

(No Model.)

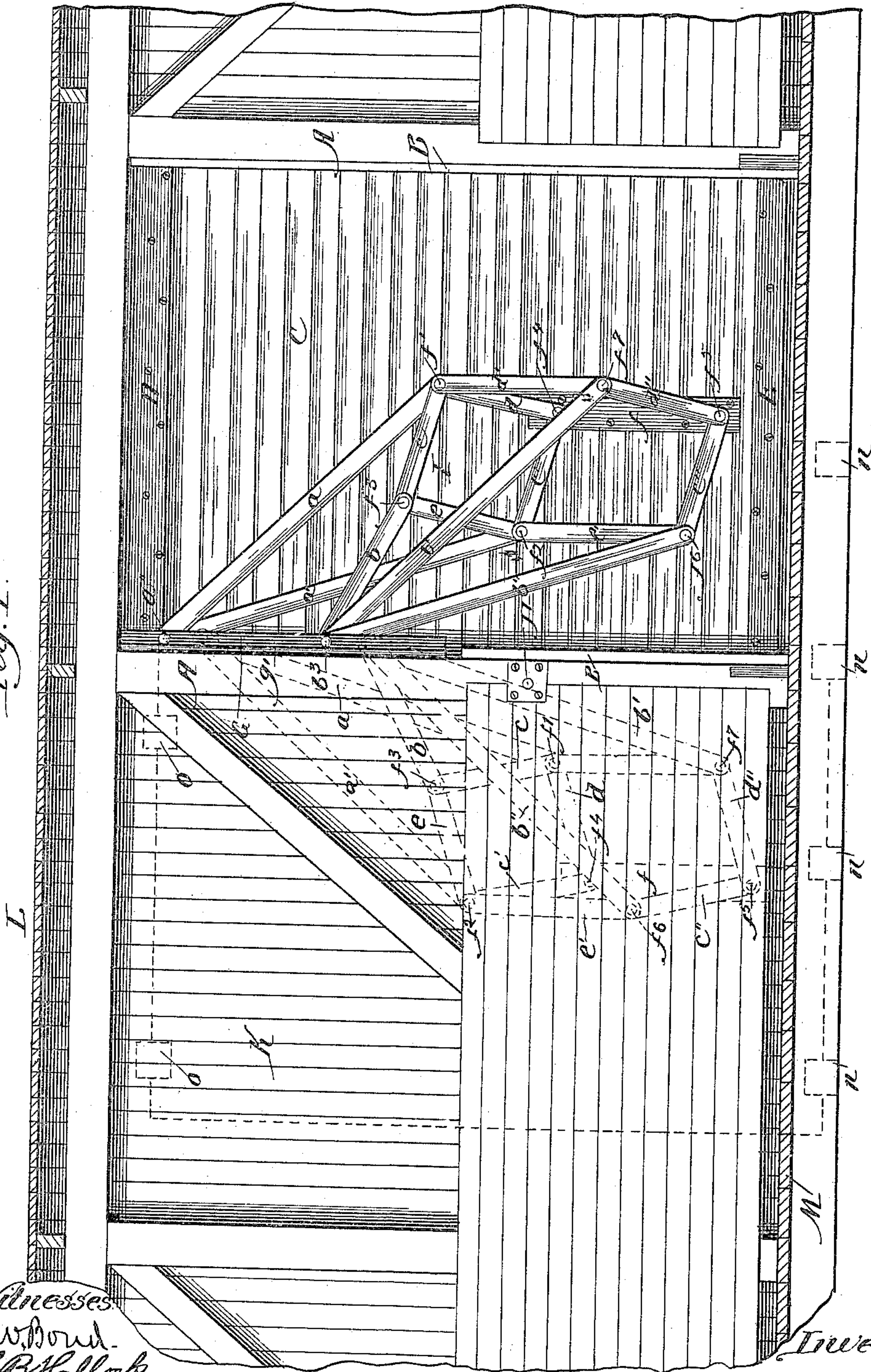
2 Sheets—Sheet 1.

E. A. HALDEMAN.
DOOR HANGER.

No. 446,516.

Patented Feb. 17, 1891.

Fig. 1.



