

Nov. 16, 1937.

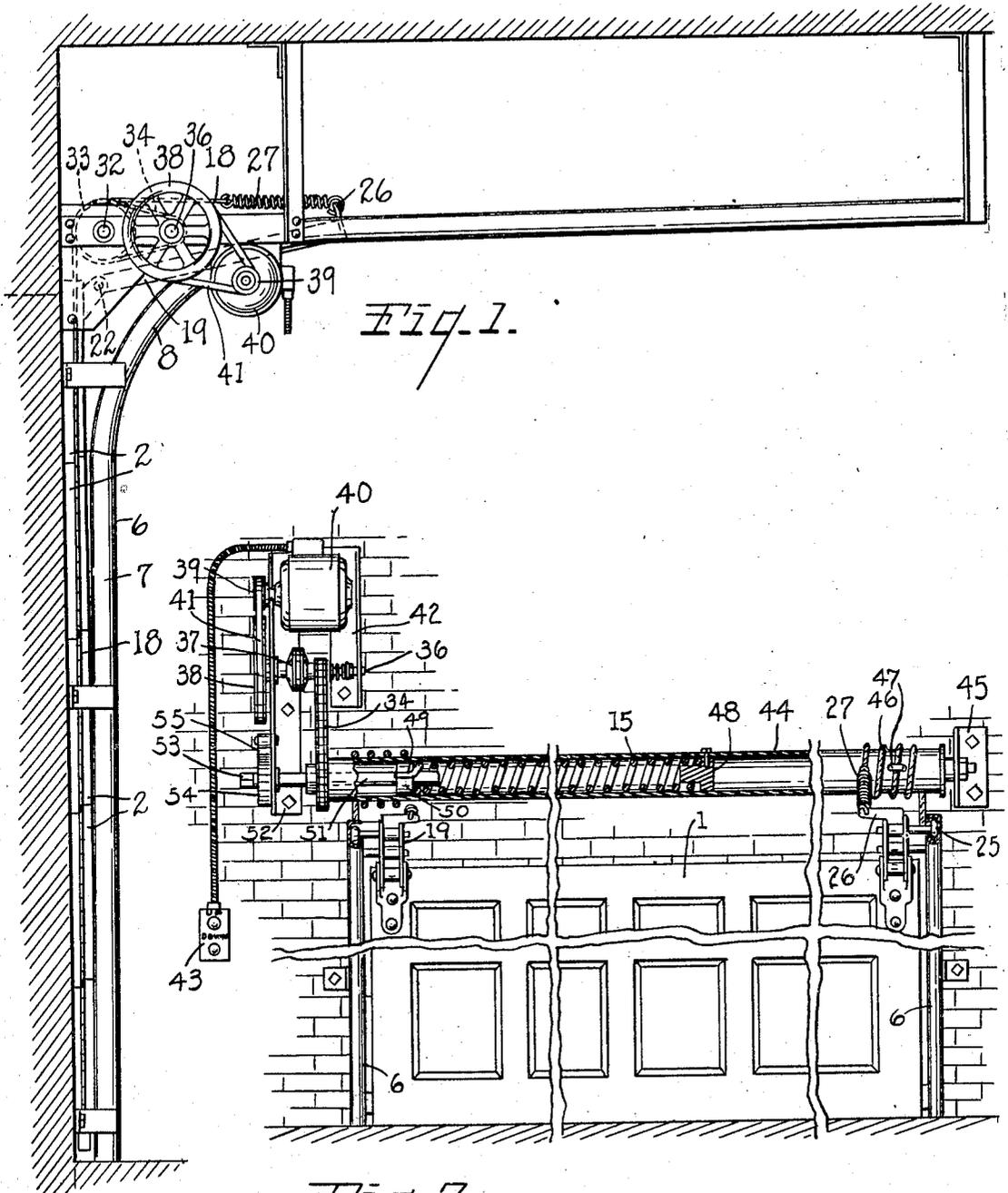
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SLIDING DOOR

