

F. CLYMER.
REVOLVING DOOR.

APPLICATION FILED SEPT. 13, 1906. RENEWED SEPT. 19, 1910.

990,227.

Patented Apr. 25, 1911.

6 SHEETS—SHEET 1.

Fig. 1

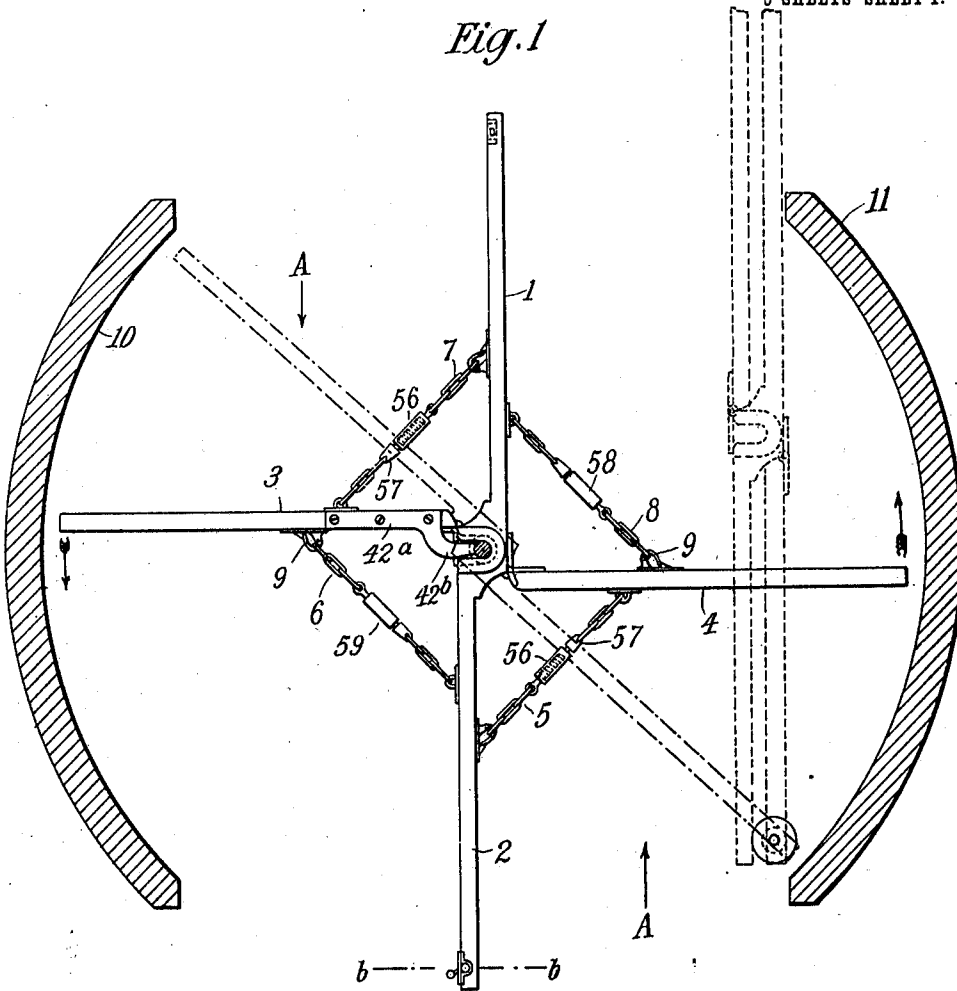
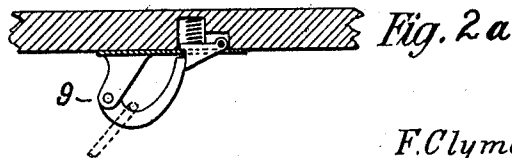
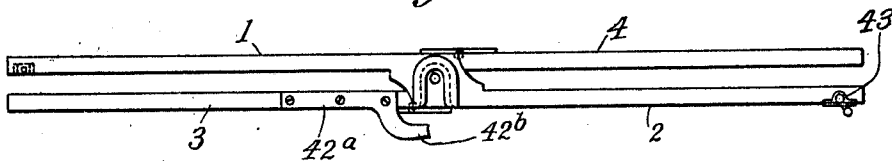


