Aug. 17, 1937. L. A. BITTORF ET AL 2,090,099

OVERHEAD DOOR STRUCTURE

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Fig. 1.

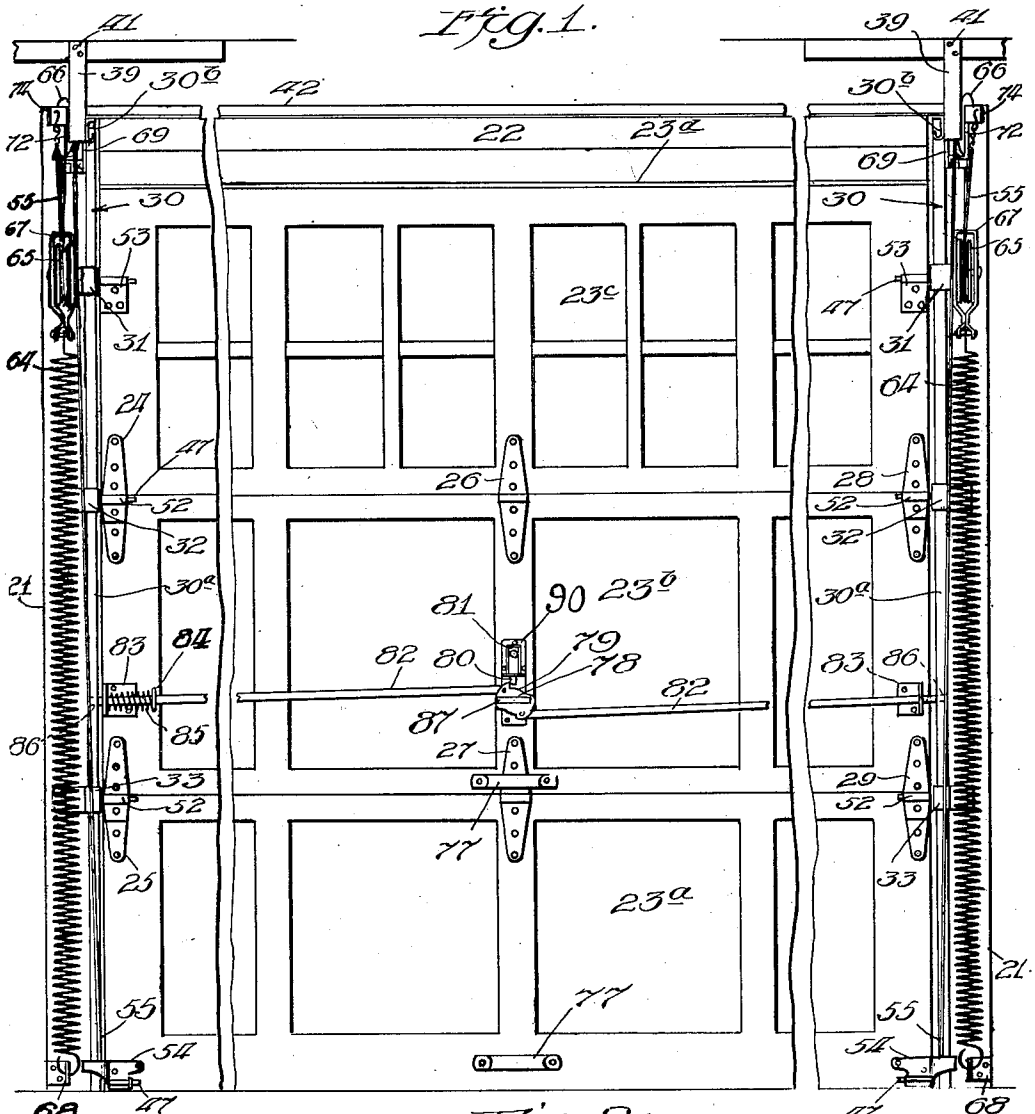
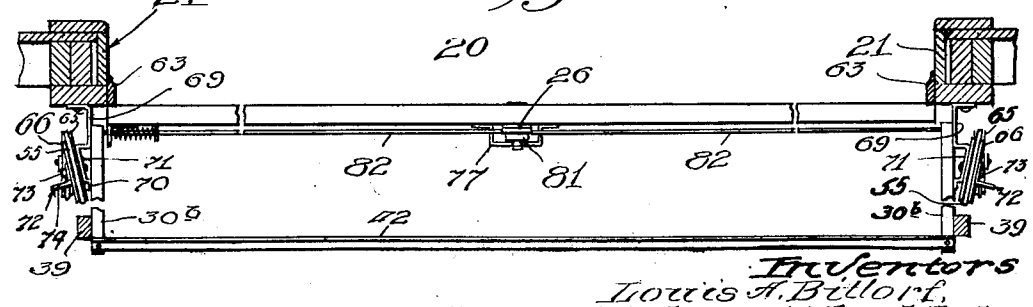


Fig. 2.



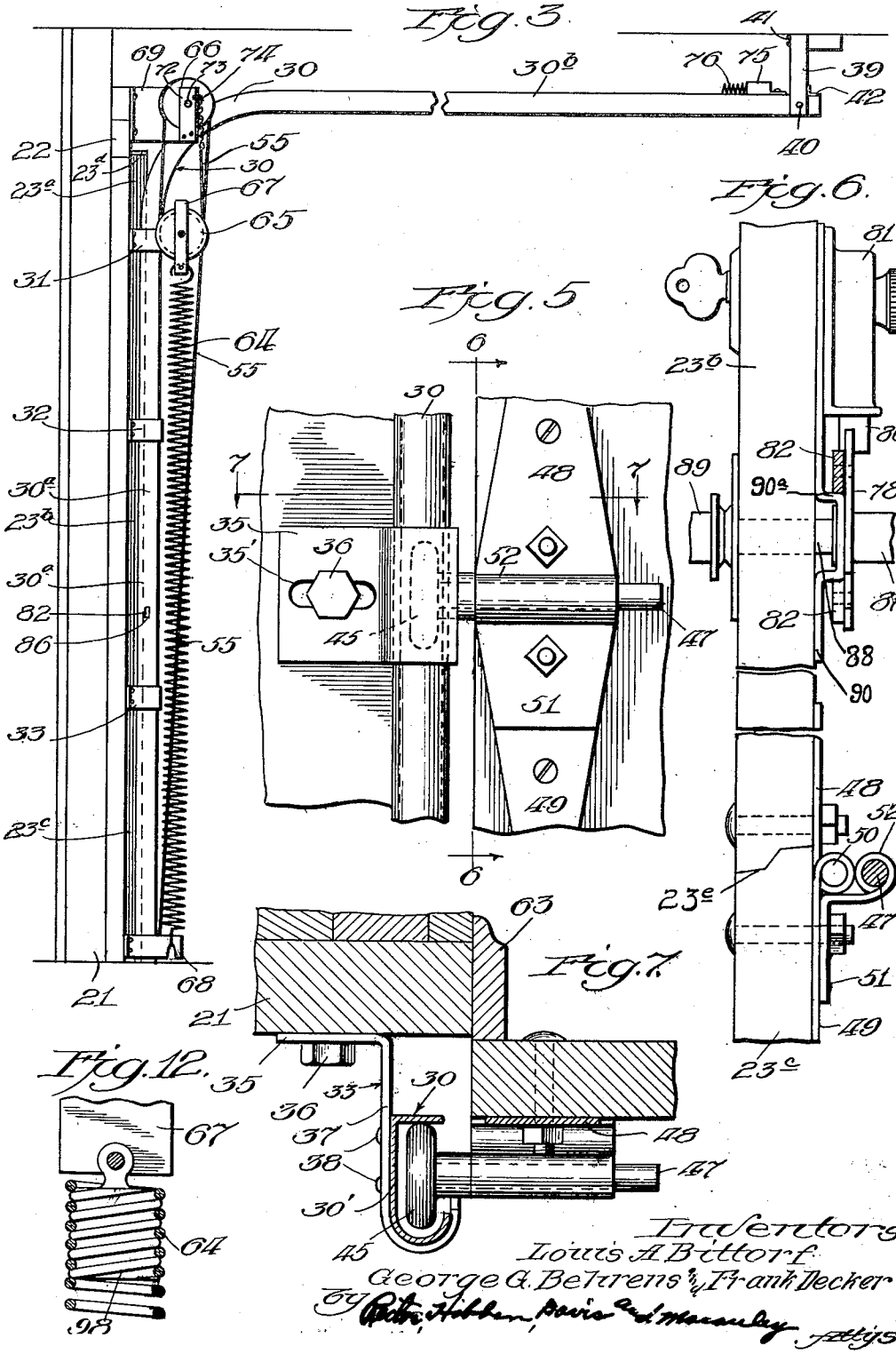
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OVERHEAD DOOR STRUCTURE

