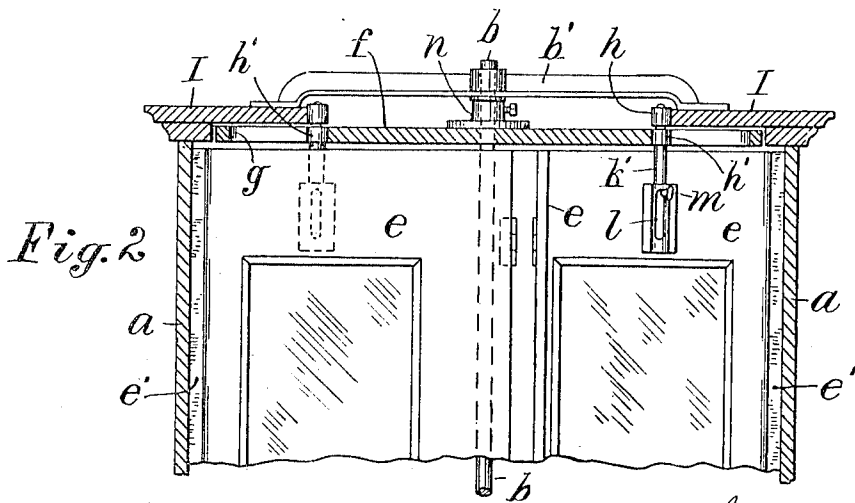
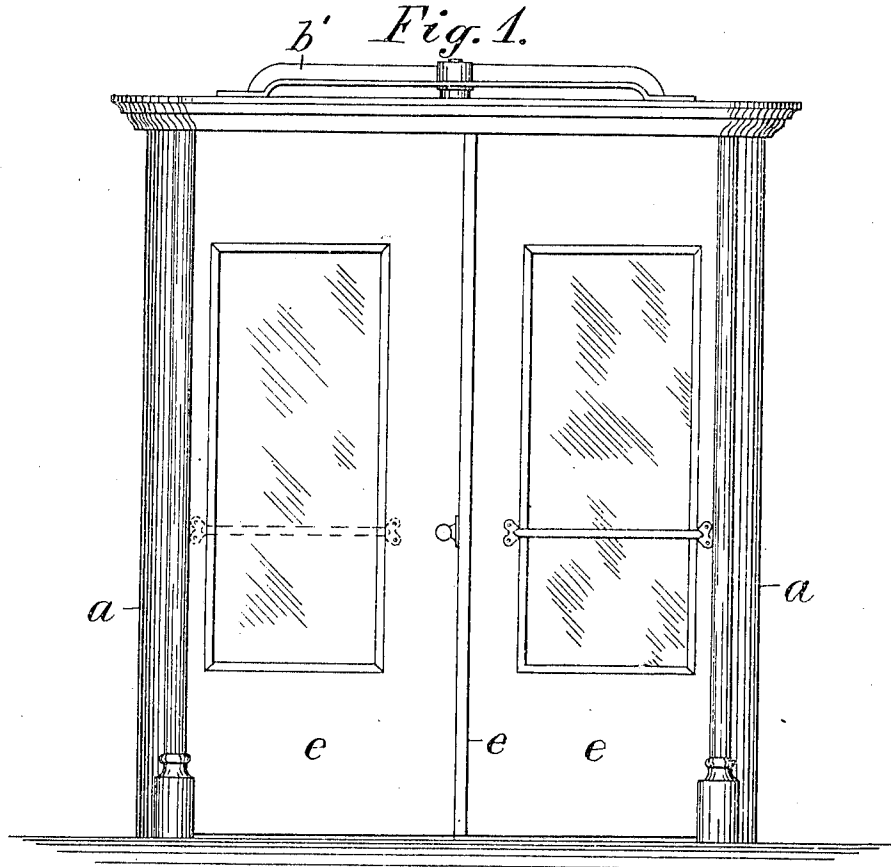


T. VAN KANNEL.
 REVOLVING DOOR WITH NON-CONCENTRIC CASING.
 APPLICATION FILED MAR. 29, 1907. RENEWED JULY 1, 1909.

947,504.

Patented Jan. 25, 1910.

