D. M. QUAY.

REVOLVING DOOR.

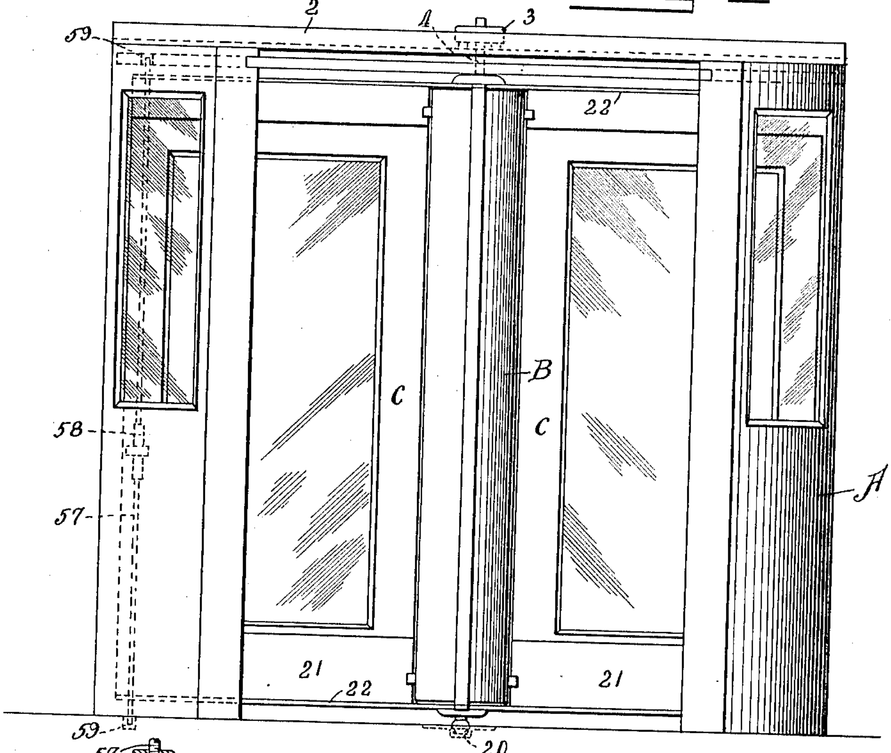
APPLICATION FILED OCT. 15, 1909.

1,030,849.

Patented June 25, 1912.

7 SHEETS—SHEET 1.

Fig 1



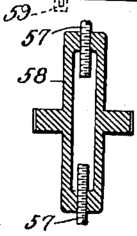


Fig 17

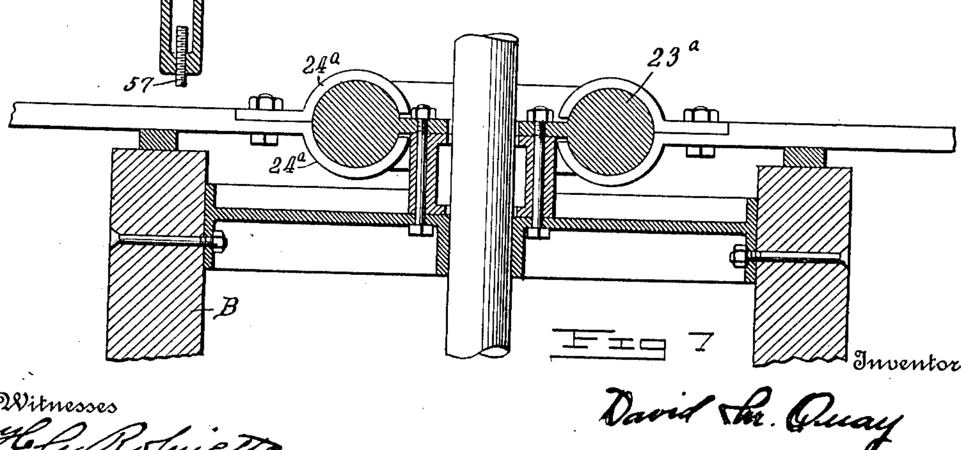


Fig 7

Witnesses

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7 SHEETS—SHEET 2.

