

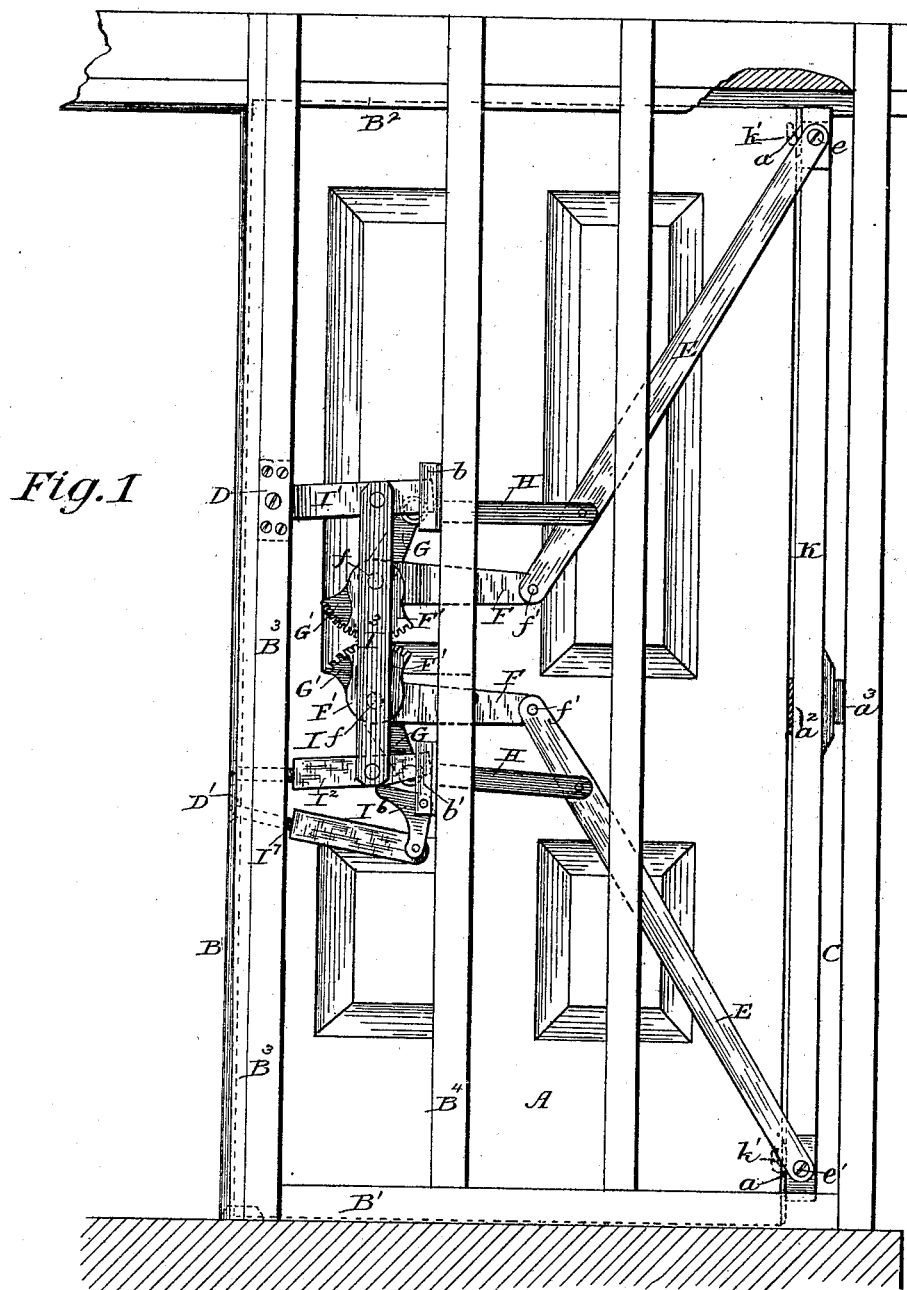
(No Model.)

3 Sheets—Sheet 1.

A. NEY & J. BAUMGARTNER.
FOLDING DOOR.

No. 423,176.

Patented Mar. 11, 1890.



WITNESSES

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Alex. Simpson

INVENTOR

Albert Ney and
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Attorney

(No Model.)