5 SHEETS—SHEET 1.



Witnesses:
 L. Lee.
 J. W. Greenbaum

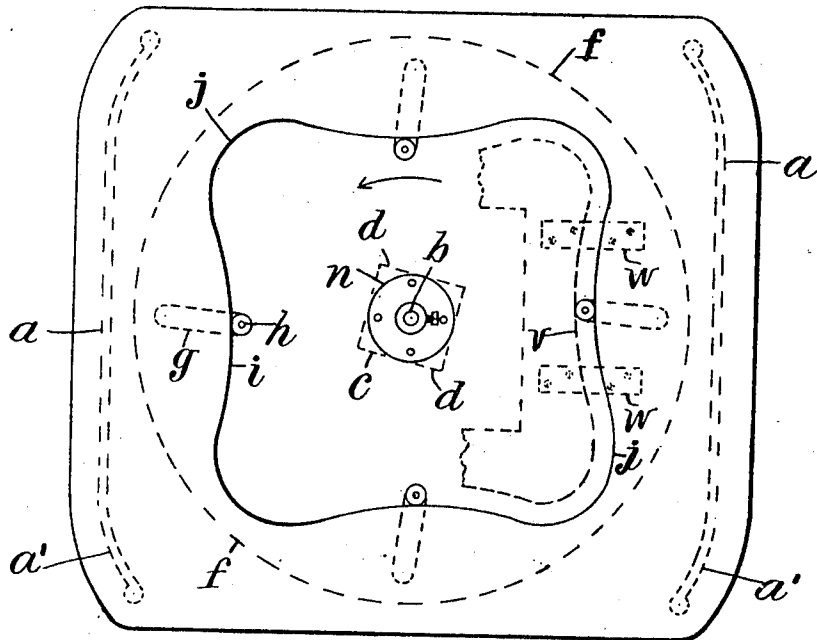
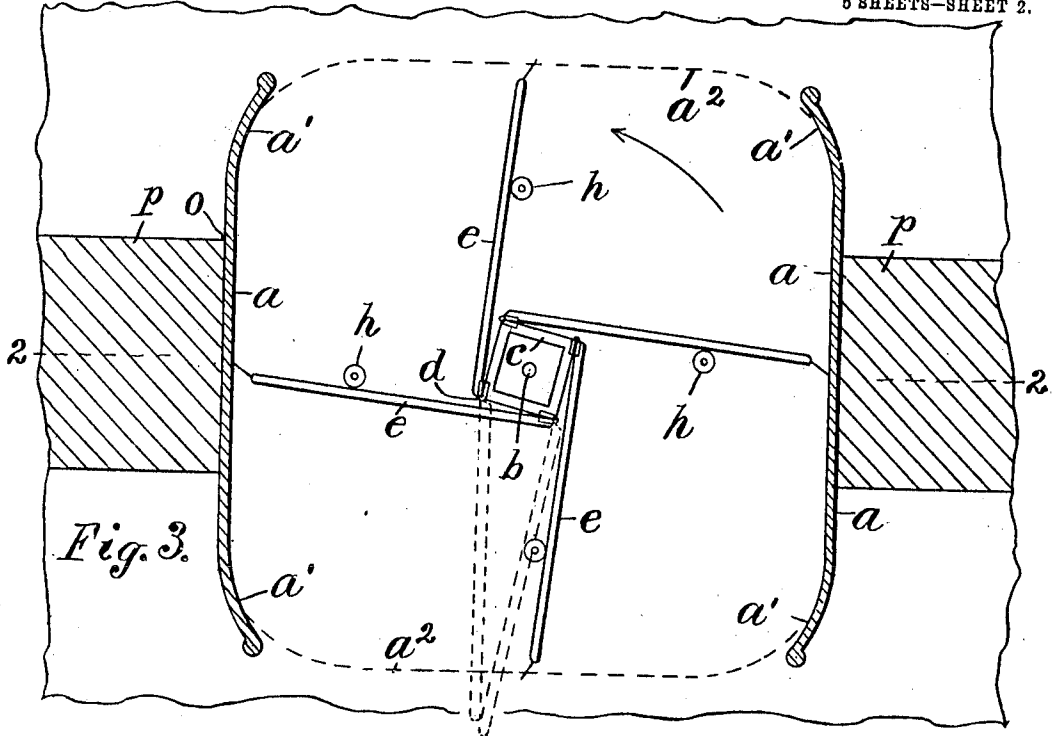
Inventor.
 Theophilus Van Kannel,
 per Thomas S. Crane, Atty

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5 SHEETS—SHEET 2.



Witnesses:
 L. Loll,
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Fig. 4. Inventor:
 Theophilus Van Kannel,
 per Thomas S. Crane, Atty

Fig. 5.

