

Feb. 4, 1936.

S. C. DREHER

2,029,914

REVOLVING DOOR

Filed Oct. 16, 1933

5 Sheets-Sheet 1

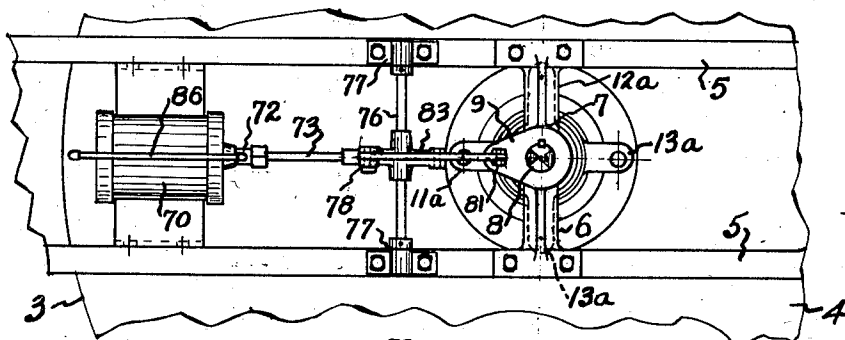


FIG. 2.

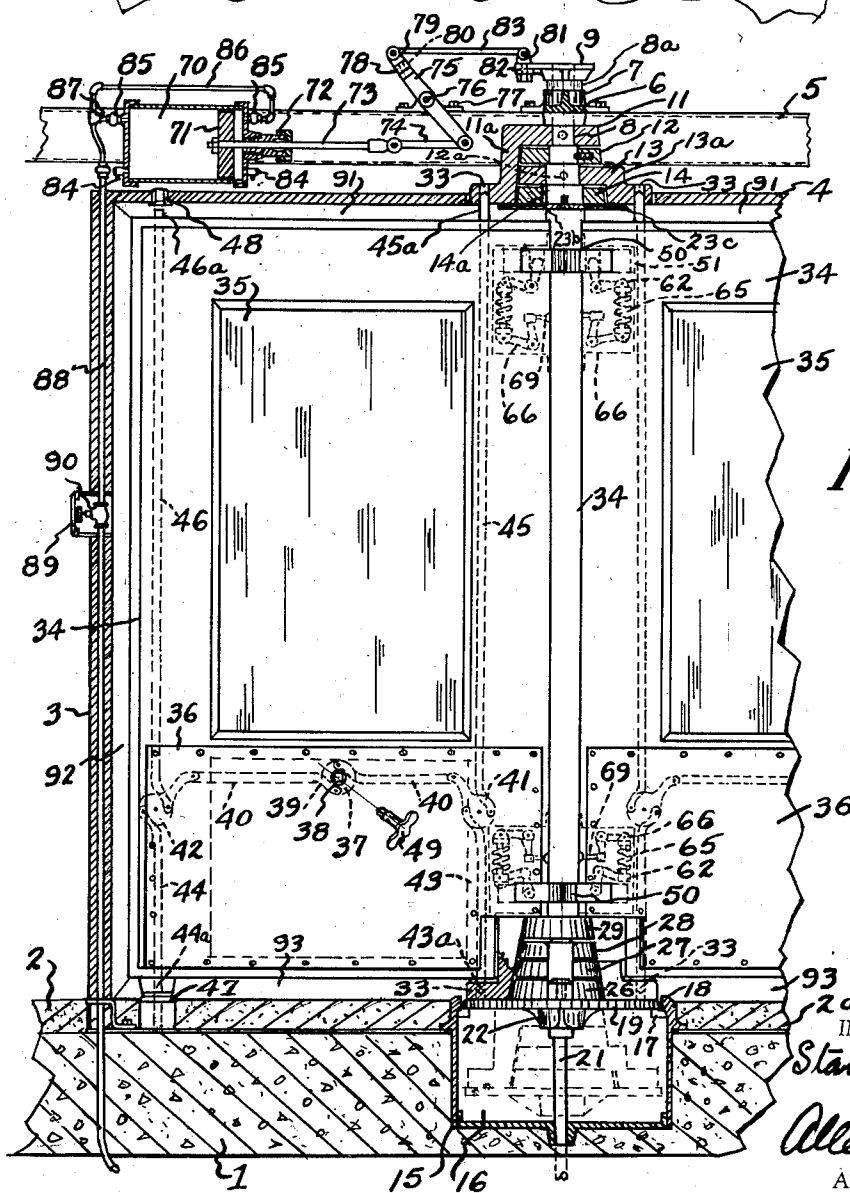


FIG. 1.