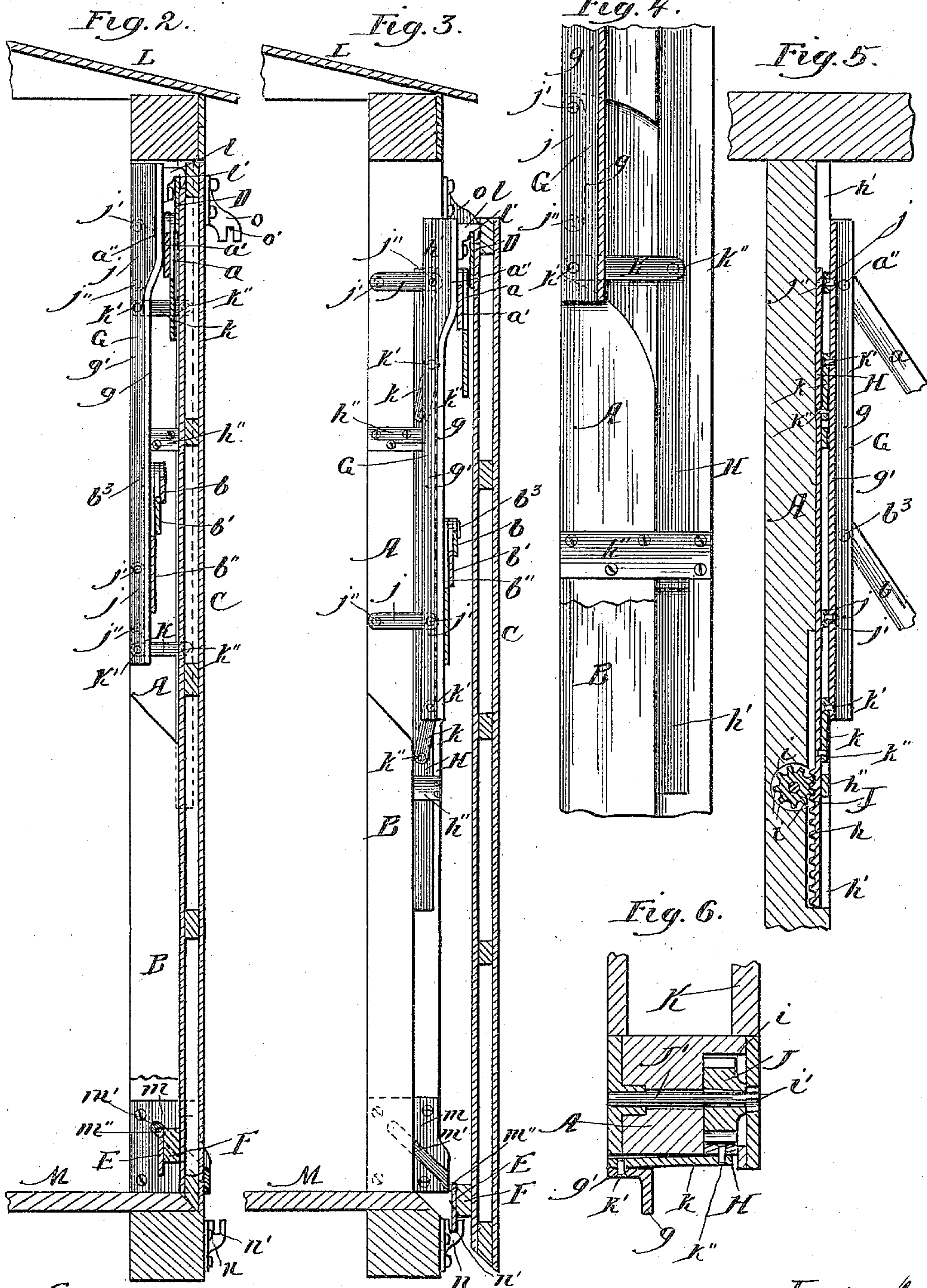
Witnesses
O. W. Bond.
H. B. Hallock.

Inventor.
Ephraim A. Haldeinan

E. A. HALDEMAN.
DOOR HANGER.

No. 446,516.

Patented Feb. 17, 1891.



Witnesses:
O. W. Bond-
H. B. Hallock.

Inventor:
Ephraim A. Haldeeman

UNITED STATES PATENT OFFICE.