Fig 2

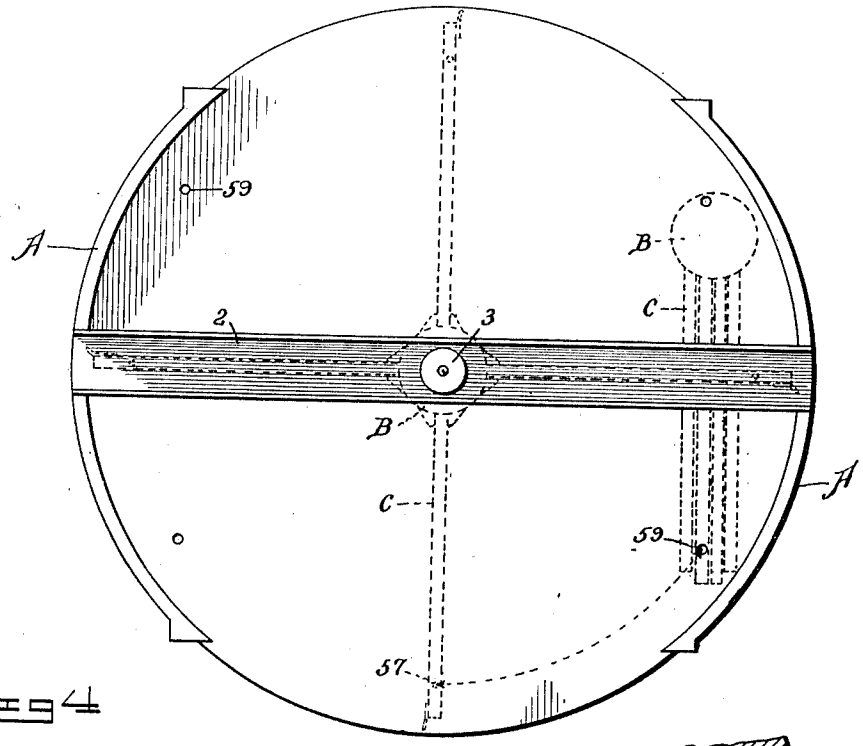
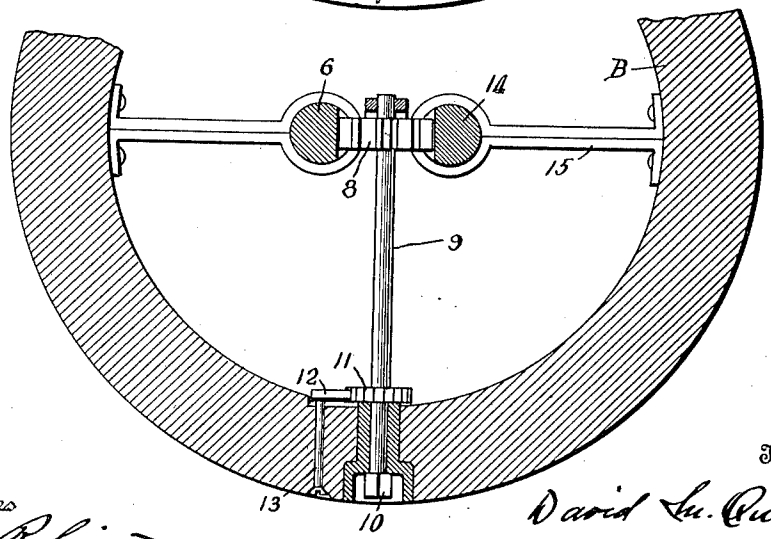


Fig 4



Witnesses

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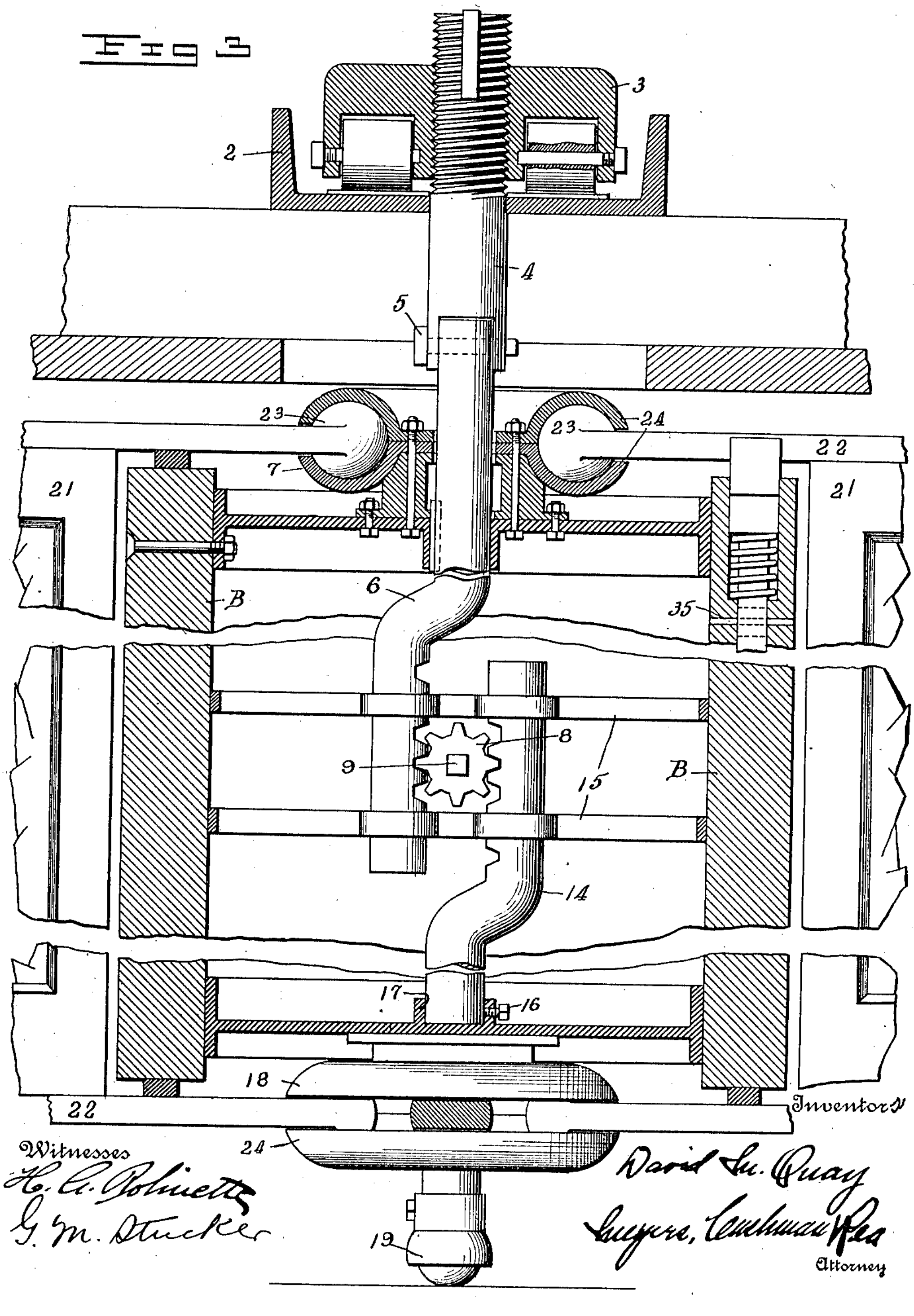
7 SHEETS—SHEET 3.



COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

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7 SHEETS—SHEET 4.

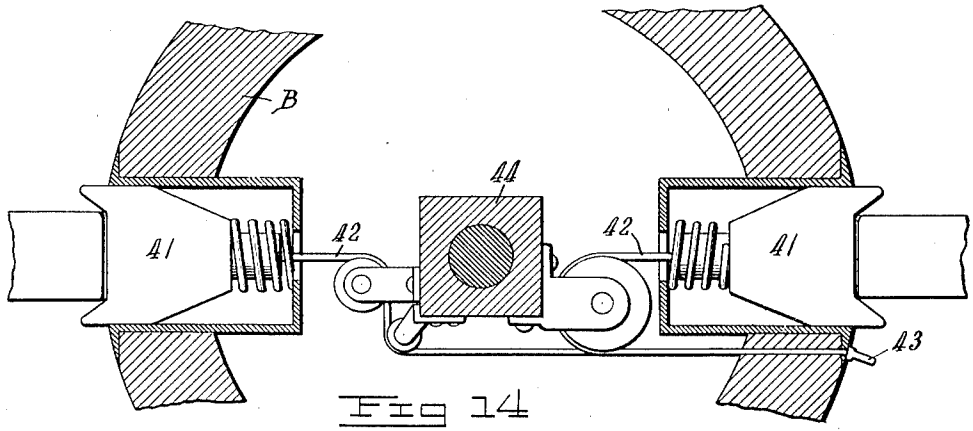
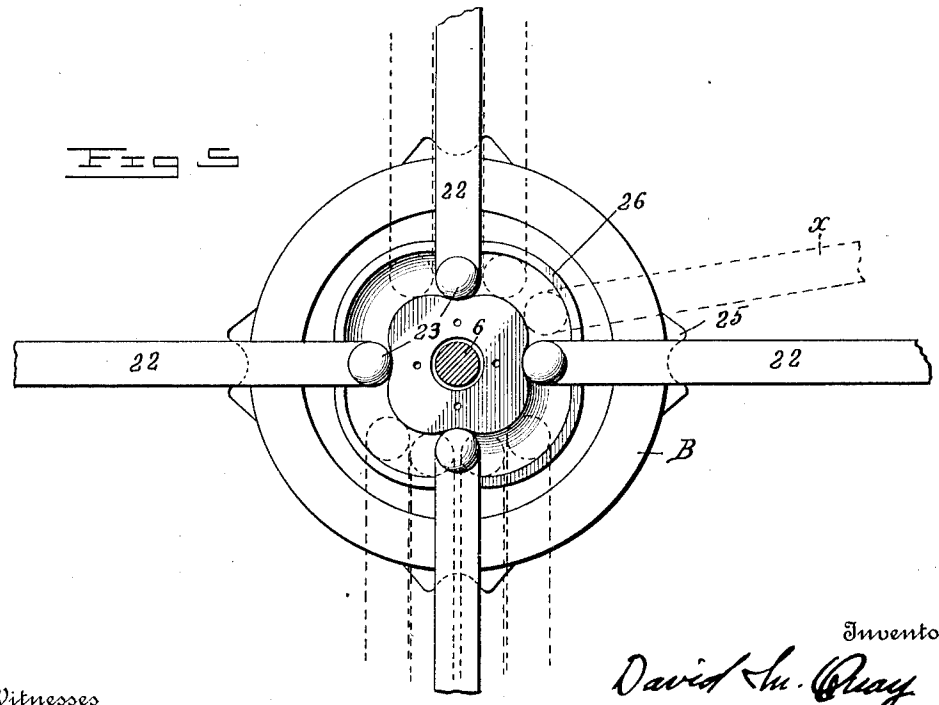


Fig 14

Fig 5



Witnesses

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7 SHEETS—SHEET 5.