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5 Sheets-Sheet 2

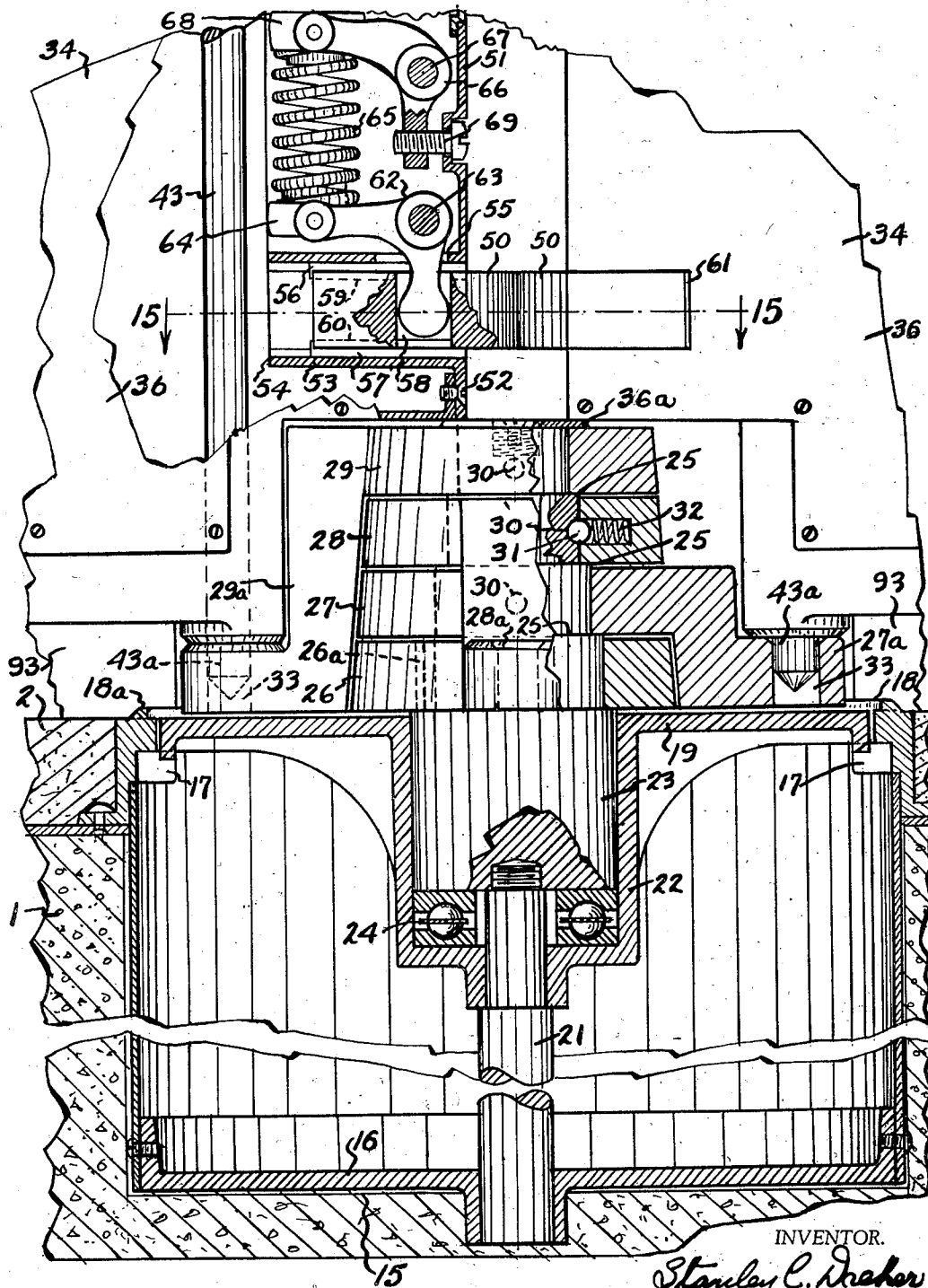


Fig. 3.

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5 Sheets-Sheet 3

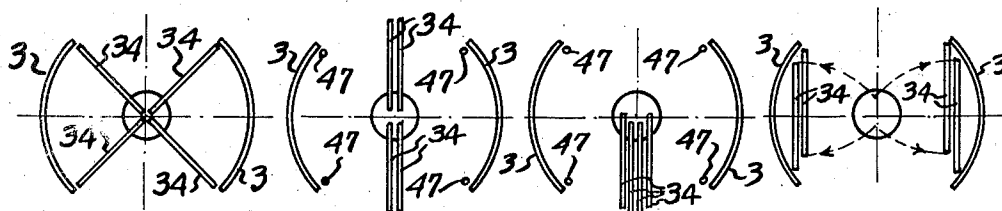


FIG. 5.

FIG. 6.

FIG. 7.

FIG. 8.

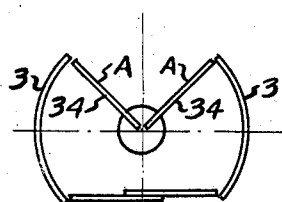


FIG. 9.

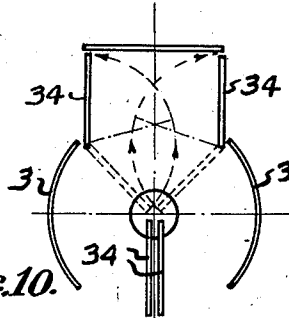


FIG. 10.

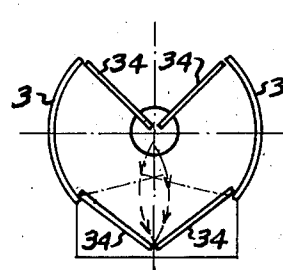


FIG. 11.

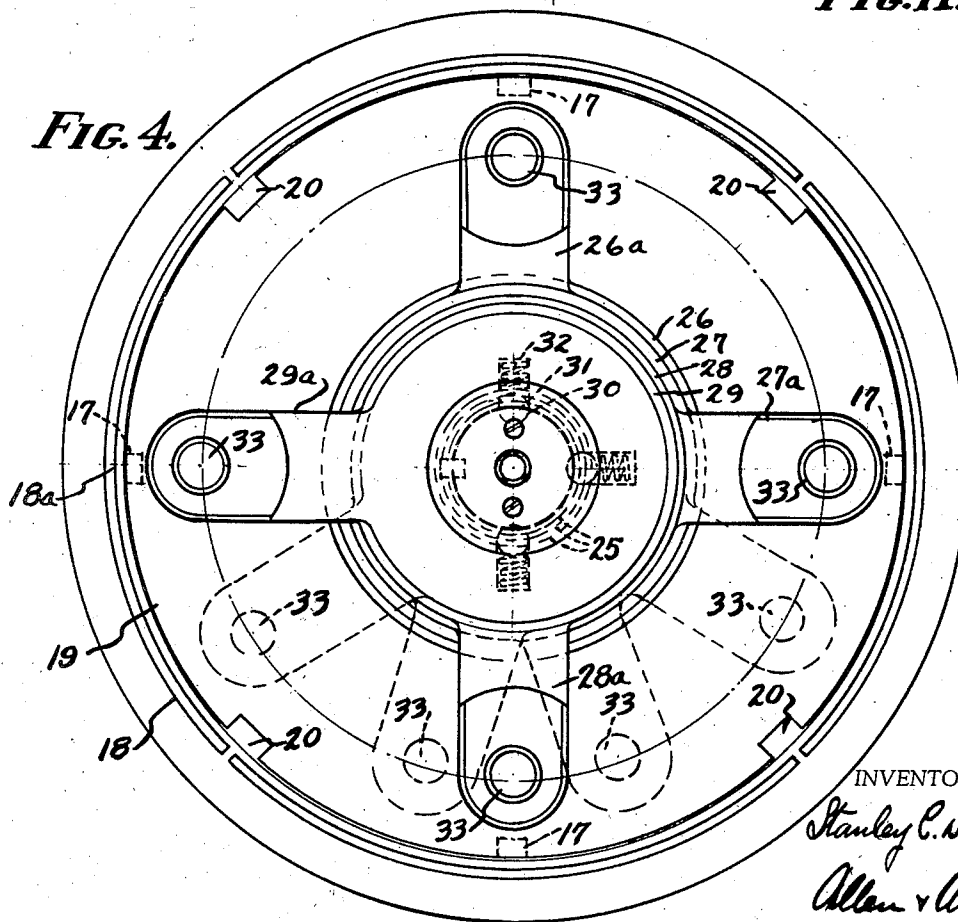


FIG. 4.