Fig. 2



Witnesses
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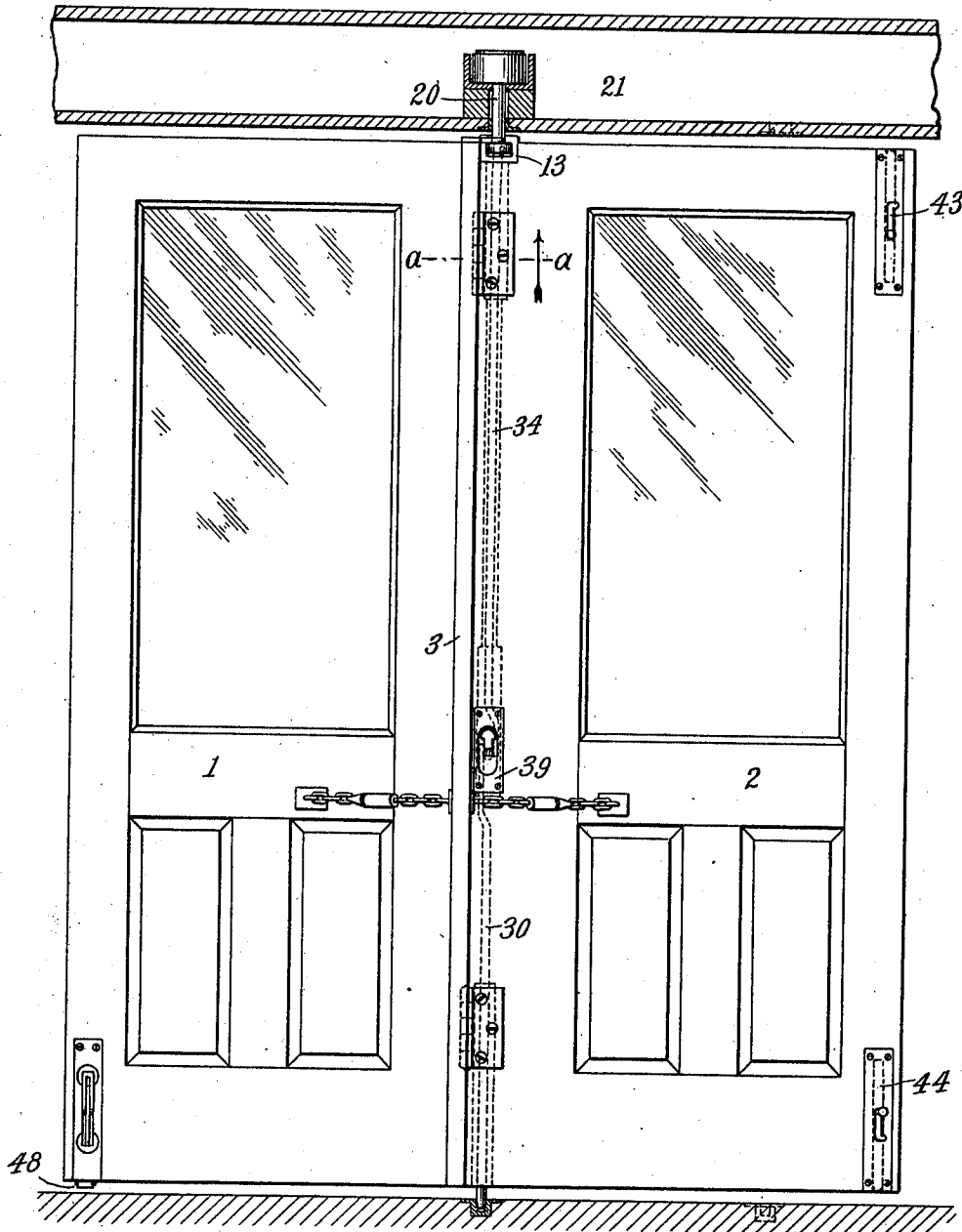
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6 SHEETS—SHEET 2.