Filed Oct. 1, 1936

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

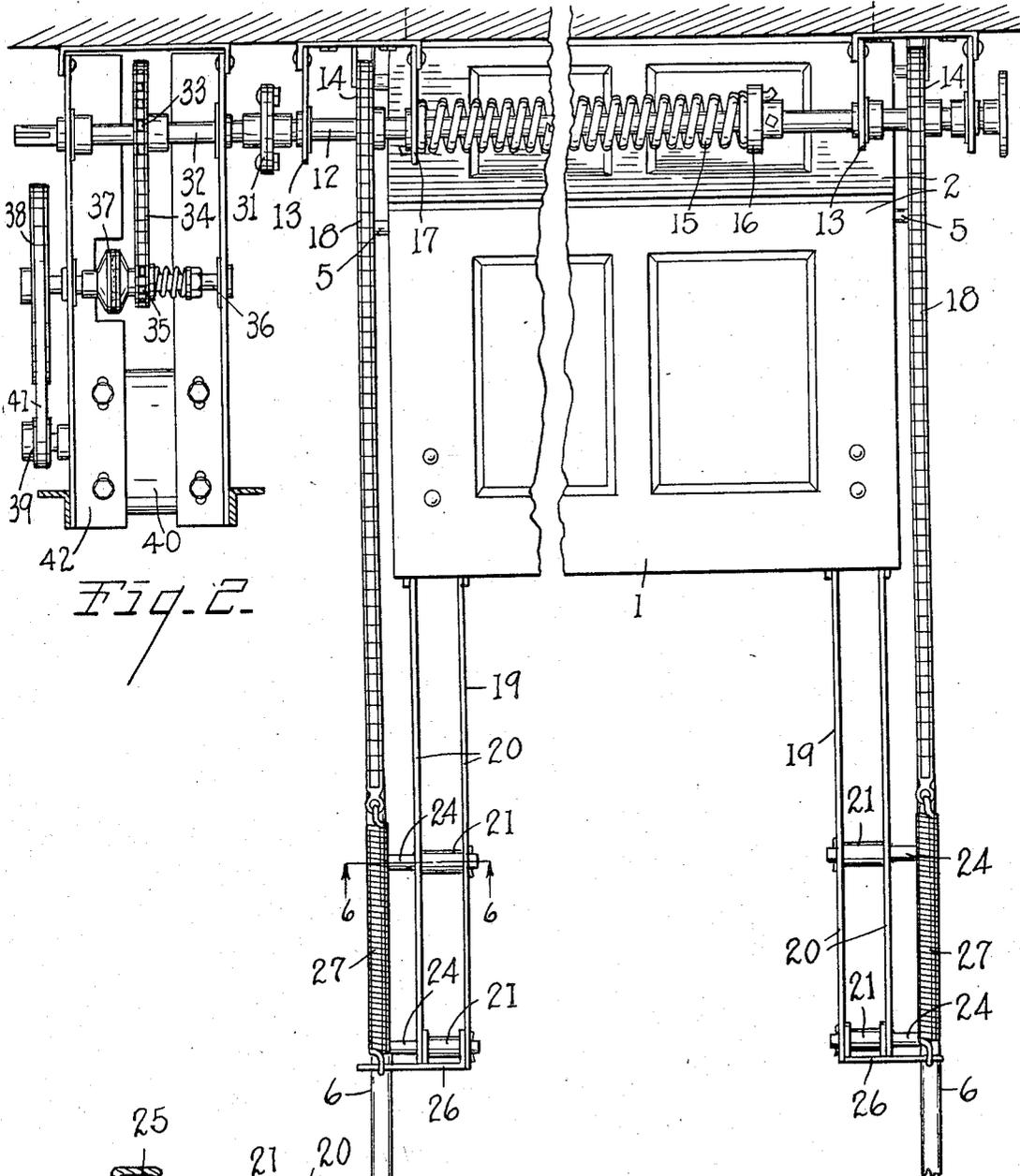


Fig. 2.

Fig. 6.

