Nov. 22, 1938. R. F. GOECKE 2,137,483

CLOSURE

Filed Aug. 21, 1937 4 Sheets-Sheet 1

Fig. 1

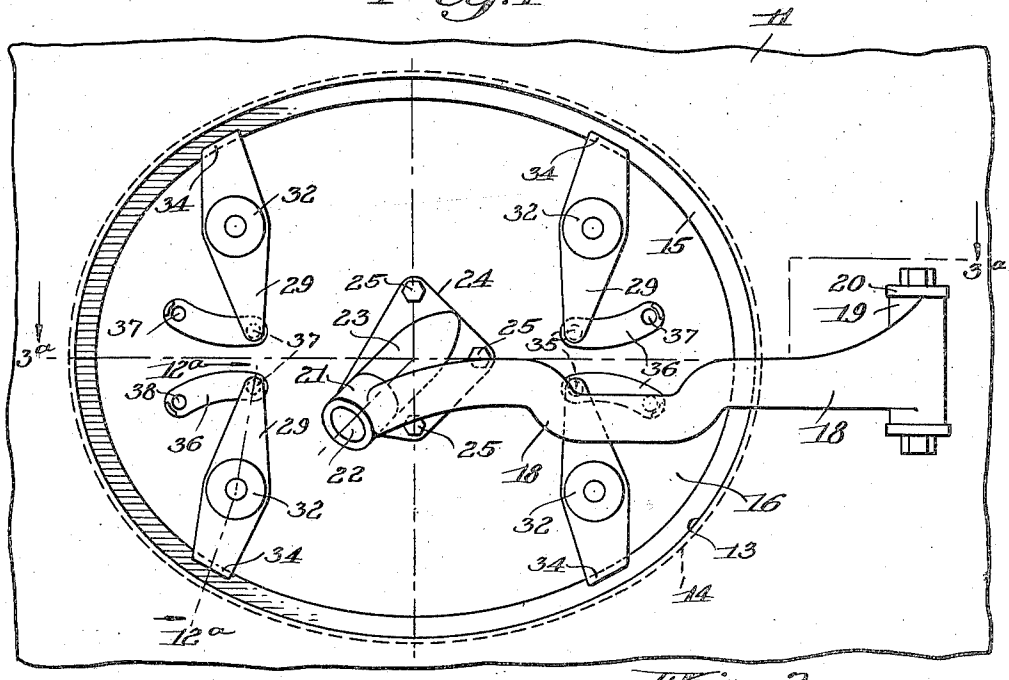
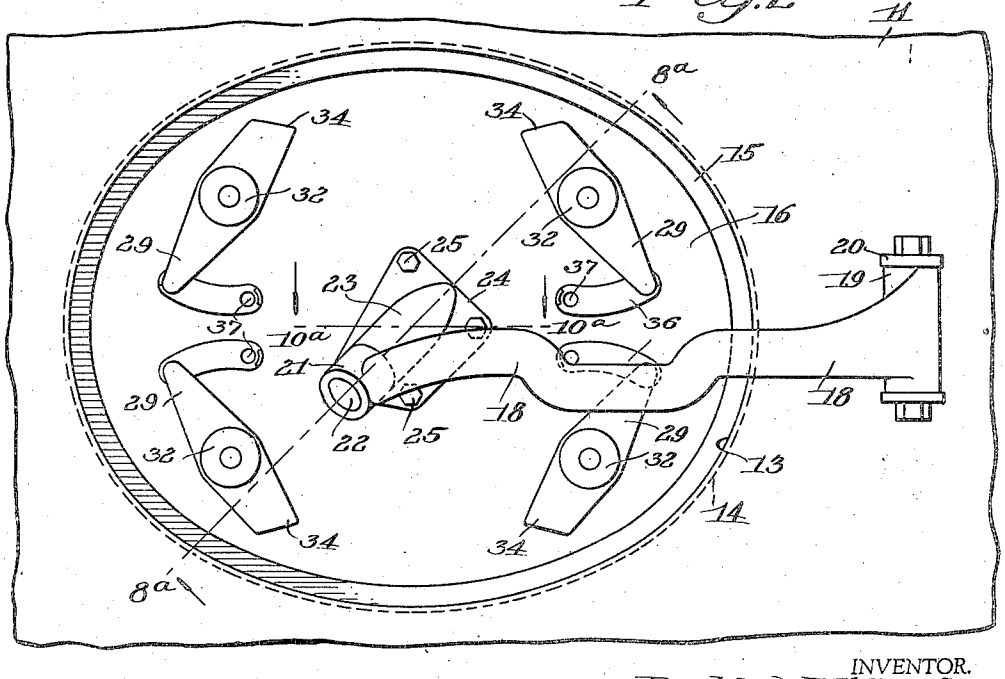