Fig 6

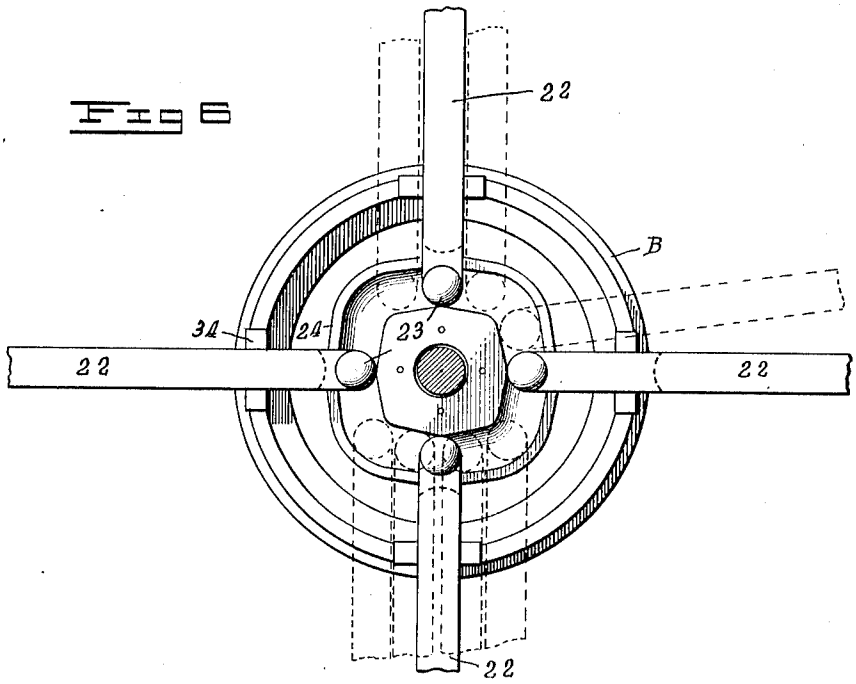
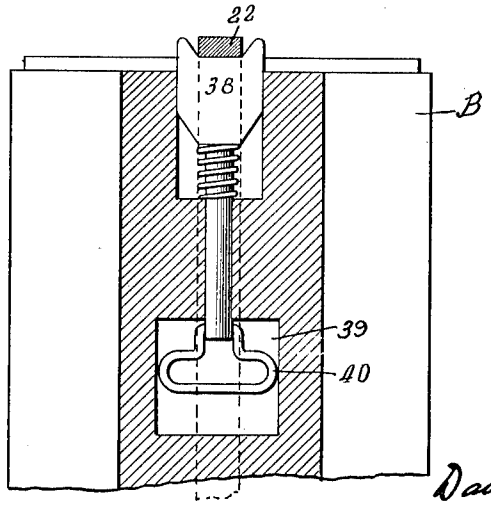


Fig 13



Witnesses

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7 SHEETS—SHEET 6.

Fig 8

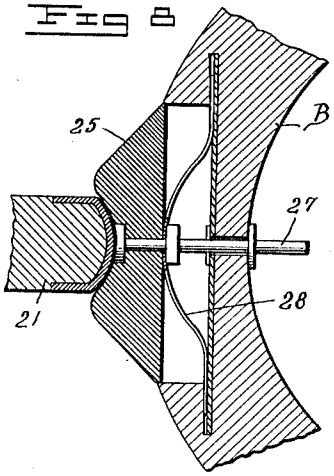


Fig 9

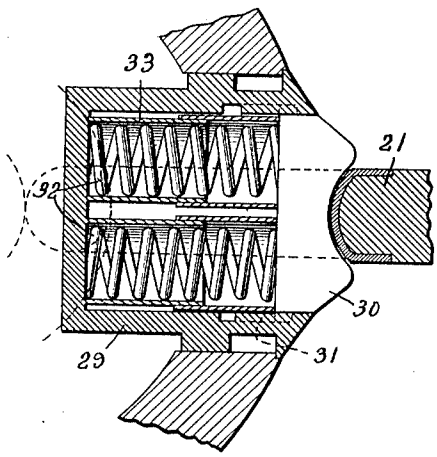


Fig 11

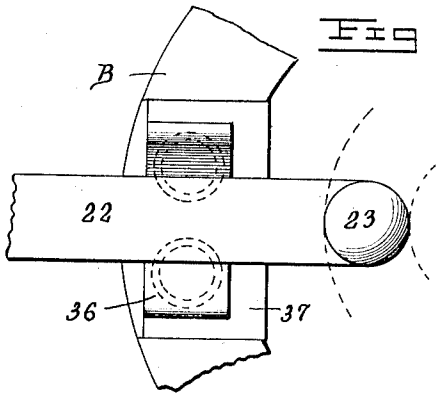
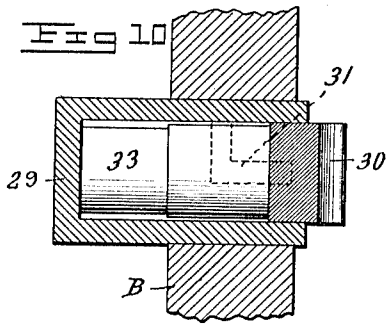


Fig 10



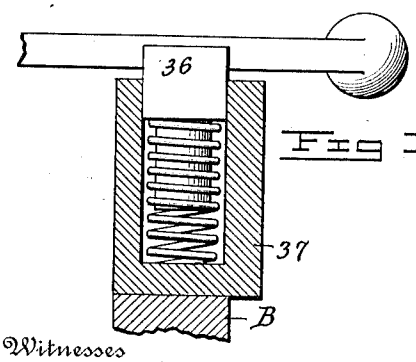


Fig 12

Witnesses

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APPLICATION FILED OCT. 15, 1909.

1,030,849.

Patented June 25, 1912.

