E. BERARDINELLI.

FOLDING DOOR.

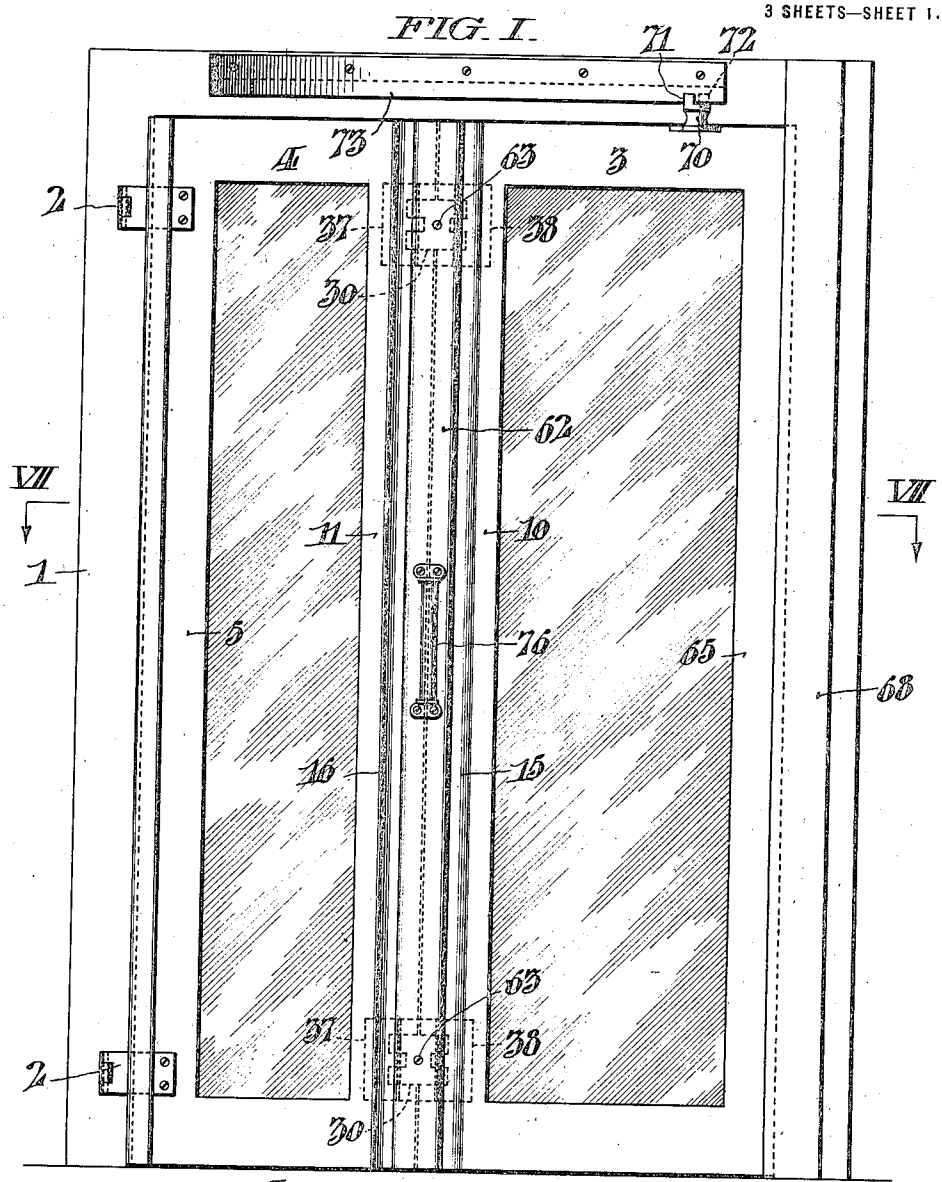
APPLICATION FILED AUG. 18, 1916.

1,318,433.

Patented Oct. 14, 1919.

3 SHEETS—SHEET 1.

FIG. I.