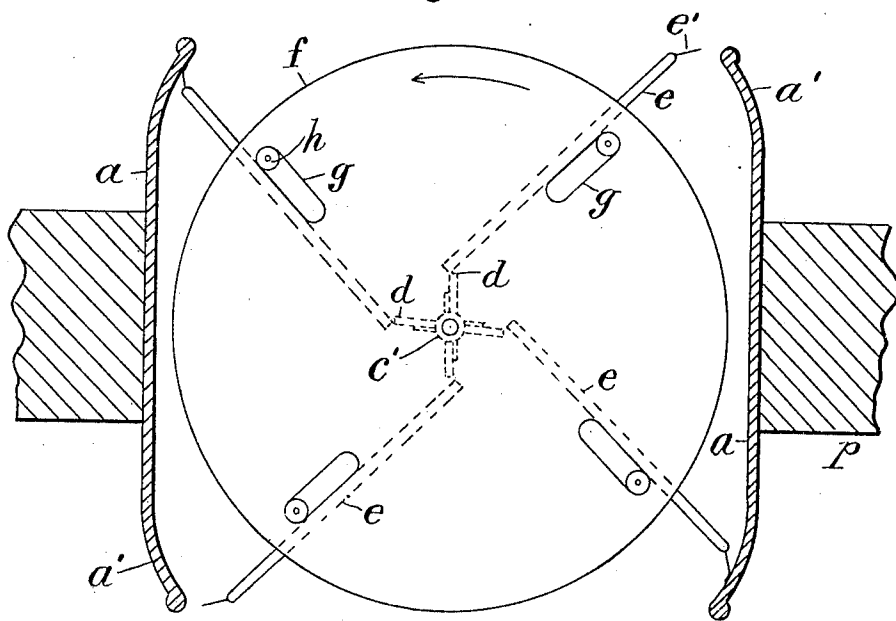
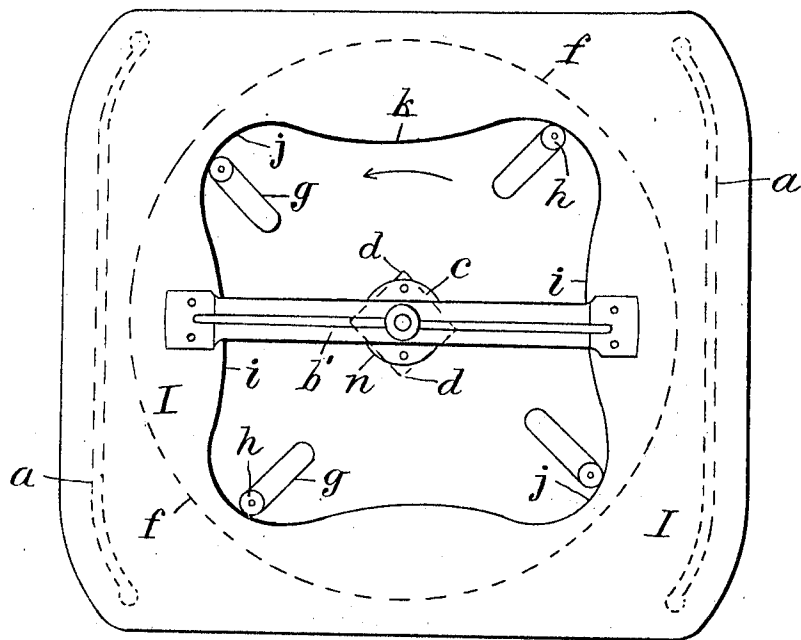


Fig. 6.



Witnesses:
 L. Lee,
 J. W. Greenbaum

Inventor.
 Theophilus Van Kannel,
 per Thomas S. Coane, Atty.

T. VAN KANNEL.

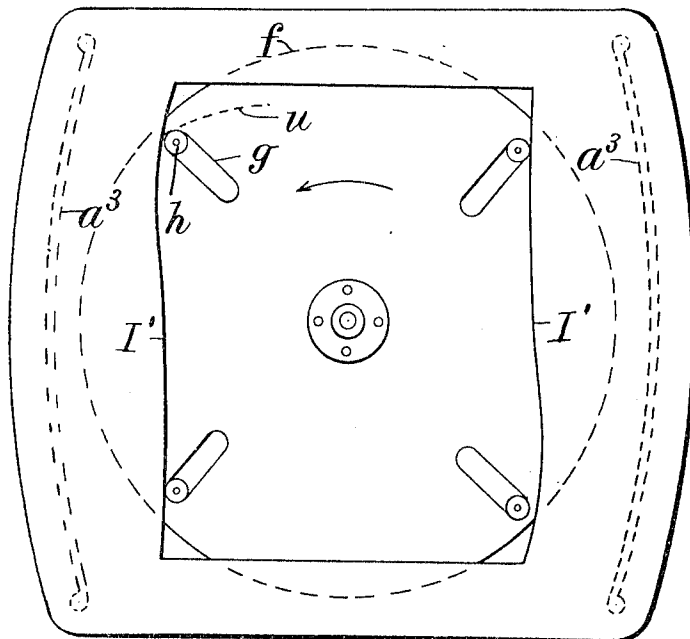
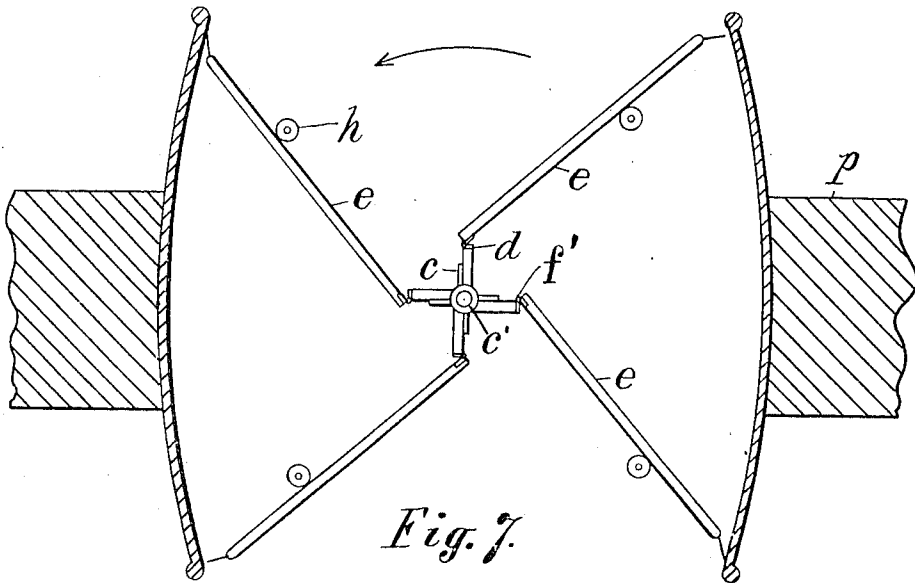
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5 SHEETS—SHEET 4.