3 Sheets—Sheet 2.

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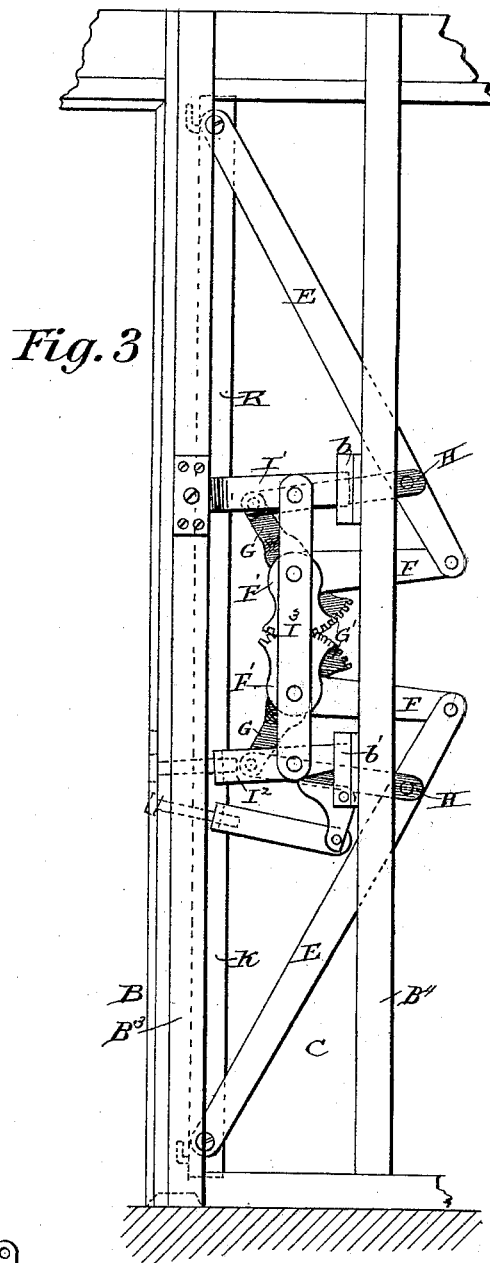
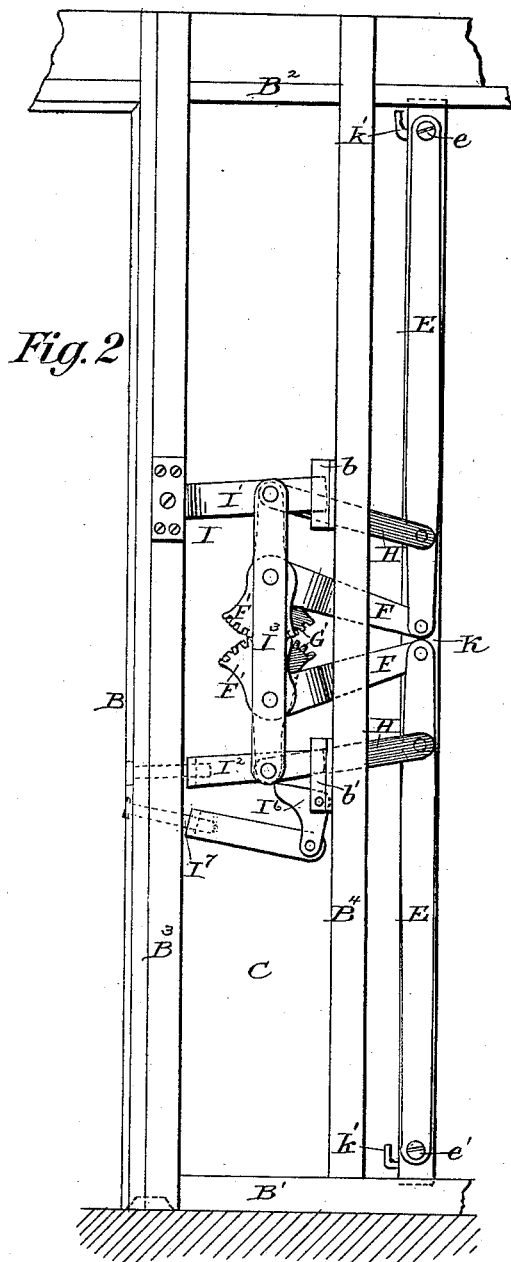
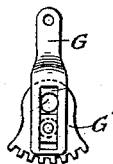


Fig. 4



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3 Sheets—Sheet 3.