EPHRAIM A. HALDEMAN, OF CHICAGO, ILLINOIS.

DOOR-HANGER.

SPECIFICATION forming part of Letters Patent No. 446,516, dated February 17, 1891.

Application filed September 3, 1888. Serial No. 284,503. (No model.)

To all whom it may concern:

Be it known that I, EPHRAIM A. HALDEMAN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Door-Hangers; and I do hereby declare the following to be a full, clear, and exact description of the invention, that it pertains to make and use the same, reference being had to the accompanying drawings, forming a part hereof, in which—

Figure 1 is an elevation showing in full lines the door closed and in dotted lines the door open; Fig. 2, an edge elevation, partly in section, showing the door closed; Fig. 3, an edge elevation, partly in section, showing the door swung out and in position for opening; Fig. 4, a detail, partly in section, showing the sliding rack-bar and the movable support; Fig. 5, a sectional elevation edgewise through the sliding rack-bar and the movable support, showing the pinion for operating the rack-bar; Fig. 6, a cross-section through the door-frame, showing the rack-bar, its operating-pinion, and the movable support.

This invention relates to door-hangers designed for use with sliding doors or doors which slide edgewise, such as freight-car doors and other sliding doors.

The objects of the invention are to dispense with guide-rails, shoes or rollers, carriages, and other appliances heretofore employed with sliding doors, and thereby simplify the construction and improve the operation of pivoted suspending-arms arranged in pairs for suspending and moving the doors; to construct a door-hanger of pivoted arms in pairs and pivoted links, which requires but the minimum of labor and force to open and close the door, and which at the same time gives the movement of the arms always in a straight plane for sliding the door in either direction, and thereby insure an easy movement in opening and closing the door; to suspend the door from a movable support which can be raised and lowered to cause the door to enter and be withdrawn from its opening, and operating to have the door when closed flush or even with the outside wall of a car or other receptacle, or with the side or wall of a building or room with which the door is used, it

being understood that the hanger is applicable to doors lying outside of the plane of the wall with which the door is used, the feature of insetting the door being especially adapted for freight-cars or other car-doors, by which the minimum of friction of air on the side of the car will be attained, the feature of insetting the door into its opening effecting also increased safety and security, as the operation of closing the door will securely lock the same, and to improve generally the construction and operation of door-hangers, as hereinafter more specifically described, and pointed out in the claims, by which the door will always be in operative condition and the sagging thereof will be overcome and the door will always be in condition to be opened and closed with readiness and ease; and its nature consists in providing suspending-arms in pairs, each pair swinging from a fixed pivot and pivotally connected to the object to be moved for producing a straight-line travel for the object without changing the points of attachment of the suspending-arms; in providing suspending-arms in pairs, each pair having a pivot and a pivotally-connected radial link to limit the horizontal movement of the arms; in providing suspending-arms in pairs, each pair radiating from its pivot, a radial link, and a series of links connecting the suspending-arms with the movable object; in providing suspending-arms in pairs, each pair swinging from its pivot, a pivotal radial link, and a parallelogram connecting the movable object and the suspending-arms; in providing a series of links pivoted one to the other and swinging from pivotal points and pivotally connected to suspending-arms; in providing a movable support carrying suspending-arms in pairs and pivoted connecting-links between the arms and the movable object or door; in providing a movable support carrying a door, a sliding bar, and links connecting the support with the door-frame and sliding bar; in providing a compensating parallelogram forming a connection between suspending-arms and a movable object or door and pivotally connected to the arms and object; in providing a compensating parallelogram formed of links pivoted one to the other and auxiliary links and supplemental links for insuring a connection between suspending-arms in pairs

and a movable object, and in the several parts and combinations of parts hereinafter described, and pointed out in the claims as new.

5 The invention is illustrated in the drawings as applied to and used in connection with a door of a freight-car, which when closed enters and fills the door-opening, and the construction and operation of the several parts
10 entering into the invention will now be described, such parts consisting of pivoted suspending-arms in pairs, each pair swinging from a fixed pivot, and a series of pivoted links, auxiliary links, and supplemental links
15 forming the door-hanger as a whole, which door-hanger can be applied to sliding doors generally where it is desired to have the door, in opening and closing, move in the same plane.