Witnesses:
L. Lee,
J. W. Greenbaum

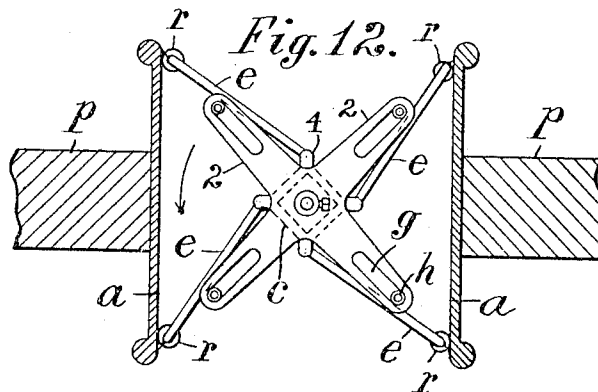
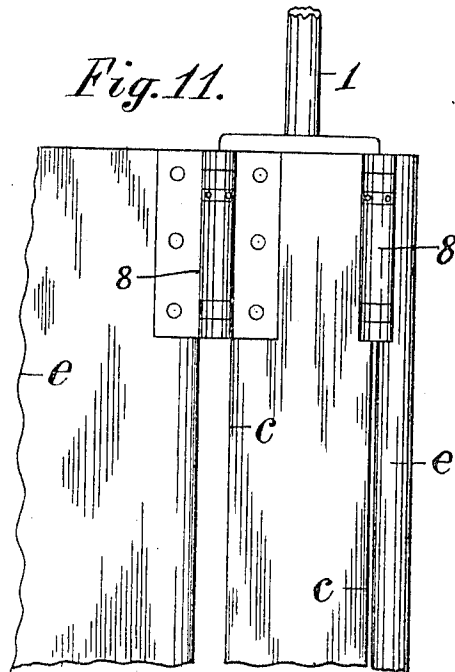
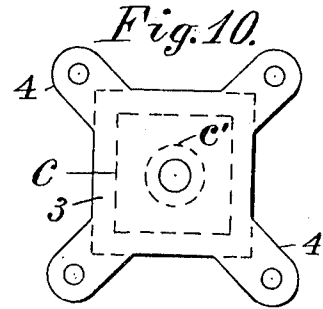
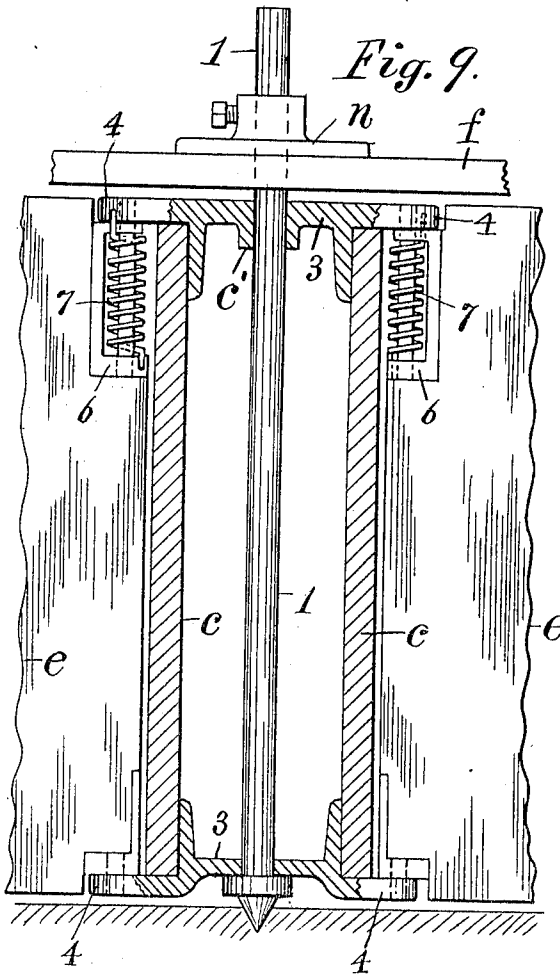
Inventor.
Theophilus Van Kannel,
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5 SHEETS—SHEET 5.



