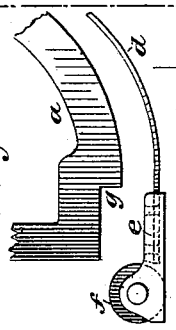

Fig. 3.

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(No Model.) 2 Sheets—Sheet 2.

W. K. CROFFORD & W. BARDSLEY.

HATCHWAY DOOR MECHANISM.

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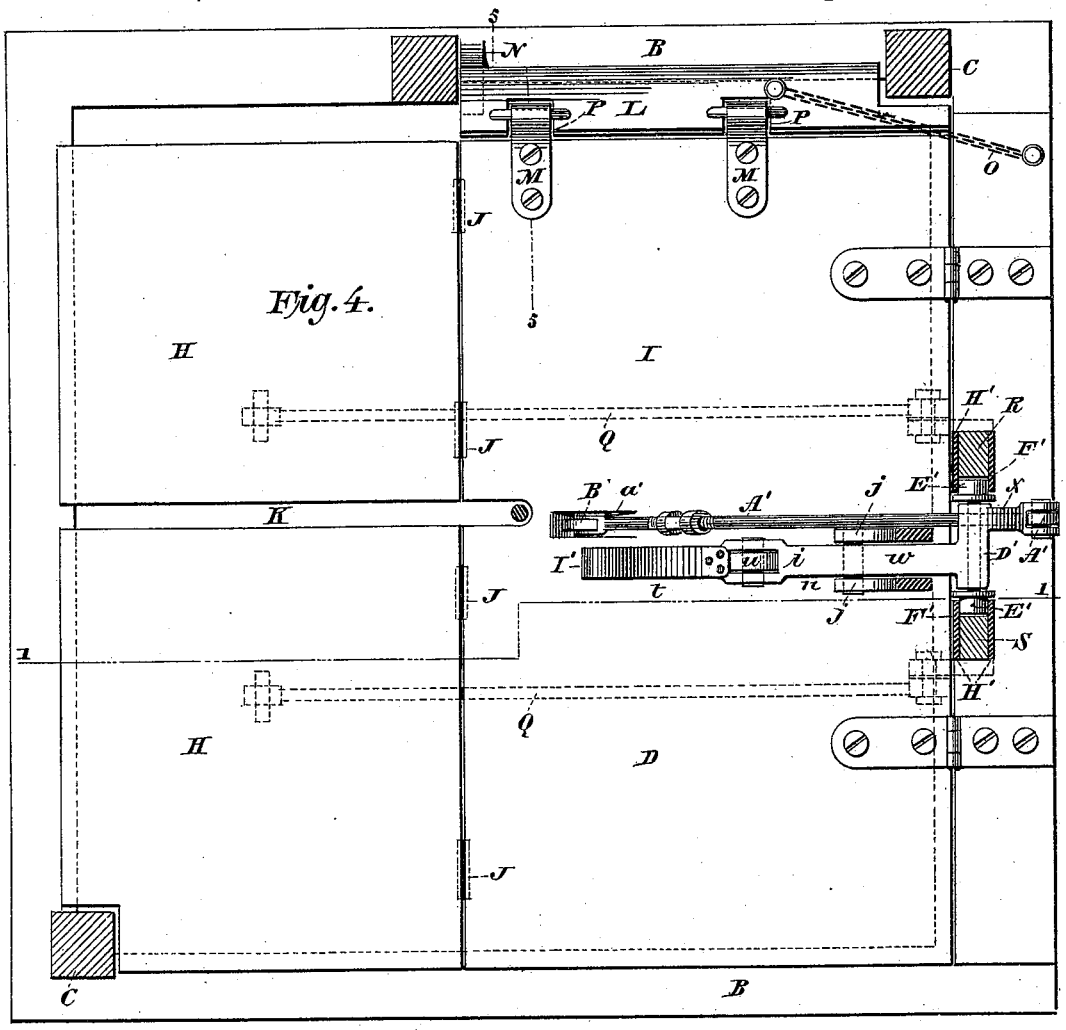

Fig. 4.

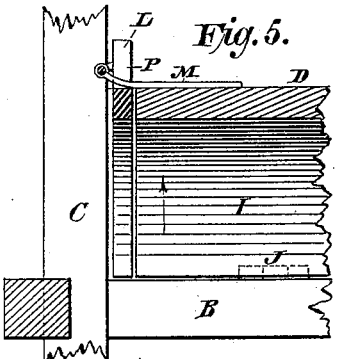

Fig. 5.