Fig. 2



INVENTOR.
Rudolph F. Goecke
BY Cumpston & Shepard
his ATTORNEYS

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Fig. 3

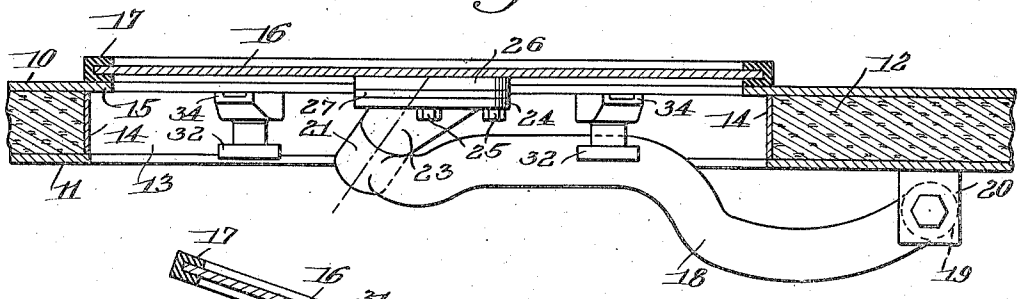


Fig. 4

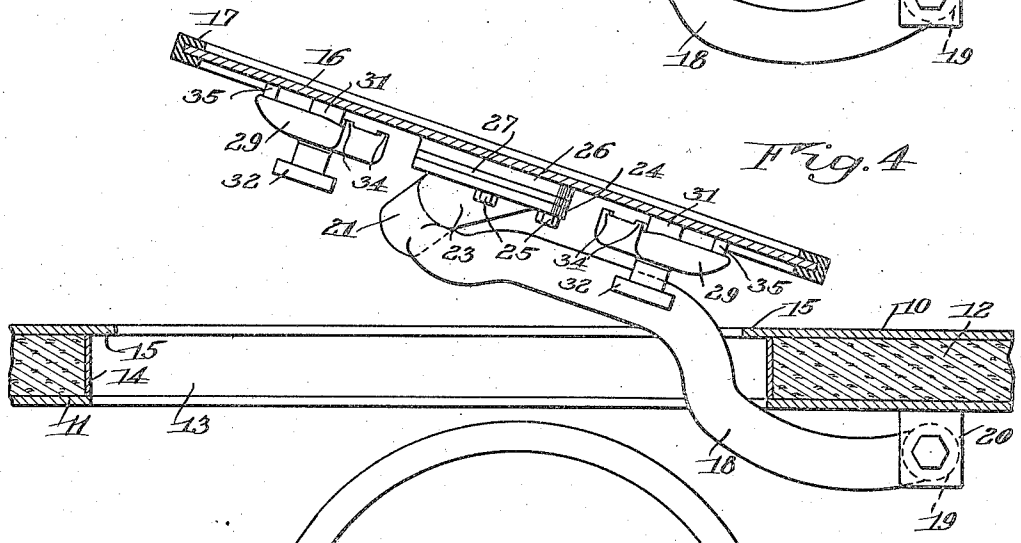
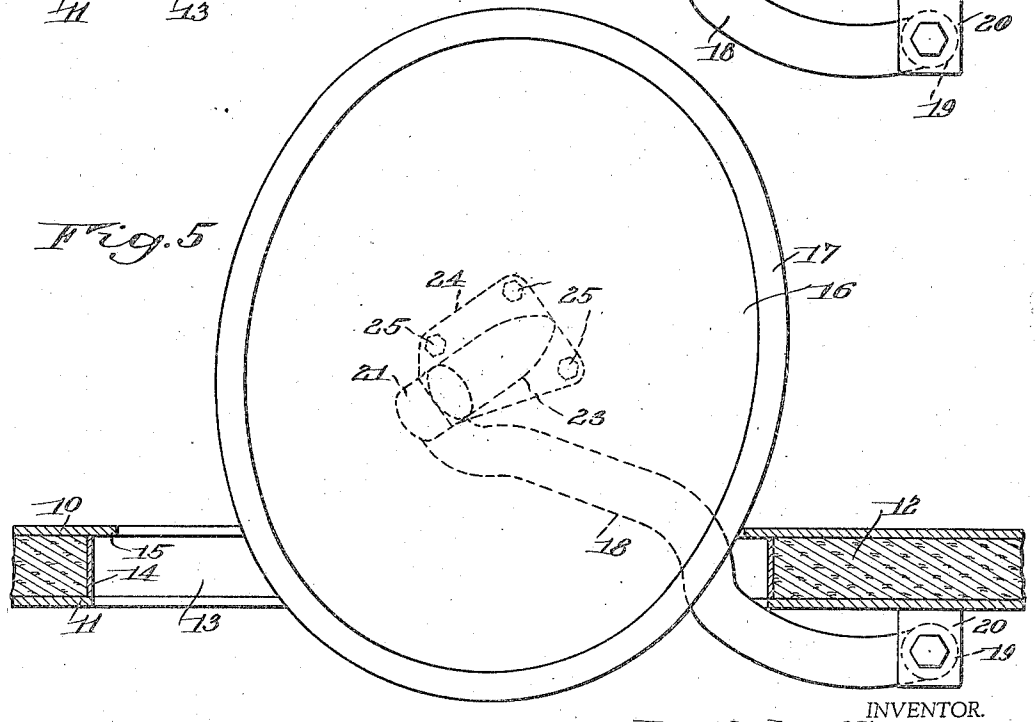