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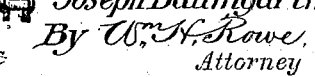
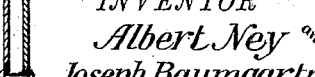
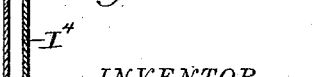
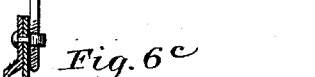
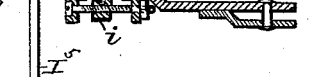
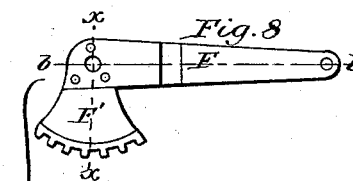
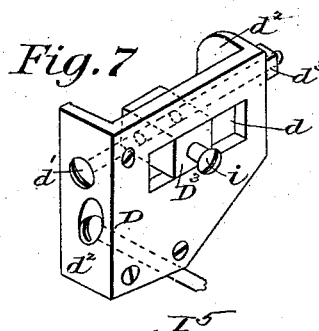
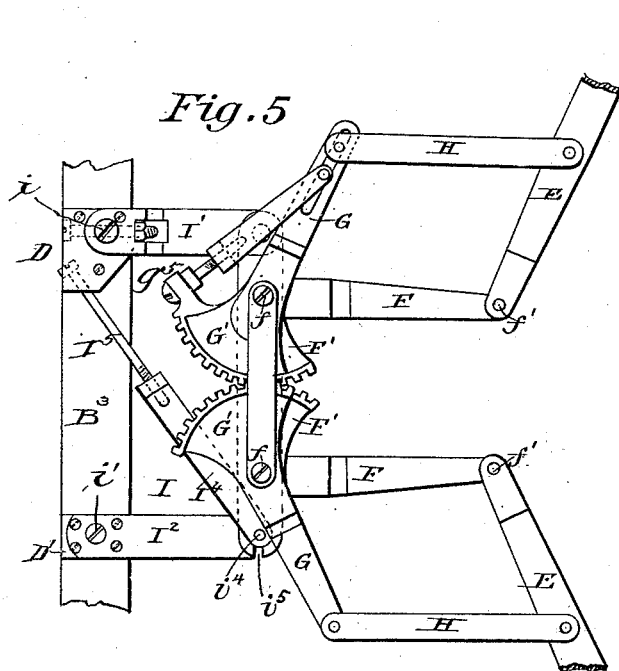


Fig. 10

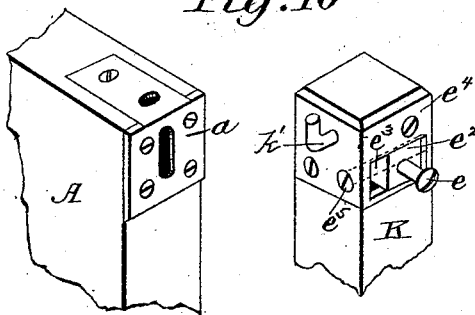


Fig. 6

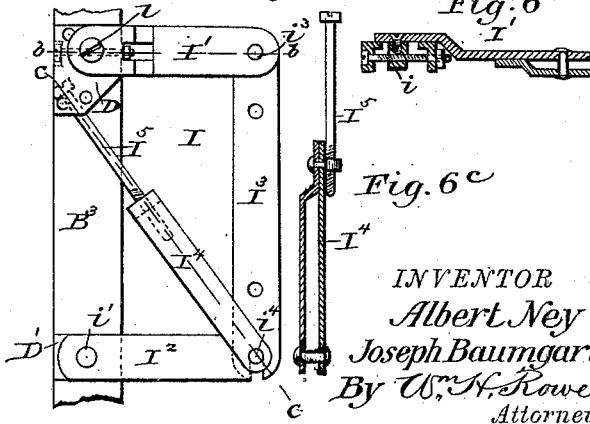
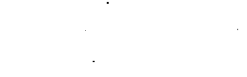
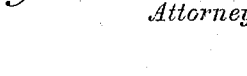
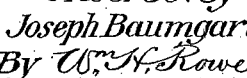
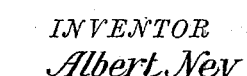
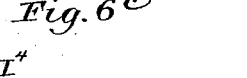


Fig. 6b



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UNITED STATES PATENT OFFICE.

ALBERT NEY AND JOSEPH BAUMGARTNER, OF DUBUQUE, IOWA.