Fig. 3



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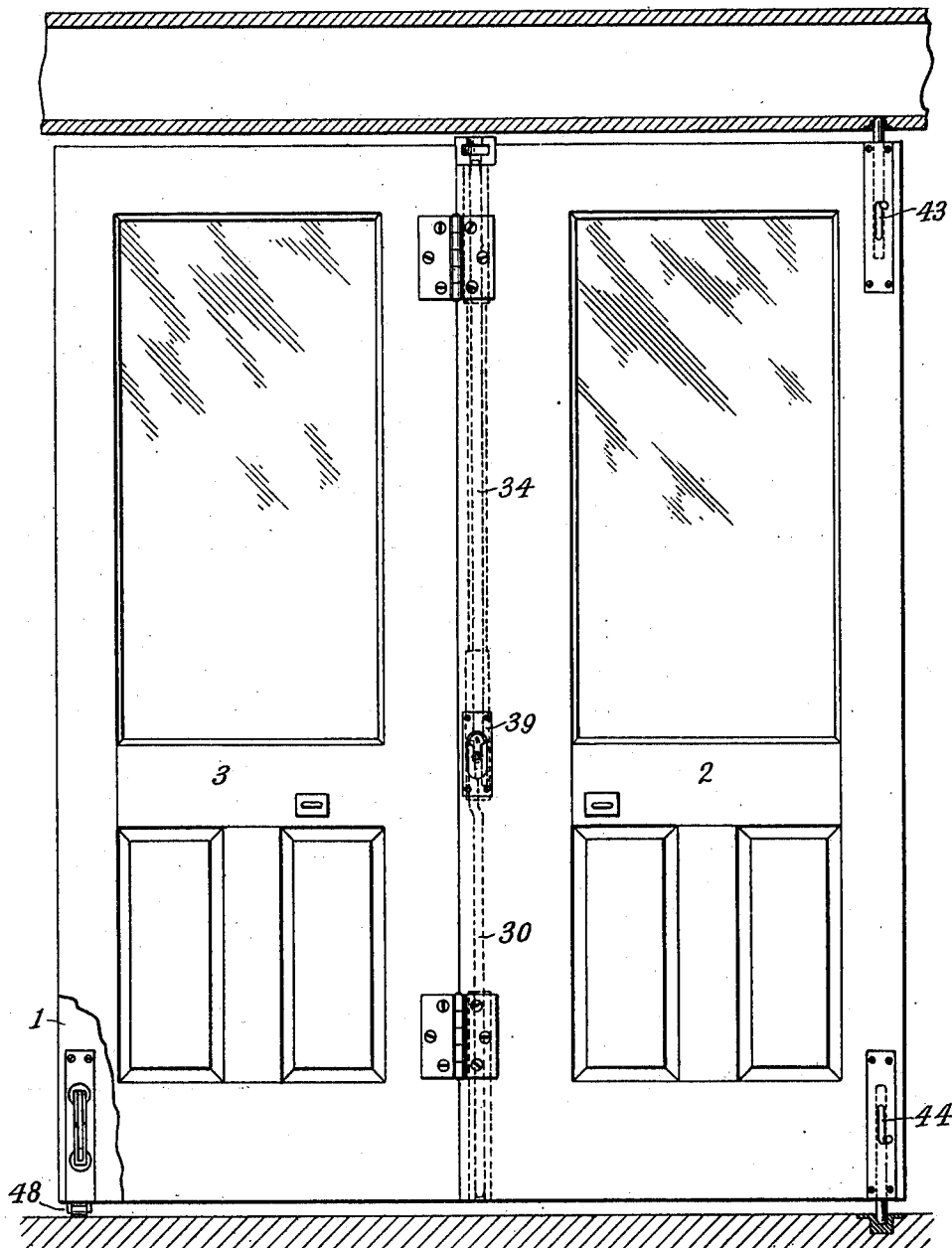
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6 SHEETS—SHEET 3.

Fig. 4



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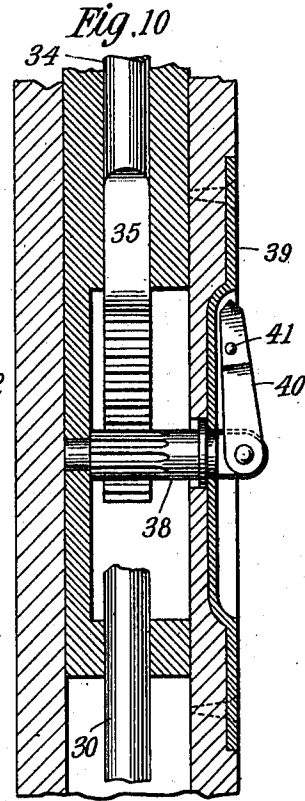
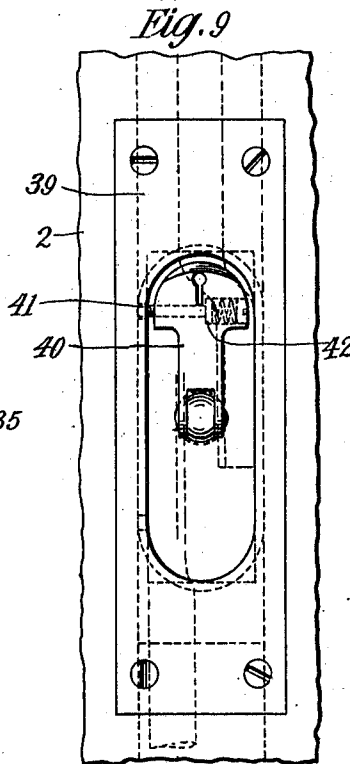
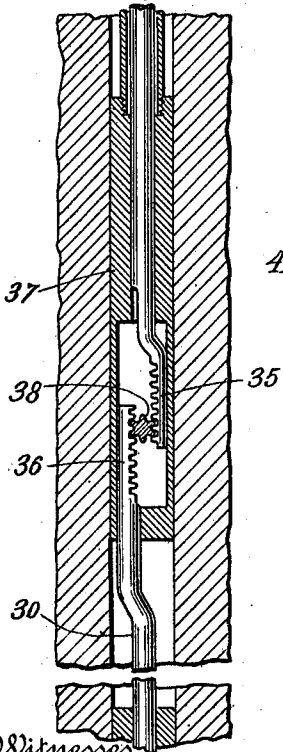
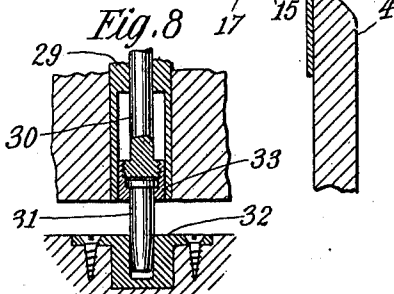
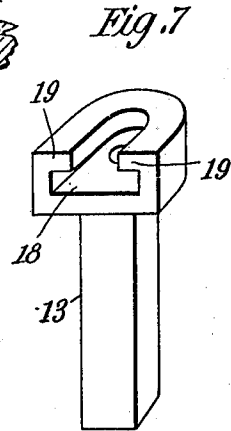
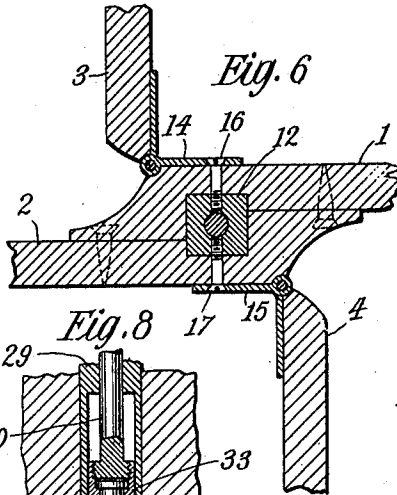
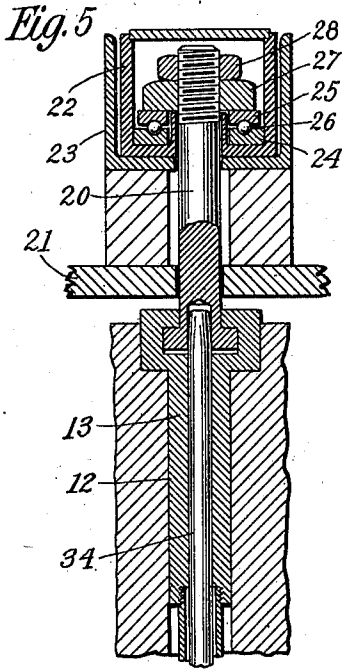
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5 SHEETS—SHEET 4.

