Sept. 24, 1940. E. L. JACOB 2,216,012

DOOR

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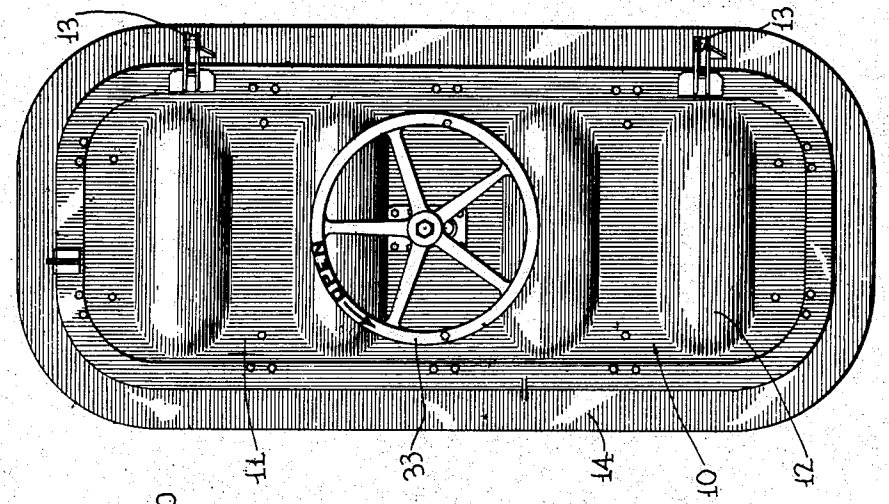