20 In the drawings, A represents the frame of the doorway; B, stop-pieces secured to the side pieces of the frame for limiting the inward movement of the door; C, the door; D, a guide rail or strip at the top of the door; E,
25 a guide rail or strip at the bottom of the door; F, a strip secured to the inside of the door and to which, in the construction shown, is secured the strip E, and G the sliding support to which the door-hanger is pivoted. This
30 support, as shown, is formed of two sides g and g' , standing at right angles to each other, with the side g' straight and the side g at its upper end projected or thrown out, as shown in Figs. 2 and 3. This support is pivoted to
35 the side of the door-frame by links j , one end of each link being attached to a pin or pivot j' on the side piece of the frame and the other end of each link being attached to a pin or pivot j'' on the part g' of the sliding support
40 G, as shown in Figs. 2, 3, 4, and 5. These pivoting-links j allow the support G to move vertically, and by such vertical movement the support G is carried in and out by the action of the pivoting-links j .

45 H is a sliding bar having at its lower end a rack h and entered into a groove h' , formed therefor in the face of one side piece of the door-frame and held in its groove so as to be free to slide up and down by strips h'' , secured
50 to the side piece of the door-frame over the sliding bar H, as shown in Figs. 2, 3, 4, and 5. The sliding bar H is connected with the support G by links k , one end of each link k being attached to a pin or pivot k' on the part g' of the support
55 G and the other end of each link k being attached to a pin or pivot k'' on the sliding bar H, so that as the sliding bar H is raised and lowered vertically the support G will be likewise raised and lowered, and at the same time
60 the support G will be moved in or out, and these movements will occur by reason of the action of the pivoting-links k , which links carry the support G upward with the movement of the bar H and at the same time carry
65 the support inward, and with the descent of the bar H the links k carry the support G down and at the same time out.

I is the door-hanger, consisting of the primary links or arms a and a' , constituting a pair of suspending-arms and both pivoted at
70 one end to a common pin or pivot a'' on the part g of the support G to have the arm or link a adjacent to the face of the door C, and other primary links or arms b' b'' , constituting a pair of suspending-arms, are pivoted by
75 a common pin or pivot b^3 on the part g of the support G, as shown in Figs. 1, 2, and 3, and these suspending-arms in pairs a a' and b' b'' are arranged for the arms of each pair to act together, and the arms are each of the
80 same length, and from the pivot b^3 a shorter link or arm b swings, which link b constitutes a radial link for limiting and regulating the movement of the other members of the construction that is causing the door or movable
85 object to move in a straight line.

The primary arms or links a a' and b' b'' radiate in pairs from their pivotal points, and their outer or free ends are pivotally connected to compensating links and to auxiliary
90 links, and the compensating links consist of a series of links c , c' , d , and e , which form when connected a compensating parallelogram, to one corner of which is pivoted the outer end of the link or arm a by a pin or pivot f' , which
95 also pivotally connects the link c to the link d , as shown in Fig. 1, and the arm or link a' is pivotally connected to the diagonally-opposite corner of the compensating parallelogram by a pin or pivot f^2 , which pin or pivot
100 also pivotally connects the link c' to the link e , as shown in Fig. 1, and the radial arm or link b is connected with a corner of the compensating parallelogram by a pin or pivot f^3 , which pin or pivot also connects the link e
105 with the link c , as shown in Fig. 1, and the link c' is connected with the link d by a pin or pivot f^4 , projecting from the stationary plate f , screwed or otherwise firmly fastened to the face of the door C, connecting the diagonally-opposite corner of the parallelogram to that to which the radial link or arm b is connected to a stationary point on the door.
An auxiliary link d' is pivoted to the pin or pivot f' , and a corresponding auxiliary link
115 e' is pivoted to the pin or pivot f^2 , and these auxiliary links d' and e' are connected by supplemental links c'' and d'' , pivoted to a common pivot f^5 , projecting out from the plate f . The free end of the link c'' is connected to
120 the link e' by a pin or pivot f^6 , which pin or pivot also connects the free end of the link or arm b'' , and the free end of link d'' is connected with the link d' by a pin or pivot f^7 , which pin or pivot also connects the arm or
125 link b' at its outer or free end.