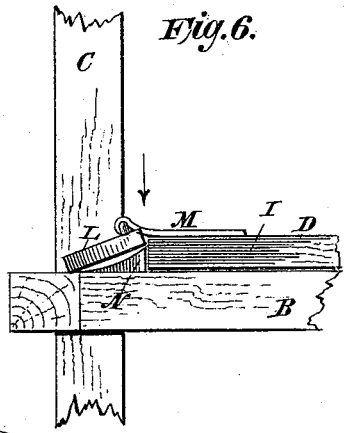

Fig. 6.

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UNITED STATES PATENT OFFICE.

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HATCHWAY-DOOR MECHANISM.

SPECIFICATION forming part of Letters Patent No. 494,550, dated April 4, 1893.

Application filed March 1, 1892. Serial No. 423,339. (No model.)

To all whom it may concern:

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

The invention relates to improvements in hatchway door mechanism, and consists in the novel devices and combinations of parts hereinafter described and particularly pointed out in the claims, and by which the doors at the various floors of the building may be automatically opened and closed during the ascent and descent of the carriage or hoist.

The object of the invention is to produce effective, safe and convenient hatchway door mechanism adapted for use in connection with swift running elevators.

Referring to the accompanying drawings Figure 1 is a vertical section through an elevator shaft employing mechanism embodying the features of the present invention, the section being on the dotted line 1—1 of Fig. 4 and showing the elevator carriage on its descent into contact with the leverage mechanism connected with the door. Fig. 2 is a like view of same showing the position of said leverage mechanism when the door connected with it is open. Fig. 3 is an enlarged detached view of a portion of the cam connected with the lower end of the elevator carriage or hoist for acting upon the leverage mechanism during the descent of the said carriage. Fig. 4 is an enlarged transverse section of the elevator shaft, looking downward upon the leverage mechanism and the door connected therewith, said section being on the dotted line 4—4 of Fig. 1. Fig. 5 is a vertical section, partly broken away, on the dotted line 5—5 of Fig. 4 and showing the door in a partly open position with the supplemental or auxiliary hinged door turned inward against the edge of the main door for the purpose of avoiding the usual adjacent vertical post or guide. Fig. 6 is a front edge view of the door shown in its closed position with the auxiliary hinged door extended outward to close the space between the framing of the hatchway and the main door.

In the drawings A designates the elevator shaft; B the framing at each floor of the building encompassing said shaft; C the usual guide posts; D the doors at each floor of the building, and F the usual elevator carriage or hoist connected with the cable G. The doors D are hinged to the frame B and are composed of the two sections H, I, secured together by the hinges J whose position is such that upon the doors D being opened the sections H will fold downward to the position illustrated in Fig. 2. The doors D are provided with the customary slot K for the hoisting rope or cable G, and are also each provided with the auxiliary door L secured by hinges M to the main body of the door adjacent to the guide C, as illustrated more clearly in Fig. 4. When the door D is composed of sections H, I, the former being adapted to fold downward; the auxiliary door L will be hinged to the section I, but when the door D is not composed of sections the auxiliary door L will preferably extend the full length of said door D. The auxiliary door L is designed to turn downward upon its hinges M when the main door D is open, as illustrated in Fig. 5, in order thereby to avoid contact with the post C; and upon the closing of the main door D the auxiliary door L turns upward and outward again to its former position, thereby closing the space between the edge of the main door D and the surrounding framing B, said space being in line with the guide C and being indicated by the dotted line in Fig. 4. During the opening of the main door D the auxiliary door L will turn downward to the position shown in Fig. 5 by its own specific gravity and thus be enabled to pass the post C, and when the door D is closed the auxiliary door L may be turned upward and outward to its initial position, being that illustrated in Fig. 6, either by the employment of a cam N or the chain O, or both said cam and chain. In case the chain O is employed for returning the auxiliary door L to its initial position the length of the chain should be such that upon the closing of the door D it will at the proper moment draw on and cause the turning upward and outward of the auxiliary door to the position shown in

Fig. 6. When the cam N is employed for moving the door L we prefer that the same taper downward and outward from its inner edge, as illustrated in Fig. 6, in order that the said door L, when the door D is closed, may assume the inclined position illustrated.