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Fig. 3.



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OVERHEAD DOOR STRUCTURE

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Fig. 4.

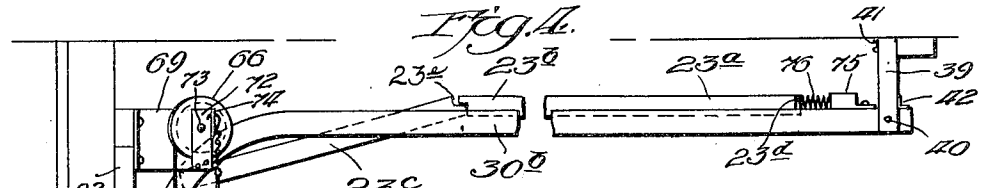
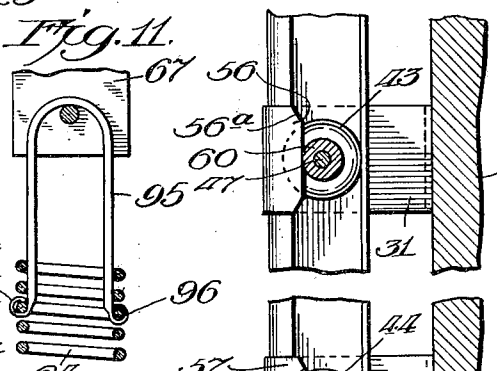


Fig. 11.



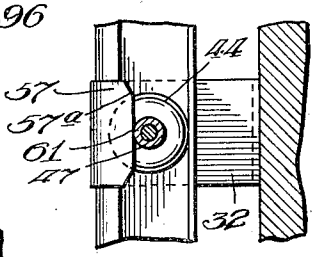


Fig. 8.

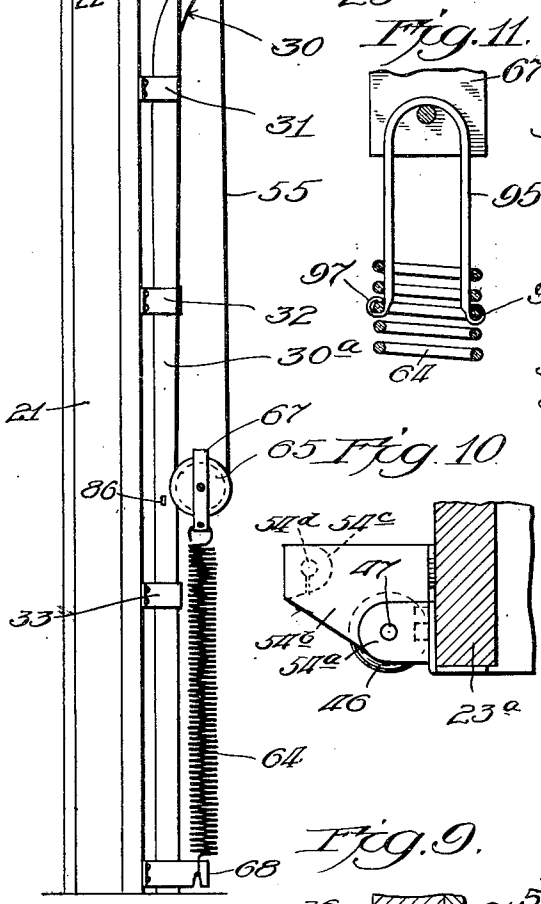


Fig. 10

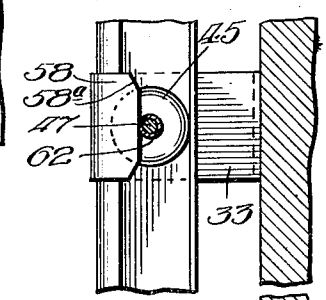
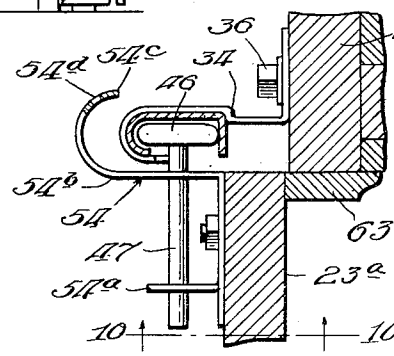
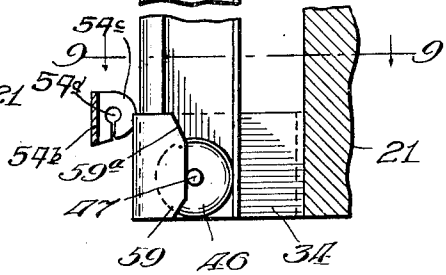


Fig. 9.





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OVERHEAD DOOR STRUCTURE

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Fig. 13.

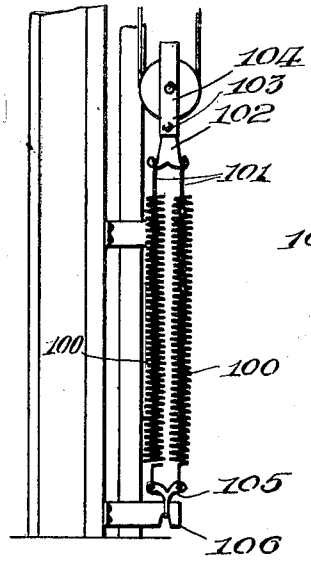


Fig. 14.