7 SHEETS—SHEET 7.

Fig 15

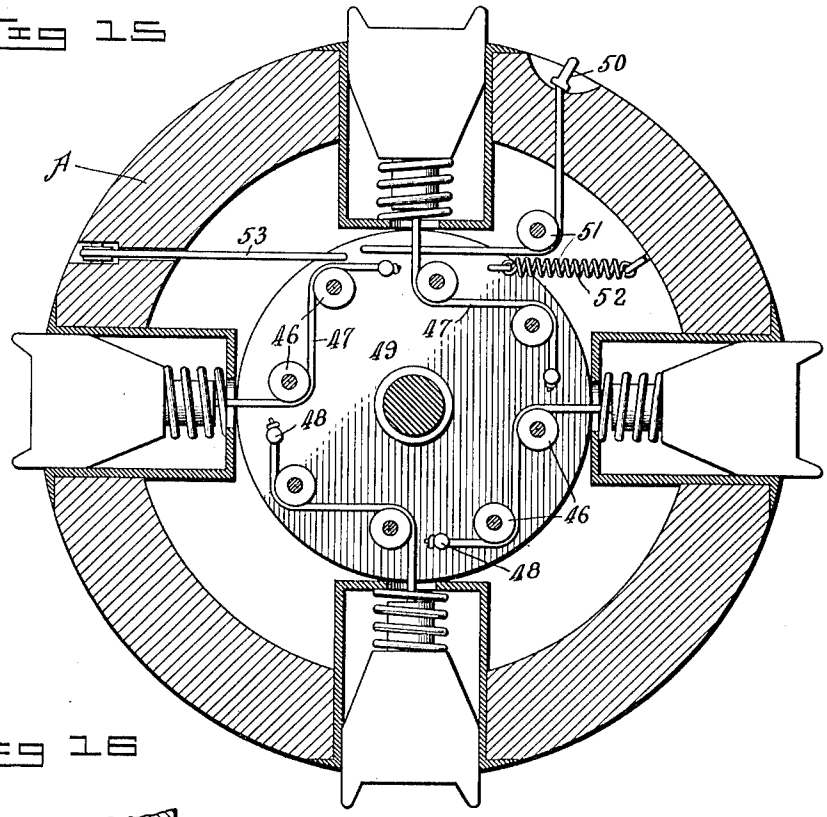
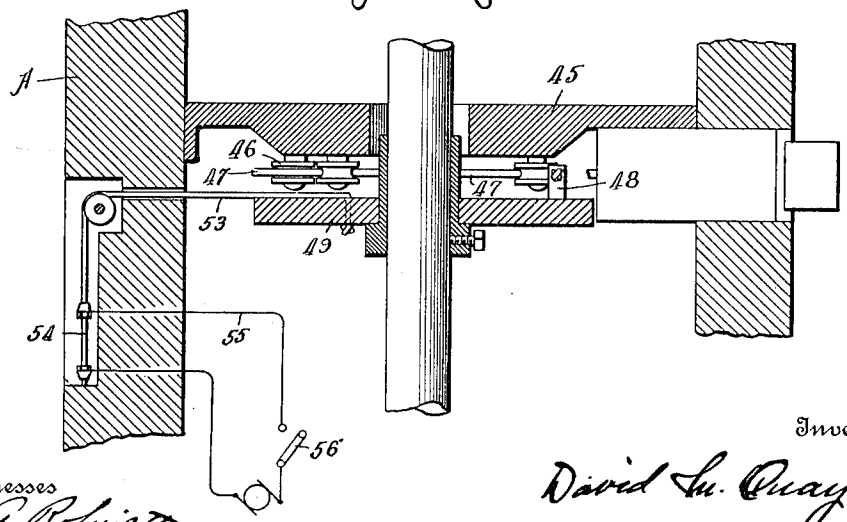


Fig 16



Witnesses

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UNITED STATES PATENT OFFICE.

DAVID M. QUAY, OF NEW YORK, N. Y., ASSIGNOR, BY MESNE ASSIGNMENTS, TO VAN KANNEL REVOLVING DOOR COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

REVOLVING DOOR.

1,030,849. Specification of Letters Patent. Patented June 25, 1912.

Application filed October 15, 1909. Serial No. 522,792.

To all whom it may concern:

Be it known that I, DAVID M. QUAY, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented new and useful Improvements in Revolving Doors, of which the following is a specification.

The present invention relates to doors, and particularly to that type now generally in use in vestibules, entrances, and the like, and commonly known as "revolving" or "turnstile" doors.

The invention has for its objects: First: To improve the construction of such doors and the appurtenances for mounting and handling them. Second: To provide a door which will, under panic conditions, automatically yield to undue pressure, collapse to an open position, and leave a free passageway. Third: To provide a door which may be readily collapsed by an attendant or doorman, either at the door or at a distance therefrom, when such collapsed condition is desired.

In the accompanying drawings I have illustrated one embodiment in order that the same may be clear to those skilled in the art, the various views detailing such features as are essential to the make-up and operation of the structure.

In said drawings,—Figure 1 is a general view of an arch or doorway having installed therein a revolving door embodying my improvements. Fig. 2 is a plan view showing the door members proper in active and collapsed condition in dotted lines. Fig. 3 is an enlarged detail, partly in section, to show the manner of hanging the door. Fig. 4 is a detail cross-sectional view of the central pillar and hanger, showing the hanger-operating gear and associated parts. Fig. 5 is a plan view of the pillar top, showing the lower half of the supporting race for the door members proper or wings, the normal position of the doors being shown in full lines, the dotted lines showing collapsed condition. Fig. 6 is a view similar to Fig. 5, showing a slightly different form of wing race. Fig. 7 is a sectional view showing a modified race. Figs. 8, 9 and 10 are detail views of wing locks to maintain the door-members or wings normally in proper position. Figs. 11 and 12 are top and sectional views, respectively, of a slightly different form of wing lock. Fig. 13 is a sectional view showing one type of manually releasable wing lock. Figs. 14, 15 and 16 are views showing a plurality of wing locks which are releasable manually simultaneously. Fig. 17 is a detail of the wing locking bolt and turn buckle or nut.

In the description which follows the same reference characters are used to designate like parts in the several views.

The general structure of door and frame is not unlike those commonly in use, comprising the usual curved side frame A, the central pillar B, and the door members or wings C which radiate, quartering, from the central pillar B. Except for these general similarities, however, the present structure differs markedly from doors of this type with which I am familiar.