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Witnesses

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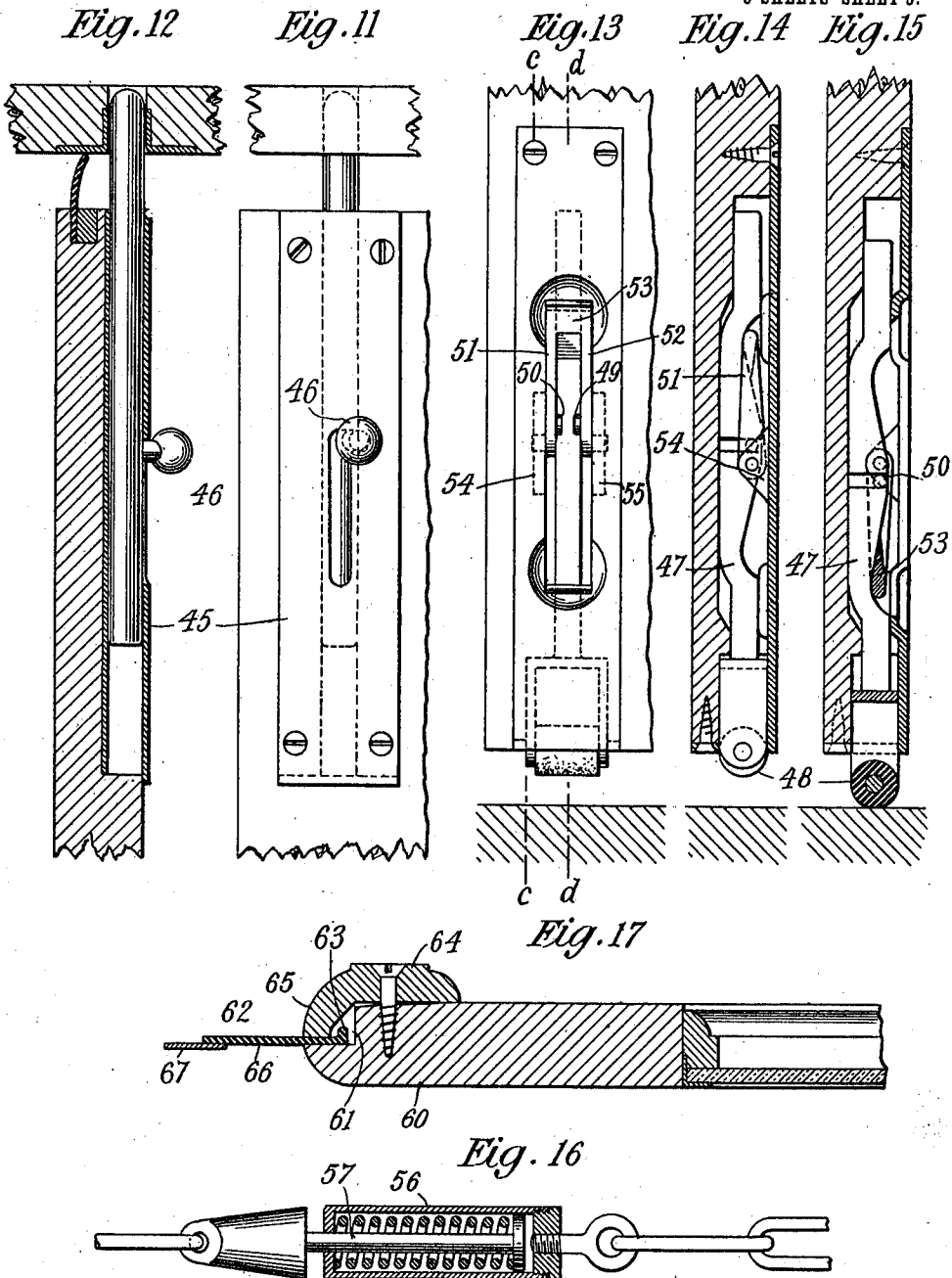
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5 SHEETS—SHEET 5.