FIG.1

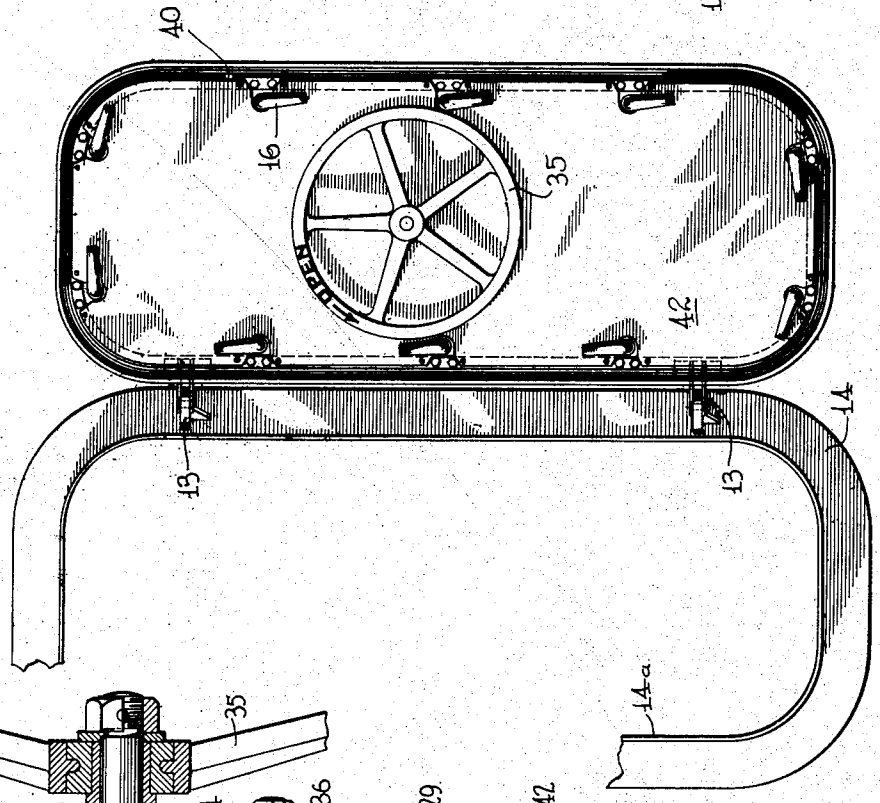



FIG.2

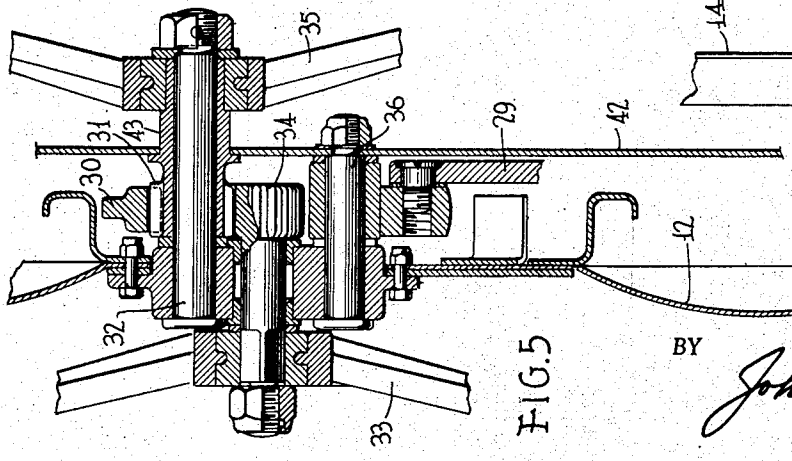



FIG.5

INVENTOR.
Ellis L. Jacob
BY
John P. Barlow
ATTORNEY.

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FIG. 3

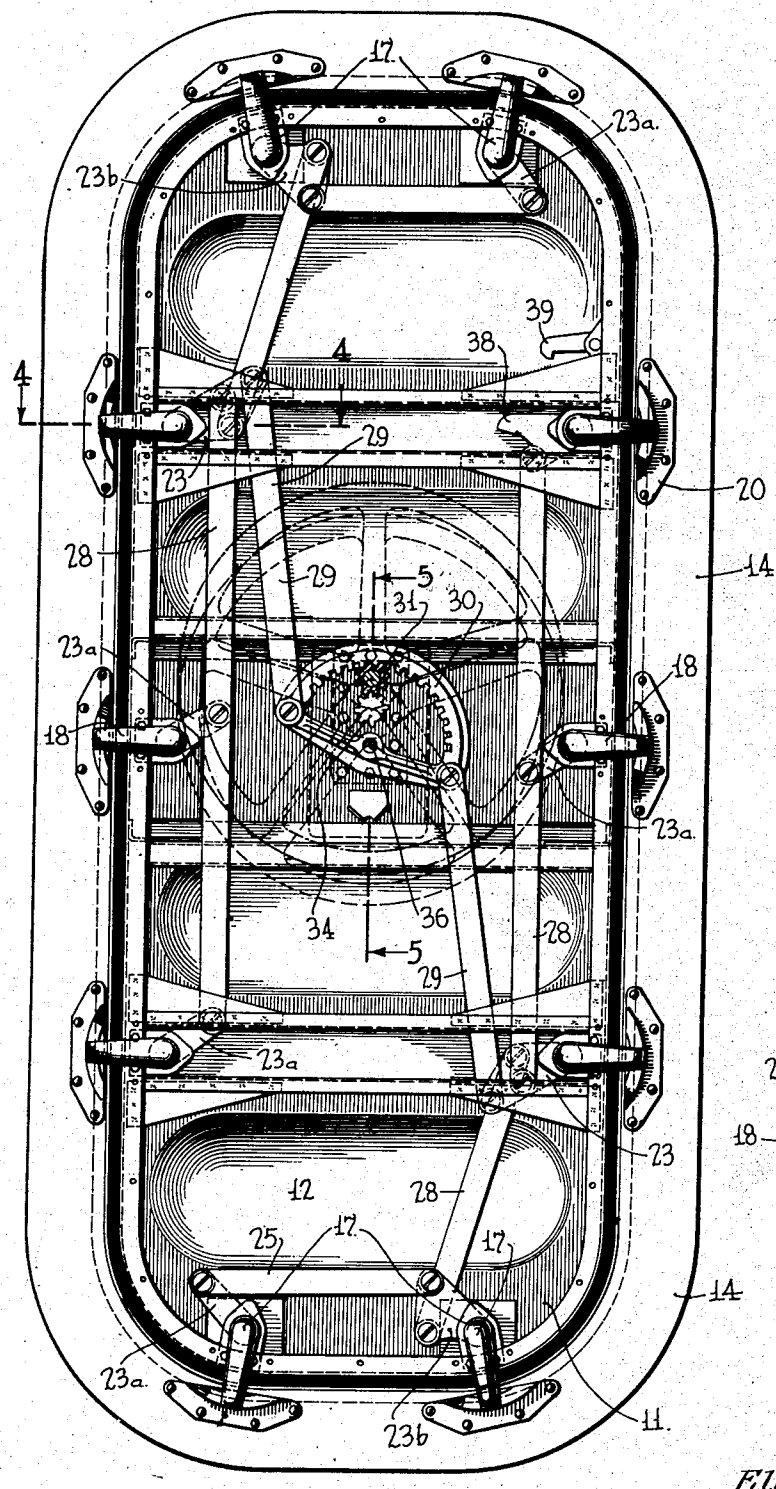
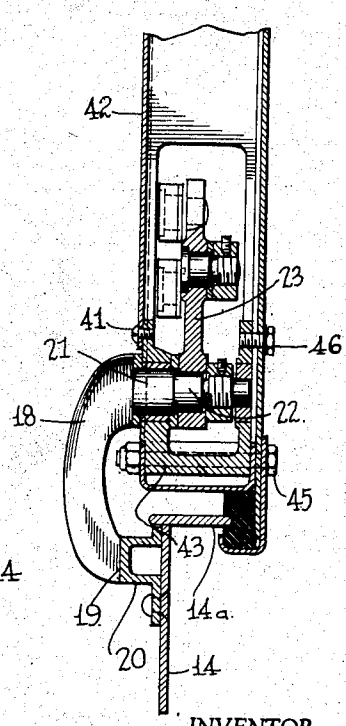