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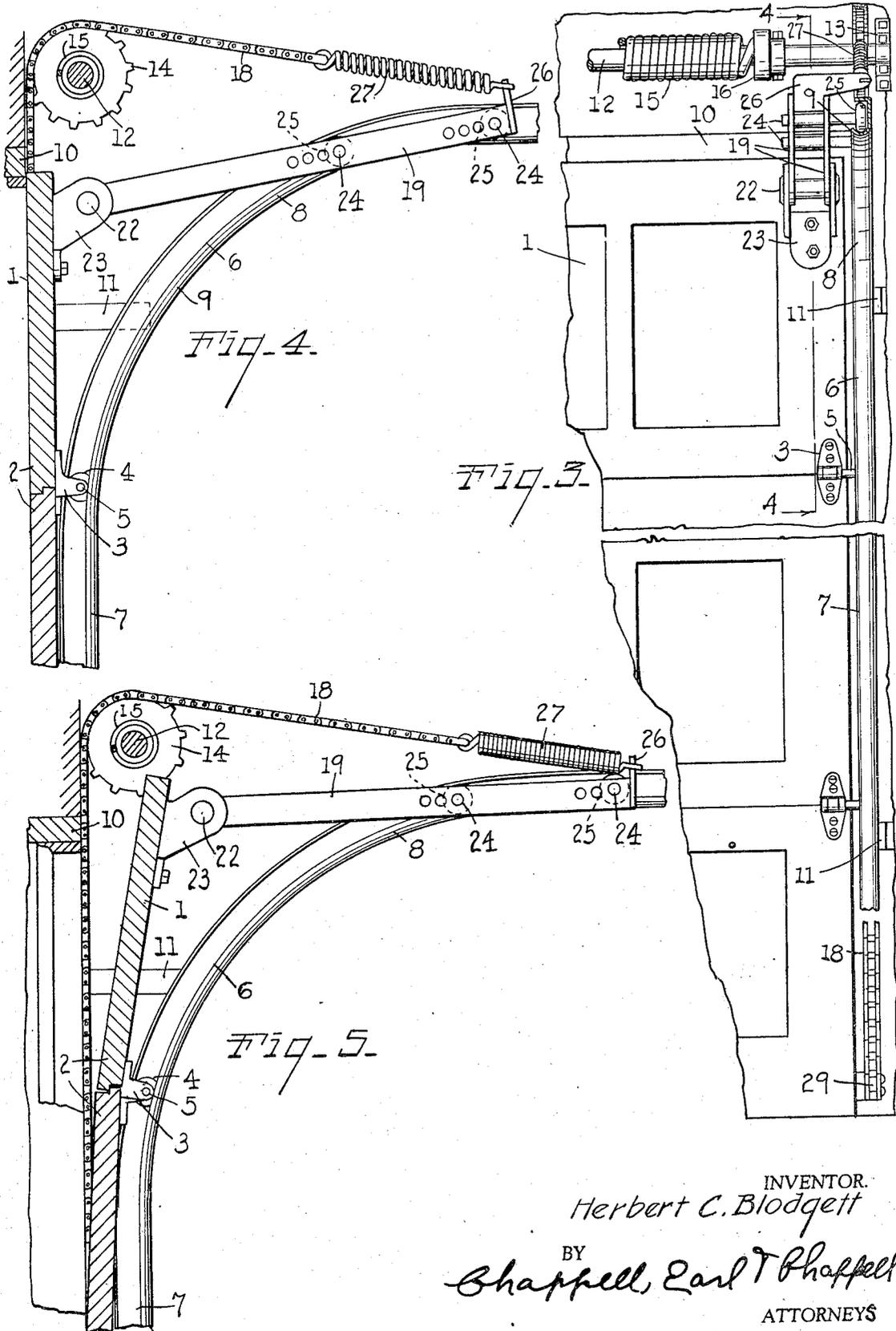
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3 Sheets-Sheet 3



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SLIDING DOOR

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21 Claims. (Cl. 20—20)

This invention relates to improvements in sliding doors.

The main objects of this invention are:

5 First, to provide a vertically sliding door having means for maintaining the same in tightly closed position whereby to provide a close joint between the door and its jamb and to resist wind pressure, the door thus being non-rattling in closed position.

10 Second, to provide a door of the type described which can be produced at relatively small cost, being characterized by the simplicity of its parts.

Third, to provide a sliding door having these advantages, which opens and closes easily.

15 Fourth, to provide a sliding door characterized by actuating means which is positive and certain in operation in either direction of movement.

Further objects relating to details and economies of my invention will definitely appear from the description to follow. The invention is defined in the claims.

20 Preferred embodiments of my invention are illustrated in the accompanying drawings, wherein:

25 Fig. 1 is a side elevational view illustrating a vertically sliding door construction incorporating features of my invention.

30 Fig. 2 is a fragmentary top plan view illustrating a modified form of sliding door and control embodying my invention, the door being shown in horizontal retracted position.

Fig. 3 is a fragmentary view in elevation of the inner side of the door embodying my invention.

35 Fig. 4 is an enlarged fragmentary view in section on line 4—4 of Fig. 3, illustrating my door in closed position with the top panel or section thereof in tight sealing engagement with the door jamb.

