Jan. 8, 1935. D. C. E. LEONARD 1,987,512

HINGE FOR DOORS

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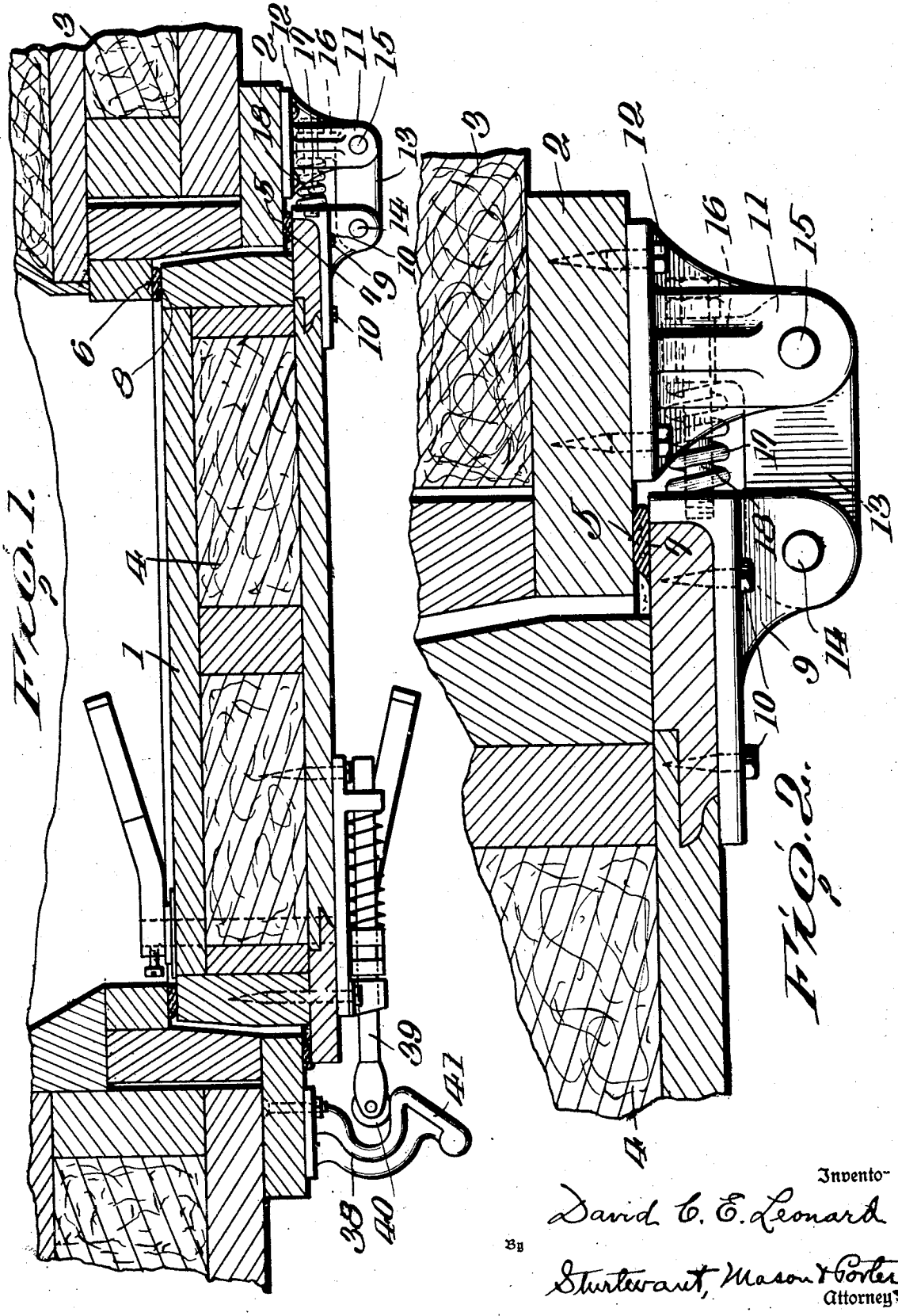


Fig. 1.

Fig. 2.

Inventor
David C. E. Leonard
By
Sturtevant, Mason & Porter
Attorneys.

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Fig. 3.