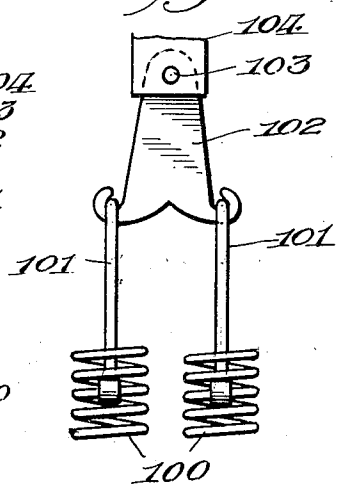


Fig. 18.

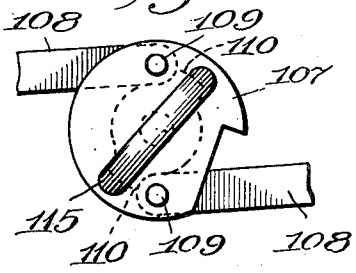


Fig. 15.

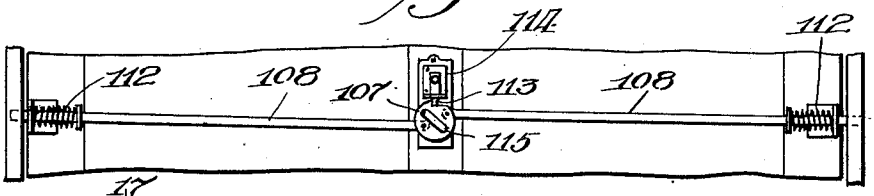


Fig. 16.

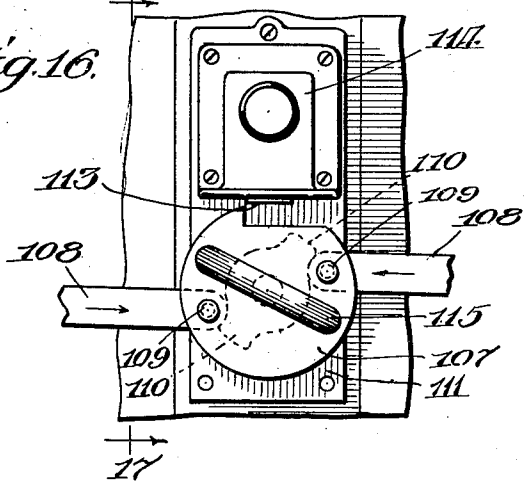
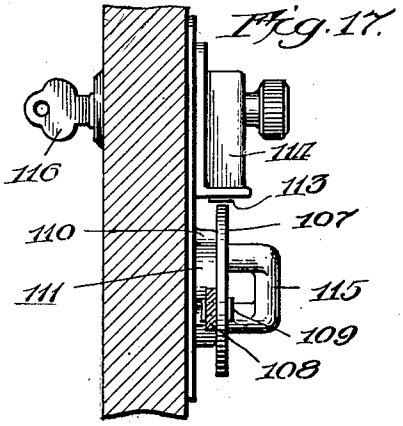


Fig. 17.



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UNITED STATES PATENT OFFICE

2,090,099

OVERHEAD DOOR STRUCTURE

Louis A. Bittorf, George G. Behrens, and Frank Decker, Sterling, Ill., assignors to National Manufacturing Company, Sterling, Ill., a corporation of Illinois

Application December 18, 1930, Serial No. 503,165

20 Claims. (Cl. 20—20)

Our invention relates to closure structure of the overhead type formed of a plurality of horizontal, hingedly-connected sections so mounted that the structure assumes a substantially horizontal overhead position when opened and a substantially vertical position when closed. Although our invention has utility in any environment where an arrangement of the foregoing character is desirable, it is particularly useful in connection with garage doors, and the like, where a large unobstructed doorway is employed and where head room is by necessity, or otherwise, limited.

One of the objects of our invention is to provide a closure of the foregoing character embodying improved details of construction rendering it simple in construction, cheap to manufacture and maintain, easy to operate and positive in action.

Another object is to provide a door or closure including a plurality of units which may be easily and quickly set up together and installed with operative precision in connection with old or new buildings and buildings wherein the ceiling is low and the head room is limited, being not much greater than that of the doorway.

A further object is to provide a novel means for positively sealing the door, or the like, in its closed position against the doorway frame, rendering the closure practically air-tight and weatherproof while at the same time insuring that the door may be moved easily and quickly to and from its sealing position.

A more specific object of our invention is to provide a door sealing arrangement wherein the door supporting rollers coact with camming devices as the final closing movement of the door takes place to displace the door laterally toward the sealing surface, the movement of the door up to that point being free, whereby the door seal may be broken and free door movement established upon a very slight opening movement of the door.

Another more specific object of our invention is to employ the camming devices last referred to as supporting means for the vertical section of the track, and to so relate said devices and track structure that the shafts of the door-supporting rollers coact with the camming devices, respectively, to effect the door-sealing movement.

A further object is to provide improved hinge structure between the several horizontal door sections, which hinge structures include as a fixed part thereof elongated bearings for the door roller shafts, which shafts are freely supported therein and are of sufficient length to permit the door to adjust itself laterally with respect to the doorway insuring at all times free door movement irrespective of settling, warping and the like, conditions.

Still another object is to provide improved means for counterbalancing the door in open and various partially open positions whereby the door is free-moving and under complete counterbalance control at all times, which means is of such construction and so arranged relative to the door and doorway members that its operation is practically noiseless without slapping, whipping and back-lash during opening and closing movements of the door.

Another object is to provide counterbalance means which is adjustable to compensate for variation in weights of doors as well as wear to insure the proper counterbalancing of the door as initially installed and to maintain that condition. A more specific object is to provide as a part of the counterbalance a spring which is adjustable in active length to vary its strength.

Still another object is to provide an improved spring-type counterbalance which embodies self-contained safety provision preventing falling of the door (with its attendant dangers) from a raised position in the event that a counterbalance spring should break, become loosened, weakened or the like. More specifically, we may employ a plurality of equally effective counterbalance springs at each side of the door instead of a single spring, wherefore should one spring break the others will serve to support the door against falling (as distinguished from gradually lowering).

A further object is to provide a novel form of latch for holding the door in its closed position, which latch embodies a common means for yieldably holding the door latching members in both their latched and unlatched positions.

Additional objects are to provide means for cushioning the movement of the door into its full-open position, aiding in the noiseless operation of the door and rendering the door and operating structure more efficient in operation; to provide a spring counterbalance which includes spring supporting structure serving as counterweight means aiding the spring in counterbalancing; to provide an improved joint between the adjacent door sections whereby the joint sections are strengthened, positive clearance for the tight fitting joint parts is provided in their relative movements, and moisture, weather, etc., which may tend to later or may find its way into the joint is drained to the outside of the door; and to

provide against sagging of the door sections when they are in their overhead horizontal position.