40 Fig. 5 is a view similar to Fig. 4, illustrating the door in a partially closed position.

Fig. 6 is a sectional view on the line 6—6 of Fig. 2, illustrating a detail of the roller construction.

45 Fig. 7 is a front elevational view partially broken away and in vertical section, illustrating a modified form of my invention.

The construction of my invention eliminates an objectionable feature which has sometimes been present in vertically sliding door structures, that is, the fact that it has not been possible to maintain the door in snug relation to the door jamb at all points when the door is in closed position. Previously, it has been proposed to maintain the contact between door and jamb by designing the track and the supports for the track guide rollers 55 in such proportion that the proper contact will

be had. One feature of my invention involves the provision of an arm pivoted to the topmost door section, carrying rollers which travel in the guide track, the arm being resiliently urged by suitable means whereby the top section or panel of the door is snugly thrust against the door jamb in a manner which will be hereinafter more particularly described.

The vertically sliding door of the present invention further embodies novel and improved actuating means whereby the door will be positively shifted in either direction of movement by an upwardly or downwardly effective pulling action to take the place of the ordinary forms of actuating mechanism which operate against the action of a retracting spring. In the construction of my invention, the door is positively pulled to both open and closed positions.

Referring to the drawings, a door is designated by the reference numeral 1 and consists of a plurality of panels 2 suitably articulated by means of hinges 3. Guide rollers 4 are mounted on the hinge pintles 5 and roll in a guide track 6, said track being in the form of a vertical portion 7 adjacent the door jamb joined by a curved arcuate portion to a horizontal portion 8 wherein the door is supported in retracted or open position. The track, as illustrated in section in Fig. 4, has an upwardly curved inner flange 9 which maintains the roller against accidental displacement.

The tracks are mounted in fixed relation to the door jamb 10 by means of brackets 11 or other suitable means which will suggest itself, and the tracks are disposed in opposed relation on opposite sides of the door.

For the purpose of actuating and counterbalancing the sliding door, I provide a shaft 12 rotatably mounted in bearing hangers 13. Sprockets 14 are fixedly secured to the shaft in alignment with the tracks 6 on either side of the door, and the door is resiliently counterbalanced by means of a torsion spring 15 which surrounds the shaft, being connected to the shaft at one end by means of a collar 16 clamped on the shaft. The other end of the torsion spring 15, as viewed in Fig. 2, is anchored to a hanger member 17, the hanger member being apertured to receive shaft 12.

Cables 18 in the form of chains are fastened to the bottom section of the door at 29 and are trained over sprockets 14, the chains and sprockets constituting part of the actuating means to be hereinafter described, whereby the door is raised and lowered in positive fashion.

For the purpose of thrusting the uppermost

section 2 of the door into snug engagement with the door jamb in closed position, whereby the same will be efficiently sealed, I provide an arm 19 made up of a pair of bars 20 spaced by sleeves 21, the bars being pivoted at 22 to brackets 23 fixedly secured to the upper panel on the inner side of the same. Bars 20 are apertured in line with the sleeves 21 which slidably receive the shafts 24 of rollers 25, the rollers 25 acting to guide the arm and govern its door closing action and being restrained from separating movement relative to arm 19 by cotter pins 30. In Figs. 4 and 5, I illustrate three apertures provided in the bars to receive the roller shafts. However, more holes may be employed if desired. The position of the curved track will be altered according to the height of vertical track 7, and this means that the workable position of arm 19 will vary. In practice, a series of holes about an inch apart is utilized. At the end thereof opposite its pivot point, arm 19 is provided with an offset 26 having a coil tension spring 27 secured thereto. The other end of the spring is secured to the free end of chain 18.

Shaft 12 is connected by a coupling 31 to an aligned shaft 32 carrying a sprocket 33 over which is trained an endless chain 34. Chain 34 is driven from a sprocket 35 on a jack shaft 38, sprocket 35 being in turn driven through a friction clutch 37 by a pulley 38. The pulley 38 is connected to the shaft through a pulley 39 on the shaft of a motor 40 by means of a belt 41. The control or actuating mechanism just described is suitably mounted on frame pieces 42 supported from the ceiling.

Motor 40 is a reversible motor and is controlled by a switch 43 illustrated in Fig. 7, whereby the chains 18 may be positively actuated in either direction as desired.