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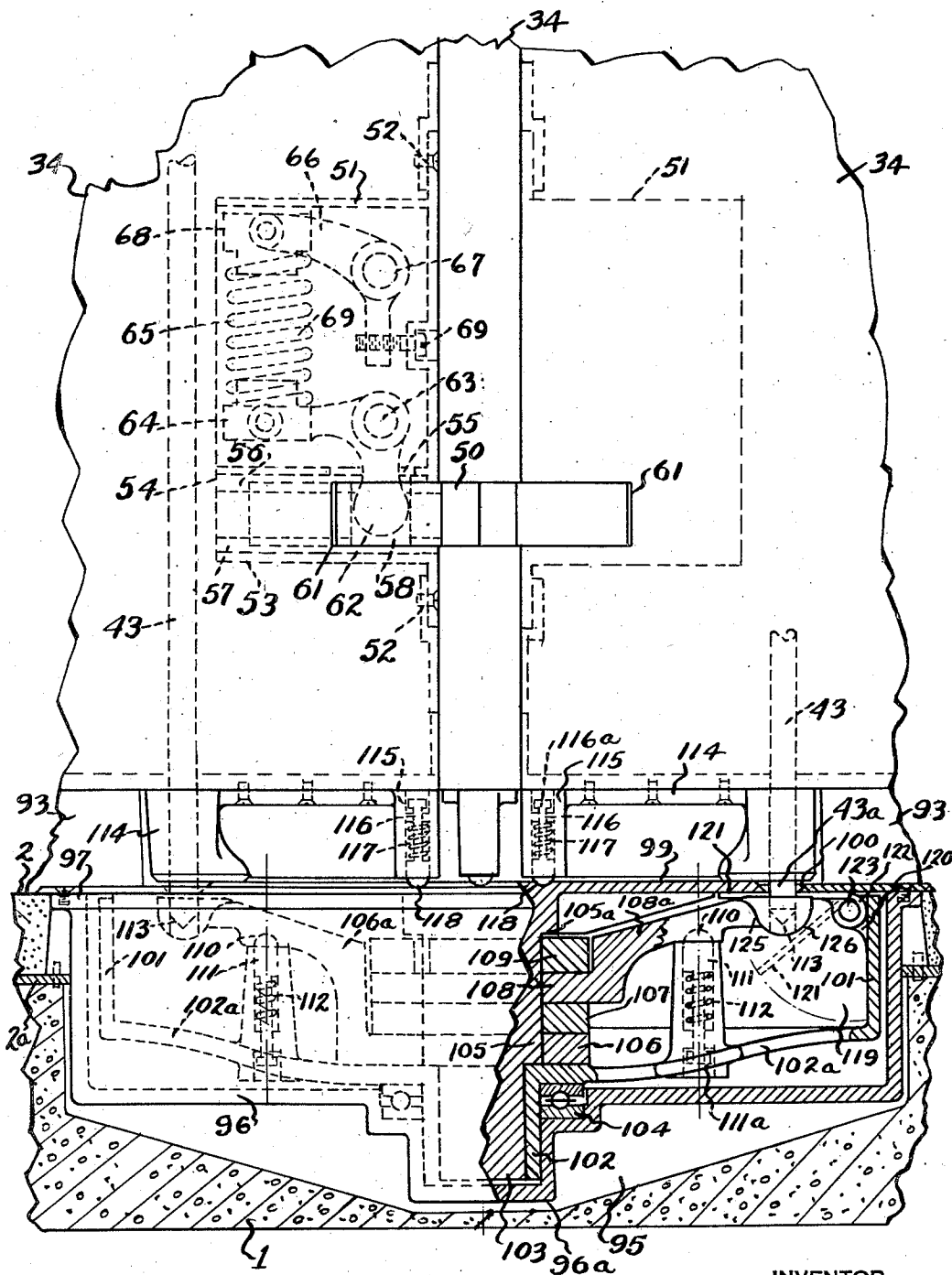


Fig. 12.

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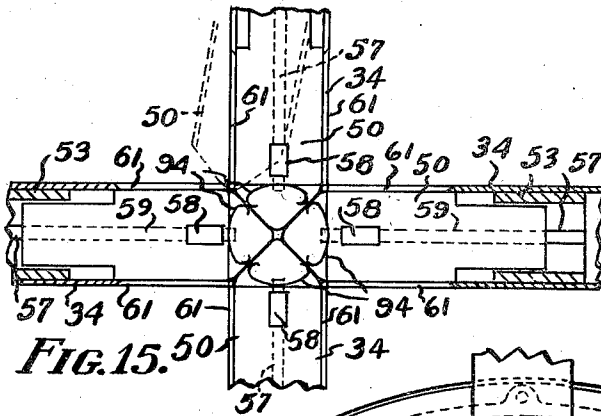
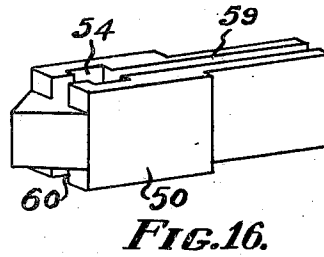
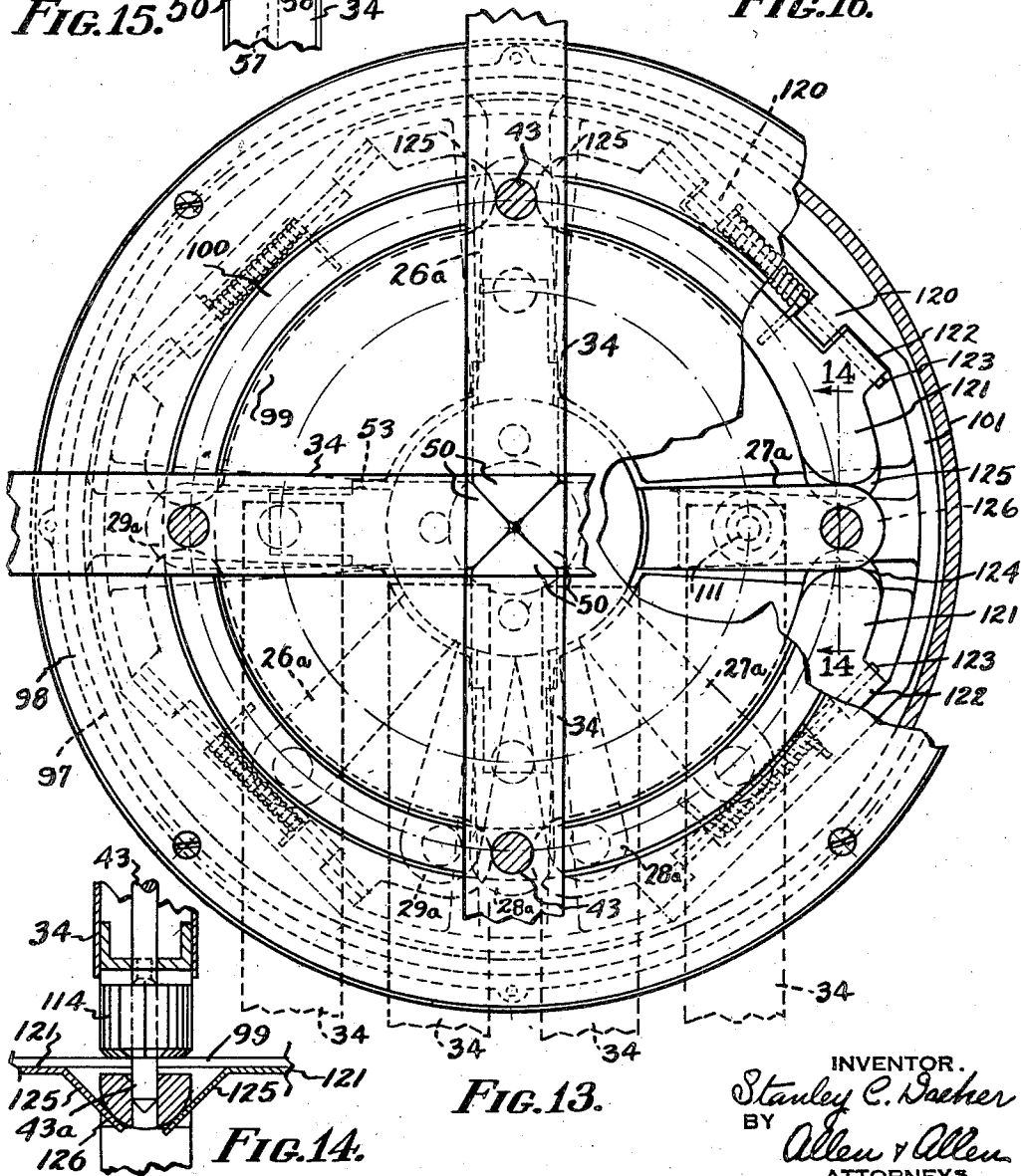
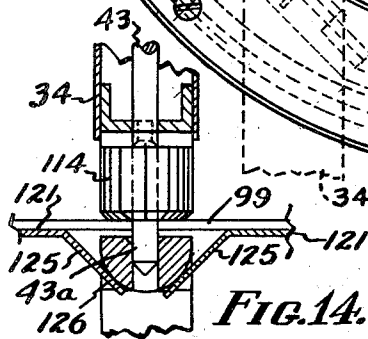
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5 Sheets-Sheet 5