The form, arrangement, and manner of pivoting the suspending links or arms in pairs and the radiating link or arm, the compensating parallelogram, the auxiliary links, the
130 supplemental links, and the stationary pivot are shown in Fig. 1, in which figure the several parts are shown in full lines in the position they occupy and their relation one to

the other when the door is closed and by dotted lines when the door is open.

J is a pinion secured to a stem J' for its cogs or leaves to mesh with the rack h , as shown in Figs. 5 and 6. This pinion is located in an opening formed therefor in the side piece of the door-frame, which opening i is located in line with the groove h , and one end i' of the stem J' is squared to receive a key or lever by which the pinion can be rotated to move the bar H.

K is the side of a car, L the roof of a car, and M the floor of a car.

As shown, a lug l , having a slot l' , is secured to the upper end of the support G on the part g to receive the guide-strip D when the door is closed, as shown in Fig. 2, and to each side piece of the door-frame above the floor M is secured a plate m , having an inclined slot m' for the passage therein of a pin m'' on the end of the guide-strip E, as shown in Figs. 2 and 3, by means of which slot and pins the door when closed is held from swinging out at the bottom, and these slots and pins m' and m'' serve to guide the door when entering the doorway. A series of lugs n , Figs. 1, 2, and 3, are arranged on the outside of the car in the same plane as that on which the door opens, and each lug n has a slot n' to receive the guide-strip E to hold the door from swinging outward, and on the side of the car, as shown in Figs. 1, 2, and 3, is a series of lugs o , each having a slot o' to receive the guide-strip D when the door is open and hold the door in place at the top in opening and closing, the same as the lugs n hold the door at the bottom in opening and closing.

The operation is as follows: The door-hanger I, when the door is closed, stands in the position shown in Fig. 1 with the primary arms a a' b b' b'' radiating from their respective fixed pivots a'' and b'' and with their free ends attached, respectively, to the movable pivots carried by the compensating parallelogram and the auxiliary arms or links. The door, as shown in Fig. 1, is closed and entered into the doorway, and to open the door a suitable key or lever is placed on the square end i' of the stem J' and the stem turned for the pinion J to act on the rack h and carry down the sliding bar H, and in and by the descent of the sliding bar H the links k at the end attached to the bar H are carried down, drawing down such links, and with them the door B, and with the descent of the door the links j are turned down, forcing the door B outward. The links j , when the door is closed, stand vertical, as shown in Fig. 2, and the links k , when the door is closed, stand horizontal, as shown in Fig. 2, and as the support G descends by the action of the sliding rack-bar H the links j turn on their pivots j'' and the links k turn on their pivots k' , the links also turning on their respective pivots j'' and k' , and these links, when the door C has descended and been forced outward to a posi-

tion for opening, will stand with the links j horizontal and the links k nearly vertical, as shown in Fig. 3. The guide-lug l descends with the support G, and as the door is suspended from the support G the door will descend and the guide-strip D will be in the lug l , and as the door descends the pins m'' will pass out of the slots m' , and the guide-strip E will enter the slot n' of the lug n below the door, holding the bottom of the door against outward swing, and when down the guide-strip D aligns with the slots o' of the lugs o . The door is now ready for opening. The door, when in position for opening, is suspended from the support G by the hanger I, so as to hang free and clear for a slight exertion to move it into its open position, as shown by the dotted lines in Fig. 1, and in opening the suspending arms or links the compensating parallelogram, the auxiliary links in pairs, the radial link, the supplemental links, and the pivot-plate are carried over into the position shown in Fig. 1 by the dotted lines, so that the arm or link a' is outside, the arm or link b' is inside, and the arm or link b'' in the middle, with the link c occupying the position of the link d , d that of c' , c' that of e , e that of c , as shown in Fig. 1, and the other links accordingly, the several links assuming the different positions without changing the plan of the movement of the door by reason of the compensating parallelogram and the auxiliary and supplemental links. The door is closed by sliding it back into position shown in Fig. 1 with the door down, as shown in Fig. 3, and in this position the key or lever is turned to rotate the pinion J and raise the rack-bar H, carrying up with it the support G through the connecting-links k , raising the door C, and on the upward movement of the support G the links j and k turn and carry the door into its opening, the pins m'' passing up in the slot m' , and when the door is in place and closed and the key or lever withdrawn from the stem J' the door is firmly locked against opening until the stem J' is again turned to swing the door down and out, as when the door is in place and shut the sliding bar H is locked and immovable, locking the support by the links j and k .