FIG. 4




INVENTOR.

*Ellis L. Jacob*

BY *John P. Tabor*

ATTORNEY.

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FIG. 6

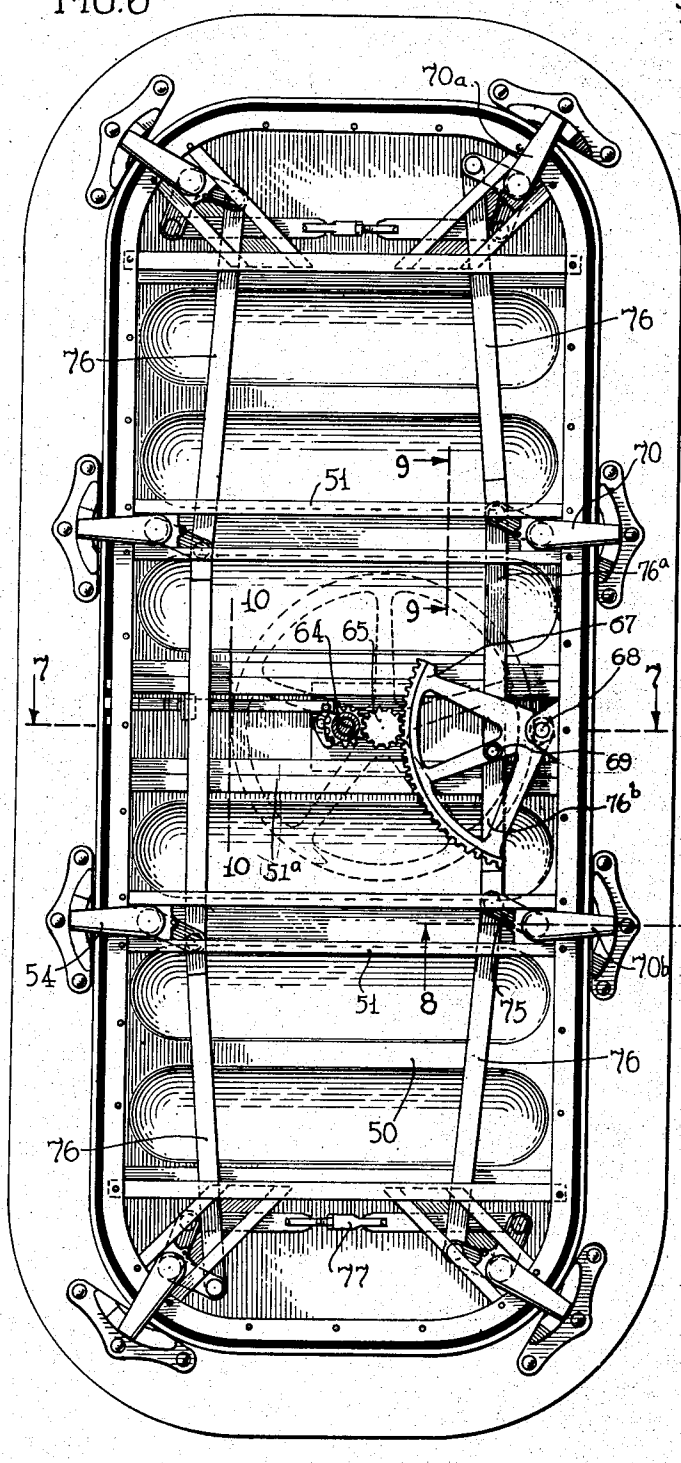
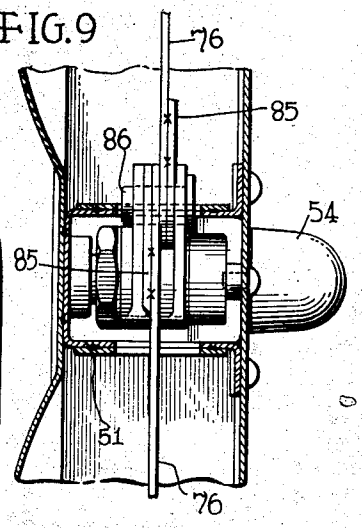