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UNITED STATES PATENT OFFICE

2,029,914

REVOLVING DOOR

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Application October 16, 1933, Serial No. 693,749

20 Claims. (Cl. 20—18)

My invention relates to doors of the kind in which a plurality of radiating wings or shutters revolve about an axis at the central part of a doorway, between jamb sections in such manner that the door is never entirely open, yet allowing passage of persons between adjacent revolving wings. Such doors have been provided in which the wings are so associated as to be capable of collapse into a compact relation for removal to one side of the doorway when they are not needed, as in warm weather. In most cases, the wings are supported on means travelling on an overhead track for this lateral removal. This involves considerable complication and cost, and it is not convenient for providing the revolving doors with suitable checking means to prevent too rapid rotation of the doors, with liability of injuring persons entering or leaving them. So far as I am aware, any proposed improvements for avoiding the bodily removal of the assembled wings has involved equal complication, with practically the same difficulty as to providing a checking means. In most cases, the construction has involved the use of a vertical shaft which adds to the complication. Revolving doors also have been made in various designs with releasable means maintaining the wings in their radial relation, to release under abnormal pressure, as in case of panic, allowing the door wings to collapse and afford free egress; and where a central shaft has been included, this has involved complication in the construction and operation of the door for this latter purpose. It is with relation to these features of revolving doors that my invention is concerned, viz: disposal of the wings when not needed; provision of checking means with such doors; and provision for collapse under abnormal pressure, quickly and automatically, for free egress in emergencies.

One object of my invention, therefore, is to provide for supporting the wings in their radial disposition upon revolving supports which do not materially obstruct the doorway, and for disconnection of each wing from these supports and disposal of the disconnected wings to one side of the doorway. A further object is to provide for disposal of the wings, of which less than the whole number are disconnected from their supports, to provide various arrangements of closure for the doorway other than the revolving closure.

A further object, in connection with checking the operation of the door, is to provide the checking means, of simple and reliable construction,

readily adjusted to afford different degrees of checking effect, and in a fixed position with simple and substantial connection to one of the rotatable supports which remains on a fixed axis when the wings are disconnected and disposed away from the central part of the doorway, whereby, when the door is in operation, it is reliably checked according to the adjustment of the checking means.

A further object is to provide a very simple, compact releasable means, operating to allow collapse of the wings under abnormal pressure as above mentioned, yet holding them rigidly in their radial arrangement for normal use; and preferably to avoid the use of the central vertical shaft which is a part of most of the revolving doors heretofore provided for automatic collapse under such conditions. A further object is to provide such an automatically releasable means in a door including the provisions for ready disposal of the wings away from their central supporting means in the manner above mentioned. A further object is to provide adjustment of resistance to automatic collapse which will permit the doors to be suited to varying conditions.

Other objects will appear in the course of the following description, illustrated by the accompanying drawings, in which—

Figure 1 is a partial side elevation, partly in vertical section, of a revolving door embodying my invention.

Figure 2 is a partial plan view of the same.

Figure 3 is a sectional elevation of lower parts of the door, corresponding to the view in Fig. 1, on an enlarged scale.

Figure 4 is a plan view of the lower mounting.

Figures 5 to 11, inclusive, are diagrams illustrating various positions to which the detachable wings may be brought.

Figure 12 is a sectional elevation corresponding to Fig. 3, showing a modification of the lower mounting construction.

Figure 13 is a plan view of the same, with parts broken away and omitted to reveal lower parts.

Figure 14 is a partial vertical section on the line 14—14 of Fig. 12.

Figure 15 is a partial horizontal section on the plane of the line 15—15 of Fig. 3.

Figure 16 is a detail perspective view of one of the dogs or bolts that lock the wings in radial position.

In my preferred embodiment of the invention, I may use either one of two means for providing, both in the same structure, a mounting that will allow the door wings to collapse, or which will

allow them to be detached from the mounting for displacement from the center of the doorway. In the first example, Figs. 1 to 4, inclusive, the lower mounting is lowered below the floor level when the wings are detached. In the second example, Figs. 12, 13 and 14, the mounting is permanently below the floor level. The example of Figs. 1 to 4, inclusive, will be described first.

As I prefer to construct my improved revolving door, and as illustrated in the drawings, the doorway comprises, mounted on the floor structure of the building, represented at 1, a bottom or floor slab 2, suitably secured to the floor structure 1; a casing structure with upstanding arcuate wall or jamb portions 3, the shape of which may be understood from any one of the diagrams of Figs. 8 to 14, inclusive; and a top or ceiling structure 4 supported on the casing structure portions 3. Over this ceiling structure, and suitably supported by adjacent parts of the building structure as may be readily understood without detailed illustration, a pair of parallel beams 5, equidistant from the vertical center line of the doorway, support a cross yoke 6 with a bearing on said center line, at 7, for a stub shaft or spindle 8 having fixed to its upper end above the bearing a crank 9 which holds it suspended in the bearing. Below this bearing 7 the spindle 8 is made with portions of successively increasing diameter downwardly, forming a series of annular steps 10 supporting the links 11, 12, 13 and 14.

The floor slab 2 is apertured, and the building floor structure 1 has a well 15, this and the aperture being circular with their centers alined on the vertical center line of the doorway. Within the well and aperture a receptacle 16 is fixed, having its top rim formed with inwardly extending lugs 17, and, above these, a flange 18. A supporting disc 19, with notches 20 in its periphery, rests on the lugs 17; or, if it is turned so that its notches 20 register with the lugs, it may slide down into the receptacle 16. It has a central depending stem 21 guided in the bottom of the receptacle to maintain it horizontal when being lowered; it being understood that there is space below the well 15 into which this stem may slide upon lowering the disc 19. Centrally, this disc 19 is formed with a cup-shaped part 22 opening upwardly through its upper surface; and fitting into this part 22 is the lower end part of the lower stub shaft or spindle 23, so that the part 22 forms a side thrust bearing for the spindle 23. A ball bearing 24 supports the spindle 25 on the bottom of the cup; and the stem 21 preferably is extended up through this ball bearing 24 and fixed at the lower end of the spindle 23, with a bearing in the bottom of the cup-shaped part of the disc, so that this stem 21 acts to steady the spindle by its bearing here and in the bottom of the receptacle 16. The upper portion of the spindle 23, above the disc 19, is made with four portions successively decreasing in diameter upwardly, forming a series of annular steps 25, supporting the links 26, 27, 28 and 29.