The door-hanger I can be applied and used with an outside door or a door which does not close into an opening, and when so used the sliding support G is dispensed with, and the arms or links a a' b b' b'' can be pivoted directly to the side of the door-frame, or to the side of the wall, or to a support affixed to the door-frame or the side of the wall, as may be desired, and when the door-hanger is attached to a stationary support the guide-lugs n and o are to be arranged in the plane of the movement of the door to receive the guide-strips D and E to hold the door against outward strain at the top and bottom.

The door-hanger I is formed of two systems, an upper and a lower one, the upper system consisting of arms or links swinging

from fixed pivotal points, and the lower system consisting of arms or links attached to the door to be moved, and these two systems, arranged as described, operate together to carry the door in the same horizontal plane from its closed to its opened position, and vice versa, and this without any change in the relative positions of the points of attachment to the door and to the fixed object or pivotal point, except that as the door moves the fixed point of attachment thereon changes sides in relation to the fixed pivot from which the door is suspended, and the door will be held or sustained both vertically and horizontally and will be maintained in a direct line of travel from one side to the other without deviation in its course and without any sidewise turning, as in the movement the several levers and arms composing the door-hanger moves simultaneously and parallel with each other by reason of their pivotal connection one to the other and their coacting relation.

What I claim as new, and desire to secure by Letters Patent, is—

1. A door-hanger consisting of suspending-arms in pairs, each pair swinging from its own fixed pivotal point and connected at their free ends with a movable object, whereby the object, as a door, may be slid back and forth in a straight line of travel without changing the points of attachment of the suspending-arms, substantially as and for the purpose described.

2. A door-hanger consisting of suspending-arms in pairs, the arms of each pair swinging from a pivot common to both arms of the pair, and a pivotally-connected radial link which limits and regulates the movements of the arms in a straight plane, substantially as and for the purposes specified.

3. A door-hanger consisting of two pairs of suspending-arms, each pair at the upper end swinging from a pivot, and each pair radiating from its pivotal point and attached at the lower end to a movable object, and connected with each other and the movable object by a radial link and a series of links, whereby the arms move simultaneously and in a straight plane, substantially as and for the purpose described.

4. In a door-hanger, the combination, with two pairs of similar arms, each pair connected at the upper end to a fixed pivotal point forming suspending-arms in pairs and connected at their lower ends one with the other and with a movable object, whereby the plane of the movement is always horizontal, substantially as and for the purpose described.

5. A door-hanger consisting of primary suspending-arms in pairs, each pair swinging from a fixed pivotal point and each pair pivotally connected with a compensating parallelogram formed of pivoted links, pivoted auxiliary links, pivoted supplemental links, and fixed pivotal points for the parallelogram

and supplemental links, substantially as and for the purpose specified.

6. A door-hanger consisting of suspending-arms in pairs, each pair swinging from a fixed pivotal point, and a series of links connected one with the other and with the suspending-arms by pivots and swinging from a stationary pivot on a door, and a radial link connecting the series of links with one pair of suspending-arms for carrying the door in a straight horizontal plane in opening and closing, substantially as specified.

7. The combination, in a door-hanger, of two pairs of suspending-arms, each pair swinging from a fixed pivotal point, with a series of links pivotally connected one with the other and with the suspending-arms and swinging from pivotal points on the door, and a short radial arm between the series of links and the suspending-arms and swinging from the pivot of one pair of arms, substantially as and for the purpose specified.

8. A door-hanger consisting of a movable support carrying fixed pivots, arms in pairs, each pair swinging from a fixed pivot of the movable support, and pivoted connecting-links between the suspending-arms and the door, substantially as and for the purpose specified.

9. The arms $a a'$ and pivotal point a'' , in combination with the links $c c' d e$ and pivots f', f^2, f^3 , and f^4 , substantially as and for the purpose specified.

10. The arms $a a'$, pivot a'' , arm b , and pivot b^3 , in combination with the links $c c' d e$ and pivots f', f^2, f^3 , and f^4 , substantially as and for the purpose specified.