FOLDING DOOR.

SPECIFICATION forming part of Letters Patent No. 423,176, dated March 11, 1890.

Application filed August 27, 1888. Serial No. 283,936. (No model.)

To all whom it may concern:

Be it known that we, ALBERT NEY, a citizen of the United States, residing at Dubuque, in the county of Dubuque and State of Iowa, and JOSEPH BAUMGARTNER, a subject of the King of Bavaria, also residing at Dubuque, in the county of Dubuque and State of Iowa, have jointly invented certain new and useful Improvements in Folding Doors, of which the following is a specification.

Our invention relates to that class of folding doors which are supported upon hangers attached to the inner edge of the door and to the door-frame, which will permit the door to be moved across the doorway without contact with either the floor or the cap of the frame.

The object of our invention is to dispense with guideway-rails, rollers, and slots, and to support and balance the door, that it may be easily adjusted to the required position and to a plane of movement free of both the floor and the cap-frame, and the supports of which will be free from frictional or sliding contact with the inner edge of the door and with the frame upon which it is supported.

To this end our improvements consist in certain novel combinations and peculiar arrangement of parts, which will hereinafter be fully described in the annexed specification, and particularly pointed out in the claims, reference being had to the accompanying drawings, in which—

Figure 1 represents a side elevation of the door and a part of its frame, the partition-covering being omitted to more clearly illustrate the operating mechanism. Fig. 2 is a side view of a portion of the door-frame, showing the mechanism which operates the door in the position it assumes when the door is partly closed. Fig. 3 is a similar view showing the parts in the position they assume when the door is fully closed. Fig. 4 is a detail view in elevation of a modified form of one of the segment-plates and the connecting-arm forming part of the mechanism for operating the door. Fig. 5 is an enlarged detail view of a modified arrangement of some of the operating mechanism. Fig. 6 is side elevation of the bracket shown in Fig. 5, with the segment-arms removed. Fig. 6^b is a sec-

tion on the line *b b*, Fig. 6. Fig. 6^c is a similar view on the line *c c*, Fig. 6. Fig. 7 is a perspective view of one of the plates to which said brackets are secured. Fig. 8 is a detail side view of one of the segments provided with a fixed arm or extension. Fig. 8^b is a section taken on the line *b b*, Fig. 8. Fig. 8^c is a section on the line *x x*, Fig. 8. Fig. 9 is a detail side view of one of the segments provided with an adjustable arm or extension. Fig. 9^b is a vertical section on line *b b*, Fig. 9. Fig. 9^c is a section of the adjustable connection on line *c c*, Fig. 9; and Fig. 10 represents enlarged details of the upper corner of the door and edge strip detached.

In the accompanying drawings, A indicates the door, which is hung in the frame B, which consists of a sill B', a cap-piece B², posts B³, and studding B⁴. Said posts and studding B³ B⁴ are in practical construction covered over to form a pocket C, into which the door is moved when opened. The door is supported upon a hanger consisting of a double system of bars E, arms F G, and links H, coupled together and pivotally connected to a bracket I, secured to the door-post B³, the outer ends of the bars E being pivotally connected to the top and bottom of the inner edge of the door.

The arms F are provided with toothed segments F', geared together, and are pivoted at *f* to the vertical arm I³ of the bracket I. The outer end of said arms are pivoted at *f'* to the inner ends of the bars E, and are by the movement of said bars E simultaneously raised and lowered, whereby the outer ends of the bars E, pivoted at *e e'*, respectively, to the top and bottom of the door, are allowed to move in parallel horizontal planes, and thus follow the horizontal frame-pieces of the door as the said bars are swung in either direction away from a vertical position.

The bars E are braced and sustained to support the door in an upright position by arms G, provided with toothed segments G', geared together, and by the links H, which are pivoted to and connect the outer ends of said arms G to the bars E at a suitable distance from the pivot *f'* at the ends of the said bars to form hinged pivoted parallelograms at the inner ends of the bars E, which are geared