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REVOLVING DOOR.

990,227.

Specification of Letters Patent. Patented Apr. 25, 1911.

Application filed September 13, 1906, Serial No. 334,388. Renewed September 19, 1910. Serial No. 582,731.

To all whom it may concern:

Be it known that I, FREDERICK CLYMER, a citizen of the United States, residing at Belmar, in the county of Monmouth and State of New Jersey, have invented certain new and useful Improvements in Revolving Doors, of which the following is a specification, reference being had to the drawings accompanying and forming part of the same.

My invention relates to so-called revolving doors, consisting of a plurality of radial wings or leaves rotating in a casing or chamber whose curved walls are arranged to provide an air-lock in connection with the revolving leaves or wings, so that no current of air can flow directly from one side of the door to the other. It is desirable, in fact for practical purposes it is necessary, that such doors be capable of being collapsed to one side of the chamber or casing in which it rotates, so as to leave a clear passage, as may be desirable in warm weather or to admit bulky articles.

My present invention is directed more particularly to the improvement of this feature, though the invention embraces other matters, as will be apparent from the detailed description of the preferred embodiment.

As commonly constructed, doors of the type described are made with four leaves, two of which are permanently fixed edge to edge, or are in the form of a single member, of a width sufficient to extend from wall to wall of the casing. The other two are hinged at the center on opposite sides of the main member, so that they can be folded upon the latter at will. The upper pivot on which the door revolves passes through the ceiling of the casing, and the said ceiling is provided with a radial slot, so that when the leaves are collapsed the entire door can be carried laterally to the side of the casing, the upper pivot passing through the ceiling slot, while the lower pivot is raised out of engagement with its bearing in the floor.

The construction just described possesses certain disadvantages. For instance, the upper pivot, when it is released from the door or from its bearing, is above the ceiling and hence not readily accessible for repairs, etc. The slot in the ceiling is also unsightly and is objectionable for that reason, while the necessary track or guide above the slot, on which track the upper pivot slides in the

operation of collapsing the door, is also not readily accessible.

My present invention is designed primarily to overcome these and other drawbacks, and, in general, to provide a door of simple, relatively inexpensive, and above all, durable construction.

The nature of the invention, by which these objects are attained, will be more readily understood from a more or less detailed description of the preferred embodiment. The same is illustrated in the annexed drawings, in which—

Figure 1 is a plan view, with the walls of the chamber or casing in section, showing in full lines the door in its operative or revolving position, and also showing, in dotted lines, the door when collapsed at the side of the casing or chamber. Fig. 2 is a detail plan view of the door folded or collapsed, and removed from the casing. Fig. 2^a is a detail view showing the preferred type of hook for securing the connecting chains to the wings. Figs. 3 and 4 are side elevations, the former showing the door in its operative or revolving position, and the latter showing the door collapsed at the side of the casing. Fig. 5 is a vertical section at the axis of the door, showing the construction and arrangement of the parts for permitting rotation of the door. Fig. 6 is a horizontal section on line *a-a*, Fig. 3. Fig. 7 is a detail perspective view showing the part carried by the door to engage the upper pivot on which the door revolves. Fig. 8 is a vertical section showing in detail the construction of the lower pivot and socket. Fig. 9 is an elevation of the device at the axis of the door for actuating the bolts which control the pivots. Fig. 10 is a sectional view of the same parts, on a plane at right angles to the plane of Fig. 9. Fig. 11 is a vertical section taken substantially on the line *b-b*, Fig. 1, showing the construction of the upper bolt on which the door, collapsed, swings to the position shown in dotted lines in said Fig. 1. Fig. 12 is an elevational view of the same parts. Fig. 13 is an elevational view of the devices for lifting the door out of engagement with its upper axial pivot, so that it may be swung to the side of the casing as shown in dotted lines in Fig. 1. Figs. 14 and 15 are sections on lines *c-c*, and *d-d* respectively, in Fig. 13. Fig. 16 is a detail sectional view showing one of the devices

employed for yieldingly connecting the leaves or wings of the door, so as to cushion the strain produced when pressure is exerted on a leaf to revolve the door. Fig. 17 is a horizontal sectional view showing the manner of securing the wipers which are carried by the edges of the leaves or wings of the door and bear on the inner surface of the casing.