FIG. 9



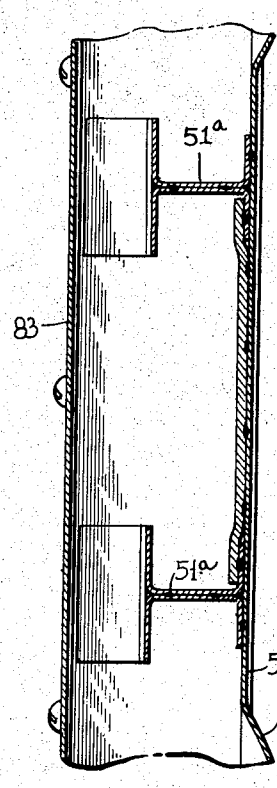




FIG. 10

INVENTOR.
Ellis L. Jacob

BY John P. Bubx

ATTORNEY.

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DOOR

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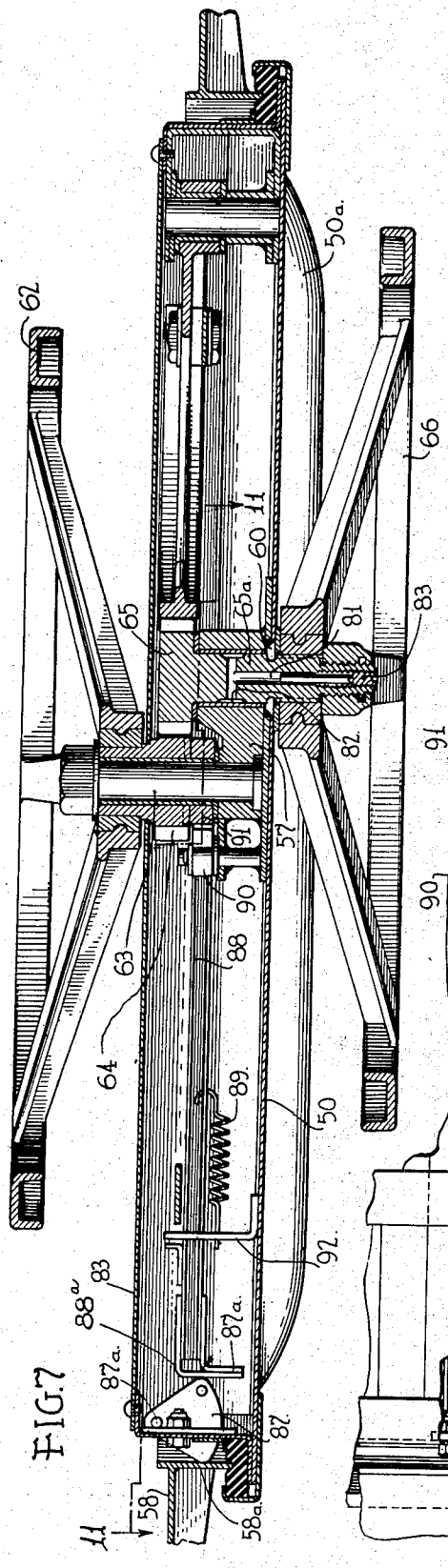