The arch or door-frame comprises the curved side frames A which are spanned by a cross-beam 2, centrally of which, depending from a roller-bearing truck 3, is a hanger 4, preferably adjustable by a screw-threaded and splined connection with relation to said truck, all as shown in Fig. 3. Secured to the lower end of said hanger 4, by a detachable connection, such as pin 5, is a supporting shaft 6 which lies centrally of the pillar B and is splined near its upper end to a wing-race supporting-web 7 secured within the bore of the hollow pillar B, as best shown in Fig. 3. The lower end of the shaft 6 may be offset, as shown in Fig. 3, and is toothed so as to mesh with a gear 8 on a shaft 9 carried in suitable bearings within and intermediate the ends of pillar B (see Fig. 4), said shaft having a head 10 at its outer end pocketed within the enlarged shaft bearing or sleeve, to receive a wrench or other tool by which it may be turned and the gear 8 rotated; and, to lock said shaft 9, a ratchet 11 and pawl 12 are provided, said pawl 12 being mounted on pivot shaft 13 which may be rocked by its slotted head from outside the pillar B to throw the pawl 12 in and out of the ratchet 11. Opposed to the offset, toothed lower end of hanger shaft 6, is a similar foot shaft 14 having an offset toothed end, which, ogether with the lower end of

shaft 6 are kept in proper relation and in mesh with gear 8 by suitable keepers 15 through which the shaft ends play. The said foot shaft 14 is secured by set screw 16 to a web or strut 17 fastened within the bore of pillar B near the lower end thereof, with its lower end traversing a wing race 18 and having an antifriction or ball foot 19, which, under normal conditions, rests in a socket 20 in the floor.

From the pillar B the wings 21 of the door are suspended, and said wings, pillar, and all of the appurtenances of the revolving door structure are hung from and supported by the two-part central shaft made up as hereinbefore described of the hanger shaft 6 and the foot shaft 14, and obviously this central hanger shaft is carried by the truck 3 and its hanger 4, said truck revolving upon suitable rollers traveling over a circular track arranged on the cross-beam 2. The wings 21 are provided at top and bottom with arms 22 tipped with ball members 23, which ball members are clamped between the plates of the wing races 24 at top and 18 and 24 at the bottom of the pillar.

In the form of the invention shown in Figs. 1, 5 and 6, I have shown the ball members 23 as carried by the arms 22 and the race plates as being formed to receive these members, but obviously as shown in Fig. 7, the construction might be reversed and the race consist of the ring-like plate 23^a while the arms of the wings would be made up of complementary top and bottom plates 24^a of the contour to engage the ring race 23^a.

The wings 21 are, of course, under normal conditions ninety degrees apart about the pillar A as shown in Figs. 2, 5 and 6, and the whole structure under ordinary traffic revolves as a unit. The wings 21 are locked to the pillar so as to give a unitary revolving device by means of locking plates 25, as shown in Fig. 8, which shows the locking plate 25 carried by a shaft or rod 27 mounted in a suitable aperture in the pillar B, said plate 25 being normally projected in the position shown by a spring 28 of sufficient strength to hold the plate 25 projected from its pocket and in engagement with the wing 21 and capable of holding such wing against independent movement relative to the pillar B under the conditions of ordinary traffic. If, however, undue and opposing pressure, as in a crush or panic, be brought to bear upon the opposite wings 21 of my improved door, the locking plates 25, see Fig. 5, will yield and the wings 21 move independently relative to the pillar B to the position shown in dotted lines in the upper half of the Fig. 5 referred to, the balls 23 traveling along the wing races under pressure to the dotted line collapsed position, it being obvious that only such wings as lie transversely to the passage-way would be collapsed, although in event of all of the wings 4 being crowded around by pressure against them all four would ultimately be brought to the dotted line position shown in the lower half of Fig. 5.

In order that there may be no danger of jamming the wings 21, the ball race 24, see Fig. 5, is not made in the form of a true circle, but is in the nature of a flattened circle or lobe shaped, giving the appearance of a polygon having rounded sides as shown, so as to permit a substantially straight travel of the ball 23 in moving from its normal to its collapsed position, and prevent any jamming of the wing 21, as might be the case if the race were struck on a true circle, there being sufficient clearance with my improved race between the inner edge of the wing and the side of the pillar to insure collapsing of the wing without jamming against the pillar as will be clear from the dotted lines x in Fig. 5, which shows the wing 21 moving from its normal full line position to collapsed dotted line position.

In Fig. 6 a slightly different form of race is shown from that described and shown in Fig. 5, the inclosing walls of this race or course for the most part being straight walls instead of curved as in the other form, although in principle and in operation the race is the same, and, as will be seen, it is not a circular but is rather a flattened circular form, or one which approaches a rectangle. This feature of a non-jamming wing supporting race I regard as of considerable importance, for it permits hurried displacement and collapsing of the wings by a crowd endeavoring to pass through the door without danger of such wings jamming and blocking the entrance.

The locking plates which hold the wings normally in the full line position shown in the various views may, of course, take several forms, and in Figs. 9 and 10 I have shown a side lock for engaging the inner edge of the wing 21 which comprises a box 29 let into the pillar B and having a locking plate 30 which has slot engaging lugs adapted to drop into and lie within the bayonet slot 31, this block being backed by spiral springs 32 housed within suitable cases 33. These lock plates for holding the wings in normal position may be located in the sides of the pillar B as shown in Figs. 1, 5, 8, 9 and 10, or as illustrated in Figs. 3, 6, 11, 12 and 13, they may be located in the top of the pillar and engage the arms 22 of the wings 21, and obviously their locking and retaining action will be the same as the action of the locking plates just described. In the form of locking plate shown in Figs. 3 and 6, the plate 34 is mounted in a suitable recess in the pillar with a projecting spring beneath it to hold it in locked engagement with the arm 22 of the wing,

the tail of the plate being slotted and pinned as shown at 35 to its seat.