Other objects and advantages involving details of construction and arrangement of parts having to do with our improved overhead closure structure will become obvious as this description progresses and by reference to the drawings wherein,—

Figure 1 is a rear elevational view of one form of door structure embodying our invention;

Fig. 2 is a parti-sectional, top plan view of the structure shown in Fig. 1;

Fig. 3 is a side view of the structure shown in Fig. 1, illustrating the relative position of the parts of the structure in door-closed position;

Fig. 4 is a view similar to Fig. 3, except that the door is shown in open position;

Fig. 5 is an enlarged fragmentary view showing one of the door hinges, a portion of the track structure and the track supporting and door-camming means associated therewith;

Fig. 6 is a view taken substantially on line 6—6 of Fig. 5;

Fig. 7 is a sectional view taken substantially on line 7—7 of Fig. 5;

Fig. 8 is an enlarged sectional view taken substantially at a position along the side edge of the door looking toward the adjacent track structure;

Fig. 9 is a horizontal section taken substantially on line 9—9 of Fig. 8;

Fig. 10 is a vertical section taken substantially on line 10—10 of Fig. 9;

Fig. 11 is a sectional view, partly in elevation, showing a preferred form of adjustable spring attachment for the counterbalancing spring;

Fig. 12 is a sectional view of a modified form of adjustable spring attachment;

Fig. 13 is a side elevation of the lower portion of another form of overhead door structure (door in open position) embodying still another form of spring counterbalance;

Fig. 14 is an enlarged fragmentary view of the upper ends of the counterbalance springs of Fig. 13;

Fig. 15 is an inside elevational view of an overhead door embodying one form of latch constructed in accordance with our invention;

Fig. 16 is an enlarged fragmentary elevation of the latch structure of Fig. 15;

Fig. 17 is a section taken substantially on line 17—17 of Fig. 16, the latch being shown in its door latching position; and

Fig. 18 is a fragmentary view illustrating the positions of the latch parts in their unlatched condition.

In the drawings, we have illustrated our invention as applied to a garage door; but it is to be understood that we do not wish to be limited to such type of door, or any other particular form of closure, because it is obvious that our invention has utility in other installations in which similar conditions of operation and use are to be met.

Referring particularly to the structure illustrated in Figs. 1–10, the building may take any suitable form having a doorway 20 defined by side frame members 21 and top frame member 22. This doorway is of sufficient width to permit the passage of one or more automobiles to and from the interior of the building.

The door opening 20 is adapted to be closed by a flexible-type door of the overhead or roll-top type which is comprised of a plurality of panels (in this case three in number, but more or less may be used as desired) 23^a, 23^b and 23^c. These door sections are horizontally disposed and joined together for relative flexible, hinge action by a plurality of suitable hinge devices 24 to 29, inclusive. The overall height and width of the door is sufficient to completely cover the door opening 20.

The flexible construction of this door permits of its movement from a substantially vertical position (Fig. 1) to a substantially horizontal position (Fig. 3) along a curved pathway, and for accomplishing that we provide a suitable track 30 having a vertical portion 30^a extending upwardly in a substantially vertical plane to a point slightly beneath the top door member 22 where it curves rearwardly into a horizontal plane portion 30^b extending to near the rear of the building as clearly shown in Figs. 3 and 4.

It will be appreciated that when the door is in its horizontal overhead position the weight of the same and the width of the doorway may be such that there is a tendency for the door sections to sag and become deformed to such an extent, unless guarded against, that it will not seal properly in its closed or vertical position. It will be noted from Figs. 1 and 4 that the lowermost door section 23^c is carried in a slightly inclined position when the door is open and the intermediate section 23^b is supported along its hinge-connected edges by the other sections and the hinges 24 to 29; consequently, the tendency for these two sections to sag is offset. The top edge of the upper section 23^a is unsupported and to prevent it from sagging, we employ a metal strip 23^d extending entirely across the top edge of the door in such relation thereto that it is positioned edgewise when the door is in its horizontal position. The adjacent hinge-connected edges of the door are of the interlocking type and are shaped to provide a joint 23^e which extends in a general upwardly-inclined direction from the outside of the door. With this arrangement a tight weather-proof joint is provided but, if any moisture, snow, ice, water, etc. should find its way into the joint it will be drained toward the outside of the door. Furthermore, the door section is not weakened by the cutting of this form of joint and the joint parts of the separate door-sections will positively clear each other during hinging movement of the sections.

The track 30, throughout its length, preferably, takes the cross sectional shape clearly shown in Figs. 7 and 9. The tracks on both sides of the door are identical and but one of them will be described in detail. More particularly, the track is provided with a housing portion 30' L-shaped in cross section and an integral track portion of U-shape in cross section. This track structure is easily and quickly mountable by means of a plurality of brackets 31, 32, 33, 34 (Figs. 3, 4, 8 and 9) each of which are of general L-like shape in cross section with their base portions 35 secured, as by fastening studs, or the like, 36, to the side door members 21. The other, or arm portions 37 of these brackets extend inwardly at right angles from the base portions and are secured by means of bolts, rivets, or the like, 38 to the side of the track housing, these portions of the bracket being of sufficient length to extend around and embrace the track portion of the track structure (Figs. 7 and 9). Further, the length of the bracket arms 37 is such that the track 30 is carried at a distance inwardly of the door member 21 substantially equal to the thickness of the door for best cooperation with the door supporting

rollers which will be more fully described hereinafter. The base portions of these track supporting brackets are slotted as at 35' so that they may all be independently adjusted relatively for properly supporting the track in the desired vertical position with respect to the door frame members 21, 22, etc. This provides for proper track mounting notwithstanding some dis-alignment of the door frame part and insures proper alignment of the opposite track structures.

The horizontal portions of the track are supported at their inner end by means of substantial hanger pieces 39 secured as at 40 to the track structure and as at 41 to the building. We maintain the tracks in predetermined laterally-spaced relation by means of an angle bar 42 spanning the same at their extreme inward ends (Figs. 3 and 4).

The door is supported upon the track by means of a plurality of rollers 43, 44, 45, 46, all of which are of identical construction. These rollers may be of ball-bearing or any other suitable form supported by shafts 47, and are of proper size to move freely along the track portions of the track structure and to permit slight displacement of the rollers in the track structure for sealing purposes as will be referred to further hereinafter.

Supports for the rollers 44 and 45 are provided in connection with the hinge structures 24, 25, 28 and 29 (Figs. 1 and 8). More particularly, these hinge structures take the form of a pair of leaves 48, 49 (Figs. 5 and 6) connected together by a hinge pintle 50 and mounted respectively on the door panels 23^a, 23^b, 23^c with the pintle's center line "on center" with respect to the outer end of the irregular weather-proof joint 23^e between the adjacent panels. This "on center" arrangement provides against throwout of the adjacent hinge-connected edges of the door beyond the normal vertical plane surface of the door when the sections hinge relative to each other during movements of the door; thereby confining the door to a more limited operating space. The hinge leaves support L-shaped brackets 51 (preferably fixedly secured thereto), which have their outer ends turned to form elongated cylindrical bearings 52 which freely and slidably receive the roller shafts 47. As shown in Fig. 6, the center line of the shaft supporting part of the bracket 51 is on center with respect to the center of the hinge pintle whereby the rollers and shafts are free to adjust themselves as the door is moved along the track to open or close the same. The freedom of fit as between the roller shafts 47 and the bracket bearing 52 permits of endwise adjustment of the shafts 47 therein and consequent lateral adjustment of the door with respect to the doorway whereby the door automatically adjusts itself irrespective of settling, warping, and the like, conditions and will always move freely in its opening and closing movements.

The uppermost rollers on panel 23^a are supported by brackets 53 which are similarly constructed and are secured directly to the door panel. These brackets are similar to the hinge brackets 51 and are located, preferably, slightly above the mid-portion of the upper panel 23^a so that in the closed position of the door they are directly opposite the track supporting brackets 31.