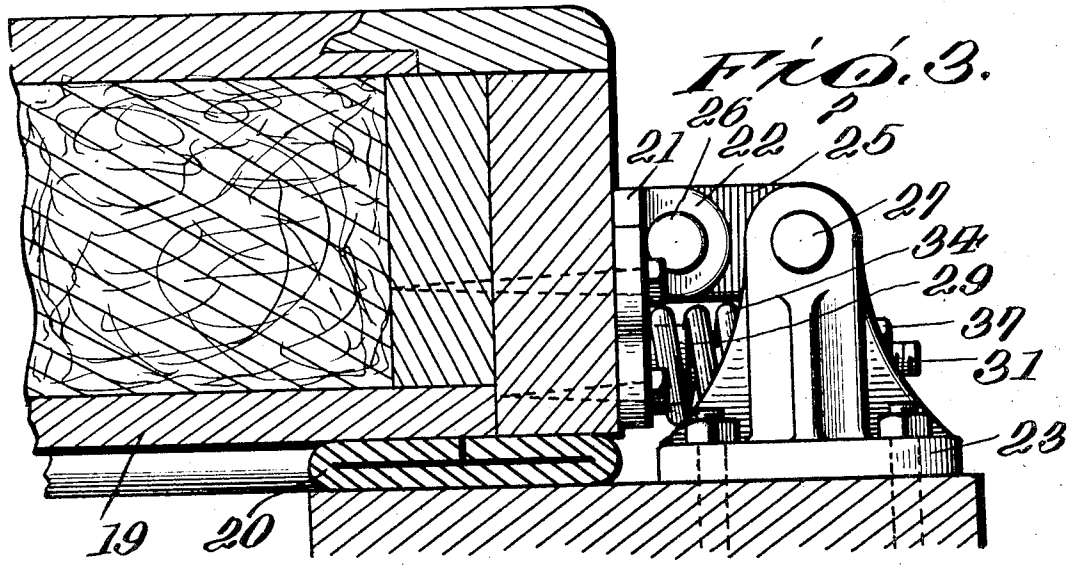
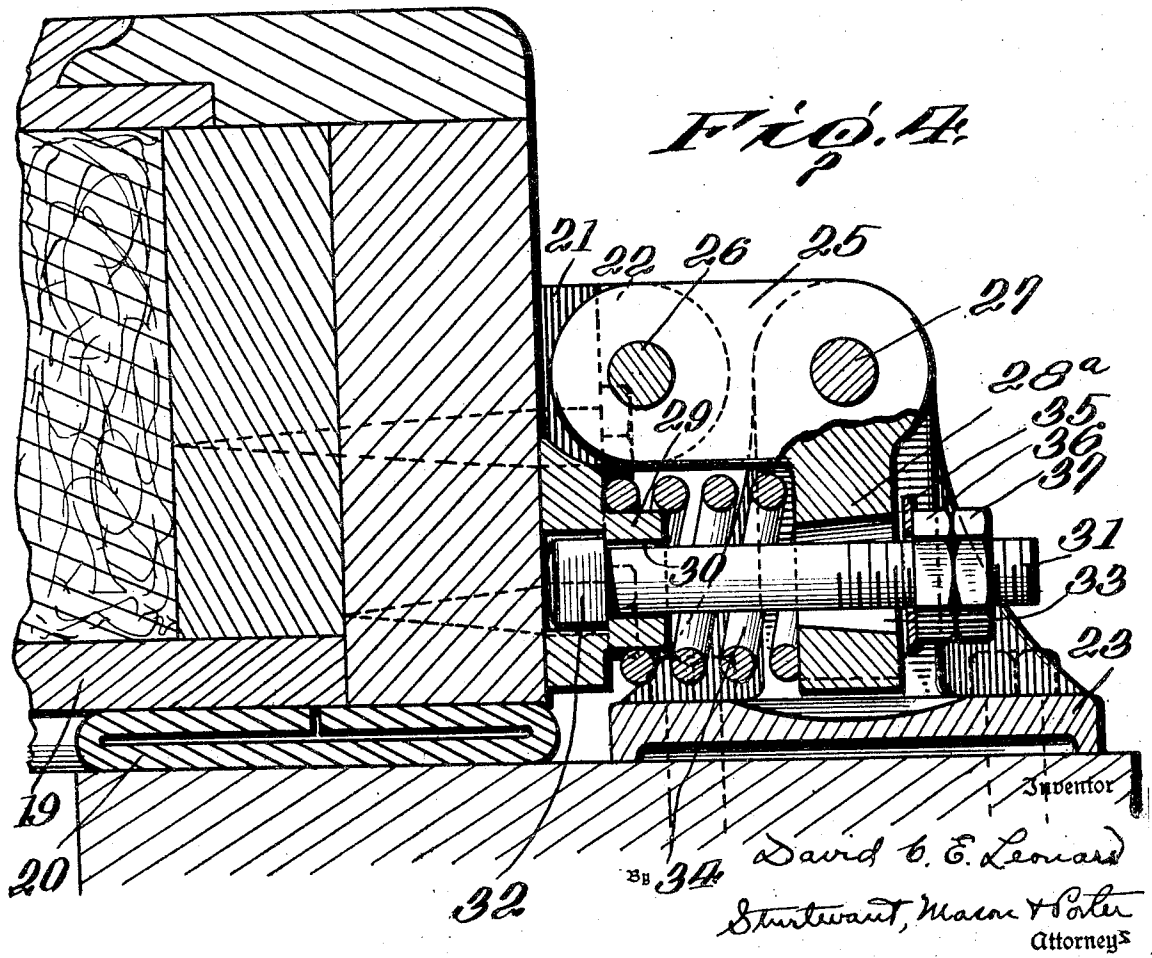