It is to be noted that the hinges M at the point of their connection with the auxiliary door L are on a higher plane than the horizontal upper surface of the door D when the latter is closed and that the thickness of the auxiliary door L is less than that of the main door D; and it will be seen also upon reference to Fig. 4 that the edge of the auxiliary door L is provided with the notches P of sufficient size to snugly receive the outer portion of the hinges M when said auxiliary door is turned downward to admit of its passage by the vertical guide C. By the hinging of the auxiliary door L on a higher plane than the upper surface of the main door D we are enabled to preserve the maximum amount of space for the passage of the elevator carriage F through the shaft A when the doors D are open, since by reason of the said hinging of the auxiliary door L the outer edge of the latter will, when the main door D is open, be about on the same plane as the lower surface of said main door; thus the auxiliary door L when the door D is open will not materially project outward into the elevator shaft but will have its projecting portion at the outer side of the main door D as indicated in Fig. 5, the notches P permitting the turning of the auxiliary door L to bring its inner edges upward beyond the horizontal plane of the door D. The elevator carriage F opens and closes the doors D during its ascent and descent being provided upon its upper and lower ends respectively with cams of novel construction, as hereinafter described, for the purpose on the ascent of the carriage of coming into contact with the lower surface of the doors D and opening the same to the position shown in Fig. 2.

Since the doors D are composed of the hinged sections, H, I, it is necessary that upon the closing of the doors some means be provided for causing the outer hinged section H to assume its former horizontal position, and hence we have connected said outer sections H of the doors D with the hinged rods Q, indicated by dotted lines in Fig. 4 and by full lines in Fig. 2, which rods extend at an angle below the doors and are pivotally secured at their outer or lower ends to the vertical guide posts R, S, or to the wall of the elevator shaft as may be preferred; the sole object of the rods Q is to insure the outward movement of the sections H of the doors D when the latter are closed.

The elevator carriage F is provided upon its upper end with the cam T composed of the rigid metal frame V and spring W. The metal frame V has a curved upper surface, as illustrated more clearly in Fig. 2, and is secured at one end to the usual center beam X, while the other end of said frame V is bent into angular form and fitted against the cross-beam Y to which it is bolted. The spring W conforms in general outline to the curved surface of the metal frame V and is secured at its lower end to the cross-beam Y as indicated in Fig. 2. The lower portion of the spring W closely impinges the lower outer portion of the frame V and at its upper portion as shown in Fig. 2 diverges from the curvature of the frame V in order that a cushioning effect may be secured when the upper end of said spring comes into contact with the lower surface of the door D.

The form of the frame V and the method of securing it to the beams X, Y, are novel, and the fact that the bolts securing the end of the frame V to the beam Y are also utilized for securing the lower end of the spring W to said beam, renders the construction entirely durable and reliable.

The cam at the lower end of the elevator carriage F is illustrated more clearly in Figs. 1 and 3, and said cam consists of the frame *a* having the flanges *b* bolted to the lower surface of the carriage and having also the spring *d* which extends downward on a larger arc than the main arc of the cam *a*. The outer end of the spring *d* has secured to it the metal box *e* in the outer end of which is mounted the roller *f* whose lower surface is about on the same plane as that of the spring *d* and whose object is, upon the descent of the elevator carriage, to make the first contact with the automatic leverage mechanism hereinafter described. The outer end of the box *e* is entirely open between its opposite sides and hence the roller *f* is fully exposed at its circumference at all times. The lower edge of the cam *a* is provided with recess *g* to receive the box *e* when during the operation of the devices the spring *d* is pressed close against the lower curved surface of the cam *a*, thereby insuring an even and regular contact of said spring with the cam.

The width of the cam T on the top of the elevator carriage will be slightly less than the width of the slot K in the doors D, in order that upon the opening of the latter the hinged section H thereof may freely fold downward, supported by the rods Q, the slot K at such time passing over the opposite sides of said cam. The width of the cam *a* and spring *d* at the bottom of the carriage F is about equal to or slightly greater than that of the main operating lever *i* with which they come into contact during the descent of said carriage. The lever *i* is pivotally secured between the lower ends of the arms, which constitute a link *j* suspended from the horizontal pivot *m*, and said lever *i* at the inner side of said link *j* is formed with the convex and concave portions *n*, *t*, at the junction of which is provided the roller *u*. At the outer side of the link *j*, the lever *i* is composed of the intermediate portion *w* and the short downwardly extending arm *x*, to which is secured the upper

end of the connecting rod A′, whose lower end is bent outward as at a' and pivotally secured to the door D on the pivot carrying the roller B′, as shown in Figs. 1 and 2.

Between the portions w, x, of the outer end of the lever i there is formed the horizontal bearing D′, through which passes a shaft, as shown by dotted lines in Fig. 4, carrying upon its ends the rollers E′, which are confined and directed in their movement by the guides F′ composed of the vertical beams or posts R, S, and the metal plates H′ secured thereto. The main body of the lever i and the short arm x thereof are on different vertical planes, as shown in Fig. 4, and hence when said lever is turned downward under the action of the descending carriage its end may pass the connecting rod A′, without danger of striking it. The upper end of the lever i has secured to it the bowed spring I′, which serves as a cushion therefor, and this cushion is important particularly for use in connection with swift running elevators.