The lowermost roller supporting brackets 54 are, preferably, attached to the extreme lower corner edge portions of the door so that they will be in a position directly opposite the track supporting brackets 34 when the door is in its closed position. These brackets are of identical construction and each takes, preferably, a U-shape (Fig. 9) with its U arms 54^a and 54^b provided with suitable openings which freely and slidably receive the shaft 47 of the bottom roller 46. The arm 54^b of this bracket is extended inwardly then curved laterally and forwardly around the adjacent bottom track supporting bracket 34 providing a cable-attachment extension 54^c having an opening 54^d therein to which the door operating cable 55 is attached. In this manner, the cable may be readily attached to the bottom of the door and is sufficiently removed from the track structure to avoid interference in the operation of these several parts throughout their range of movement.

As will be readily appreciated, it is necessary in the operation of doors of this character that they not only be readily and easily movable along the trackway to and from the overhead position, but that they also shall be effectively sealed, rendering the door substantially air and weather-proof, in the closed position of the door. To accomplish this, we provide novel means associated with the door-supporting roller shafts 47 and the track-supporting brackets, whereby an exceedingly cheap structure which is easily and quickly installed is provided, all without giving up any of the effective sealing and operating properties of the entire door structure. More particularly, the curved ends of the bracket legs 37 (Figs. 7 and 8) which embrace the track portions of the track structure are extended slightly inward of the edge of the track portion toward the roller shafts 47 and these extending edges of the brackets are shaped to provide cam surfaces, indicated, respectively, at 56, 57, 58, 59. These cam elements are identical in shape and construction except that the upper one 56 is of a lesser depth so that its camming surface is the farthest spaced from the center of the roller shaft 47. The camming elements 57, 58 and 59 are progressively increased in depth (with respect to the cam element 56) to extend progressively nearer the centers of the respective roller shafts 47 so that the lowermost roller shaft (the shaft at the bottom of the door) will freely pass the camming elements 56, 57 and 58, but will engage the bevel surface 59^a of the lowermost camming element 59 as the door moves into its final closed position to throw the door laterally toward the door frame and into the position best illustrated in Fig. 8. In order to get a similar action, during the final closing movement of the door with respect to the other camming elements 56, 57 and 58, and their respective roller shafts, we mount on the roller shafts supporting the rollers 43, 44 and 45 sleeves 60, 61 and 62, respectively, which progressively increase in outside diameter correspondingly to the progressive decrease in the depth of the camming elements 56, 57 and 58; whereby the shafts supporting the roller 45 will freely pass the camming devices 56 and 57, but will engage the beveled surface 58^a of the camming element 58 and ride onto the camming surface thereof as shown in Fig. 8 in the final closing movement of the door; the shaft supporting the roller 44 will freely pass the camming element 56 and will engage the bevel surface 57^a of the camming element 57 and finally engage such camming device as clearly illustrated in Fig. 8; and the sleeved roller shaft supporting the roller 43 will engage the beveled surface 56^a of the camming element 56 and move into the position illustrated in Fig.

8 during the final closing movement of the door. With this arrangement, as the door is moved into its final closing position, all of the camming elements are simultaneously engaged in a similar manner and the door is cammed or thrown bodily forwardly as a unit toward and into engagement with the door frame structure 21, 22 to securely seal the same throughout its length and width to render it substantially air-tight and weather-proof. It will also be noted that with this arrangement, the sealing action does not begin and does not finally take place until the door has been moved almost into its fully closed position and when it is moved into that position it is immediately sealed without any such wedging action that will tend to restrict immediate free movement of the door toward its open position. In other words, with this arrangement, the door seal may be broken and the door freed for ease in movement practically immediately upon the beginning of the upward opening movement of the door. If desired the diameter of the roller shafts may be increased instead of using the sleeves 60, 61, 62.

The accomplishment of the foregoing door seal is further provided for by the use of weather strips 63 (Figs. 7 and 9) secured to the side door members 21. Specifically, the door structure so far described may be first set up in position and the door moved downwardly into its fully closed position. After that has been done, the weather strips 63 may then be applied, as illustrated, and in such abutting relation to the front face of the door that the effective and desired seal is accomplished. With this arrangement, the track structure may be readily applied to both new and old structures quickly and accurately so that the door may be moved by the operator with great ease and without any appreciable exertion.

To aid in such ease in operation of the door, and to hold the same in its full-open position or in various partially-open positions, we provide an efficient form of counter-balancing means. It will be appreciated that the greatest door weight to be taken care of by the counter-balancing means is when the door is in its closed or vertical position; and that, as the door is moved progressively toward its open position, and as part of the same is supported upon the horizontal track portion 30b, the suspended weight of the door becomes gradually and progressively less. Consequently, for accurate and positive counter-balancing, the counter-balancing means should be such that its lifting and counter-balancing effect be progressively and proportionately diminished as the door is progressively opened and its weight progressively borne by the horizontal track portion 30b and vice versa.

One form (Figs. 1–4) of counter-balancing means which we provide for accomplishing the foregoing takes the general form of a vertically disposed coil spring connected by means of pulleys 65 and 66 and cable 55 to the opposite bottom corners of the door. We use two such counter-balancing means, one at each side of the door, and we will, therefore, describe only one of them in detail. The pulley 65 supports a depending bifurcate bracket 67 to which the upper end of the spring 64 is connected, the other end of the spring being connected to a suitable right-angled bracket 68 carried by the side door frame structure 21 at such a position that it does not interfere with the free movement of the door and its operating parts (Figs. 3 and 4). The pulley 66 is supported by a bracket 69 (Figs. 2 and 3) carried by the side door member 21 slightly above the top door member 22. This bracket extends inwardly along the track portion 30b and is additionally supported thereby as at 70. The arm 71 of this bracket which directly supports the pulley 66 tapers inwardly toward the track structure (Fig. 2) so as to mount the pulley 66 in a diagonal position. The support of the pulley 66 is completed by means of a bracket 72 carried by the bracket arm 71 and between which two parts the pulley is rotatably mounted upon a suitable cross shaft 73. The inward end of the bracket is provided with a laterally projecting extension 74 to which one end of the door operating cable 55 is connected, which cable extends from such part of the connection around the pulley 65 thence around the pulley 66 and down to and connects with the cable-attachment bracket as hereinabove described. The diagonal mounting of the pulley 66 so positions this pulley with respect to the pulley 65 and the spring 64 and cable 55 that even with the bracket 69 offset laterally from the side edge of the door and the connection of the cable 55 to the door, the movement of the pulleys, spring and cable is entirely free and without binding effect whereby the intended door action is accomplished in a free and easy manner. By mounting the spring and associated parts in the vertical position, and in the manner shown, there is no tendency for such parts to whip and slap and set up a back-lash condition as the door is moved into its open and closed positions such as would be the case were the counterbalancing means mounted in a horizontal or partially horizontal position.