From the above description, the operation of my improved door will be clear. The torsion spring 15 counterbalances the weight of the door and motor 40, through the flexible power transmitting means or chains 18 operatively connected at the top and bottom of the door, raises and lowers the same positively. Other forms of sliding door control operate against the counterbalance spring; that is, the control, where employed, pulls the spring out, thus removing the pull on the door, and if sufficient weight is present, the door will start down, taking up the slack provided by the control. However, if the door resting on horizontal tracks is not overbalanced or pulled by gravity, it will remain stationary. This condition is difficult to handle when cables and drums are used, since the cable being unwound by the control becomes loose and falls out of its grooves. In the device of my invention, the door is pulled open and closed to eliminate possibility of such difficulty.

Upon lowering the door to closing position, spring 27 automatically resiliently thrusts arm 19 in the direction of the jamb, whereby the uppermost section of the door is snugly fitted against the jamb, and as a result the entire door is rendered weather-tight. It should be observed that chain 18 of my device effects a double function; that is, it transmits vertical door closing and opening movement from sprockets 14 and, further, urges sealing arm 19 horizontally to sealing position. The device is characterized by economy of construction and design and is accordingly simple and effective in operation.

It will be observed that while the door is closed firmly against the jamb, immediately upon the initial opening movement of the door the top panel

swings inwardly and the other panels guided by the track swing free of the door jamb.

In Fig. 7, I illustrate a modified form of my invention, employing a motor actuated rotatable drum, corresponding parts being designated by like reference numerals. In this form, a cylindrical drum 44 extending the width of the door is suitably rotatably mounted in brackets 45, being driven from reversible motor 40 by means of chain 34 passing over a sprocket (not shown) mounted on the drum. In place of the raising and lowering chains 18 of the previously described embodiment of my invention, I employ cables 46 wound about drum 44 and secured at an intermediate point to the drum by means of clamps 47. Spring 27 is secured to one end of the cable and to the offset 26 as previously described, and the other end of the cable is connected to the bottom panel of the door at a point corresponding to point 29.

Drum 44 encloses counterbalancing means for the door, comprising a plug 48 fixedly secured to the drum by a set screw and forming an anchor for the right hand end of a coiled torsion spring 15, as viewed in Fig. 7. The opposite end of the spring is fastened by an offset 49 to a second plug 50 smaller in diameter than the drum, about which the drum rotates during shifting movement. Plug 50 is fixedly secured to a rod 51 extending through a suitable bearing in the drum 30 end and through a bracket 52 terminating in a squared end 53. A toothed wheel 54 is carried by the rod and a pivoted dog 55 is provided for the purpose of selectively locking the wheel, hence rod 51, against rotation.

From the above description, the operation of the structure illustrated in Fig. 7 will be clear. By raising dog 55 from wheel 54, the wheel will be free for rotation, whereupon a tool applied to the squared end of the rod may be employed to tension the counterbalancing spring 15 as desired. The operation of the actuating means in the form of the flexible cable, having the sealing arm resiliently connected at one end thereto, corresponds to the action of the construction of Figs. 1 to 6. As the drum is rotated in one direction or another by reversible motor 40, the cable will be taken up on one side and paid off on the other, at all times exerting a positive action to shift the door from vertical closed position to 50 horizontal or open position or vice versa.

I have shown preferred embodiments of my invention characterized by a unitary sealing arm pivoted to the upper section of the door. However, it is pointed out that the invention is in no way limited to this particular construction, inasmuch as it could be practically embodied in any structure, such for example as toggle arrangement whereby a resilient thrust may be imparted to the door to seal the same.

I have illustrated and described my improvements in embodiments which I have found very practical. I have not attempted to illustrate or describe other embodiments or adaptations as it is believed this disclosure will enable those skilled in the art to embody or adapt my improvements as may be desired.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a vertical slidable door comprising a plurality of articulated sections provided with guide rollers, tracks for said rollers operatively mounted adjacent a door jamb and comprising horizontal and vertical portions connected by 75

arcuate portions, means for raising and lowering said door from vertical closed position to horizontal open position and vice versa, comprising a cable attached at one end to the bottom of the door, and means actuating said cable engaging the same intermediate its ends, means for resiliently thrusting the uppermost of said sections against said jamb when said door is in closed position, comprising an arm pivotally connected to the upper section of said door, rollers carried by said arm disposed in one of said tracks, and a coiled spring connected to the other end of said cable and to the free end of said arm.