Witnesses:
 L. Lee.
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Inventor.
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UNITED STATES PATENT OFFICE.

THEOPHILUS VAN KANNEL, OF NEW YORK, N. Y., ASSIGNOR TO VAN KANNEL
REVOLVING DOOR COMPANY, A CORPORATION OF WEST VIRGINIA.

REVOLVING DOOR WITH NON-CONCENTRIC CASING.

947,504.

Specification of Letters Patent.

Patented Jan. 25, 1910.

Application filed March 29, 1907, Serial No. 365,235. Renewed July 1, 1909. Serial No. 505,493.

To all whom it may concern:

Be it known that I, THEOPHILUS VAN KANNEL, a citizen of the United States, residing at 519 West One Hundred and Forty-fourth street, New York, county of New York, and State of New York, have invented certain new and useful Improvements in Revolving Doors with Non-Concentric Casings, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

The object of this invention is to provide a construction for a revolving door, so that, with a door of given diameter, the entrance and exit to the casing may be wider than those heretofore attainable with the circular casings in common use.

Where a circular casing is used for a revolving door, the inlet and outlet of the casing embrace only ninety degrees of the circle, and thus afford a passageway which has only seven-tenths of the width of the casing.

In the present invention, a casing having sides non-concentric, or with parallel walls, is used in connection with an expansible rotatable door having wings which are projectable to a greater or less extent from the axis of the door, and which are guided during the rotary movement of the door so that their outer ends follow the non-concentric line of the casing and maintain a contact therewith to prevent the ingress of wind and dust. The door is made expansible by providing a hinge-body upon the center spindle of the door and jointing the wings thereto transversely to the radius of the hinge-body, so that the edges of the wings may move outwardly by turning the body in relation to the wings. Such turning of the body causes the wings to swing to positions more or less approaching a radius to the axis of the door, the outer edges of the wings being carried outward the more they approach the radial line, and such expansion of the door enables the edges of the wings to follow a casing of non-concentric character. By making the opposite walls of the casing of symmetrical character as is common, all the wings may be suitably actuated so that their edges move simultaneously in similar paths; the wings not in contact with the walls thus traveling through paths similar to those which are in contact. Any means may be used to guide the edges of the wings along the wall of the casing; and in practice, I

find it desirable to provide each wing with a guide roller fitted into contact with a cam or with the wall of the casing. Where a cam is used above the tops of the wings, guide-rollers are carried by vertically movable bolts which may be drawn downward to clear the cam, when it is desired to collapse the doors to form an open passageway.

The walls of the door-casing are made of suitable length to maintain a contact at all times with wings at opposite sides of the door, and it is found that a cam adapted to operate smoothly upon the door-wings requires that a slight inward curve be formed at the ends of the casing-walls. This will be understood by reference to the annexed drawing, in which—

Figure 1 is an elevation of a door constructed with my improvement; Fig. 2 is a cross section of the top of the casing on line 2—2 in Fig. 3, with an elevation of the upper ends of the lateral wings, and the edge of the center wing. Fig. 3 is a plan of the casing, the hinge-body, and the revolving wings attached thereto, with the walls at the sides of the doorway, two of the wings touching the middle part of the casing-walls; Fig. 4 shows the top of the casing, with the side walls of the casing in dotted lines, and showing the guide-rollers as in Fig. 3; Fig. 5 is a plan similar to Fig. 3 with two of the wings in contact with the end curved portions of the walls; Fig. 6 shows the top of the casing with the side walls of the casing in dotted lines and showing the guide-rollers as in Fig. 5. Figs. 7 and 8 are like Figs. 5 and 6, but with a continuously curved casing; Fig. 9 is an elevation of the hinge-body and connections broken at the middle for want of room; and Fig. 10 is a plan of the same. Fig. 11 shows the wings connected with the hinge-body by spring-bolts. Fig. 12 shows a casing with straight parallel side walls. Arrows show the direction of rotation.

In Figs. 3 to 6, *a* designates the side-walls of the casing formed parallel with one another throughout the greater part of their length, but having inward curves *a'* at the ends. *b* designates the door-spindle at the center of the casing, with a hinge-body *c* mounted thereon and provided with hinge-seats *d* corresponding in number with the four wings *e*. The wings are hinged to the seats by hinges *f'*, shown in several of the

figures, but lettered only in Fig. 7 and are extended from the seats transversely to a radial line drawn from the spindle to each seat, the wings assuming different angles to such radial line when at the middle of the side-walls as in Fig. 3, and near the ends of the side-walls as in Fig. 5. In Fig. 3, the hinge-body is shown rectangular, and in Fig. 5 the four bars project radially from the spindle with the hinge-seats upon their outer ends, and it will be noticed that such hinge-body is turned very materially in relation to the wings, and the wings opened materially upon their hinges; in moving from the middle portion of the side-walls as in Fig. 3, to the ends as in Fig. 5. Spring hinges press the wings constantly outward.