Furthermore, in the counterbalance mechanism which we provide the pulley 65 serves as a counterweight consequently reducing the effective weight of the door to be counterbalanced by the spring an amount proportionate to its effective weight. If desired, this pulley may be weighted or its own weight may vary to vary the condition just explained. With such an arrangement, a lighter weight spring 55 may be employed than that normally required for counterbalancing the door. A heavy door may be effectively counterbalanced with a comparatively light spring or the weight of the door may be increased (with a proportionate increase in the weight of the pulley 65 or additional counterweight) without increasing the strength of the spring with all of the attendant advantages of the spring counterbalance. By using a light spring and reducing the strain on the same, as is the case with the foregoing, the life of the counterbalance is increased with continued free and smooth action.

In the use of the counter-balance structure shown in Figs. 1–4, the spring 64 is fully extended, exerting greatest pull and lifting effect, when the door is in its fully closed position of Fig. 3. As the door is moved from that position toward an open position, and the position of Fig. 4, the upward movement of the door gradually releases the cable 55 and the spring 64 gradually moves toward its normal unstretched condition of Fig. 4, gradually reducing the pull action of the spring 64 as the door is gradually opened and the weight of the door is gradually borne by the track portion 30b. We preferably arrange the spring and pulleys in such cooperative relation to the door (as shown) that upon raising or opening the door the gradually diminishing weight of the door to be lifted is

proportionate to the gradually diminishing pull of the spring 64 whereby, in any position during this movement, the door is positively and accurately counter-balanced so that it will remain in any such position ready for further movement upon the application of slight pressure thereto. This same action takes place in the movement of the door from its full open position toward its closed position, all of which will be readily understood by those skilled in this art.

It will be appreciated that in the manufacture of structure embodying our invention, the weight of the door or spring or both may vary whereby an accurate counterbalance may not be provided or considerable difficulty may be experienced in initially properly counterbalancing the door. Furthermore, due to wear of the parts or lessening of the strength of a counterbalance spring from any cause, the initially-provided counterbalance condition may be disturbed resulting in improper counterbalancing of the door, after it has been in use.

To take care of the foregoing conditions, in the form of Figs. 1–4, we, preferably, provide an adjustable attachment for the counterbalance spring 64. Specifically, referring to Fig. 11, we, preferaby, employ a bail-like member 95 looped through the pulley support 67 and having the ends of its arms extending within the spring and looped around a coil of the spring at diametrically-opposed points 96 and 97. The looped ends of these arms are, preferably, flattened so as to pass freely between the adjacent coils. The bail thus has in effect a screw-thread-like engagement with the spring.

By turning or screwing the bail 95 in one direction upon the spring, the bail moves nearer the mid-portion of the spring reducing the active length of the spring and increasing its effective strength. The reverse is true when the bail is turned or screwed in the opposite direction. Obviously, the same results are obtained by turning the spring relative to the bail. In the foregoing manner the effective power of the spring 64 may be increased or diminished to effect an accurate counterbalance; whereby a positive counterbalance is always assured with a minimum of labor and attention.

The foregoing may also be accomplished with a screw-plug-like attachment 98 such as illustrated in Fig. 12. As the plug-attachment is screwed inward the active length of the spring is decreased and the opposite is true when such plug is screwed outwardly.

In use of the spring type counterbalance, there is, of course, a possibility of breakage of a counterbalancing spring resulting in falling of the door with its consequent dangers. While this possibility is somewhat remote with proper care in selection of and installation of parts, we do not fail to recognize it—particularly, where the springs are subjected to severe working, strains and stresses. We, therefore, may employ as a safe guard an arrangement such as shown in Figs. 13 and 14 wherein the counterbalance has inherent safety provision. Specifically, we may substitute for the single spring 64 (of Fig. 1), at each side of the door, a pair of springs 100 which are of combined strength equal to the strength of the single spring 64 so as to do the work of the single spring in the same manner as hereinbefore described. However, in case one of these springs 100 should break (there being four of the same) with the door in a raised position, the door would still be supported by the remaining three springs, the total strength of which is sufficient to support the door against falling as distinguished from slow lowering of the same. These springs are supported in the following manner: A bail 101 similar to the bail 95 (Fig. 11) is adjustably attached to the upper end of each spring and these bails, in turn, hook-engage the arms of a yoke member 102 which is pivotally secured as at 103 to the pulley bracket 104. The lower ends of springs 100 are hook-engaged with the arms of a yoke bracket 105 which is in turn, hook-engaged with the bottom frame bracket 106 (similar to bracket 68 of Fig. 1). If desired, the same adjustable bail fitting may be used at both ends of each spring for attachment of the same. Other than the above, this structure is the same as that previously described.

To avoid shock to the door structure, and to cushion its final opening movement, we provide on the top of the track structure a spring bumper device, one on each side, which takes the form of a casing 75 supporting a short forwardly projecting spring 76 which the top of the then-horizontal door structure abuts. The yielding action of these springs permits the door to move on into its fully opened position in a smooth and noiseless manner. To facilitate movement of the door just described, we provide the door panels 23^a and 23^b with handles 77.

It is highly desirable that means be provided for locking the door in its closed position and to accomplish this, we may employ a locking means of the form shown in Figs. 1, 2 and 6. Specifically, a plate 78 is rotatably mounted upon the panel 23^b near the center of the door and on the inside thereof, which plate is provided along one edge with a latching notch 79 adapted to be engaged by the depressible locking tongue 80 (Fig. 1) of a lock device 81 when the latter is in its locked position. To the opposite ends of the plate 78, and at laterally and vertically offset points, we pivotally connect rods 82 which are guidingly supported at their outer ends by passing through suitable openings in the right-angled arms of brackets 83 secured to the panel 23^b near its opposite side edges. At least one (or both if desired) of these rods is provided near its free end with a fixed stop 84, and between this stop and the supporting arm of the bracket 83 there is disposed a spring 85 which tends to self-return the plate 78 and rods 82 to an unlocking position. When the door is closed with rods 82 in the position shown in Fig. 1, they extend beyond the side edges of the door to engage suitable aligned openings or slots 86 in the adjacent track 30 and the rods remain in that position so long as the locking tongue 80 engages the plate notch 79 as indicated in Fig. 1. When the lock 81 is actuated to withdraw the locking tongue 80 the spring 85 moves its rod 82 inwardly of the door structure, rotating the plate 78 and likewise moving the other rod 82 inwardly and withdrawing it from its locking opening or slot 86. The parts will remain in this unlocked position until the plate handle 87 is again moved to turn the plate to the position shown in Fig. 1. The rotatable supporting member 88 which supports the plate 78 upon the door extends on through the panel 23^b and on the outside of the door it has connected to it another handle 89 similar to the handle 87. The locking device 81 has the usual outside extension for receiving a key which permits of unlocking of the door from the outside in the manner just described. Both the locking device 81 and the plate 78 are supported, as a unit, by a bracket 90

secured to the door in any suitable manner. Thusly, the lock and plate are maintained in a predetermined relationship for engagement of the parts as above described. The raised or offset portion 90a of the bracket 90 which supports the plate 78 is of such shape and it is so positioned that it will be struck by the inner end portions of the lock rods 82 (Fig. 6) when the plate 78 is rotated toward unlocking position to limit the unlocking movement of such rods.