Fig. 4.



Inventor

David C. E. Leonard

By Stuntevant, Macon & Porter

Attorneys

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FIG. 5.

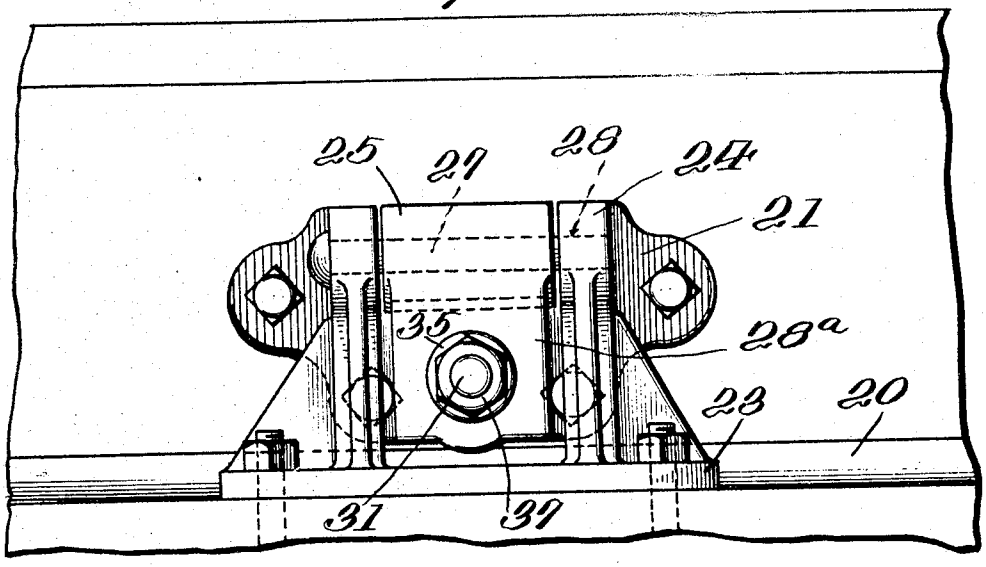


FIG. 6.