A roof-plate *f* is shown in Fig. 2 fitted to the spindle above the top of the wings and furnished with four slots *g* one extended along the line of each wing, through which a roller *h* is extended from the top of the wing into contact with a cam *i*, *j*, *k*, sustained upon the top of the casing. The cam is shown with a continuous curve extending around the inner side of a nearly rectangular opening in a cam-plate I, the curve having convex portions as *i*, adjacent to the middle of each side-wall, and concave portions *j* adjacent to the curved end portions of such walls. The corner curves *j* are connected by transverse portions *k* of the same curvature as the portions *i*. A bridge *b'* is supported upon the cam-plate I and extended across the cam-opening to support the top of the door-spindle *b*. (Figs. 2 and 6.) The roller *h* is carried by a bolt *h'* movable vertically in a housing *l* attached to the face of the door-wing near the top, and a knob *m* upon the bolt, which is movable in a slot in the housing, serves to move the bolt vertically and to lock it in its upper position, by turning the shank of the knob into the notch in the housing, as shown at the right hand side of Fig. 2. The bolt is provided beneath the roller *h* with a roller *h'* to fit the slot in the roof-plate *f*, both rolls turning independently upon the bolt; but when the bolt is lowered both of the rollers are drawn below the roof-plate *f* and the wings can be turned freely upon their hinges. Two of the wings may thus be released at any time and folded each along side one of the intermediate wings, when an open passageway through the casing is desired. The rollers *h* are, by the construction, always at a uniform distance from the flaps *e'* upon the outer edges of the door-wings, and the curve of the cam wherever the roller contacts with it, is therefore at an equal distance from the side-wall of the casing where the wing is to contact therewith.

With four wings in the door, the roof-plate *f* has four equidistant slots *g* which hold the wings in all positions at ninety de-

grees from one another; but the spindle cannot be connected rigidly with both the roof-plate and the hinge-body *c*, as such hinge-body and roof-plate have an oscillating movement, in relation to one another, four times during each rotation of the door. This is apparent from the position of the slots in relation to the seats *d* of the hinge-body, as shown in Figs. 4 and 6, the slots showing the position of the roof-plate while the seats show the position of the hinge-body in relation thereto. The roof-plate is preferably attached to the spindle as by the hub and flange *n* in Fig. 2, and the hinge-body fitted to turn loosely upon the spindle by means of a central hub *c'*. The hinge-body and roof-plate may be connected with the spindle in any manner to rotate independently of one another.

The wall *p* of a building containing the doorway *o* is shown in Figs. 3 and 5, with the side-walls of the casing fitted to such doorway, and it is obvious that the passageway through the casing is contracted only a very little by the curved portions *a'* at its opposite ends, thus affording much freer ingress and egress than with a circular casing having ninety degrees opening.

Figs. 7 and 8 show a casing with continuous curvature in each of the side walls, and the opening contracted the same as with the parallel walls having curved ends in Fig. 3, and Fig. 12 shows a casing with straight parallel side walls, the wings in such latter construction necessarily requiring a greater degree of extension than if the ends of the side walls were curved. Owing to the connection of the wings to the hinge-body and the engagement of their rollers *h'* with the roof-plate *f*, the movement of each wing is communicated to all the others and a cam operating upon one wing only would produce identical movements in the other wings, as indicated by dotted lines *a''* in Fig. 3. It is preferable, however, to have four identical cams to operate simultaneously upon the four rolls so as to diminish the strain imposed upon the rollers and thus increase their smoothness of operation and durability. Such continuous cams are shown in Figs. 4 and 6, but Fig. 8 shows only two of the cam surfaces with clearance between their opposite ends where the rollers pass across the casing from one side to the other coming into contact with the cam surface by the dotted curve *u*, in which curve the roller is moved by the operation of the other rollers already in contact with the cam surfaces. It will be observed that such line makes an obtuse angle with the curve of the cam and thus produces a sudden contact of the roller therewith, which undesirable effect is avoided with the short curves formed upon the ends of the straight-sided casing shown in Fig. 3.

With the casing shown in Fig. 8, or the casing having completely straight sides, as shown in Fig. 12, a cam similar to that shown in Fig. 4 may be used and proportioned to hold the wings in contact with the side walls until they are near the ends, and then to draw them gradually away from the same so as to maintain an easy movement of the rollers over the cam surface. The spring-hinges are shown in Figs. 9, 10 and 11 to press the wings constantly outward, for the purpose of holding the rollers in contact with the cam surfaces; but the cam may be formed with a groove to fit the opposite sides of the rollers *h* and thus move the doors inward and outward positively without the use of springs. A portion of such cam groove is indicated on the right hand side of the cam in Fig. 4, the inner portion *v* of the cam groove being secured to the outer portion by bridge-pieces *w*. The use of a spring which holds the roller firmly against the cam surface avoids, however, the shocks and jars which arise in moving a roller through a cam groove having reverse curves and lost motion.