FIG. 7

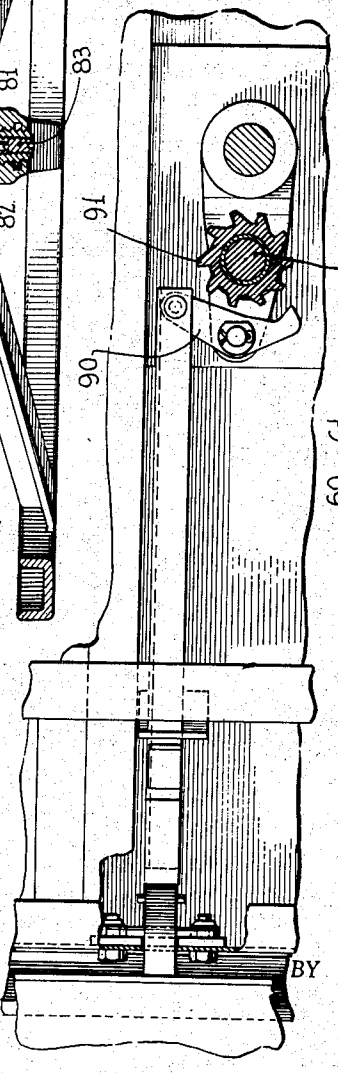



FIG. 11

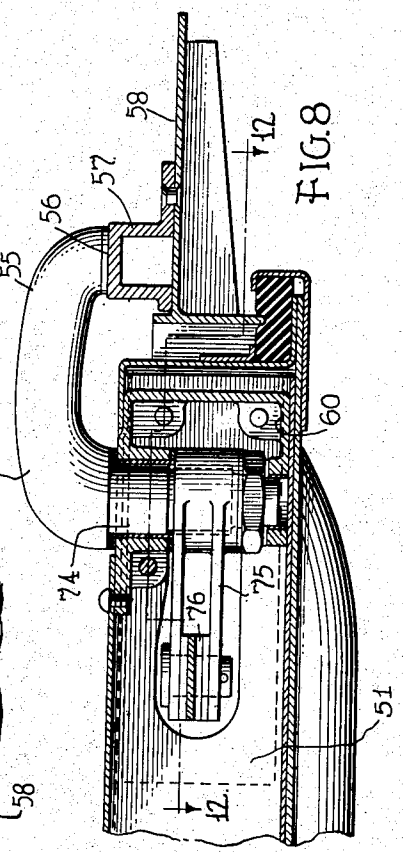



FIG. 8

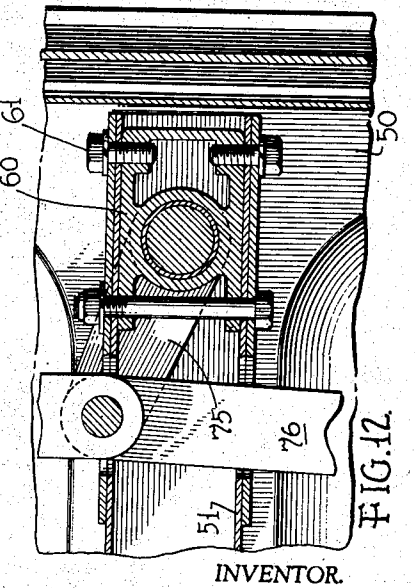



FIG. 12

INVENTOR.