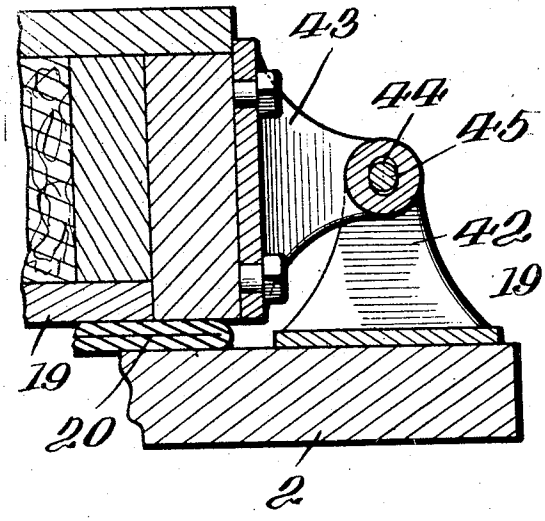
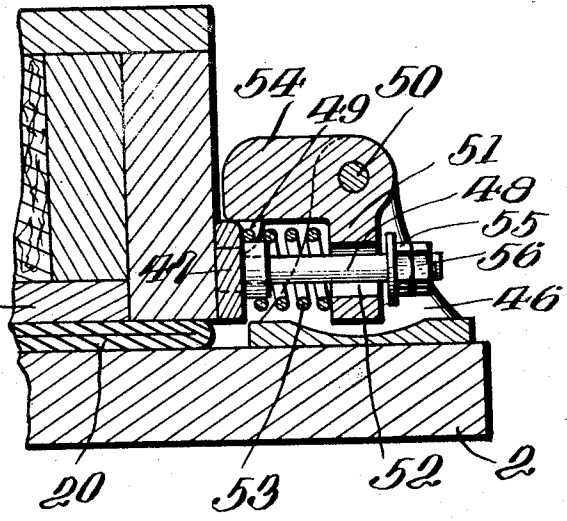


FIG. 7.



Inventor

David C. E. Leonard

By

Sturtevant, Mason & Porter

Attorneys

Patented Jan. 8, 1935

1,987,512

UNITED STATES PATENT OFFICE

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HINGE FOR DOORS

David Charles Elwyn Leonard, Hagerstown, Md., assignor to Jamison Cold Storage Door Company, Hagerstown, Md., a corporation of Maryland

Application April 5, 1932, Serial No. 603,296

7 Claims. (Cl. 16—163)

The invention relates to new and useful improvements in a door mounting, and more particularly to a door mounting which permits the door to swing freely and to make a tight sealing contact with the door frame all the way around the door opening.

An object of the invention is to provide a door mounting which may be attached to the door at the edge thereof and to the adjacent door frame, which mounting includes means permitting the door to swing freely to open and closed position, and means for yieldingly forcing the door edge adjacent the mounting into contact with the door frame.

A further object of the invention is to provide a door mounting of the above type which includes means for varying the yielding pressure of the edge of the door adjacent the mounting against the frame.

These and other objects will in part be obvious and will in part be hereinafter more fully disclosed.

In the drawings—

Figure 1 is a horizontal sectional view through the door, the door frame and one of the door mountings;

Fig. 2 is an enlarged horizontal sectional view through the door, the door frame and the door mounting;

Fig. 3 is a view similar to Fig. 2, but showing a slightly modified form of door mounting for a door which overlies the door frame instead of extending into the opening formed by the door frame as in Figures 1 and 2;

Fig. 4 is an enlarged horizontal sectional view through the central portion of one of the door mountings;

Fig. 5 is a view showing the door mounting of Figures 3 and 4 as viewed from the side edge of the door;

Fig. 6 is a horizontal sectional view showing the door supporting means in a modified form of door mounting, and

Fig. 7 is a horizontal sectional view showing the spring means used in the modified form of door mounting with the supporting means shown in Fig. 6.

The invention is shown as applied to a door mounting for a door which is particularly adapted for closing an opening to a chamber which it is desired to maintain at a temperature differing from normal atmospheric temperature, such as, for example, a cold storage chamber, a heated chamber or a chamber to hold moderate pressure. The door is of the usual construction and is provided with sealing strips which make engagement with the door frame for establishing a tight seal. The invention has to do particularly with the mountings for the door. The door mountings include a door supporting means and a spring means which is associated therewith for forcing the edge of the door adjacent the mounting into tight sealing contact with the door frame. In one form of the invention, the door supporting means and the spring means are all interconnected in a single mounting or series of mountings, while in another form of the invention, the door supporting means and the spring means are in separate units. In each instance, the door is mounted to swing about an axis at one side of the opening, and the spring means includes an abutment member which is connected to the door and which swings with the door and about the door swinging axis. A spring is interposed between this abutment member and the door, and is so arranged as to exert an abutment pressure against the edge of the door in a direction laterally of the door. The abutment member is so connected to the door that the spring through said abutment member exerts a yielding force in a direction at right angles to the door, and thus forces the edge of the door adjacent the mounting into contact with the door frame when the door is closed.