The square hinge-body *c* is shown hollow in Figs. 9 and 10 fitted to turn on the spindle 1 by spiders 3 secured on the ends of the body, and which have lugs 4 projected over the corners of the body to receive the hinge-pintles 5 of the wings. Hinge-ears 6 are shown upon the wings and spiral springs 7 connected with such ears are wound around the pintles and are secured to the lugs 4 under a tension to throw the wings constantly outward.

In Fig. 11, the wings are shown connected with the corners of the hinge-body by spring-bushes 8 which may be of any ordinary construction and adjusted to press the wings constantly outward from the body.

Instead of a roof-plate, the slots may be formed in a four-armed spider 2, as shown in Fig. 12, to hold the wings in their successive positions by means of the rollers *h*. In such case, the roof-plate may, if desired, be stationary, and the bearing for the upper end of the spindle fixed in such roof-plate, and a cam dispensed with by pivoting rollers *r* directly in the edges of the wings to contact with the walls of the casing. The rollers *r* contact with the casing near one end of the same and force the wings inwardly until the middle of the casing is reached, when the wings again expand outwardly under the spring pressure until they leave the casing. Such rollers shown in Fig. 12 obviously have the same effect upon the wings as rollers operated upon a cam surface, which in any case would move the edge of the wing through a corresponding path.

As stated in connection with the line *a*² in Fig. 3, a cam operating upon one wing only would produce identical movements in

the other wings, which is due to the means shown for jointing the wings to the spindle and for guiding the wings by the rollers *h* in the slots *g* of the roof-plate.

Any means may be used for guiding the edges of the wings, (that is the flaps *e'* upon their edges) in contact with the walls of the casing; provided the wings are made expansible to follow the non-concentric surfaces of the walls.

Where the rollers *r* bear directly upon the walls of the casing, the rollers *h* are also required operating in slots *g*, to hold the wings in their proper relation to one another, the slots being made to limit the outward movement of the rollers, and the corresponding extension of the wings under the outward pressure of the spring hinges.

It will be understood that the rollers are applied to the stud or stud-bolt *k'* merely to diminish the friction, and that the stud upon each of the wings is fully adapted without the bolt to contact with the cam, and guide the edges of the wings in the desired manner. The stud-bolt *k'* illustrated in Fig. 2, is made as a movable bolt to permit the disengagement of the door-wings from the cam so that the wings may be collapsed when desired; but a non-retracting stud would obviously guide the wing as effectively, and I have, therefore, claimed broadly a stud upon each of the wings co-operating with a cam upon the top of the casing. The construction may thus be materially modified without departing from the invention, and any suitable means may be used to guide the edges of the wings along the inner walls of the casing, as the essential feature of the invention is the combination with non-concentric walls, of an expansible door having wings provided with means to guide their edges along the non-concentric surfaces of the walls.

To effect the expansibility of the door, the wings have a freely movable hinge-connection with the hinge-body on the spindle during the rotation of the door, and differ in this respect from any wings which have been heretofore jointed to a hinge-body merely for the purpose of collapsing to open the door-passage in emergencies, as all such previously hinged wings have been braced to hold them in a radial position during the normal rotating movements of the door, while the present wings are not held in a fixed relation to the hinge-body, but constantly change their relation as the door rotates.

Having thus set forth the nature of the invention what I claim herein is:

1. In a revolving door, the combination, with a door-casing having opposite walls, of a center spindle having an expansible door mounted thereon with means adapted to guide the ends of the wings along the inner

sides of the walls, and moving the edges of the wings in and out from the center of the spindle during such rotation.

2. In a revolving door, the combination, with a door-casing having opposite walls, of a center spindle, an expansible door comprising a hinge-body mounted upon said spindle with wings having a freely movable hinge-connection thereto during the rotation of the door, and means arranged and operated, when the door is rotated, to guide the ends of the wings along the inner sides of the walls, thereby swinging the wings into positions more or less approaching a radius to the axis of the door.

3. In a revolving door, the combination, with a door-casing having opposite walls, of a center spindle, an expansible door comprising a hinge-body mounted upon said spindle with wings having a freely movable hinge-connection thereto during the rotation of the door, a stud at the top of each of said wings, and a cam attached to the top of the casing to contact with the stud and guide the edges of the wings along the inner sides of the walls.