*Ellis L. Jacob*

BY

*John P. Barker*

ATTORNEY.

Patented Sept. 24, 1940

2,216,012

# UNITED STATES PATENT OFFICE

2,216,012

## DOOR

Ellis L. Jacob, Moylan-Rose Valley, Pa., assignor to Edward G. Budd Manufacturing Company, Philadelphia, Pa., a corporation of Pennsylvania

Application August 11, 1937, Serial No. 158,501

6 Claims. (Cl. 114—117)

This invention relates to improvements in doors and more particularly to a bulkhead door which is adapted to be sealed under pressure.

One of the principal objects of the present invention is to provide a multiple fastening construction for a bulkhead or similar fluid pressure tight door operated by a common control so that the entire peripheral edge of the door may be simultaneously sealed.

Another object of my invention is to provide a metal door construction having a plurality of rotatable locking dogs, such door being provided with an internal panel removably secured to the dog journals so that the operating mechanism within the door can be completely sealed to prevent the entrance of vermin, dust, etc.

A further object of the invention is to provide an improved door construction having a high strength and great rigidity with the fastening mechanism carried internally in the reenforcing structure so that the door is imperforate except for a single actuating control.

Another and more particular object of the invention is to provide an improved linkage for the simultaneous operation of a plurality of fastening mechanisms by a common gear having a trip so adapted that it cannot be accidentally operated with the door in open position and in which the fastening mechanisms are all controlled by a single system of interconnected links.

Further objects and advantages of my invention will appear from the following description of a preferred form of embodiment thereof taken in connection with the attached drawings, in which:

Fig. 1 is an outside elevation of one form of embodiment of the door and adjacent frame.

Fig. 2 is an inside elevation of the door and part of the frame with the door in open position.

Fig. 3 is an inside elevation of the door and frame shown in Figs. 1 and 2 with the internal sealing plate removed from the door to show its internal mechanism.

Fig. 4 is a horizontal section substantially on the line 4—4 of Fig. 3 showing the dog operating mechanism.

Fig. 5 is a vertical section taken substantially along the line 5—5 of Fig. 3 and showing the hand wheel control mechanism.

Fig. 6 is an inside elevation of a modified form of door with the sealing panel removed and showing a different type of linkage.

Fig. 7 is a horizontal section taken substantially along the line 7—7 of Fig. 6.

Fig. 8 is a horizontal section taken substantially along the line 8—8 of Fig. 6 and showing a modified form of dog and operating mechanism associated therewith.

Fig. 9 is a vertical section taken substantially along the line 9—9 of Fig. 6 showing other parts of the dog operating mechanism.

Fig. 10 is a vertical section taken substantially along the line 10—10 of Fig. 6 showing the manner of reenforcement of the central part of the door.

Fig. 11 is a fragmentary sectional view on the same scale as Figure 7, the section being taken substantially on the line 11—11 of Fig. 7 looking in the direction of the arrows at the ends of the section line.

Fig. 12 is a vertical section showing the dog journal block construction.

In accordance with one form of embodiment of my invention, more particularly shown in Figs. 1 to 5 inclusive, I have shown a door generally indicated at 10 which is provided with an external panel 11 which may have local bumps or projections 12 for added rigidity and strength. This door is generally provided with external hinges 13 carried by a framing 14 which is a part of any desired partition structure. While I have particularly shown a type of bulkhead door commonly used in navel construction, it is of course to be understood, that the door is applicable to any desired opening but it is especially adapted for bulkhead use where the pressures to be resisted may become substantial.

The interior of the door is provided with a plurality of rotatable dogs 16 which are mounted around the periphery of the door and which are adapted to extend beyond the periphery to contact with wedges 20 as shown in Fig. 4. The dogs 16 are provided with a projecting head portion 18 terminating in a wedge surface 19 which cooperates with the wedge 20 carried on the interior of the framework 14.