Referring more in detail to the drawings, the invention as shown in Figures 1 and 2 is applied to the door which swings in part into the opening formed by the door frame. The door is indicated at 1 and the door frame at 2. The walls of the chamber are of insulating material as indicated at 3. This insulating material may be cork or any other suitable material of low conductivity. The door is made very thick, and is likewise provided with a suitable insulation as indicated at 4. The door makes contact with the frame along the lines 5 and 6. There is a sealing gasket 7 between the door flange and the frame along the line 5 and a sealing gasket which is carried by the door and contacts with the frame along the line 6. Of course, the gaskets may be placed otherwise, instead of on the door.

The door, as shown in Figures 1 and 2, is carried by a hinge mounting which includes the supporting means for the door and a spring means operating to press the edge of the door adjacent the mounting into contact with the door frame when the door is closed. There is a mounting 9 which is secured to the door by suitable screws 10, 10, and a mounting 11 which is secured to the door frame by suitable screws 12, 12. A link 13 is se-

cured to the mounting 9 by a pivot bolt 14. The link is also secured to the mounting 11 by a pivot bolt 15. The link 13 is provided with an arm 16 which is formed integral therewith and constitutes a bell crank abutment member. A spring 17 bears against the mounting 9 and against the arm 16 of this abutment member. A bolt 18 is carried by the mounting 9 and extends through an opening in the arm 16. The bolt is provided with a nut which engages the outer face of the arm and limits the movement of the bell crank abutment member, holding the same in a predetermined position relative to the door during this swinging of the door. This construction of abutment member and the function of the spring in connection therewith will be described more in detail in connection with the mounting for the door as shown in Figures 3 to 5, inclusive.

In Figures 3 and 4, the door is shown as of a type which is larger than the opening to be closed and overlies the door frame surrounding the opening. The door is indicated at 19. The door carries a gasket 20 which makes contact with the door frame. Attached to the side edge of the door is a door mounting 21 which is similar to the door mounting 9, except that it is constructed for attachment to the side edge wall of the door instead of the front face of the door, and said edge is shown in Figures 1 and 2. This enables the door to be made of any desired thickness, as the door mounting is attached solely to the side edge wall of the door and does not extend around on to the front face thereof. The door mounting 21 includes a body portion having spaced projecting lugs 22, 22. The mounting on the door frame indicated at 23 is provided with spaced projecting arms 24, 24. A link 25 is mounted on the pivot bolt 26 which passes through openings in the lugs 22, 22. This link 25 is also mounted for swinging movement on a pivot bolt 27 which passes through openings in the arms 28, 28 of the door frame mounting 23. The link 25 is provided with an integral arm 28^a which extends substantially at right angles to the link and forms a bell crank abutment member. This bell crank abutment member swings in the space between the arms 24, 24. In this form of the invention, the link 25 serves as a support for the door and the door with the link swings as a unit about the pivot bolt 27. The mounting 21 attached to the door is provided with a boss 29 formed with an opening 30 therethrough to receive a bolt 31. The mounting in rear of the boss has an enlarged recess receiving the head 32 of the bolt. This forms a substantially rigid support for the bolt. The bolt extends through an opening 33 in the arm 28^a, which opening is larger than the bolt, so as to allow a movement of the arm 28^a lengthwise of the bolt to different angular positions relative to the bolt. A coil compression spring 34 surrounds the boss 29 and bears at its outer end against the arm 28^a as an abutment. The spring at its inner end bears against the boss or the door and exerts a pressure thereagainst in a direction laterally of the door or of the plane of the door. This is purely an abutment for the spring. The spring at its other end exerts a pressure against the bell crank abutment member tending to turn the same about the pivot bolt 27. When the door is away from the gasket, the movement of the bell crank abutment member is limited by the nuts 36 and 37 which bear against a washer 35. This will hold the bell crank abutment member in a predetermined position relative to the door during the swinging movement of the door. The nuts are preferably so adjusted that when the door is closed, the edge of the door adjacent the mounting will first contact with the door frame. When the door is forced to full closed position where it is locked by the latch 39 cooperating with a keeper 38, then the spring will be compressed and the arm 28 of the bell crank abutment member will be moved out of contact with the washer and the nuts on the bolt. The spring is constantly exerting a force against this bell crank abutment member, tending to turn the same about the pivot bolt 27 as an axis, which is also the swinging axis of the door, in a counter clockwise direction as viewed in Fig. 4, and through this bell crank abutment member, is therefore, exerting a force on the pivot bolt 26 and the door in a direction at right angles to the plane of the door. Thus the edge of the door adjacent the mounting is held in tight contact with the door frame, but the contact is of a yielding character permitting the entire door to seat against the frame and form a tight sealing contact therewith. If, during the swinging of the door, the edge thereof adjacent the mountings should strike against an obstruction, the spring will yield, allowing the edge of the door to stop movement out of contact with the frame, and thus prevent the breaking of the parts of the mountings. It will be understood, of course, that for heavy doors, a series of mountings such as described above would be used. The latch 39 is provided with a roller 40 which engages a cam face 41 on the keeper, so that the door may be automatically secured in closed position. The latch mechanism, however, may be greatly varied as to structure, and any form may be used which will operate to hold the door in closed position.