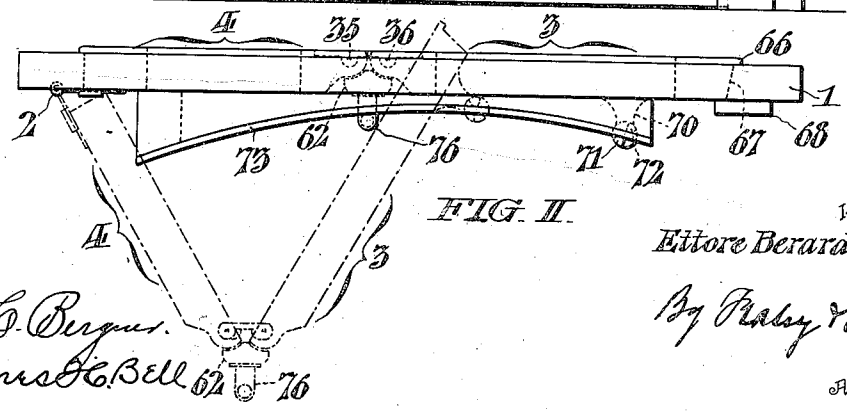


FIG. II.

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FIG. III.

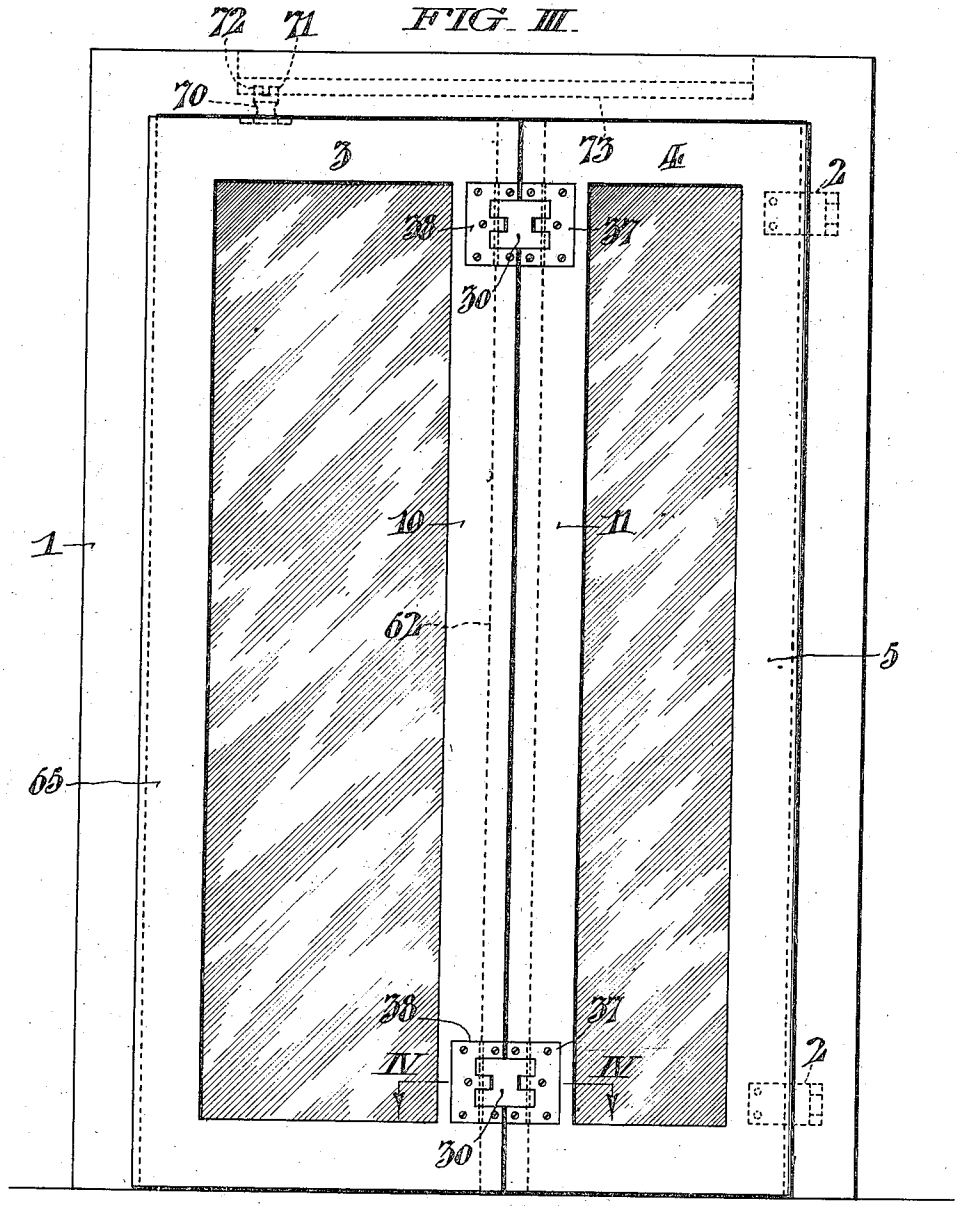
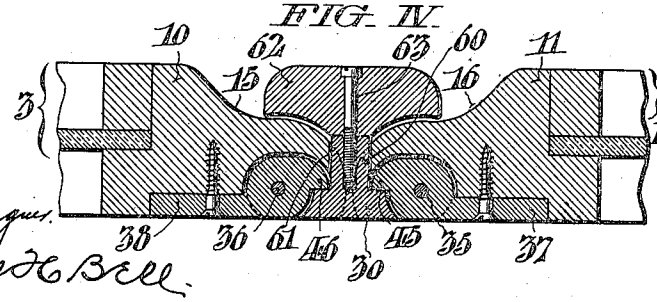