4. In a revolving door, the combination, with a door-casing having opposite walls, of a center spindle, an expansible door comprising a hinge-body mounted upon said spindle with wings having a freely movable hinge-connection thereto during the rotation of the door, a roof-plate fitted to the spindle and slotted along the side of each wing, a cam attached to the top of the casing to guide the door-wings, and stud-bolts movable vertically upon certain of the wings and extended into the slots to contact with the cam, and wholly retractable from the slots to permit the collapsing of the wings.

5. In a revolving door, the combination, with a door-casing having sides parallel for at least the middle portion, of a center spindle, an expansible door comprising a hinge-body mounted upon said spindle with wings having a freely movable hinge-connection thereto during the rotation of the door, a roof-plate fitted to the spindle and slotted along the line of each wing, a bolt-housing upon each wing with a stud-bolt movable vertically therein through the slot, a cam supported upon the casing above the roof-plate, and rollers upon the bolt fitted respectively to the slot and to the cam when the bolt is elevated, whereby the bolt is guided in the slot and the wings guided by the cam.

6. In a revolving door, the combination, with a door-casing having sides parallel for at least the middle portion, of a center spindle, an expansible door comprising a hinge-body mounted upon said spindle with wings having a freely movable hinge-connection thereto during the rotation of the door, a roof-plate fitted to the spindle and slotted along the line of each wing, a bolt-housing

upon each wing with a stud-bolt movable vertically therein through the slot, a cam supported upon the casing above the roof-plate, and rollers upon the bolt fitted respectively to the slot and to the cam when the bolt is elevated, and the bolt when lowered operating to withdraw both of the rollers through the slot to permit the collapsing of the wings.

7. In a revolving door, the combination, with a door-casing having opposite sides, of a center spindle with a hinge-body supported thereon and having hinge-seats corresponding to the number of door-wings, wings hinged upon such seats transversely to a radial line from the spindle to each seat, and means for guiding the edges of the wings along the parallel sides of the casing, the hinge-body being turned in relation to the wings during such guiding movement.

8. In a revolving door, the combination, with a door-casing having opposite parallel sides, of a center spindle with a hinge-body supported movably thereon and having hinge-seats corresponding to the number of door-wings, wings hinged upon such seats as set forth, a roof-plate supported upon the spindle and hinge-body and slotted in the line of each wing, bolts extended from the wings through the said slots, and a cam supported upon the casing above the roof-plate and operating upon the bolts to guide the edges of the wings along the parallel sides of the casing, the roof-plate and hinge-body being moved in relation to one another during such guiding movement.

9. In a revolving door, the combination, with a casing having its walls parallel at opposite sides of the center spindle and the walls having inward curves at the ends as set forth, of a center spindle, an expansible door comprising a hinge-body mounted upon said spindle with wings having a freely movable hinge-connection thereto during the rotation of the door, a roller upon each of said wings, and a cam adapted to guide the ends of the wings along the parallel sides of the casing and into contact with the curves at their opposite ends.

10. In a revolving door, the combination, with a door-casing having opposite walls, of a center spindle, an expansible door comprising a hinge-body mounted upon said spindle with wings having a freely movable hinge-connection thereto during the rotation of the door, means for pressing the wings normally outward, and means for guiding the edges of the wings successively into contact with the walls of the casing.

11. In a revolving door, the combination, with a door-casing having opposite walls, of a center spindle, an expansible door comprising a hinge-body mounted upon said spindle with wings having a freely movable hinge-

connection thereto during the rotation of the door, means for pressing the wings normally outward, and means for guiding the outer edges of the wings in similar paths adapted to contact successively with the walls of the casing.

12. In a revolving door, the combination, with a door-casing having opposite walls, of a center spindle, an expansible door comprising a hinge-body mounted upon said spindle with wings having a freely movable hinge-connection thereto during the rotation of the door, means for pressing the wings normally outward, means for guiding the outer edges of the wings into contact with the walls of the casing, and mechanism for moving the edges of all the wings simultaneously in similar paths.

13. In a revolving door, the combination, with a central spindle 1 having a hollow hinge-body *c*, of spiders 3 secured on the ends of the body to support it rotatably upon the spindle, and wings hinged upon the body, the construction making the outer edges of the wings simultaneously expansible in relation to the spindle.

14. In a revolving door, the combination,

with a center spindle 1 having a hollow hinge-body *c*, of spiders 3 secured on the ends of the body to support it rotatably upon the spindle, lugs 4 projected from the spiders and wings having hinge-ears jointed to such lugs, the construction making the outer edges of the wings simultaneously expansible.

15. In a revolving door, the combination, with a center spindle having a hollow hinge-body *c*, of spiders 3 secured on the ends of the body to support it rotatably upon the spindle, lugs 4 projected from the spiders, wings having hinge-ears jointed to such lugs, and spiral springs applied to the hinge-ears and lugs to throw the wings normally outward, the construction causing the outer edges of the wings to expand normally in the same degree.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

THEOPHILUS VAN KANNEL.

Witnesses:

FRED. FIEN,

THOS. JOSEPH CONNORS.