In Figures 6 and 7 of the drawings, a mounting is provided for a door wherein the door is supported independently of the spring means which is continuously urging the edge of the door toward the frame when the door is closed. In this form of the invention, the frame mounting 42 is provided which is attached to the door frame indicated at 2. Attached to the side edge wall of the door is a door mounting 43. The door mounting 43 is provided with an opening 44 therethrough which is elongated in a direction parallel with the side edge wall of the door. The pivot bolt 45 passes through this opening 44 and openings in the frame mounting 42 and serves as the pivotal supporting means for the door. The door swings about this bolt 45 as an axis, and is free to move bodily toward and from the door frame when in closed position. There will be a series of mountings similar to that just described for supporting the door. The spring means which functions precisely as the spring means described above, is separate from this support for the door, but constitutes a part of the door mounting as a whole. The spring means includes a bracket member 46 which is secured to the door frame by suitable bolts so that it is rigidly attached thereto. Rigidly attached to the side edge wall of the door is a plate 47 which carries a bolt 48. This plate 47 is also provided with a projecting abutment lug 49. Mounted on a pivot bolt 50 carried by the bracket 46 is a bell crank abutment member 51. Said bell crank abutment member has an opening 52 therethrough, and the bolt 48 extends through this opening. A spring 53 bears against the plate 47 at its inner end, and against the bell crank abutment member at the outer end thereof. This bell crank abutment member is provided with an

arm 54 which is adapted to engage the lug 49 when the door is open. The bolt 48 carries nuts 55, 56 which are preferably set so that they are out of contact with the bell crank abutment member in this form of the invention. The spring is urging the arm 54 into contact with the lug 49 when the door swings to closed position. When the inner edge portion of the door or the gasket carried thereby contacts with the door frame, the remaining portion of the door has not yet made contact with the frame, and when the door is forced to closed position, this inner edge portion of the door adjacent the mounting will be firmly pressed into contact with the door frame and the spring 53 will be compressed. This is brought about by reason of the fact that the pivot bolt 50 is further away from the door frame than the point where the door contacts with the door frame, and therefore, the point of contact of the door is moving toward a line cutting the door frame plane at right angles and passing through the pivot bolt 50. The spring 53 is compressed and bearing on the bell crank abutment member produces a force on the arm 54 against the lug 49 in a direction at right angles to the plane of the door and toward the door frame. Inasmuch as the pivot slot in the mounting 43 is elongated, this allows the door to move into very tight sealing contact with the door frame. It is, however, the yielding contact brought about by the spring 53. Again, if in closing the door, it strikes an obstruction, the spring will yield and allow the door to swing to the extent of movement permitted by the elongated slot in the mounting 43.

Instead of two separate mountings, one for supporting the door and one which includes the spring means for yieldingly holding the door against its seat, these parts may be built into the same unit and still be separate in their action. Or, as shown in Figures 1 to 5, they may not only be built into the same unit, but function together in the supporting of the door and yieldingly pressing the door against the door frame. It will be understood, therefore, that the invention is directed broadly to any means of mounting the door so that it has the capability of bodily shift in a direction at right angles to the plane of the door adjacent the swinging axis of the door, and in spring means whereby a spring having the edge of the door as an abutment operates through a bell crank abutment lever for exerting a pressure on the door in a direction at right angles to the plane of the door along the edge portion of the door adjacent the mounting. While I have shown a one-piece bell crank abutment member, it will be understood that this may be otherwise shaped, as again the essential feature resides in the transferring of the pressure of the spring which is laterally or in the plane of the door to a direction against the door at right angles thereto. Instead of using a compression spring, the arm of the bell crank abutment member may be extended upwardly and a tension spring used.