The main member of the door consists of two leaves, 1, 2, secured at their edges in any suitable manner, as indicated in Fig. 6. Hinged to these leaves or wings are the laterally extending wings 3, 4, normally held in their radial positions, 90° apart, by chains, 5, 6, 7, 8. At least two of the chains, 6, 8, are at one end secured by snap hooks, as 9, Fig. 2^a, so that by releasing the chains from the hooks the wings may be folded upon the main member 1—2, as shown in Fig. 2. The other connecting chains, 5, 7, may also be fastened by similar devices, as shown, if desired. I prefer to employ hooks of the type illustrated, in which the hook member is pivoted at its base, so that the chain can be readily engaged and yet be taut when the hook is closed.

The door revolves on its axis in a casing having arc-shaped sides 10, 11, each at least 90° in extent so that in every position of the door each wall will be engaged by at least one of the wings.

The preferred devices for pivoting the door to permit rotation about its axis are shown in Figs. 1 to 10, inclusive, and will be clearly understood by reference thereto. Between the contiguous edges of the wings 1, 2, is an opening 12, preferably square in cross section, extending the full length of the door, from top to bottom. Fitting in the upper end of this opening is a socket member 13, shown more clearly in Fig. 7, with its shank extending down into the said axial bore or opening 12. Extending through the hinges 14, 15, which carry the wings 3, 4, and through the edges of the wings 1, 2, into the shank of the socket member, are screws 16, 17, serving not only to secure the socket member in place but also to firmly fasten the hinges in place. The head of the member 13 is formed with a laterally open slot 18, with overhanging lips or edges 19, to engage the head of a pivot member 20 extending downward from the ceiling 21 of the casing or chamber in which the door rotates. When the door is in rotating position the head of the pivot 20 engages the lips 19 on their under side and forms the principal support of the door, the weight of the latter being carried chiefly if not entirely by the said pivot member. At the upper end of the pivot member is an oil cup 22, of annular form, inclosed by a cylindrical casing 23. In the oil cup are grooved rings 24, 25, constituting ball races for the

balls 26. On the upper ring or race the pivot member 20, and from it the door, is supported by a nut 27, held in adjusted position by a jam nut 28. It is clear that by raising or lowering the nut 27 the position of the door can be correspondingly varied. In the lower end of the axial bore 12 is a member 29, (see Fig. 8), having a longitudinal opening in which is a reciprocating bolt 30, carrying a pivot 31 extending into a bearing or socket in a socket plate 32 fixed in the floor of the door chamber. The pivot 31 is carried by the bolt, by means of a bearing cup 33 engaging the head of the pivot. By this construction the pivot remains stationary in the socket, while the door rotates, and there is therefore no friction in the socket, which, being exposed to dirt and grit, would soon wear out. On the other hand, the head of the pivot, on which the door moves, is fully protected.

For the purpose of locking the pivot 20 and socket member 13 together, so that the door cannot be released from the pivot except when it is desired to collapse the door to one side of its casing, a bolt 34 is provided, extending vertically at the axis of the door, through a suitable bore in the member 13 into a socket in the lower end or head of the pivot. The bolts 30 and 34 extend to a point near the center of the door, and are provided with off-set portions 35, 36, in the form of toothed racks, with their teeth inwardly disposed, as shown in Fig. 5. These racks are located in a recess in a central guide member 37 through the ends of which the bolts work. Extending between the racks is a pinion 38, journaled at its inner end in the rear wall of the guide member and at its outer end in a plate 39 fastened to the wing 2. The journal of the pinion extends outside of the plate and is provided with a folding handle 40, by which the pinion may be rotated, thus drawing the bolt 30 up and carrying the pivot 31 out of its socket in the floor, and drawing the bolt 34 down out of the socket in the head of the pivot 20. When not in use the handle 40 is folded into a recess in the plate 39, as shown in Figs. 9 and 10. In order to prevent meddling with the parts the end of the handle is formed as a lock, with a spring bolt 41 normally holding the handle in its folded position. When the key is turned in the lock the stop 42, shown in dotted lines in Fig. 9, is engaged and thrown back, permitting the handle to be thrown out to its operative position. To prevent any possible disengagement of the socket and pivot members when the door is in the rotating position, the wing 3 is provided at its top with a plate 42^a having a lateral extension 42^b which closes the slot in the member 13 when the wing is in its radial position, as in Fig. 1. When the wing is folded, the lat-

eral extension moves out of the slot, leaving the parts as shown in Fig. 2.