It will be seen that the sets of links at the top and bottom of the door are similar in their support by the respective spindles 8 and 23 on steps. Each link is formed so that its central aperture snugly fits around a respective one of the four portions of the spindle. Each of the three smaller portions has a semi-spherical depression 30, into which a ball 31 is yieldingly depressed by a helical spring 32 in a radially inwardly opening socket in the link. The largest portions of the spindles have the links 14 or 26 fixed to them by

keys 14a and 26a, respectively. There being four links, the depressions 30 are spaced ninety degrees from each other and from the keys 14a and 26a. This arrangement of the balls entering the depressions automatically locates the links with their arm portions, 11a, 12a, 13a and 14a, of the upper set, and 26a, 27a, 28a and 29a of the lower set, diverging radially, equidistant around the assembly. The arms of the three upper links 11, 12 and 13, or 27, 28 and 29, have their junction portions 11a, 12a, and 13a, or 27a, 28a and 29a, that connect the arms to the central parts of the respective links extended alongside the assembly downward, so that these three arms and the arm of the lowest link 14 or 26 are all in the same horizontal plane. Each arm has an aperture 33 down through its outer end portion.

The above described assemblies of spindles and links constitute the rotatable mountings for the wings 34, each of a construction generally similar to that of usual wings of a revolving door, with its upper portion formed with a panel 35, usually of glass. The wing is constructed, at the sides of and below this panel, so as to be hollow; and below the panel it has a readily removable plate 36 which when removed affords access to a space inside the wing. At the middle of the top of this space a short shaft 37 is journaled transversely with a portion having a squared opening 38 exposed outside the wing, and with a crank disc 39 fixed on it inside the space, having links 40 pivoted to it diametrically opposite and extending in opposite lateral directions and pivoted to arms on respective additional discs 41 and 42 journaled in the wing structure on horizontal axes. Each one of these additional discs 41 and 42 has pivoted to it, diametrically opposite, a lower downwardly extending pivot bolt 43 or 44, and an upper longer upwardly extending pivot bolt 45 or 46, at the radially inner and outer parts of the wing, respectively. The lower pivot bolts are slidably guided in the bottom of the wing structure, and the upper pivot bolts are slidably guided in the top of the wing structure; having projecting portions 43a, 44a, 45a and 46a, respectively, outside the structure.

At spaced locations in the outer portions of the doorway, sockets are provided, on a circle which is concentric with the rotation of the wings when they are supported on their central mountings by the radially inner pivot bolts projecting their terminal portions 43a and 45a into the apertures 33 of the link arms of the lower and upper mountings, respectively. The lower sockets 47 are formed in the floor slab 2, and are adapted to receive the terminal portions 44a of the lower pivot bolts; and the upper sockets 48 are formed in the ceiling structure 4, and are adapted to receive the terminal portions 46a of the upper pivot bolts. By inserting a suitable key 49, with a square shank fitting in the square opening 33 of the middle crank disc, this disc may be turned one way or the other, so that by the system of links and additional discs 41 and 42, the radially inner pivot bolts will withdraw their portions 43a and 45a from the mounting apertures 33 and at the same time the radially outer pivot bolts will insert their portions 44a and 46a into the sockets 47 and 48, or vice versa.

Thus it will be seen that, with the inner pivot bolts in the mounting apertures 33, the wings are supported on their central mountings and are free of the floor and ceiling sockets; or, with the outer pivot bolts in the sockets 47 and 48, the wings are free of their central mountings and are

pivoted in these sockets so that they may be swung away from the central part of the doorway. The sockets 47 and 48 are preferably located as may be understood from the diagrams of Figs. 6 and 7, where the locations of the lower sockets 47 are indicated; being near the opposite ends of the arcuate casing or jamb portions 3, and it being understood that the upper sockets 48 are in vertical alinement with respective lower sockets 47. Fig. 5 shows the wings in normal radial positions as they are when mounted on their central mountings for normal operation. Fig. 6 shows the positions of the wings, in oppositely extended pairs, still connected to their central mountings, forming two passages through the doorway. Fig. 7 shows the wings all extending in the same direction, in parallelism, as they would be when collapsed under pressure of a crowd, for emergency exit, being still connected to their central mountings. Fig. 8 shows the wings disconnected from their central mountings and swung away therefrom, two to each side of the doorway, on their pivotal mountings in the sockets 47 and 48; this being the arrangement in which they are removed for full opening of the doorway, usually employed when the revolving door is not to be used for some time, as in warm weather. Fig. 9 shows how two wings may be left connected to their central mountings, as at A, A, while the other two are disconnected from the mountings and swung out on their outer pivotal mountings in the sockets 47 and 48, as at B, overlapping each other and forming a closure at the outer ends of the casing members 3. This closes the doorway completely when no passage is to be allowed through it, and prevents entrance of weather, and also of persons who might loiter in the space within the doorway were the door merely locked against turning in the condition shown in Fig. 5. Fig. 10 shows another arrangement wherein, with the addition of a closure member, C, two wings at D, D form extended storm doors swinging in their sockets 47 and 48, detached from the central mountings, with the other two wings at E still connected to the central mountings but collapsed to the inside of the building, in parallelism. Fig. 11 shows two wings at F, F, retaining their radial extension on the central mountings, and the other two wings at G, G, disconnected from said mountings and swung on their pivotal mountings 47 and 48; thus forming succeeding shutters at each side of the doorway after the manner of well known storm door arrangement.

The above examples illustrate the versatility of use of the door when constructed with the wings adapted to hinge either on the central mountings or on the outer pivotal mountings, as in the example just before described in detail. It will be understood that the floor and ceiling may have additional lower and upper alined sockets 47 and 48 at such positions as it may be desired to have the wings swing away from the center of the doorway; always, however, preferably being on the circle described by the outer pivot bolts when the door rotates normally, which arrangement avoids the necessity of lifting the wing in effecting the transfer of its position.

The lower inner corners of the wings 34 are cut away to fit over the assembly of the lower mounting, which stands with its links above the floor of the doorway for normal operation. A cap plate or disc 23a is screwed to the top of the lower spindle 23 as seen in Fig. 3, to hold the links down thereon. In view of the weight of the upper assembly of links constituting the upper

central mounting, a small ball bearing 8a is interposed between the crank 9 and yoke 6; and a plate or disc 23b is screwed to the bottom end of the upper spindle 9 to support the lowermost link thereon, with an additional larger disc or plate 23c supported on the disc 23b to conceal the links from the view of a person looking upward.

The mounting of the lower central mounting on the plate or disc 19 allows it to be lowered so that its top is below the floor level by lowering the plate 19 into the container or receptacle 16 as before described. Thus, when the wings are disconnected from this central mounting and swung aside, and this central mounting lowered, the floor of the doorway is entirely freed of obstruction. A suitable circular cover plate, fitting inside the flange 18 of the receptacle rim, may then be placed in position, making the floor of the doorway practically continuous at its central part. The cap plate 23a of the lower spindle preferably has an aperture 49a over a socket 49b in the end of the spindle, into which a suitable hook may be inserted for lowering and lifting the mounting and its support. The rim flange 18 is preferably provided, at intervals of ninety degrees, with marks 18a, aiding in the quick location of the link arms to receive the inner pivot bolts of the wings when the latter are to be swung in to connect with their central mountings. Of course it will be understood that only one, or any number less than four of these marks 18a will suffice, with the aid of the detent balls 31 at the spindle, locating the links with their arms at ninety degree intervals.