It will be noted that in the use of the foregoing lock structure, the springs 85 always tend to move the rods 82 to an unlatched position so that the lock-tongue must always be thrown to a locking position to hold the door latched. This requires that a key be available at all times for opening the door. This may be objectionable in many instances and to avoid the same we provide the following as shown in Figs. 15 to 18, inclusive. A plate 107 is mounted similarly to the plate 78 (Fig. 1) upon a door-carried support 111. The latch rods 108 are pivoted at 109 to this plate and their pivot points are so relatively positioned and offset on opposite sides of a line passing through the center of such plate that when the plate 107 is rotated (from the position of Fig. 18) to the position of Figs. 15 and 16 on the other side of such center line, these pivot points assume a position wherein the springs 112 tend to move the rods 108 back toward an unlatching position. This movement of the rods is, however, limited to a slight distance past center by stop elements 110 formed on the plate support 111, which stop elements are engaged by the pivoted ends of rods 108 in their beyond-center position, as best shown in Fig. 16; when the parts assume the position of Fig. 16, the springs 112 then yieldably oppose movement of the rods to an unlatched position so that the locking tongue 113 of the lock 114 may remain in unlocked position with the door remaining latched in closed position. To unlatch the door it is only necessary to grasp the handle 115 to rotate the plate 107 to throw the rod pivots on the other side of the center where they are moved by the springs 112 to the unlatched position of Fig. 18. In this position the stop elements 110 also serve to limit the unlatching movement of the rods 108. The plate 107 is provided with a notch to receive the lock tongue 113 to lock the door in its latched condition when the lock is accordingly actuated by the key 116. Otherwise, this latching structure is the same as that shown in Figs. 1, 2 and 6.

We believe that the operation of the foregoing door structure, as well as the advantages of our invention, will be readily understood from the description already given. Furthermore, we wish it to be understood that while we have shown and described several arrangements of our invention, other changes in details and arrangement of parts may be made without departing from the spirit and scope of our invention as defined by the claims which follow.

We claim:

1. In closure structure of the character described, a frame defining an opening to be closed, a pair of track members adapted to be mounted at the opposite sides of said opening, said track members each having a vertical and a horizontal portion, a closure member formed of a plurality of panels hingedly connected, brackets supported by said closure, rollers having shafts supported by said brackets, said rollers riding on said track members to move said closure member from a vertical to a horizontal position and vice versa, and means engaging said roller shafts between said rollers and said closure member as said closure member moves into its finally-closed position for shifting said closure member bodily toward said frame to seal the closure member.

2. In closure structure of the character described, a frame defining an opening to be closed, a pair of track members adapted to be mounted at the opposite sides of said opening, said track members each having a vertical and a horizontal portion, a closure member formed of a plurality of panels hingedly connected, rollers having shafts connected to said closure and riding on said track members to move said closure member from a vertical to a horizontal position and vice versa, door-shift elements carried by said roller shafts between said rollers and said closure member, and cam means engaged by said shift-elements as said closure member moves into its finally-closed position for shifting said closure member bodily toward said frame to seal the closure member.

3. In closure structure of the character described, a frame defining an opening to be closed, a pair of track members adapted to be mounted at the opposite sides of said opening, said track members each having a vertical and a horizontal portion, a closure member formed of a plurality of panels hingedly connected, rollers having shafts connected to said closure and riding on said track members to move said closure member from a vertical to a horizontal position and vice versa, and means supporting said track members said means being adapted to engage said roller shafts as said closure member moves into its finally-closed position for shifting said closure member bodily toward said frame to seal the closure member.

4. In closure structure of the character described, a frame defining an opening to be closed, a pair of track members adapted to be mounted at the opposite sides of said opening, said track members each having a vertical and a horizontal portion, a closure member formed of a plurality of panels hingedly connected, rollers having shafts connected to said closure and riding on said track members to move said closure member from a vertical to a horizontal position and vice versa, and brackets supporting said track members and having parts thereof adapted to be engaged by said roller shafts as said closure member moves into its finally-closed position for shifting said closure member bodily toward said frame to seal the closure member.

5. In closure structure, the combination with frame members forming the opening to be closed, of track members each having a vertical portion supported by said frame members at the opposite sides of said opening and a horizontal portion extending overhead and inwardly away from said opening, a sectional closure member having its sections hingedly joined; shafts supported by said closure member, rollers supported by said shafts and guidingly riding on said track members for movement of said closure member from an open-horizontal to a closed-vertical position and vice versa, brackets supporting said vertical track portions on said frame members, and means carried by said brackets obstructing the pathway of said roller shafts during closing movement of said closure member, which means shifts said shafts and closure member laterally to seal said closure member against said frame members in the final closing movement of the closure member.

6. In closure structure, the combination with

frame members forming the opening to be closed, of track members each having a vertical portion supported by said frame members at the opposite sides of said opening and a horizontal portion extending overhead and inwardly away from said opening, a sectional closure member having its sections hingedly joined; shafts supported by said closure member, rollers supported by said shafts and guidingly riding on said track members for movement of said closure member from an open-horizontal to a closed-vertical position and vice versa, supporting brackets secured to said frame members and to said vertical track portions, said brackets having cam-faced edge portions extending in the path of said shafts as the door moves into its closed position whereby said closure member is shifted laterally to seal said closure member against said frame members in the final closing movement of the closure member.

7. In a closure structure of the overhead type, means constituting a seal surface around the opening to be closed, track members each having a vertical portion mounted along the opposite sides of said opening and a horizontal portion extending overhead and inwardly away from the opening, means supporting said track members, a door, or the like closure, formed of top, bottom and intermediate sections hingedly connected together to swing about horizontal lines, roller-and-shaft means mounted at the opposite side edges of said door with the rollers thereof engaging said track members for movement of said door from a horizontal-open to a vertical-closed position, certain of said rollers being shaft mounted on the top section, others on the bottom section and the remainder at the hinged joints between said sections, cam elements associated with said track member supporting means and so positioned that they are opposite and extend at substantially right angles to the respective roller shafts in the closed position of the door, the upper of said roller shafts having an enlarged diameter with the lower shafts progressively diminishing in diameter, and the upper of said cam elements being of sufficient length to engage the upper of said shafts in door-closed position with the lower of said cam elements progressively increasing in length proportionately to the diminishing diameter of said shafts.

8. In a closure structure of the overhead type, track members at the opposite sides of the opening to be closed, said members each having a vertical and a horizontal portion, a door, or the like closure, means for supporting said door on said track comprising a plurality of shafts supporting rollers mounted along the side edges of the door at top, bottom and intermediate points, said rollers engaging said track members, and track supporting means mounted along the vertical portions of said track members for sealing the door against the frame means defining the opening to be closed including cam members corresponding in number to said rollers and positioned so as to engage said shafts as the door is moved into its final vertical-closed position, the uppermost of said cam members being located farthest from the axes of said shafts with the successive lower cam members progressively approaching nearer said shaft axes, and the diameter of said uppermost shaft being the greater to engage said uppermost cam member in the closed position of the door with the successive lower shafts progressively decreasing in diameter proportionately to the progressive increase in projection of said lower cam members whereby all said cam members become engaged with their respective shafts in door-closed position without camming engagement of any of said parts prior to movement of the door into its finally closed position.