For the purpose of swinging the door to its collapsed position at the side of the casing, as shown in dotted lines in Fig. 1, one of the wings, preferably one of the main wings, as 2, is provided at top and bottom at its outer edge with bolts or sliding pivots 43, 44, Fig. 4, which in their outermost positions engage sockets or bearings in the ceiling and floor respectively, as shown in the figure just mentioned. It will of course be understood that in the normal operation of the door, that is, when the door is arranged to rotate, the bolts or pivots 43, 44 are retracted. The construction and arrangement of the bolts are illustrated in Figs. 11 and 12, which show the upper of the two. The case or carrier 45 is sunk into the wing frame, and the slot through which the operating knob 46 extends is provided at its upper end with a laterally and downwardly extending notch into which the knob is slipped when the bolt is raised, thus preventing accidental retraction. The lower bolt, 44, is precisely similar, except that the retaining notch is at the lower end of the slot, as will be readily understood.

As previously stated, the door is suspended from the upper pivot 20. Means are therefore provided to lift the door so that socket member 13 may readily be disengaged from the pivot when it is desired to collapse the door. For this purpose the devices shown in Figs. 4, 13, 14, and 15 are provided, at the bottom of the outer edge of the wing 1. Vertically movable in a recess in the wing frame is a bolt or rod 47, carrying at its lower end a roller 48. In the sides of the bar are transverse grooves 49, 50, into which extend studs on the inner faces of the arms 51, 52 constituting the lever 53. These arms are pivoted at their ends near the studs to ears 54, 55, extending from the concave face plate. It will now be clear that if the lever be depressed, as by means of the foot, the bolt will likewise be depressed until the roller strikes the floor. Further movement of the lever will then lift the door slightly, sufficient to enable the socket member 13 to clear the head of the pivot 20.

From the foregoing the operation of the door will now be readily understood. Assuming the door to be in the rotating position, when it is desired to collapse the door the wings 3, 4, are folded to the position of Fig. 2 and the door turned until the side pivots 43, 44 can be thrown into their sockets or bearings, as in Fig. 4. The lever 53 is next depressed, lifting the door so that the socket member 13 may clear the head of the pivot 20. The bolts 30, 34 are now retracted by rotating the handle 40, as already described, whereupon the door, with its hinged wings folded, can be swung

bodily, or as a whole on the pivots or bolts 43, 44, to the position shown in dotted lines in Fig. 1. In this movement of the door it is supported at its outer edge by the roller 48, which rolls over the floor and permits the door to swing without undue strain on the pivot bolts. To reassemble the door in its rotating position the operation just described is simply reversed. It will be observed that when the door is folded at the side of the casing only one edge projects beyond the walls of the casing. This permits the use of a gate across the opening, as is frequently desirable, particularly in the case of institutions like banks, etc., which are closed to the public before the employees are through with their work. In such cases it is sometimes desirable to have the door open, as for purposes of ventilation, and yet barred to the public. This cannot readily be done with doors which project on both sides of the casing, but with my door a gate may be set up without in any way interfering with the door. This feature of having the door flush or within the casing is also of advantage in rooms where the projecting door would be in the way of persons occupying the room, as where it projected into a passage or other confined space. In such cases my door can of course be arranged so as to project on the outside instead of on the inside of the room. It will also be observed that the operative parts which are directly associated with the door are easy of access for inspection, repair, etc. The point where the door engages and disengages the upper pivot is also readily accessible, while the only parts above the ceiling, namely, the bearing devices for the upper pivot, are of such simple construction as to need only infrequent attention, if any, during the season when the door is in use. The oil cup 22 having been filled with oil, lubrication at that point requires no further attention for a considerable time.

As revolving doors are now commonly constructed, the wings when extended as in Fig. 1 are connected rigidly, so as to permit no movement relative to each other. The result is that the sudden force, frequently applied, to rotate the door puts the parts under considerable strain since there is no cushioning of the force. In a comparatively short time this usage causes parts to become loose, resulting in an objectionable shaking when the door is rotated. This looseness of the leaves, without cushioning means to relieve the same, also causes a severe pounding and racking when force is applied to start or stop the door, which greatly increases the wear and tear on the door and correspondingly shortens its life. This strain on the door is particularly injurious when the pressure to rotate the door is applied to one of the folding leaves, as

will be readily understood. I propose to obviate the drawback just mentioned by providing yielding connections between the leaves, so that the force exerted to start the door 5 will be cushioned and communicated more gradually to all parts of the door. For this purpose I employ in the chains between the wings devices like that shown in Fig. 16. This device consists of a casing 10 or tubular member 56, connected at one end with the chain and containing a coil spring, and a plunger 57 connected at its outer end with the chain and carrying at its inner end a stop engaging said spring. Each 15 chain may be provided with a device of this kind, but usually two will be found sufficient, in the chains between the wings of the main member and the wings which fold thereon, as for example in the chains between wings 20 2 and 4, and 3 and 1, in Fig. 1. Where no such devices are employed in the other chains, dummies, as 58, 59, may be used to preserve a uniform appearance. It will be clear that when persons enter the door in 25 the directions of the arrows A, Fig. 1, and push on the wings 3, 4, the first effect of the force exerted, if greater than the tension of the springs and the inertia of the door, will be to turn the wings slightly on their 30 hinges, while at the same time the force is communicated gradually to the other leaves in succession until the door starts to revolve. In this way no great strain is suddenly produced on the other leaves, while the strain 35 on the first wing is cushioned and relieved by the spring. The durability of the door is thus greatly increased and its life correspondingly lengthened. It is to be understood, of course, that yielding devices may 40 be employed in all the chains if desired.