11. The arms $a a'$, pivot a'' , arms $b b' b''$, and pivot b^3 , in combination with the links $c c' d e d' d'' c'' e'$, and pivots $f', f^2, f^3, f^4, f^5, f^6$, and f^7 , substantially as and for the purpose described.

12. A movable support carrying a door, in combination with a sliding bar, and links connecting the support with the door-frame and with the sliding bar, for moving the door into and out of its opening, substantially as specified.

13. A movable support carrying a hanger for a door, in combination with a movable bar, and connecting-links between the movable bar and the support and the door-frame and the support, substantially as and for the purposes specified.

14. The support G , connected with a door-frame by links j , in combination with the sliding bar H and connecting-links k , substantially as and for the purpose specified.

15. The support G and links j , in combination with the sliding bar H , with rack h , links k , pinion J , and stem J' , substantially as and for the purpose specified.

16. The support G , links j , sliding bar H , and links k , in combination with the door C , arms $a a' b b' b''$, pivots $a'' b^3$, and a series of links pivotally connected with the arms and

with the door C, substantially as and for the purpose specified.

17. The movable support G and lug *l*, having a notch *l'*, in combination with the door C and guide-strip D, substantially as and for the purpose specified.

18. The movable support G and plates *m*, having the groove *m'*, in combination with the door C and guide-pins *m''*, substantially as and for the purpose specified.

19. The sliding support G, in combination with the door C, plates *m*, with grooves *m'* and pins *m''*, and the lug *n*, with a notch *n'*, substantially as and for the purposes specified.

20. The door C, guide-strips D and E, lugs *n*, each having a notch *n'*, and lugs *o*, each having a notch *o'*, in combination with the arms *a a'*, *b b'*, pivots *a'' b''*, links *c c'*, *d d'*, *e e'*, and pivots *f', f''*, *f''*, *f''*, *f''*, *f''*, and *f''*, substantially as and for the purposes specified.

21. The combination, in a door-hanger, of a compensating parallelogram formed of links pivoted one to the other and interposed between a door and suspending-arms in pairs, a door, and suspending-arms in pairs, each pair swinging from a fixed pivotal point, substantially as and for the purpose specified.

22. The combination, in a door-hanger, of a compensating parallelogram formed of links pivoted one to the other and to the door, auxiliary links pivoted to the parallelogram, and supplemental links pivoted to the auxiliary links and to the door, substantially as and for the purpose specified.

23. The combination, in a door-hanger, of pivoted swinging arms, a compensating parallelogram formed of links pivoted one to the other and to the door, auxiliary links pivoted to the parallelogram, and supplemental links pivoted to the auxiliary links and to the door, substantially as and for the purpose specified.

24. A door-hanger consisting of a series of

four long arms or links *a a' b' b''*, suspended from a support by pivots and carrying the series of shorter links *c d c' e* and *d' d'' c'' e'*, pivotally connected one to the other and connected to the support by a link *b*, substantially as and for the purpose described.

25. In a door-hanger, the combination of long arms or links *a a' b' b''* and the short link *b*, carrying the series of links *c d c' e d' d'' c'' e'* and the plate *f* and operating to cause the movement of any point or points in said plate to be in straight parallel lines, substantially as and for the purpose specified.

26. The combination, in a door-hanger, of four long arms or links suspended in pairs by pivots from a support, a series of short links pivotally connected with each other and the said long arms or links and with the said support at the pivotal point of the lower pair of long arms or links and interposed between the door and the support, substantially as and for the purpose specified.

27. The combination, in a door-hanger, of the support G and the door-plate *f*, attached to the door and connected by the interposing arms and links *a a'*, suspended and radiating from said support by means of a pivot *a''*, and links of corresponding length *b' b''*, suspended and radiating from the support by means of the pivot *b''*, said upper pair of arms *a a'* having their lower ends connected by links *c' d'*, and said lower pair *b' b''* having their lower ends connected by links *c'' d''*, said corresponding upper and lower pairs connected by links *d' e'* and door-plate *f*, and said upper system *a a'*, *d c'*, and *d' e'*, connected by links *c e* and pivots *f'* and *f''*, and to the said support by link *b* and pivots *f''* and *b''*, substantially as and for the purpose specified.

EPHRAIM A. HALDEMAN.

Witnesses:

O. W. BOND,
H. B. HALLOCK.