Each dog has a central trunnion 21 with an operating portion 22 which may be polygonal or otherwise fastened so that it may be rotated by the link arm 23. The dog is mounted in a suitable journal member 43, which in this form of construction, is shown to be bolted to the door frame by the bolts 45 and 46, it being understood that a journal member 43 is provided for each dog around the periphery of the door.

The dog link arms 23 are of several shapes to be properly connected with the connecting links 28 which are in turn operated from the operating links 29. The operating link arm 23, for example, is a compound arm which is adapted to receive

two connecting links 28 and the main operating link 29. Other link arms are of the simple lever type as shown at 23a and the bell crank type shown at 23b. It will be noted that in this form of construction, the linkage is duplicated on each side and on each end of the door so that there are two main operating links 29, each of which operates one-half of the dogs.

The main operating links 29 are each connected to a sector 30 which is suitably pivoted to the door framework and operated by the spur gear 31 revolving about the fixed shaft 32, an extension of said spur gear extending through the plate 42 and operated by the hand wheel 35 as shown in Fig. 5. Also geared to this spur gear 31 is a second spur gear 34 carried by a shaft driven by the external wheel 33 so that there is a direct interconnection between the respective hand wheels 33 and 35 and the sector 30 by which the links are operated. The sector rotates about pivot 36.

The gear reduction is such that a rotation of either wheel of less than two revolutions will move the dogs from a complete off position to a complete on position.

Operation of the hand wheels is prevented when the door is in the open position by a latch 38 engaged by keeper 39 which in turn is operated by the trip 40 which contacts with the frame flange 14a which extends around the opening in the frame 14. Under normal conditions with the door open, latch 38 engages the keeper 39 and is released when the door is closed by the trip 40 engaging the flange 14a.

The interior of the door may be readily covered by a cover plate 42 extending over all of the operating mechanism and suitably notched out around the respective dogs 16 and secured to the dog journal blocks 43 by the screws 41 with the result that the operating mechanism is completely covered and there is no possibility of vermin getting into the interior of the door. There are no slots or other openings except the cylindrical bearings for the dogs and hand wheels with the result that the sanitary qualities of the door can be maintained.

In a modified form of construction as shown in Figs. 6 to 12 inclusive, the outer panel of the door is generally represented at 50 in Figs. 7 and 10 and may likewise have the reenforcing projections 50a, but in this form of construction, the panel 50 is substantially of one piece extending across the entire frame opening. It may be reenforced on the inside by channels 51 and 51a such as shown in Fig. 6 and Fig. 10, which channels are preferably welded to the face plate to eliminate apertures through the door. This door is similarly provided with a plurality of dogs 54 which, as shown in Fig. 8, are similarly provided with projecting portions 55 terminating in a wedge surface 56 which cooperates with the wedges 57 carried by the outside framework 58.

As in the prior construction, each dog 54 is journaled in a suitable bearing block 60, but in this case, the journal block is bolted as by the bolts 61 to the reenforcing channels 51 and it is unnecessary for the bolts 61 to extend through the door. Furthermore the journal block may be constructed as a separate sub-assembly member, which facilitates assembly of the sub-assembly unit to the door structure.

Each of the dogs is connected through suitable link arms 75 with the links 76 and 77 forming a continuous circuit as shown in Fig. 6. Certain of the links 77 are adapted for adjustment. The sector 67, which is pivoted at 68 to the door framework is connected at 69 to the closing links 76a and 76b.

It will be noted that upon rotation of the hand-wheel 62 which is fastened to an extension of the spur gear 64, said gear revolving upon the fixed shaft 63, the gear 64 will rotate the gear 65 which in turn is geared to the sector 67 to move the respective connecting links 76. The other hand wheel 66 is mounted on the extension 65a on the gear 65.

The interconnection between the hand wheel 62 and the hand wheel 66 is shown in detail in Fig. 7 and it will be noted that the stub shaft 65a, on which gear 65 is formed, is drilled at 81 and has a reduced cross section as shown at 82 forming a kerfed portion into which grease and packing may be forced when the plug 83 is removed. In this manner, a water-tight joint can be formed and as this is the only aperture through the outer plate 50 of the door, leakage can be prevented. The expansion of the packing sets up no longitudinal strain on the parts as it is entirely resisted by the stub shaft 65a.