The links are made rotatable on the spindles 8 and 23 to provide for the automatic collapse of the wings to the position shown in Fig. 10. The small detent means comprising the balls 31 of course readily yield for this turning, and serve only for readily locating the links again after such collapse, as before described. To hold the wings rigidly in their normal radially extended positions, yet allow their collapse as above mentioned, each wing 34 has slidably projecting from its inner edge, near its top and near its bottom, respectively, bolts or dogs 50. Each bolt or dog 50 has its projected end beveled at an angle of 45 degrees to its length, in both lateral directions, leaving a vertical ridge at its middle; so that when the wings are in their normal radiating positions each dog or bolt 50 has its beveled sides fitting closely against the beveled sides of the two adjacent bolts or dogs 50, as best seen in Fig. 5. Provision is made for strongly yet yieldingly holding these dogs or bolts together in this arrangement, and for adjusting the yielding pressure with which they are thus held.

As I prefer to construct the device for the last mentioned purpose, for each bolt or dog 50, a casing or frame 51 is fitted into an opening in the edge of the wing 34 and at 52 screwed to the face of the edge, as best seen in Fig. 3. This casing comprises a barrel 53 projecting horizontally inwardly from the face plate of the frame or casing, with its lateral vertical sides entirely open and its top and bottom flat, next to the face plate, and its inner end part with a reduced four sided interior. This inner end part is terminated at the end of the casing to allow passage of the upper pivot bolt 45, at 54. The top of the lower barrel and the bottom of the upper barrel, on each wing, has a slot 55; and a key portion 56 is formed along the middle of the underside of this slotted portion, from the slot 55 into the inner

slot 54. The opposite side of the interior of the barrel has a key portion 57 facing the key portion 56, but extending from the inner slot to the outer end of the barrel, which is unslotted near this outer end. The dog or bolt 50, clearly shown in Fig. 6, has near its outer end a slot 58 vertically through it, and has keyways 59 and 60 in its opposite sides, respectively, to receive the key portions 56 and 57, which form accurate guides for the dog or bolt to prevent its sidewise deflection. The dog or bolt is as wide, laterally, in its outer portion, as the total width of the wing 34, which has portions cut away at 61 to admit the dog or bolt; the latter being reduced in width in its inner portion to fit in the four sided inner part of the barrel. The wide and narrow portions and the total length of the bolt or dog are so proportioned that it may slide inwardly of the wing 34 until its outer end is even with the face of the wing edge, without its shoulders where it is narrowed striking the edges of the cut away portions of the wing side plates, and without its inner end striking the pivot bolt 45.

Above the barrel 53 in the lower device, and below it in the upper device, a bell crank lever 62 is fulcrumed on a cross pin 63 held in the casing sides, with one arm having a rounded terminal portion fitting snugly but movably in the slot 58 of the dog or bolt, and its other arm projected inwardly in the form of a fork, in which is trunnioned a pad member 64 to receive one end of a strong helical spring 65. Beyond this lever 62 from the barrel, a second bell crank lever 66 is fulcrumed on a second cross pin 67 held in the casing sides, with one arm extended inwardly in the form of a fork in which is trunnioned a second pad member 68 compressing the spring 65 against the first pad member 64. The other arm of the second lever 66 extends toward the first lever 62 and a screw 69, passing in through the face plate of the casing, with its head countersunk therein, is threaded through this other arm. By turning the screw 69 in one direction, for which it is readily accessible at the wing edge, the second lever may be swung to further compress the spring 65, increasing the resistance against recession of the dog or bolt 50; or by turning the screw in the opposite direction, the pressure may be decreased. The spring will always cause the screw to seat its head snugly in the countersink at the wing edge.

As the wing is pivoted by its pivot bolt portions 43a and 45a in the link apertures 33 a considerable distance from the inner edge of the wing where these bolts or dogs are strongly pressed together by the springs 65, there is great mechanical advantage against recession of the bolts or dogs which thus hold the wings in their normal radial positions. However, the springs are designed of such stiffness, and are so adjusted, that the bolts or dogs 50 will yield when a pressure is exerted on two opposite wings outwardly of the doorway, as by a crowd in panic, so that the wings will collapse in that direction, leaving at least two clear passages for escape of the crowd. In so yielding, the bolts or dogs 50 will slide on one another in relations not easy to predict, but not inwardly beyond the limits of the exposed sides of the wider portions of the bolts or dogs in the cut away parts 61 of the sides of the wings 34. The lateral thrust is resisted by the key portions 56 and 57 under these conditions, while allowing free sliding of any bolt or dog to any position necessary to permit full release of

the wings from each other. When the wings are to be restored to their normal positions, the bolts slide against each other in like manner, automatically resuming their orderly arrangement as the wings are swung to their respective positions. The links in the central mountings turn on the spindles 8 and 23 in such degree as is necessary to allow collapse as above described.

As I prefer to provide checking means for my door, a cylinder 70 is mounted on cross pieces 70a and 70b fixed to and extending between the beams 5, near one side of the doorway over the ceiling structure 4, with the axis of the cylinder horizontal. Inside the cylinder is a plunger or piston 71, and the cylinder has in its end nearer the center of the doorway a stuffing box 72 through which a rod 73 extends with its inner end fixed to the plunger 71. The other end of this rod 73 is connected by a link 74 with the lower end of a lever 75 that is fulcrumed about midway of its length on a cross shaft 76 mounted in bearings 77 on the beams 5. The upper end of this lever 75 has a laterally extended portion 78, and a small fork 79 has its shank 80 mounted to turn in the portion 78. A similar small fork 81 has its shank 82 mounted to turn in the end portion of the crank 9 that is fixed to the upper end of the spindle 8 as before described; and a connecting rod 83 is pivoted to the two forks 79 and 81. Thus, rotation of the crank 9 with the spindle 8 results in reciprocation of the plunger 71.

The two ends of the cylinder 70 have check valves 84 admitting but preventing escape of air; and also outlet nipples 85 connected by pipes 86 and 87 to a pipe 88 that leads down inside the adjacent casing wall or jamb structure 3 to any desired place below the floor structure 1. The jamb portion 3 has an access opening closed by a cover 89, removal of which permits access to a valve 90 in the pipe 88. More or less closure of this valve 90 increases or decreases resistance to escape of air from the cylinder 70, so that the rotation of the door may be checked to the degree desired. It will be seen that none of this checking mechanism needs to be disturbed for removal of the door wings to the side of the doorway, as the wings are detachable from their central mountings as before described.

When the door collapses, the wing connected to the link 14 will be resisted by the checking device, but not to such extent as to hinder the collapsing action materially under the relatively heavy pressure exerted on the wings by a crowd in panic. By having the one top link 14 fixed to the upper spindle 8 the four wings are subject to the control of the checking means connected to the spindle 8 as long as they are maintained in normal radiating positions by the bolts 50. It also is desirable to have the one lower link 26 fixed to the lower spindle 23, so that the rotation is definitely confined to the lower spindle bearing 24, which might not always be assured merely by the engagement of the detent balls 31 with the spindle 23.