2. In a vertical slidable door comprising a plurality of articulated sections provided with guide rollers, tracks for said rollers operatively mounted adjacent a door jamb and comprising horizontal and vertical portions connected by arcuate portions, means for raising and lowering said door from vertical closed position to horizontal open position and vice versa, comprising a cable attached at one end to the bottom of the door, and means actuating said cable, and means for resiliently thrusting the uppermost of said sections against said jamb when said door is in closed position, comprising an arm actuated by said actuating means and pivotally connected to the upper section of said door, and rollers carried by said arm disposed in one of said tracks.

3. In a slidable door comprising a plurality of articulated sections provided with guide rollers, tracks for said rollers, said tracks having angularly disposed portions connected by arcuate portions and being operatively mounted adjacent a door jamb, means for counterbalancing said door, means for raising and lowering said door from closed position to open position and vice versa, means operatively connected with said means for thrusting one of said sections against said jamb when said door is in closed position, comprising an arm pivoted to said sections, and rollers carried by said arm disposed in said tracks, and resilient means for actuating said arm on the closing movement of the door.

4. In a slidable door comprising a plurality of articulated sections provided with guide rollers, tracks for said rollers, said tracks having angularly disposed portions connected by arcuate portions and being operatively mounted adjacent a door jamb, means for counterbalancing said door, means for raising and lowering said door from closed position to open position and vice versa, means operatively connected with said means for thrusting one of said sections against said jamb when said door is in closed position, comprising an arm pivoted to said section, and members on said arm engaging a track, and means for actuating said arm on the closing movement of the door.

5. In a slidable door, tracks by which said door is guided, means for shifting said door from closed position to open position and vice versa, comprising a cable attached to the bottom of said door, and means for driving said cable, means for thrusting said door against said jamb when said door is in closed position, comprising an arm pivoted to said door, spaced track engaging members adjustably mounted on said arm, and a coiled spring connected to said cable and to said arm.

6. In a slidable door, tracks by which said door is guided, means for shifting said door from closed position to open position and vice versa, comprising a cable attached to the bottom of said door, and means for driving said cable, means for

thrusting said door against said jamb when said door is in closed position, comprising an arm pivoted to said door and slidably guided by a track, and a coiled spring connected to said cable and to said arm.

7. Sealing means for an articulated door adapted to be guided by tracks disposed adjacent a door jamb, comprising an arm pivotally connected to the door, said arm being guided by said tracks, and means connected to said arm and operatively connected to said door to resiliently thrust the same against said door in closing position of the door.

8. Sealing means for an articulated door adapted to be guided by tracks disposed adjacent a door jamb, comprising an arm connected to the door, said arm being guided by said tracks, and means connected to said arm and operatively connected to said door to thrust the same against said door in closing position of the door.

9. In a vertically slidable door, the combination with the door jamb, of a door comprising a plurality of articulated sections provided with guide rollers, tracks for said rollers operatively associated with said door jamb and comprising horizontal and vertical portions connected by arcuate portions, a shaft mounted above the door opening and provided with sprocket wheels, sprocket chains coacting with said sprocket wheels and connected at one end to the bottom of said door, a door counterbalance spring operatively associated with said shaft, arms pivotally connected to the top panel of the door and provided with spaced members engaging said tracks, and springs connecting the outer ends of said arms to the said chains at the rear of said sprocket wheels.

10. In a vertically slidable door, the combination with the door jamb, of a door comprising a plurality of articulated sections provided with guide rollers, tracks for said rollers operatively associated with said door jamb and comprising horizontal and vertical portions connected by arcuate portions, a shaft mounted above the door opening and provided with sprocket wheels, sprocket chains coacting with said sprocket wheels and connected at one end to the bottom of said door, arms pivotally connected to the top panel of the door and provided with spaced members engaging said tracks, and springs connecting the said arms to the said chains at the rear of said sprocket wheels.

11. In a vertically slidable door, the combination with the door jamb, of a door comprising a plurality of articulated sections provided with guide rollers, tracks operatively associated with said door and door jamb and comprising horizontal and vertical portions connected by arcuate portions, a shaft mounted above the door opening and provided with sprocket wheels, sprocket chains coacting with said sprocket wheels and connected at one end to the bottom of said door, arms pivotally connected to the top panel of the door and provided with spaced rollers engaging said tracks, and springs connecting the outer ends of said arms to the said chains at the rear of said sprocket wheels.