FIG. IV.



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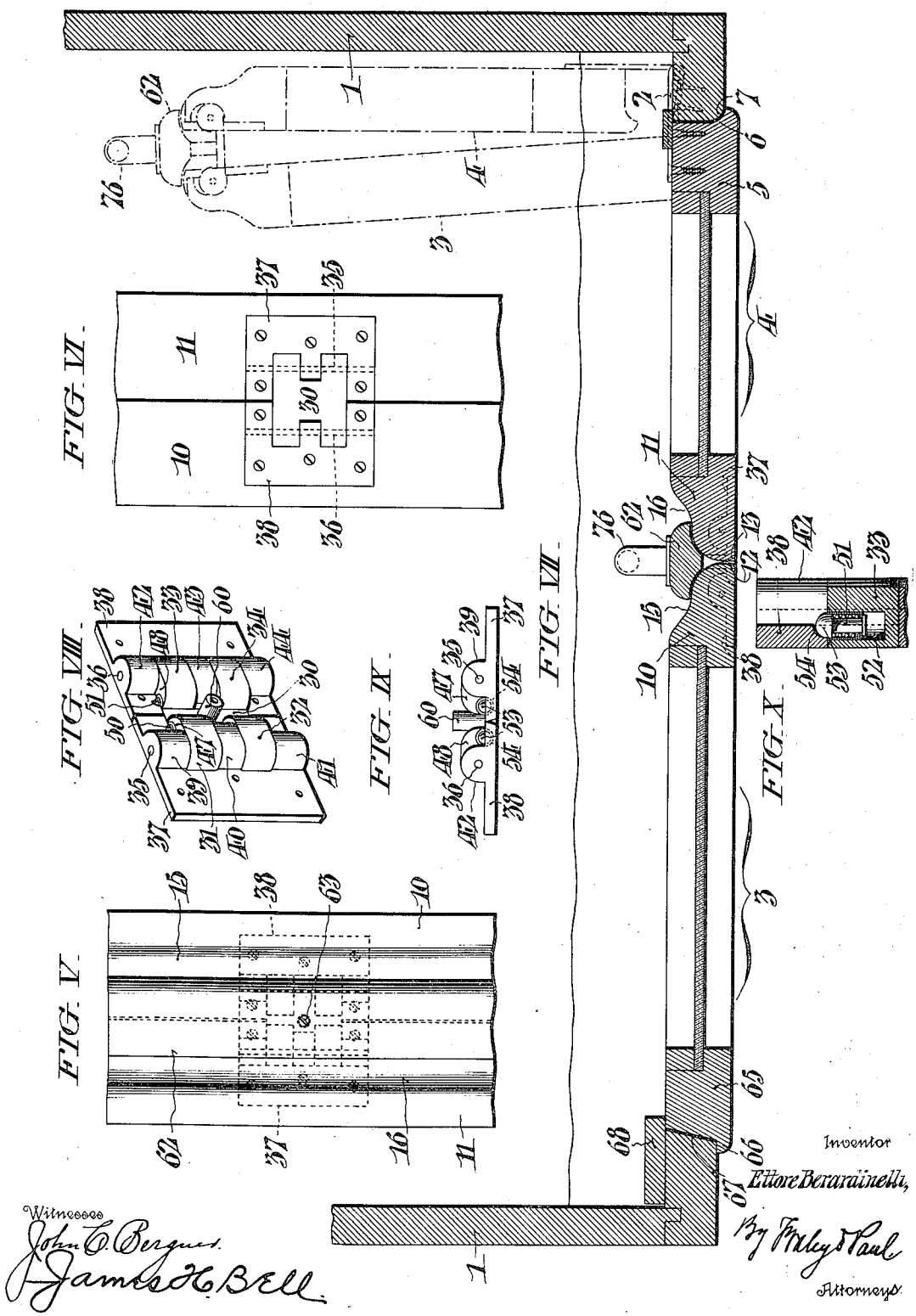
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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