The normal position of the lever i and connecting mechanism is shown in Fig. 1, the door D being closed, and the extreme folded position of said lever and connecting mechanism is illustrated in Fig. 2, the door D being open. Upon the descent of the carriage F, the roller f followed by the spring d, comes into contact with and depresses the upper end of the lever i, turning said lever to the inverted position presented in Fig. 2, and thereby through the rod A′ opening the door D preparatory to the continued downward travel of the carriage. During the turning downward of the lever i, the rollers E′ travel upward in the guides F′ and permit a quick movement of the lever and the rapid opening of the door D. When the lever i, link j and rod A′ are arranged as shown, they are permitted to fold compactly and in the minimum amount of space, as indicated in Fig. 2. As the carriage F passes downward, the lever i is gradually released and returns to its normal position, and the door D closes, the rods Q during the closing of the door turning the hinged sections H thereof outward to their former horizontal position. During the ascent of the carriage the cam T comes into contact with the roller B′ and opens the door D, the upward movement of the rod A′ folding the lever i downward and the rods Q drawing the hinged section H of the door downward, as shown in Fig. 2, thus clearing the shaft A for the passage of the carriage. As the carriage passes upward beyond the door D the latter closes as before and the lever i and connections return to their normal position. Upon the descent of the carriage the roller f follows along the outer portion of the working face of the lever i, and thereafter the roller u on said lever follows along the spring d sustained by the cam a to complete the opening of the door. The roller f on the spring d will thus be specially useful when employed in connection with an operating lever having a roller u located about midway of its working surface, under which condition the roller f forms the contact during the first part of the opening of the hatchway door and thereafter the roller u continues the contact during the remainder of the opening of the door.

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

1. The hinged hatchway door composed of the sections H, I, hinged to each other, the hinges being arranged oppositely so that as the door opens upward the hinged section H will fold downward, combined with the hinged rod Q connected directly with said section H at a point beyond its hinges, and extending at an angle below the door, the carriage having the cam on its upper end adapted on its ascent by direct contact with the door to open the same, and lever mechanism independent of the rod Q for opening said door on the descent of the carriage; substantially as set forth.

2. The carriage having upon its lower end the rigid cam curving toward the edge of the carriage, the spring secured at one end and free at the other and extending over the curved surface of said cam, and the roller f journaled to said spring, combined with the hinged door, and a pivotally mounted lever connected at one end to said door and having about midway of its working face the roller u; substantially as and for the purposes set forth.

3. In hatchway door mechanism, the pivotally secured swinging link, and the reversely curved rocking lever pivotally sustained by and adapted to move with said link and provided with rollers on the opposite sides of its lower end, combined with the vertical guides receiving and directing said rollers and the door connected with the lower end of said lever; substantially as and for the purposes set forth.

4. In hatchway-door mechanism, the link, and the reversely curved lever pivotally secured to said link and constructed at its lower end with the horizontal bearing D′ and arm x, the latter being on a plane different from that of the main body of said lever, as shown, combined with the vertical guides for the lower portion of said lever the door, and the connection between said door and said arm x; substantially as and for the purposes set forth.

5. In hatchway door mechanism, the pivotally mounted lever, and the hinged door having the roller B′, combined with the rod A′ connecting said lever and door, the lower end of the rod at a' being bent outward and secured to the pivot of the roller B′; substantially as and for the purposes set forth.

6. The hinged hatchway-door, combined with the auxiliary door L secured to the edge thereof by hinges M and having notches P for passage over said hinges, said auxiliary door being hinged to turn downward along the edge of the main door during the opening of the latter; substantially as and for the purposes set forth.

7. The hinged hatchway door, combined

with the auxiliary door L hinged thereto on a higher plane than the horizontal upper surface of the main door and adapted to turn downward along the edge of the latter when said main door is opened; substantially as and for the purposes set forth.

8. The hinged hatchway-door D, combined with the auxiliary door L hinged to the edge thereof and adapted to turn downward at right angles to the main door when the latter is opened; substantially as and for the purposes set forth.

Signed at the city of New York, in the county and State of New York, this 27th day of February, 1892.

WARREN K. CROFFORD.
WILLIAM BARDSLEY.

Witnesses:
CHAS. C. GILL,
ED. D. MILLER.