In the form of the top locking plate shown in Figs. 11 and 12, the plate 36 backed by spiral springs, as shown, is mounted within a box or holder 37 let into the top of the pillar B.

The locking devices heretofore shown and described have all been arranged to release automatically under undue pressure, but in some instances it may be desirable to provide locking plates which may be operated by the attendant, when, for example, he wishes to collapse the wings and leave the door open, and in order that a suitable construction to accomplish this may be provided I have devised several ways of securing a manual release of these locking plates, although it will be understood that this manual release feature is additional to the automatic release under undue pressure on the wings, and in no way interferes with this automatic release. The simplest form of this manual released locking plate is shown in Fig. 13 in which the locking plate 38 of the top lock type is let into a suitable seat in the pillar B, and the tail of the locking plate drops down to a cavity or opening 39 in the side of the pillar where it is provided with a bail 40 which is accessible on either side of the wing 21 (shown in dotted lines) so that an attendant may reach into the cavity 39 and pull down on the bail 40 to withdraw the plate 38 and release the wing. This, of course, involves the individual operation of each locking plate, and in order that these locking plates may be operated in pairs I have devised the construction shown in Fig. 14 in which the side locking plates 41 are let into suitable seats in the pillar B, such locking plates 41 being connected by suitable cords 42 with a pull cord or handle 43, proper running sheaves being provided over which these pull cords 42 pass, these running sheaves being mounted on a block 44 secured to the central hanger shaft hereinbefore described. It will be obvious that with this construction the doors on diametrically opposite sides of the pillar may be simultaneously released by simply pulling on the cord 43 and through the pull cords 42 withdrawing the locking plates 41 into their pockets.

In the form of release device shown in Figs. 15 and 16, I have made provision for simultaneously releasing all four or any number of wings with which the door may be provided. As shown in these figures, I provide a sheave-supporting disk or web 45 secured within the bore of the pillar B and carrying the small sheaves 46 about which reversely pass the pull cords 47 of the locking plates, the ends of these cords being fastened to posts 48 carried by a disk 49 rotatably mounted upon a bearing sleeve on the central hanger shaft as best shown in Fig. 16. Said disk has connected thereto a pull cord 50 which is led through the pillar B to a suitable point, said pull cord 50 preferably passing over a fixed sheave 51, so that when the cord 50 is pulled, the disk 49 will be rotated, the lock plate pull cords 47 will be simultaneously pulled and the lock plates withdrawn, simultaneously releasing the wings which may then be moved to collapsed position. In order that the simultaneous release of these wings may be accomplished from a distance I have provided a pull spring 52 of sufficient strength to overcome the lock plate springs, said spring 52 being secured to the drum and to the disk 49, and being normally distended and held in active position by a tie connection 53 which carries a fusible section 54, which fusible section is in circuit with an electric line 55 of sufficient power to fuse the connection when the line 55 is closed, such line being conventionally shown in Fig. 16. With this arrangement an attendant at a distance from the door may, by closing the line 55 through the switch 56, destroy the fusible section 54, releasing the tie connection 53, and allowing the spring 52 to rotate the disk 49 and withdraw the locking plates.

In order that the door may be taken down readily and removed to one side of the passage-way, as for example, in warm weather, when closing of the passage-way is not necessary, I provide a convenient means for securing this taken-down condition, which means is best illustrated in Figs. 1 and 2 of the drawings. Each wing 21 is provided with a two-part pivot bolt 57 mounted near the outer edge of the wing 21, as clearly shown in Fig. 1, and provided with an operating device, such as a turn buckle 58, or any suitable projecting instrumentality, by means of which the ends of the two members of the pivot bolt 57 may be projected beyond or withdrawn within the top and bottom edges of the wing 21. The floor and ceiling of the passage-way are each provided with a socket 59 to receive the ends of the pivot bolt 57 when they are projected, these sockets 59 being located preferably as shown in Fig. 2, at the side and within the fixed curved side frame A of the doorway. When it is found desirable to remove the door from its central revolving position, one of the wings 21 will be swung to the angle where the pivot bolt 57 will register with the ceiling and floor sockets 59, whereupon the ends of the pivot bolt will be projected by means of the turn buckle 58 or other bolt operating device to engage these sockets. After this operation has been effected the other wings 21 will be collapsed, as hereinbefore described, the hanger shaft 6 will be disengaged from the lower end of the hanger 4 by removing the pin 5, and the said hanger shaft 6 will then be run down-

ward so as to clear the ceiling of the doorway by means of the gear 8 hereinbefore described. This will leave the pillar free at the top and resting upon its foot shaft 14, which foot shaft may then be lifted from its socket 20 in which it normally rests, and the central pillar with its collapsed wings may be rolled upon the ball foot 19, swinging about the pivot bolt 57 as a center, until the entire collapsed door structure will be brought to the position shown in Fig. 2 in dotted lines, at the right hand side of said figure, housing all of the parts within the side frame of the doorway and leaving the passage clear. This arrangement is a very desirable one for the reason that the entire door structure can be quickly and easily thrown to one side out of the way and leave the passage-way entirely unobstructed, without the necessity of removing the door parts bodily from the doorway, but, on the contrary, leaving them in readily accessible position where they may be quickly installed in service again.

While I have shown a particular embodiment of my invention it will be understood that this embodiment and disclosure is merely illustrative and I do not limit myself to the details of construction illustrated in this disclosure, except so far as I am limited by the prior art and the appended claims.