ETTORE BERARDINELLI, OF PHILADELPHIA, PENNSYLVANIA.

FOLDING DOOR.

1,318,433. Specification of Letters Patent. Patented Oct. 14, 1919.

Continuation in part of application Serial No. 79,503, filed February 21, 1916. This application filed August 18, 1916. Serial No. 115,639.

To all whom it may concern:

Be it known that I, ETTORE BERARDINELLI, being a subject of the King of Italy, but having declared my intention of becoming a citizen of the United States, and being now a resident of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Folding Doors, whereof the following is a specification, reference being had to the accompanying drawings.

My invention is particularly adapted for use in connection with such structures as telephone booths, and the main objects thereof are to simplify the construction of the folding-door element without sacrifice of strength, to improve the appearance of the exterior thereof, to facilitate the manipulation of the door for closing or opening, to maintain a close and relatively sound-proof fit when the door is shut, and to avoid danger in the act of opening or closing the door.

In the accompanying drawings, Figure I, represents an elevation of the door in a closed position, as seen from the inside of the booth.

Fig. II, is a top or plan view of the parts shown in Fig. I, indicating by dot and dash lines the door in a partly open condition.

Fig. III, is a view in elevation, showing the door in closed position as seen from the exterior of the booth.

Fig. IV, is a view, in horizontal cross section and on an enlarged scale, of the members at the region of the fold, the plane of section being indicated by the line IV, IV, of Fig. III.

Figs. V, and VI, are respectively interior and exterior views in elevation of that portion of the door which is immediately adjacent to the parts indicated in cross section in Fig. IV.

Fig. VII, is a view, in horizontal section through the door in a closed position, showing adjacent portions of the wall of the booth and taken on the plane indicated by the line VII, VII, of Fig. I, the position of the parts, when the door is completely open, being indicated by dot and dash lines.

Fig. VIII, is a view, in perspective, of one of the hinges.

Fig. IX, is an end view of the hinge, and Fig. X, is a vertical sectional view showing the details of one of the spring actuated cam stops for detaining the door in a closed position, the scale of the last mentioned figure being very considerably enlarged above that of the other figures.

Referring to the general views of Figs. I, III, and VII, 1, indicates the wall of the booth, or other inclosure, showing the frame of the doorway in which the folding door is hung by means of a plurality of ordinary hinges such as are indicated at 2, said hinges being mounted on the inside of the structure.

The door itself comprises two folding members 3, and 4, respectively, which may be paneled with glass panes, or constructed in any desired manner.

The hanging-stile 5, which is hinged to the vertical post of the doorway is preferably made somewhat concave on its edge as indicated at 6, in Fig. VII, so as to fit snugly upon a corresponding convex portion 7, of the vertical post of the doorway. The folding members 3 and 4, are provided at their meeting edges with the folding-stiles 10, and 11, respectively, which are secured together by means of a plurality of hinges about to be described. The adjacent edges of said folding-stiles 10, and 11, are reduced, as shown, to permit turning or swinging movement with reference to adjacent parts by being convexly rounded throughout approximately a quadrant, as indicated at 12, and 13, respectively, the arcs of the rounded portion commencing at the exterior face of the stiles and the radii being considerably less than the total depth or thickness thereof. The quadrant arcs merge into reversed shallow curves 15, and 16, respectively, which continue on throughout the total depth or thickness of the members 10, and 11. As will be noted by reference to Figs. III, IV, and VII, the result of this arrangement is that when the door is in a closed position, the outer faces of the folding-stiles 10, and 11, directly meet one another, having no interposed vertical member, and thus presenting a close joint with flush exterior faces from top to bottom, on the outside of the door. The folding-stiles 10, and 11, are hinged together by means of the hinges shown in detail in Figs. VIII, and IX, (in this instance only two in number), said hinges being mounted upon the exterior faces of the folding-stiles.