The top, outer edge and bottom of each wing 34 are provided with the usual flexible weather stripping 91, 92 and 93 contacting the ceiling, sides and floor, respectively, of the doorway. The inner edges of the wings 34 have provision for making them weather tight, preferably resilient metal strips 94 each of elongated C shape as indicated by the dotted lines in Fig. 5; each being attached to one of two opposite wings by its back, with its

curved end portions expanded against the edges of the other two wings. Their curved ends are extended sufficiently to avoid catching of their edges on the corners of these other two wings

5 when the door is restored to normal condition after collapse; the strips sliding these curved ends across these corners and being squeezed in between the two wings without attention of the operator.

10 The floor slab 2 is provided by furnishing with the door a relatively thin base plate 2a of metal, having on it upstanding members 47a in which the lower sockets 47 are formed. These sockets thus may be located with the required precision

15 at the factory where the door is made. The base plate 2a is installed in correct relation to the doorway structure, and then is filled in with suitable flooring composition to form the slab 2, by the workmen who install the door; and the sockets 47 thus open at the top level of this filling or slab 2. As the base plate 2a fits accurately around the central receptacle 16, it is thus possible to insure that the sockets 47 will be located properly relative to the door wings, the central

20 mountings of which are concentric with the receptacle.

In the modification illustrated in Figs. 12, 13 and 14, the construction of my improved revolving door will be understood to be the same as or similar to that illustrated in the preceding example, except as to the lower central mounting. Instead of having this mounting to be lowered after the wings are disconnected from it and swung aside, the mounting is permanently contained in the well or depression in the floor of the doorway, and means is provided for covering the annular slot necessarily present in the top of the mounting structure for the passage of the pivotal connections between the links and the wings, for

30 collapse of the door.

In the well or depression 95 formed in the floor of the doorway is the modified receptacle 96, around which fits the base plate 2a supporting the floor slab or filling 2 as in the first example.

45 This receptacle has the top flange 97 to which is screwed the top outer ring 98, projecting out past the flange slightly and projecting inwardly to a considerable extent. Concentric with this ring 98 is the top disc 99, of sufficiently less diameter than the interior of the ring 98 to leave the annular slot 100 between the two. The edges of the ring and the disc are beveled from their upper surfaces down to very thin lower portions.

Under the top outer ring 98, out close to the wall of the receptacle 96, the lower ring 101, of considerable depth relative to its radial thickness, so as to form a cylinder of very short axial extent relative to its diameter, is carried concentric with the disc 99 by a hub 102 at the bottom of the receptacle 96, to which it is connected by radial arms 102a, four in number. This hub 102 is made up of a top flange extending out from a hollow cylindrical main part which has a snug turning fit in a cup like bearing 96a depending

50 from the center of the bottom of the receptacle 96; the arms 102a projecting from the outer edge of its top flange.

The top disc 99 has integral with it, at its center, the depending spindle 103, the lower end portion of which has a snug turning fit in the hollow hub 102, above which the spindle is enlarged to form a part 105 to receive the links, and leaving an annular shoulder bearing on top of the hub 102. Above the part 105 the spindle

70 is again enlarged, leaving a shoulder 105a facing

downwardly. The lowest link 106 bears on the top of the hub 102, around the spindle part 105, and the other three links 107, 108 and 109 succeed upwardly, each bearing on the next lower one; the upper shoulder 105a of the spindle limiting upward displacement of the links. These

5 links 106, 107, 108 and 109 have the arms 106a, 107a, 108a and 109a, extending upwardly and curving outwardly from them in a manner similar to the arrangement of the link arms of the

10 previous example; so that the outer ends of the arms are all in the same horizontal plane, up close to the under sides of the ring 98 and disc 99, across the slot 100. Intermediate parts of the arms have bosses on their bottoms in which are

15 respective downwardly opening semispherical sockets 110. On the respective arms 102a of the lower ring are upstanding sockets in which are guided plungers 111, urged upwardly by springs 112 below shoulders of the plungers in the sockets; the plungers having stems through the bottoms

20 of the sockets with heads 111a to limit upward movement of the plungers. These plungers 111 have their upper ends semispherical to fit in the respective sockets 110 of the link arms. The

25 bosses which have these sockets 110 are connected by segments 110a, which with the bosses make up a complete ring 110a with a flat bottom against which the plungers 111 bear upwardly when disengaged from the sockets 110.

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The link arms 106a, 107a, 108a and 109a, where they extend across the annular slot 100, have vertical openings 113 through them, aligned with the slot. On the bottom edges of the respective wings 34, next to their inner corners, are

35 brackets 114 which form guides for the lower pivot bolts 43 of the wings; the lower end portions 43a of which enter the openings 113 of the links, for operation as in the previous example. At their radially inner ends, these brackets 114

40 have vertical sockets 115 in which plungers 116 are pressed down by springs 117, limited by heads 116a on the upper ends of the stems of the plungers that extend through the tops of the sockets. These plungers 116 bear down in sockets

45 118 in the top surface of the disc 99, or ride out therefrom on the top surface of this disc, accordingly as the wings are in normal radial positions, or are being swung away from those positions. The purpose of these plungers

50 116 is to hold the first, second and third wings 34 to be brought into their radial positions until the fourth one can be brought into such position; because the bolts 50 will not maintain the wings in these positions until all four are co-

55 acting.

The lower ring 101 has chordal walls 119, four in number and equally spaced around it; each wall having at its top a pair of spaced hinge lugs 120. Plates 121 have hinge lugs 122 straddling

60 the wall lugs 120; and pins 123 pass through the aligned lugs 120 and 122, hinging these plates 121 to swing up against the under sides of the top ring 98 and disc 99 across the slot 100, when the parts are in normal operative relation. The

65 plates 121 are pressed up into these positions by springs 124 coiled around the hinge pins and having ends engaging the walls 119 and the under sides of the plates 121. These plates 121 are of segmental shape, conforming to the circular

70 shape of the slot 100; and their end portions 125 inclined downwardly; and the bottoms 126 of the end portions of the wing arms are rounded to ride easily against the inclined end portions 125 of the plates and depress the plates when the

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links swing around together for collapse of the wings 34; the depressed position of a plate 121 being indicated by dotted lines at the right in Fig. 12. When the plates 121 are pressed up, normally, they close the portions of the slot 100 between the link arms, to prevent passage of dirt from the floor of the doorway down into the receptacle 96. The beveled edges of the members leave the side of the slot 100 sharp, so that dirt collecting in it on top of the plates 121 may be very easily swept out therefrom. The slight amount of dirt that passes into the receptacle 96 through crevices at the ends of the plates 121 will be thrown centrifugally to the outer portions of the receptacle, away from the central bearings, by the arms 102a, in normal rotation of the door.

While I have illustrated and described rather specifically certain preferred examples of my invention, it will be understood that modifications thereof may occur in practice, and that I am not limited to such precise disclosure, but what I desire to secure by Letters Patents is:

1. In a revolving door, in combination with a doorway, a series of wings radially diverging from the central part of the doorway, a mounting at said central part, confined away from the central mid-height area of the doorway and rotatable on a vertical axis, to which mounting each one of the full number of wings have their radially inner portions individually detachably connected, and means spaced at intervals at radially outer stationary parts of the doorway for detachable pivotal connection with radially outer parts of the respective wings for swinging each wing singly away from said mounting upon disconnection from said mounting.