The movement of the dogs into closing position will be apparent in Fig. 6. If the sector is moved counter-clockwise the link 76a will set up tension in the entire link circuit in a counter-clockwise direction until all of the dogs 54 are moved. In this direction of movement, the link 76b becomes redundant and although it may be subjected to some compression, the deflection is comparatively negligible and it does no appreciable work. An opposite movement of the sector 67 causes the link 76a to become redundant in a similar manner.

The link structure is such that all of the links are thus in tension, and it is possible to make them of relatively small cross section and therefore of very light weight. The bearing loads may be relatively heavy, however, and as shown in Fig. 9, it is possible to take full advantage of the thin links without damage by using a reenforcing plate 85 spot welded or otherwise fastened to the link 76 throughout the pivot portion as defined by the clevis pin 86. By doubling the area available for shear, excessive stresses are not introduced.

An interlock to prevent the operation of moving the dogs to locking position when the door is in open position is shown in Figs. 7 and 11 and consists of a trip member 87 which is engageable with the flange 58a on the door frame 58. The trip member 87 is pivoted at 87a and directly acts on the angle member 88a which is a part of the bar 88. This bar, which is held in locking position by spring 89, extends to the pawl 90 which is engageable with the ratchet 91 on the gear 64, and this tends to lock the gear 64 from rotating if the door is open. The spring 89 is suitably anchored to the door body through angle 92.

In this form of construction, the weight of the sector 67 is so arranged that it tends to close the dogs 70 when the door is shut and the keeper released. It will be noted that the sector is in a raised position when the dogs are in an inoperative position, and when the door is closed, with the keeper releasing the hand wheels for movement, the sector tends to drop and will assist in moving the dogs to the operative position. While this is not a fully automatic arrangement, it facilitates the quick closing of the door.

While I have shown a preferred form of embodiment of my invention, I am aware that modifications may be made thereto and I therefore desire a broad interpretation of my invention within the scope and spirit of the description herein and of the claims appended hereinafter.

What I claim is:

1. In a door of the class described, a plurality of clamping dogs pivoted on the door at an angle to the plane of the door and at spaced points along its peripheral margin, a pivoted actuator on the door and common to said dogs, a pair of links connecting said pivoted actuator to two dogs adjacent thereto and on opposite sides thereof, and a continuous chain of light flexible links interconnecting the said adjacent dogs and extending around the margin of the door and the remaining dogs and arranged to be in tension only in either direction of movement of the actuator, the first-named pair of links being arranged to be in tension, respectively, in only one of the directions of movement and idle in the other direction.

2. A door having a plurality of fastening dogs mounted therein adjacent its periphery and at both sides and ends of the door, said fastening dogs being movable to operative position to clamp the door firmly against a frame surrounding it or to inoperative position to permit opening of the door, common actuating mechanism mounted on the door for simultaneously moving all said dogs to operative or inoperative positions as desired, said common actuating mechanism comprising a rotary member mounted to turn in the plane of the door, and means on the outer face of the door connected to turn said member and a continuous chain of light flexible links interconnecting said member and the dogs successively around the margin of the door, one of said links connected to the rotary member being inactive in moving the dogs in one direction and all of the remaining links being active in moving the dogs in said direction and arranged to be subjected only to tension in so moving them under the action of said rotary member.

3. A door according to claim 2 in which the dogs are pivoted in the margin of the door and the links are connected to arms rigid with the pivots of the dogs and extending inwardly therefrom.

4. A door according to claim 2 in which certain of the links are adjustable in length.

5. A door according to claim 2 in which the ends of the links are hingedly connected to the dogs and to the rotary member and are reinforced in the region of said hinged connection by reinforcing strips integrally secured thereto.

6. A door according to claim 2 having face plates on opposite sides thereof and in which the dogs are pivoted in the margins of the door between said face plates and on separate pivot blocks, and means for securing the pivot blocks in place between said plates without perforating the face plates of the door.

ELLIS L. JACOB.