together and support the door in any position in which it may be placed or reciprocated. The arms G and link H being coupled together by the segments G', as described, are thereby adapted to be simultaneously moved toward or from each other to react one upon the other, and thus cause the outer ends of the bars E to follow the horizontal movement of the door and hold the same in an upright position whenever it may be placed in its horizontal reciprocating movement. To provide for the proper adjustment of the gear-sections G', we connect the said gear-segments to the arms G in the manner most clearly shown in Fig. 4 of the drawings, from which it will be seen that the segment G' is provided with an elongated slot, in which fits a sliding pivot-block, the lower end of which is provided with an aperture to receive a securing-screw, while its upper end is provided with an opening to receive the pivot-pin f. The outer ends of the hanger-bars E are connected by the edge strip k, said bars being pivoted upon the pins ee', secured, respectively, to the upper and lower edges of said strip, which is fitted upon the inner edge of the door by means of studs or hooks k' and the slotted plates a, which are interlocked with each other by slightly lowering the door after the hooks have been fitted into said plates, and which may be released therefrom by slightly lifting the door and withdrawing the hooks from the slots, by which means the door may be easily removed from the hanger.

The edge strip k is held parallel to the inner edge of the door without being in close contact therewith by the slotted plates a, at the upper and lower ends thereof, above described, and by a rubber block or cushion a², held upon the inner edge of the door between it and the strip k, and a similar cushion a³ upon the outer face of said strip, which engages a fixed part of the door-frame, said cushions serving to deaden the jar of the door against the back part of the pocket when the door is thrown violently back into the said pocket.

By reference to Fig. 10 it will be observed that the stud-pin e is secured to a block e², adjusted in a cross-slot e³ in a plate e⁴ upon the upper end of the edge strip k by means of screw e⁵, passing through said plate and block, by means of which the pivotal point of support at the upper end of the door is shifted to bring the outer vertical edge of the door even with the door-frame, or, if double doors are used, to bring their meeting edges together to form a close joint.

The bracket I, (shown in Figs. 1, 2, and 3,) consists of a vertical plate I³, to which the arms F and G are pivoted, as before described, which in turn is pivoted to the swinging arms I' and I², pivoted at one end to the post B³, their free ends being guided between retaining-plates b' b', fixed upon the studding B⁴. Said arms I' I² may be raised or lowered by means of a rocking arm I⁶, pivoted to the

lower retaining-plate b', to bear beneath the lower arm I² of the bracket, and be adjusted to raise and lower the bracket, together with the supporting-pivots, by means of a screw I⁷, connecting said rocking arm and the plate b' upon the post B³.

In Figs. 5 to 9, inclusive, I have illustrated modified constructions of the bracket I and the means for adjusting the pivot-connections of the arms F and G. By referring to Sheet 3 of the drawings it will be observed that I form the upper arm I' of the bracket with an adjustable pivot i, which is secured to a sliding box D³, working in an elongated slot d in the upper plate D, secured to the post B³, as shown, and which is adjusted by means of the screw d', passing through the block D³ and side flanges d². By this means the plate I³, which carries the pivot f, is moved at its upper end to vary the position of said supporting-pivot and thereby cause the door to move in the required horizontal plane. When thus adjusted, the set-screw d' is secured by a lock-nut d³, fitting upon the end thereof to bear against the inner flange of the plate D. I also provide the lower end of the vertical plate I³ of the bracket I with a notch i⁵, in which fits a cross-pin i⁴ on the lower end of a diagonally-disposed trace-bar I⁶, the upper end of which connects with an adjusting-screw I⁵, the upper end of which passes through the front wall of the plate D, as most clearly shown in Fig. 7 of the drawings. The hanger and its brackets are swung out into the doorway for removal, repairs, or adjustment by disconnecting the plate I³ from the arm I' or by unscrewing it sufficiently to allow the lower pivot i⁴ to drop from the slotted end of the arm I² and plate I³. The arms I' I² may then be removed from the post B³ by removing the pivot-screws i i' from the plates D D'. By this construction we are enabled to obtain the same adjustment obtained by the rocking-lever construction I⁶ I⁷. (Shown in Fig. 1.)

In Figs. 8, 8^b, and 8^c I illustrate the construction of the arm F and its gear-segment F', and in Figs. 9, 9^b, and 9^c I show the peculiar construction of one of the arms G, its gear-segment G', and the intermediate adjusting devices whereby the pivotal point of the door may be shifted, said devices being provided by forming the arm G with a slot g', in which fits a pivot-block g, to which is connected the upper end of a bar g², to the lower end of which is connected one end of an adjusting-screw g³, the lower end of which engages a wing g⁵, formed on the gear-segment G'. The length of the throw of the arm G is thus varied and the extent of the movement of the outer end of the arms E thus correspondingly lengthened or shortened. From the foregoing description, taken in connection with the drawings, the operation of the device will be understood.