The hinge is a three-part structure, comprising a central plate 30, having four lateral bearing lugs 31, 32, 33, and 34.

The hinge comprises also the wings 37, and 38, having respectively bearing lugs 39, 40, 41, and 42, 43, 44, which are attached to the lugs upon the central plate 30, by means of the vertical hinge-pins 35, and 36. The central bearing lugs 40, and 43, of the wings are respectively provided with inwardly projecting stop shoulders, such as 45, and 46, (see Fig. IV), which engage with the inner surface of the plate 30, when the hinge is completely opened out, in order to limit its movement.

The bearing lugs 31, and 33, upon the plate 30, are also extended inwardly as shown at 47, and 48, in order to receive spring actuated stop pins 50, and 51, seated in vertical cavities, such as 52 (see Fig. X), each pin having a protruding rounded head 53, which is adapted to engage in a rounded recess 54, formed in the adjacent face of the wing plate, said head engaging in said recess, when the hinge is opened out flat, with sufficient firmness to retain the members of the hinge against accidental displacement, while the rounded head acts as a cam to depress the pin into its cavity, without requiring substantial exertion when the members of the door are shifted by the handle described later on.

The central hinge plate 30, also carries on its interior face a laterally projecting post 60, which extends inwardly to a distance somewhat greater than half the cross sectional depth of the folding-stiles 10, and 11, which latter are slightly recessed at the region immediately adjacent to the post, as shown at 61 in Fig. IV. A central vertical strip 62, reduced in correspondence with the folding-stiles by having shallow concaved faces adjacent to them, is secured to the hinged posts 60, by screws 63, which engage in the central cavities of the posts, the edges of the inner face of the strip 62 being rounded as shown, the strip 62, being wide, but of relatively small depth, so that it lies within the reversed curved portions 15, and 16, of the folding-stiles, with its rear face in the same plane with the rear faces of the latter.

It will thus be noted that the central strip 62, does not intervene between the folding-stiles, or separate them in any way, but is wholly restricted to the inner face of the door and simply fits against the rear or inner faces of the folding-stile, when in a closed position, thus obviating the presence of a central vertical member interposed between the folding-stiles from top to bottom, and also allowing the hinges to be attached at any desired vertical positions without substantially cutting into either the strip itself, or the folding-stiles, for attachment of the hinge members.

This method of construction greatly simplifies the formation and assembling of the parts, as no accurate fitting of the adjacent surfaces is required, and enhances the strength of the structure, while presenting a neat and attractive appearance of the exterior of the door when the latter is in a closed position.

The edge of the outer, or free stile 65, of the door is preferably beveled, and provided with a flange 66, adapted to overlap and engage the edge of the vertical post of the doorway, which is correspondingly beveled, as indicated at 67, (see Fig. VII). An overlapping strip 68, may be also mounted upon the inner face of the doorway post, so that there may be a complete closure of the joint when the door is shut.

The free member 3, of the door is provided with guiding mechanism, preferably comprising a bracket post 70, having at its top projecting lugs 71 and 72, with an interspace between them, said lugs engaging respectively with the front and rear faces of a curved track 73, mounted horizontally across the lintel member of the door frame. The curvature of said track may be substantially the arc of a circle, but is platted upon the line of least resistance to the swinging movement of the door in opening or closing, and, therefore, is preferably slightly unsymmetrical to the face of the lintel, as is indicated in Fig. II.

A handle 76, is mounted upon the door at the region immediately adjacent to the fold, at a convenient height to be grasped by the operator, the handle in the instance shown being directly secured to the strip 62. The feature of mounting the handle at the region of the fold and providing guiding means for the free member 3, of the door, affords the maximum of leverage to start the door from a completely folded position, and the maximum of toggle action to start the door from a completely closed position, and when the handle is mounted directly upon the central vertical strip, the strip can rock upon a vertical axis with relation to either folding-stile, and thus can automatically attain the position of least resistance, at any given position and for movement in either direction.