12. In a vertically slidable door, means for counterbalancing said door, means for shifting said door in either direction of movement, comprising a reversible motor, flexible power transmitting means connected at one end to said door, means operatively connecting said motor with said power transmitting means to drive the same in either direction, and means for operatively

connecting the other end of said flexible means to said door and for sealing said door in closed position, comprising an arm pivoted on the door and resilient means connecting the free end of said arm with said other end of the flexible means.

13. In a vertically slidable door, means for counterbalancing said door, means for shifting said door in either direction of movement, comprising a reversible motor, flexible power transmitting means connected at one end to said door, means operatively connecting said motor with said power transmitting means to drive the same in either direction, and means for operatively connecting the other end of said flexible means to said door and for sealing said door in closed position, comprising an arm pivoted on the door and means connecting the free end of said arm with said other end of the flexible means.

14. In a vertically slidable door, means for counterbalancing said door, means for shifting said door in either direction of movement, comprising a reversible motor, flexible power transmitting means connected at one end to said door, a drum, means rotatably mounting said drum, means operatively connecting said motor with said drum, said flexible means being wound around said drum for actuation thereby, and means for operatively connecting the other end of said flexible means to said door and for sealing said door in closed position, comprising an arm pivoted on the door and means connecting the free end of said arm with said other end of the flexible means.

15. In a vertically slidable door, means for counterbalancing said door, means for shifting said door in either direction of movement, comprising a reversible motor, flexible power transmitting means connected at one end to said door, a sprocket, means rotatably mounting said sprocket, means operatively connecting said motor with said sprocket, said flexible means passing over said sprocket for actuation thereby, and means for operatively connecting the other end of said flexible means to said door and for sealing said door in closed position, comprising an arm pivoted on the door and means connecting the free end of said arm with said other end of the flexible means.

16. In a vertically slidable door, the combination with a door jamb, of a door comprising a plurality of articulated sections provided with guide rollers, tracks for said rollers operatively associated with said door jamb and comprising horizontal and vertical portions connected by arcuate portions, a driven shaft mounted above the door opening, a door counterbalance spring operatively associated with said shaft, cables attached at one end to the bottom of said door and wrapped around said shaft intermediate their ends to provide driving engagement therewith, arms pivotally associated with the upper door section and having guiding engagement with said tracks, and coiled springs connected to the other ends of said cables and to the rear ends of said arms.

17. In a vertically slidable door, the combination with a door jamb, of a door comprising a plu-

5 rality of articulated sections provided with guide rollers, tracks for said rollers operatively associated with said door jamb and comprising horizontal and vertical portions connected by arcuate portions, a driven shaft mounted above the door opening, cables attached at one end to the bottom of said door and wrapped around said shaft intermediate their ends to provide driving engagement therewith, arms pivotally associated with the upper door section and having guiding engagement with said tracks, and coiled springs connected to the other ends of said cables and to the rear ends of said arms.

18. In a vertically slidable door, the combination with a door jamb, of a door comprising a plurality of articulated sections provided with guide rollers, tracks for said rollers operatively associated with said door jamb and comprising horizontal and vertical portions connected by arcuate portions, a driven shaft mounted above the door opening, a door counterbalance spring operatively associated with said shaft, cables attached at one end to the bottom of said door and having driving connection with said shaft intermediate their ends, and arms pivotally associated with the upper portion of the door and having guiding engagement with said tracks, the other ends of said cables being operatively connected to said arms.

19. In a vertically slidable door, the combination with a door jamb, of a door comprising a plurality of articulated sections provided with guide rollers, tracks for said rollers operatively associated with said door jamb and comprising horizontal and vertical portions connected by arcuate portions, a driven shaft mounted above the door opening, cables attached at one end to the bottom of said door and having driving connection with said shaft intermediate their ends, and arms pivotally associated with the upper portion of the door and having guiding engagement with said tracks, the other ends of said cables being operatively connected to said arms.

20. In a slidable door comprising a plurality of articulated sections, a track for guiding said sections from operative closed position relative to a door jamb to withdrawn position and vice versa, means comprising a flexible member connected to one end section of said door for actuating the same, and means for sealing the other end section against the same when the door is in operative position, comprising an element pivotally connected to said other end section and to said flexible member, said element being likewise guided by said track.

21. In a slidable door comprising a plurality of articulated sections, a track for guiding said sections from operative closed position relative to a door jamb to withdrawn position and vice versa, means connected to one end section of said door for actuating the same, and means for sealing the other end section against the same when the door is in operative position, comprising an element connected to said other end section and to said actuating means.

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