What I claim is:—

1. In a door structure and in combination, a rotary pillar, wing members carried thereby, and a central suspended hanger shaft carrying said rotary parts, said shaft and parts having a relative axial movement, said shaft being disconnectible from its support to permit a free bodily movement of the shaft and rotary parts to a position away from the support.

2. In a door structure and in combination, a rotary pillar, wing members carried thereby, and a vertically extensible central suspended hanger shaft carrying said rotary parts, said shaft and parts having a relative axial movement, said shaft being disconnectible from its support to permit a free bodily movement of the shaft and rotary parts to a position away from the support.

3. In a door structure and in combination, a rotary pillar, wing members carried thereby, a central suspended hanger shaft carrying said rotary parts, and means for adjusting said parts vertically on said shaft.

4. In a door structure and in combination, a rotary pillar, wing members carried by said pillar, a rotary truck-supported shaft hanger, a pillar-supporting hanger shaft detachably connected to said shaft hanger, and an adjustable connection between said pillar and wing members and said detachable hanger shaft.

5. In a door structure and in combination, a rotary door member, a two-part supporting shaft for said door member, a supporting truck from which said shaft is normally suspended and means for securing a relative longitudinal movement between the two shaft parts, the truck-supported shaft part being axially movable relative to the door-member.

6. In a door structure and in combination, a rotary door member, a hanger shaft therefor, said shaft being axially movable relative to the door member, a foot shaft therefor, and a connection between said shafts to secure a relative longitudinal movement between said hanger and foot shafts.

7. In a door structure and in combination, a rotary door member, a hanger shaft axially movable relative to the door member, a foot shaft, and a gear connection between said shaft members to secure a relative longitudinal movement between them.

8. In a door structure and in combination, a rotary door member comprising a pillar, a hanger shaft axially movable relative to the door member and a foot shaft within said pillar, and a gear connection between said shaft members operable from the outside of the pillar to effect a relative longitudinal movement between said shaft members.

9. In a door structure and in combination, a rotary door member comprising a pillar, a suspended shaft depending within said pillar and movable axially relatively thereto, a foot shaft extending within said pillar and provided with an anti-friction supporting foot, and a gear connection between said hanger and foot shafts whereby a relative longitudinal movement between the two may be secured.

10. In a door structure and in combination, a central pillar, a plurality of wing members having their inner ends carried by the pillar and freely shiftable bodily relative thereto in fixed paths around the axis of the pillar, and means carried by the pillar for normally locking the members independently and fixedly to the pillar, said means contacting with the respective members at a point spaced from the inner ends of said members, and being automatically releasable under abnormal pressure on the wing members to permit said inner ends to shift.

11. In a door structure and in combination, a central pillar, a plurality of wing members having their inner ends carried by the pillar and freely shiftable bodily relative thereto in fixed paths around the axis of the pillar, and normally-exposed spring-supported locking plates carried by the pillar for normally locking the members independently and fixedly to the pillar, said plates contacting with the respective members at points spaced from the inner ends of said members, and being automatically re-

leasable by retraction within the pillar under abnormal pressure on the wing members to permit said inner ends to shift.

12. In a door structure and in combination, a rotary pillar, wing members carried thereby, locking plates carried by the pillar and automatically releasable upon undue pressure on said wings to normally hold said wings in a predetermined position relative to said pillar, and means for operating said locking plates and releasing said wings independent of their automatic release under undue pressure.

13. In a door structure and in combination, a rotary pillar, wing members carried thereby, pressure-released locking plates carried by the pillar and normally holding said wings in a predetermined position, and means operable to simultaneously release all of said wings independently of their automatic release under undue pressure.

14. In a door structure and in combination, a rotary pillar, wing members carried thereby, pressure-released locking plates carried by the pillar to normally hold said wings in a predetermined position, and means for manually effecting the release of said wings independently of their automatic release.

15. In a door structure and in combination, a rotary pillar, wing members carried thereby, pressure-released locking plates to normally hold said wings in a predetermined position, and manually-controlled power-operated means for effecting the release of said wings independently of their automatic release.

16. In a door structure and in combination, a rotary pillar, wing members carried thereby, pressure-released locking plates to normally hold said wings in a predetermined position, and manually-controlled thermal means for effecting the release of said wings independently of their automatic release.

17. In a door structure and in combination, a rotary pillar, wing members carried thereby, pressure-released locking plates to normally hold said wings in a predetermined position, and manually-controlled electro-thermal means for effecting the release of said wings independently of their automatic release.

18. In a door structure and in combination, a rotary pillar having a wing course, and wing members carried by said pillar and provided with course-engaging arms, said course and inner ends of said arms being permanently free for relative bodily movement.

19. In a door structure and in combination, a rotary pillar having a wing course, of polygonal form, and wing members carried by said pillar and provided with course-engaging arms, said course and inner ends of said arms being permanently free for relative bodily movement.

20. In a door structure and in combination, a rotary pillar having a wing course of substantially rectangular form, and wing members carried by said pillar and provided with course-engaging arms, said course and inner ends of said arms being permanently free for relative bodily movement.

21. In a door structure and in combination a rotary pillar having a ball footed foot shaft permanently fixed with respect to the pillar and on which the door rotates, collapsible wings carried by said pillar, and pivot bolts carried by said wings near their outer edges and adapted to be engaged with th[illegible]nd floor of the doorway.

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

DAVID M. QUAY.

Witnesses:
HORACE W. PACKARD,
A. S. ARMAGAAC.