9. In a closure structure of the overhead type, track members at the opposite sides of the opening to be closed, said members each having a vertical and a horizontal portion, a door, or the like closure, means for supporting said door on said track comprising a plurality of shafts supporting rollers mounted along the side edges of the door at top, bottom and intermediate points, said rollers engaging said track members, and means mounted along the vertical portions of said track members for sealing the door against the frame means defining the opening to be closed comprising brackets supporting each of said vertical track portions and positioned opposite said rollers in closed position of the door, said brackets each having an extension projecting at right angles to the axes of said shafts and into the paths of said shafts, said bracket extensions having cam surfaces engaged by the respective of said shafts in door closed position, the extent of projection of said extensions and the diameters of said shafts, respectively, being reversely increased and diminished so that the lowermost of said shafts may pass all of the cam devices and engage only the lowermost of said cam devices, and likewise as to the intermediate of said shafts.

10. In a closure structure of the overhead type, track members at the opposite sides of the opening to be closed, said members each having a vertical and a horizontal portion, a door, or the like closure, means for supporting said door on said track comprising a plurality of shafts supporting rollers mounted along the side edges of the door at top, bottom and intermediate points, said rollers engaging said track members, and means mounted along the vertical portions of said track members for sealing the door against the frame means defining the opening to be closed comprising brackets supporting each of said vertical track portions and positioned opposite said rollers in closed position of the door, said brackets each having an extension projecting at right angles to the axes of said shafts and into the paths of said shafts, said bracket extensions having cam surfaces engaged by the respective of said shafts in door closed position, the arrangement of said cam surfaces and said shafts being such that the uppermost cam surface is farthest removed from the paths of movement of said shafts with the successive lower cam surfaces progressively projecting nearer said shaft paths, and the uppermost of said shafts having the greater diameter with the successive lower of said shafts progressively decreasing in diameter proportionately to the increase in projection of said successive lower cam surfaces whereby all of said shafts in movement of the door to closed position simultaneously engage only their respective cam surfaces for lateral displacement of the door toward a sealing surface.

11. Closure structure adapted to be associated with frame means defining a rectangularly-shaped, vertical-plane opening to be closed, comprising track members mounted at the opposite vertical sides of said opening and outside the limits thereof, means including shafts and rollers adapted to be engaged with said track members and a door for supporting a door on said track members, spaced means supporting said vertical

track portions having integral portions adapted to engage respective roller shafts for lateral displacement of the roller shafts simultaneously throughout as the parts are moved into their closed position, and seal strip means mounted on the frame means within the limits of said opening and substantially parallel with said track members and against which the vertical side edges of a door are adapted to be seated as the parts are moved into their closed position.

12. In overhead door structure, track members having vertical and horizontal portions mounted at opposite sides of the opening to be closed, a door mounted upon said track members for movement from a vertical closed position to an overhead, horizontal open position and vice versa, and means for counterbalancing said door in said movements comprising at each side of the opening to be closed a bracket mounted adjacent the bottom of said opening, a vertically disposed coil spring connected at one end to said bracket, a pulley supporting the other end of said spring, a cable attached to the bottom corner of said door, a second pulley over which said cable passes, said cable also passing over said first-named pulley, and a bracket mounted at the top corner of said opening and having an inwardly-projecting, diagonally-disposed arm supporting said second pulley at such an angle that it projects diagonally from said horizontal track portions toward said opening, said bracket also having a projecting arm to which the end of said cable which passes over said first-named pulley is connected.

13. In overhead door structure, track members having vertical and horizontal portions mounted at opposite sides of the opening to be closed, a door mounted upon said track members for movement from a vertical closed position to an overhead, horizontal open position and vice versa, and means displaced sidewise from said door and track members for counterbalancing said door in said movements comprising at each side of the opening to be closed a right-angled bracket mounted adjacent the bottom of said opening and having one arm projecting inwardly away from said opening, a vertically disposed coil spring connected at one end to said one bracket arm, a floating pulley connected to the other end of said spring, a cable attached to the bottom corner of said door, a second pulley over which said cable first passes, said cable also passing over said first-named pulley, and a right-angled bracket mounted at the top corner of said opening and having its inwardly-projecting arm supported by said horizontal track portion and diagonally-disposed and supporting said second pulley at such an angle that it projects diagonally from said horizontal track portion toward said opening, said bracket also having a projecting arm to which the end of said cable opposite its door-connected end is attached.

14. In overhead door structure, track means, a door, counterbalancing means including a cable, and means for mounting said door on said track means including a bracket secured to the bottom corner portion of said door, a bearing associated with said bracket, a shaft supported by said bearing, a roller carried by said shaft and engaging said track means, said bracket having an extension projecting inwardly of and around said track means adapted for attachment of one end of said cable.

15. In overhead door structure, track means, a door, counterbalancing means including a cable, and means for mounting said door on said track means including a U-shaped bracket having its base part attached to the lower corner of said door, the U-arms of said bracket projecting inwardly and provided with aligned openings, a relatively short shaft received and supported in said openings, a roller supported by said shaft and engaging said track means, one of said U-arms being extended and curved around said track means for attachment of one end of said cable at a point substantially inward and laterally of said track means.

16. A hardware unit for mounting a door of the character described, comprised of a plurality of connected sections adapted to be supported by track members, which includes a hinge member having hinge leaves adapted to be connected to adjacent door sections, a bracket carried by one of said leaves independent of the hinge pintle, said bracket having an arm extending at substantially right angles to said hinge leaf and having its outer end formed to provide an integral bearing, a shaft supported freely in said bearing for rotation and axial shift movement, and a roller carried by said shaft and adapted to engage one of the track members which support the door.

17. A hardware unit for mounting a door of the character described, comprised of a plurality of connected sections adapted to be supported by track members, which includes a hinge member having hinge leaves adapted to be connected to adjacent door sections, a right-angled bracket having its base portion carried by one of said leaves and its other portion or arm extended away from said leaf with its outer end turned to form a cylindrical bearing the axis of which is located above and on-center with respect to the pintle of said hinge member, a shaft freely receivable in said bearing for free rotation and axial adjustment thereof, and a roller supported by said shaft and adapted to engage one of the track members which support the door.

18. A device for closing an opening comprising a closure element, trackways for guiding said closure element between open position and closed position where the edges thereof contact with a frame around the opening, rollers carried by said closure element and cooperating with said trackways to guide it, means for forcing said closure element firmly into contact with the frame around said opening as it moves into closed position, said means comprising a plurality of sleeves carried by the closure element adjacent said rollers but being separate from the rollers, and a plurality of inclined plane devices mounted on said trackways and adapted to cooperate by camming action with said sleeves.

19. A device for closing an opening comprising a closure element, trackways for guiding said closure element between open position and closed position where the edges thereof contact with a frame around the opening, rollers mounted on supporting means attached to said closure element and adapted to cooperate with said trackways to aid in guiding said closure element between open and closed positions, said roller members being disposed at spaced intervals along the edges of the closure element, means for forcing said closure element firmly into contact with the frame around said opening as it moves into closed position, said means comprising a plurality of sleeves mounted on said roller supporting members but being separate from said rollers, said sleeves being of progressively decreasing diameter, and a plurality of inclined plane members

disposed along said trackways and adapted to contact with said sleeves as the closure element moves into closed position, said inclined plane members being of progressively increasing height.

20. In combination, a door, a guiding track therefor, a roller engaging the track supported by the door, an independently rotatable sleeve associated with the roller and the door, and means associated with the track for engaging said sleeve to position the door.

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