2. In a revolving door, in combination with a doorway having a floor with a depression therein, a series of wings diverging from the central part of the doorway, a mounting at said central part, in said depression, comprising a series of links pivotally connected together centrally of the doorway and pivoted to the respective wings for collapse of the wings by relative rotation of the links, releasable means to hold the wings normally radially extended, and a cover for said depression having an outer fixed part and an inner part rotating with the mounting, spaced to leave an annular slot to be traversed by the pivotal connections of the wings and links upon collapse of the wings, shutter elements to close the slot between the connections, and a support for said elements upon which they are movable inwardly of the depression to close or open the slot, said support being held releasably to rotate with the mounting, and said links engaging the shutter elements to move them to open positions when the wings collapse.

3. In a revolving door, a central mounting confined away from the central mid-height area of the doorway, wings, links connected to the central mounting, pivots connecting the wings to the respective links, releasable locking means on the respective wings, mutually engaging to hold the wings in normal radial extension when all of the wings have said extension, and engaging means on the respective wings and on the mounting, mutually engaging, at a material distance from the respective pivots, to hold the wings radially extended when less than the whole number of wings are held by the locking means.

4. In combination with a doorway, a revolving door comprising a central rotatable mounting, wings supported on said mounting and collapsible

thereon and also individually detachable from said mounting, and means comprised in a stationary part of the doorway structure to support the detached wings for movement of the wings individually away from said mounting toward lateral portions of the doorway, said means adapted to be rendered operative incidentally to the detachment of said wings from said central mounting.

5. A revolving door as set forth in claim 4, in which the central mounting comprises links independently rotatable and pivoted to the respective wings, forming the detachable connections therewith, for collapse of the wings thereon, and in which the doorway structure has the support for the detached wings comprising means spaced at intervals at radially outer parts of the doorway for detachable pivotal connection with radially outer parts of the respective wings for swinging each wing singly away from the mounting toward said outer parts of the doorway upon disconnection of each wing from its respective links of said mounting.

6. In combination with a doorway, a revolving door comprising a central rotatable mounting, wings supported on said mounting and detachable therefrom, and a floor structure for the doorway, adapted to be stationarily installed when the revolving door is installed, having means for locating it definitely relative to said central mounting, said stationarily installed floor structure having means forming supports at definite locations on said structure for the detached wings, for movement of the wings away from said mounting.

7. In combination with a doorway, a series of wings radially diverging from the central part of the doorway, a rotatable support normally extending above the level of the floor of the doorway at its central part, to which the wings are articulated for collapse, releasable means resisting collapse of the wings, said wings being detachable from said mounting, and a support for said mounting on which said mounting may be lowered below said floor of the doorway upon disconnection of the wings from the mounting.

8. In combination with a doorway, a series of more than two wings radially diverging from the central part of the doorway, a rotatable support at said central part, pivots connecting the respective wings to said support for collapse of the wings, and resisting means on each wing, resiliently pressed against the resisting means of another one of said wings out of line with the axes of said pivots, resisting said collapse, and yielding to allow said collapse.

9. In combination with a doorway, a series of wings radially diverging from the central part of the doorway, a rotatable support at said central part, links independently rotatable on the axis of said support and pivotally connected to the respective wings, and resisting means on each wing resiliently pressed against the resisting means of another one of said wings, resisting said collapse, and yielding to allow said collapse.

10. In combination with a doorway, a series of wings radially diverging from a central part of the doorway, a rotatable support at said central part, pivots connecting the respective wings to said support for collapse of the wings, and resisting means on each wing, resiliently pressed against another part of the structure rotating with said support, resisting said collapse, and yielding to allow said collapse.

11. In combination with the radiating wings of a revolving door, a mounting comprising a cen-

tral spindle, a series of links arranged in axial succession on the spindle, each link other than a terminal one of the series having an extension alongside the series toward the diametral plane of the terminal link, and said terminal link and said extensions having respective radially extended arms in said plane, pivotally connected to a respective wing of the door for swinging of the wings thereon, means to resist swinging of the wings from their radial positions on said links, and means for supporting said spindle for rotation of the wings collectively.

12. In combination with the radiating wings of a revolving door, a mounting as set forth in claim 11, including yieldable detent means holding certain of the links to turn with the spindle with the arms of the links radiating for support of the wings in their radiating positions, but allowing rotation of the links on the spindle upon collapse of the wings from said positions.

13. In combination with the radiating wings of a revolving door and the doorway in which the wings operate, a mounting rotatable on a vertical axis at the central part of the doorway and comprising a series of links connected to the respective wings for collapse thereof and extending normally above the floor level of the doorway, the wings being detachable from the links for removal away from the mounting, a receptacle set into said floor, and a support for said mounting underlying the links thereof, said support extending across said receptacle and the support and the receptacle rim having mutually engaging means whereby the support is held in elevated position to support said mounting with said links extending above said floor level, and said mutually engaging means being disengageable for lowering said support into said receptacle, said receptacle being of depth to contain said links below said floor level and admit a cover across the top of the receptacle.

14. In combination with the radiating wings of a revolving door, a mounting comprising a series of links independently rotatable on a common vertical axis, each pivotally connected to a respective wing for collapse of the wings, said wings when uncollapsed having their radially inner edges directly facing each other, and members on the respective wings resiliently held in collapse-resisting contact with each other, and yielding to allow collapse of the wings.

15. In combination with a series of radially extended wings of a revolving door, means on each wing to resist or allow collapse of the wings, comprising a bolt radially slidable at the radially inner edge of the wing, a lever pivoted on the wing and engaging the bolt, a spring engaging the lever, and means holding the spring against

the lever, the bolts of the respective wings engaging central structure of the door under pressure of said springs exerted through said levers.

16. A combination as set forth in claim 15, in which the means holding the spring against the lever comprises a second lever, on each wing, and a screw accessible at the radially inner edge of the wing, engaging said second lever for adjustment of the lever, to adjust the pressure of the spring.

17. In combination with more than two wings of a revolving door, a mounting to which the wings are articulated for radial extension or for collapse from their extended positions, said wings having their radially inner edges directly facing each other when radially extended, and means on each wing comprising a bolt radially slidable at the radially inner edge of the wing, and means yieldingly holding the bolt radially toward each other bolt on each other wing, each bolt having its inner end beveled in both lateral directions from its middle vertically extended area, and means preventing rotation while permitting sliding of the bolt on the ring.

18. In combination with a doorway comprising a side casing structure, and closure means revolving in the doorway, a device to govern the speed of rotation of the closure means, and a regulator for said device accessible at said side casing structure.

19. In combination with a doorway comprising a side casing structure, and closure means revolving in the doorway, a rotatable mounting on a fixed axis, to which said closure means is detachably connected, so as to be removable from its closing position in the doorway, a device having a fixed location relative to said mounting, operatively connected to said mounting to govern the speed of rotation of the closure means, and a regulator for said device accessible at said side casing structure.

20. A revolving door comprising normally radial wings and a central mounting to which the wings are linked for collapse and from which the wings are individually detachable to be moved away from the mounting, and means for locking the wings on the mounting in their normal radial positions, said mounting being below the floor of the doorway at least when the wings are detached and moved away from the mounting, and a cover over the mounting, to complete the floor of the doorway when the mounting is therebelow, said cover being adapted to leave a space for connection of the wings to the mounting, wherein the connections may move when the wings are collapsed.

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