It is obvious that many changes may be made in the details of construction and the arrangement of the mountings for the door without departing from the spirit of the invention as set forth in the appended claims.

Having thus described the invention, what I claim as new and desire to secure by Letters-Patent, is—

1. A hinge for doors for closing and sealing an opening through a door frame including a member adapted to be attached to the door, a member adapted to be attached to the door frame, a link pivotally connecting said members and adapted to support the door, said link having an arm extending at right angles thereto, a spring interposed between the member adapted to be attached to the door and said arm, and means for limiting the swinging movement of said arm whereby the link is held in a predetermined position relative to the door supported thereby during the swinging movement of the door, said spring operating through said link for exerting a force on the door at right angles to the door.

2. A hinge for doors for closing and sealing an opening through a door frame including a member adapted to be attached to the door, a member adapted to be attached to the door frame, a link pivotally connecting said members and adapted to support the door, said link having an arm extending at right angles thereto, a spring interposed between the member adapted to be attached to the door and said arm, a bolt rigidly connected to the member adapted to be attached to the door and extending through a slot in said arm, and nuts threaded on said bolt and adapted to contact with the outer face of said arm and limit the swinging movement of the arm so that said link will be held in a predetermined position relative to the door to which it is attached during the swinging movement of the door, said spring operating through said link to exert a force on the door at right angles to the door.

3. A hinge for doors for cold storage chambers comprising means for swingingly supporting a door so that the edge portion thereof adjacent the hinge may have a limited bodily movement in a direction at right angles to the plane of the door, said supporting means including an abutment member moving with the door about the swinging axis thereof and having a limited movement independent of the door, a spring interposed between the door and the abutment member and operating to exert a yielding force on the door adjacent the hinge and at right angles to the plane of the door when said door is closed.

4. A hinge for doors for cold storage chambers comprising means for swingingly supporting the door so that the edge portion thereof adjacent the hinge may have a limited bodily movement in a direction at right angles to the plane of the door, spring means including a bell crank member connected to the door and moving therewith about the swinging axis of the door, and a spring interposed between one arm of the bell crank member and operating through said bell crank member to exert a force on the door adjacent the hinge and at right angles to the door.

5. A hinge for doors for cold storage chambers comprising means for swingingly supporting a door so that the edge portion thereof adjacent the hinge may have a limited bodily movement in a direction at right angles to the plane of the door, said supporting means including an abutment member moving with the door about the swinging axis thereof, a spring interposed between the door and the abutment member and operating to exert a yielding force on the door adjacent the hinge and at right angles to the plane of the door when said door is closed, and means for limiting the movement of the abutment member relative to the door whereby said abutment member is yieldingly held in a predetermined position relative to the door during the swinging movement thereof.

6. A hinge for doors for cold storage chambers comprising means for swingingly supporting a

door so that the edge portion thereof adjacent the hinge may have a limited bodily movement in a direction at right angles to the plane of the door, said supporting means including an abutment member moving with the door about the swinging axis thereof, a spring interposed between the door and the abutment member and operating to exert a yielding force on the door adjacent the hinge and at right angles to the plane of the door when said door is closed, means for limiting the movement of the abutment member whereby said abutment member is yieldingly held in a predetermined position relative to the door during the swinging movement thereof, and means whereby the limiting movement may be adjusted for shifting the position of the abutment member.

7. A hinge for doors for cold storage chambers comprising means for swingingly supporting a door so that the edge portion thereof adjacent the hinge may have a limited bodily movement in a direction at right angles to the plane of the door, spring means including a bell crank member connected to the door and moving therewith about the swinging axis of the door, a spring interposed between one arm of the bell crank member and operating through said bell crank member to exert a force on the door adjacent the hinge and at right angles to the door, and means for limiting the movement of the bell crank member whereby said bell crank member is yieldingly held in a predetermined position relative to the door during the swinging movement thereof.

DAVID CHARLES ELWYN LEONARD.