It will be observed that when the door is opened the swinging ends of the arms F will

be drawn together until the bars E assume a vertical position, (shown in Fig. 2,) at which point the door will be half-way closed, and the arms F and G will then be spread apart at their outer ends to carry the door through the remaining portion of its movement. The arms G and links H will in the meantime have supported the bars E and door in their upright position relative to each other by means of the segment-gear G', which has a differential movement with the segment-gear F' in both directions.

A perfect parallel movement of the outer ends of the bars E is thus effected, if the connecting arms and levers be of proper lengths to form equal parallelograms connected with the inner ends of the supporting-bars.

We desire it understood that we do not limit ourselves to the precise constructions set forth to accomplish the results stated, as these may be varied in a number of ways without departing from the broad principle of our invention.

Having thus described our invention, what we claim, and desire to secure by Letters Patent, is—

1. The combination, with the door and its frame, of hangers attached to pivots fixed to the door and to a bracket upon the door-frame, the said hanger consisting of the bars E, arms F G, and links H, substantially as described.

2. The combination, with the door and its frame, of the bars E, the arms F, having gear-segments F', and the arms G, provided with gear-segments G', said arms F and G adjustably pivoted to the frame, substantially as and for the purpose described.

3. In a door-hanger, the combination, with the supporting-bars E, of the swinging arms F G, connected to said bars, and the segmental gear-connections F' G', connecting the said arms to operate the supporting-bars, substantially as and for the purpose described.

4. In a door-hanger, the combination, with the door and its frame, of a double system of swinging bars supported upon a bracket on the said frame, said bars arranged in the same vertical plane one above the other, and having fixed pivotal connections at the upper and lower ends of the door, substantially as described.

5. The combination, with a sliding door, of a hanger supported upon the framing within the door-pocket of the partition, consisting of pivoted bars and an edge strip detachably secured to the inner edge of the door and supporting the pivoted ends of the bars, substantially as described.

6. The combination, with the door, its frame, and the vertically-adjustable bracket I, secured upon the said frame, of the hanger pivotally attached to the door and similarly attached to the bracket I, said hangers con-

sisting of the bars E, arms F G, and the links H, all arranged substantially as and for the purpose described.

7. The combination, with the door and its frame, of the hanger attached to pivots fixed to the door and to a bracket upon the door-frame, the said hanger consisting of bars E, arms F and G, gear-plates F' and G', the links H, and an adjusting-bar connecting one of said arms G with its link H, substantially as described.

8. The combination, with the door, of a hanger consisting of a double system of jointed arms having a fixed pivotal connection with the door and pivoted to a bracket at centers located one above the other, said bracket consisting of an upright plate I³, arms I' I², pivoted to said plate I³ and to the frame, a rocking lever journaled below said bracket and engaging the same, and means for adjusting said rocking lever, whereby said bracket is adjusted to different vertical positions, substantially as shown and described.

9. The combination, with the door and its frame, of the double system of jointed arms pivotally connected with the door and with a bracket on the frame, the bracket I, consisting of the arms I' I² I³, pivotally connected, said arm I³ forming the pivot-bearing for said jointed arms I' I², said arm I' having an adjustable pivotal bearing on the frame, substantially as and for the purpose described.

10. The combination, with the door and its frame, of a hanger or support consisting of a double system of jointed arms pivoted to the door and to a bracket on the frame, the bracket I, consisting of an upright plate I³, the pivoted arms I' I², and the diagonal adjusting-screw I⁴ I⁵, connecting one of the upper with one of the lower pivots of said bracket, substantially as and for the purpose described.

11. The combination, with the door and its pivoted supporting-bars, of the edge strip K, detachably secured to and separated from the inner edge of the door and supported parallel thereto, and an elastic block held on the said inner end of said door and adapted to abut the adjacent face of said strip, substantially as described.

12. The combination, with the door and the supporting-brackets a, secured on the inner face of the door, of the pivot-hook e', adapted to engage said brackets a, the sliding block e², carrying the pivot e, adapted to engage the outer ends of the supporting-bars and the adjusting-screw e³, all arranged substantially as and for the purpose described.

ALBERT NEY.

JOSEPH BAUMGARTNER.

Witnesses:

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E. TRAUB.