As folding doors of this general character have been heretofore constructed, there is apt to be a resistance to movement at either extreme position, and a certain dexterity on the part of the operator is required, the initiation of the opening movement from a completely closed position being sometimes so difficult as to occasion nervousness on the part of the occupant of the booth.

By reason of the arrangement and organization of the parts which are characteristic of my invention, the manipulation of the door from, or into, any position is en-

tirely simple and requires a minimum of exertion.

When completely closed, the door is held quite lightly, but still with sufficient firmness to obviate the danger of accidental displacement, by means of the spring actuated cam-stops 50, which do not require direct actuation in order to depress them within their cavities, but will yield and recede readily through cam action alone, when the handle 76, is shifted by the operator to initiate the opening movement, the toggle action, at this position of the parts, affording a maximum resultant of the power applied.

Having thus described my invention, I claim:

1. In a door comprising two folding members, one of which is hinged to the door-way frame, the combination of a pair of folding-stiles whose exterior adjacent edges meet directly when the door is in a closed position, said folding-stiles having their proximate inner edges reduced; a plurality of folding hinges each comprising a central plate and a pair of lateral wings hinged thereto, said wings being mounted upon the exterior faces of the folding-stiles, each hinge also comprising a post mounted on said central plate and extending rearwardly through recesses in the reduced portions of the folding-stiles; and a relatively wide and shallow covering strip mounted upon the hinge posts and fitting snugly upon the inner surfaces of the folding-stiles, substantially as set forth.

2. In a door comprising two folding members, one of which is hinged to the door-way frame; the combination of a pair of folding-stiles whose exterior adjacent edges meet directly when the door is in a closed position, said folding-stiles having their proximate inner edges reduced; a relatively wide and shallow central covering strip wholly restricted to the inner face of the door, and fitting over the inner surfaces of the folding-stiles; hinges mounted upon the exterior faces of the folding-stiles and connecting said folding-stiles respectively to said strip, and a handle for operating the door, substantially as set forth.

3. In a door comprising two folding members, one of which is hinged to the door-way frame, the combination of a pair of folding-stiles whose exterior adjacent edges meet directly when the door is in a closed position and whose proximate inner edges are convexly rounded; a plurality of folding hinges each comprising a central plate and a pair of lateral wings hinged thereto, said wings being mounted upon the exterior faces of the folding-stiles, each hinge also comprising a post mounted on said central plate and extending rearwardly through recesses in the rounded portions of the folding-stiles, a relatively wide and shallow covering strip mounted upon the hinge posts and fitting snugly over the rounded inner surfaces of the folding-stiles, an operating handle mounted upon said strip; a track mounted across the upper portion of the door-way frame, and a guiding member mounted upon the free folding-stile and operatively engaging said track, substantially as set forth.

4. In a door comprising two folding members, one of which is hinged to the door-way frame, the combination of a pair of folding-stiles whose exterior adjacent edges meet directly when the door is in a closed position and whose proximate inner faces are reduced; a plurality of folding hinges each comprising a central plate and a pair of lateral wings hinged thereto, said wings being mounted upon the exterior faces of the folding-stiles, each hinge also comprising a post mounted on said central plate and extending rearwardly through recesses in the reduced portions of the folding-stiles; a spring actuated cam pin, mounted in said plate, and adapted to lightly engage said wing when the hinge is opened out, but to recede, by cam action alone, when the door is operatively shifted; and a relatively wide and shallow covering strip mounted upon the inner extremity of the hinge posts and fitting snugly over the inner surfaces of the folding-stiles, substantially as set forth.

5. In a door comprising two folding members, one of which is hinged to the door-way frame, the combination of a pair of folding-stiles whose exterior adjacent edges meet directly when the door is in a closed position; a plurality of folding hinges each comprising a central plate and a pair of lateral wings hinged thereto, said wings being mounted upon the exterior faces of the folding-stiles, and a spring-actuated cam-pin, mounted in said plate, and adapted to lightly engage said wing when the hinge is opened out, but to recede, by cam action alone, when the door is operatively shifted.

In testimony whereof, I have hereunto signed my name at Philadelphia, Pennsylvania, this twenty-seventh day of July, 1916.

ETTORE BERARDINELLI.

Witnesses:
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ANTHONY D. VALERIO.