For the purpose of producing a substantially air-tight fit between the wings and the casing walls it is customary to employ wipers, in the form of flexible rubber strips, 45 extending outwardly from the outer edges of the wings and bearing on the walls. Wear on these wipers, and loss of resiliency due to the fact that they are almost constantly flexed by engagement with the walls, soon 50 cause the desired close fit to be impaired, necessitating frequent readjustment or replacement of the wipers. In the constructions commonly employed this is a more or less troublesome operation, and I have therefore 55 devised a method of attaching the wipers to the wings such that they may be easily and quickly adjusted, or even replaced, when occasion arises. The plan just referred to is illustrated in Fig. 17. In this 60 figure, 60 designates the wing, which is provided with a rabbet 61. In the latter is placed the wiper, 62, provided with a bead or rib 63 on its inner edge. Over the wiper 65 by screws or other suitable means and hav-

ing a flange 65 bearing on the wiper outside of the bead. The binding strip is preferably constructed so as to leave a slight gap between it and the wing, as shown, so that when the fastening devices are set up the 70 wiper will be firmly held. When it is desired to adjust the wiper, either in or out, the screws are simply loosened enough to permit the necessary movement of the wiper, after which they are again tightened, binding 75 the wiper in its new position. Accidental detachment of the wiper during the adjusting operation is prevented by the bead 63. It will therefore be seen that the adjustment of the wiper to the proper position 80 may be effected quickly and easily, even by an unskilled person. The wiper itself consists preferably of a rubber strip 66, with the bead on one edge, and carrying on its outer edge a felt strip, 67, stitched or otherwise 85 fastened thereto, which bears against the walls of the casing. The wipers employed on the top and bottom edges of the wings may be secured in the same manner if desired. 90

It is to be understood that the door herein specifically described is merely the preferred form of the invention. To those skilled in the art it will be clear that the principle of the invention is capable of 95 various embodiments and that mere details of construction are immaterial.

What I claim is:

1. The combination with a casing, and a revolving door therein, having radial wings 100 and adapted to be collapsed by folding on hinges at the inner edges thereof, of a pivot member depending from the top of the casing, a member on the door at the central axis thereof, having a lateral slot in its head, 105 whereby the door is suspended from the said pivot member, means for lifting the door whereby it may be released from said pivot member, and pivots carried by one of the wings adjacent to its outer edge and adapted 110 to engage the top and bottom of the said casing, whereby the collapsed door may be swung laterally from the revolving position, as set forth.

2. The combination with a revolving door, 115 of an upper pivot member, a member at the top of the door having a lateral slot to engage the pivot member, a bolt extending through the slotted member into the pivot member, a second bolt carrying a lower pivot 120 for the door, and means common to both bolts, to retract the same, as set forth.

3. The combination with a revolving door, of an upper pivot member, a member at the top of the door having a lateral slot to en- 125 gage the pivot member, a bolt at the axis of the door, extending up through the slotted member into the pivot member, a second bolt carrying a lower pivot and extending into proximity to the first bolt, racks on the ad- 130

jacent ends of the bolts, and a manually operated pinion engaging the racks to retract the bolts, as set forth.

4. In a revolving door, the combination with a casing and a door revolving therein, of pivot devices carried by the door and the top of the casing and detachably engaging each other, said members being capable of complete disengagement from each other by lateral movement of one relatively to the other, and a reciprocating bolt at the axis of the door, extending through the pivot device carried by the door and into the device carried by the top of the casing, to lock the said devices in engagement and to permit disengagement at will, as set forth.

5. The combination with a revolving door having radial wings and adapted to be collapsed by the folding of wings hinged at their inner edges, said door being suspended from a relatively stationary upper pivot and releasable entirely therefrom by vertical and lateral movement of the door, a bar mounted on the door, carrying a roller at its lower end, means for depressing the bar and causing the roller to bear on the floor, whereby the door may be lifted, and means for swinging the door laterally from its normal position, as set forth.

6. In a revolving door, in combination, a

door having collapsible radial wings, a casing in which the door revolves, and pivot devices carried by the door and the top of the casing, comprising a headed pivot member and a socket member having a lateral socket adapted to receive the head on the pivot member and permit complete disengagement of the pivot devices from each other when the collapsed door is moved laterally from its revolving position, as set forth.

7. In a revolving door, in combination, an upwardly extending socket-member carried by the door at the axis thereof and having at its upper end a lateral socket; and a depending pivot-member having at its lower end a head engaged by the said socket; as set forth.

8. In a revolving door, in combination, an upwardly extending socket-member carried by the door at the axis thereof and having a lateral socket at its upper end; a depending pivot-member having at its lower end a head engaged by said socket; and a mounting for the pivot-member permitting rotation thereof; as set forth.

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Witnesses:

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."