Fig. 5



INVENTOR.
Rudolph F. Goecke
BY Cumpston & Shepard
his ATTORNEYS

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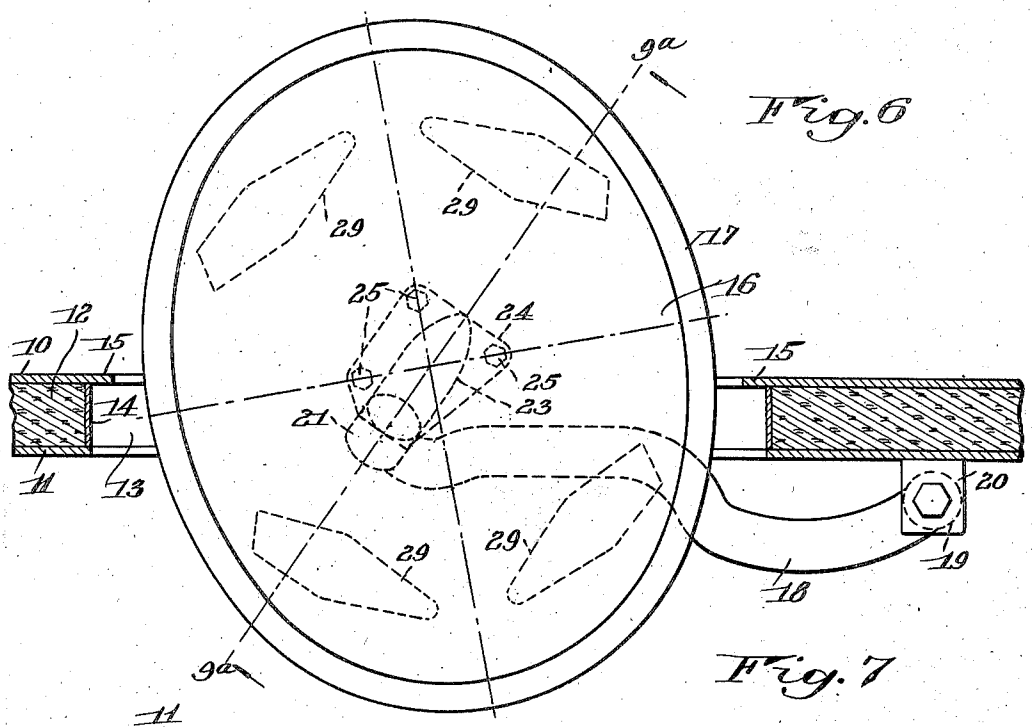
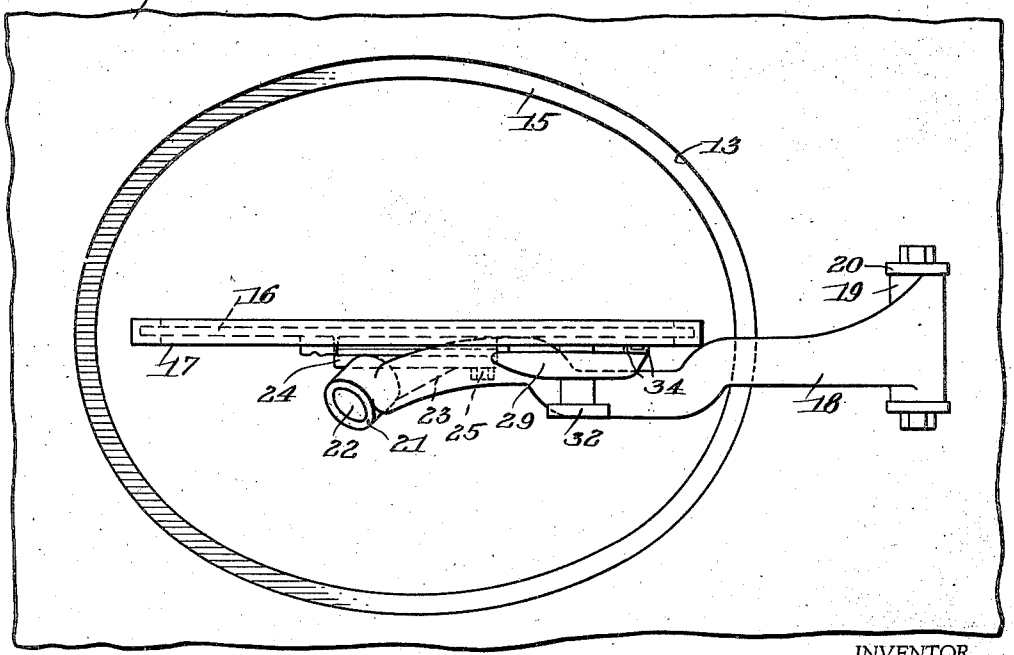


Fig. 6

Fig. 7



INVENTOR.
Rudolph F. Goecke
BY Cumpston & Shepard
his ATTORNEYS

Nov. 22, 1938. R. F. GOECKE 2,137,483

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Fig. 8

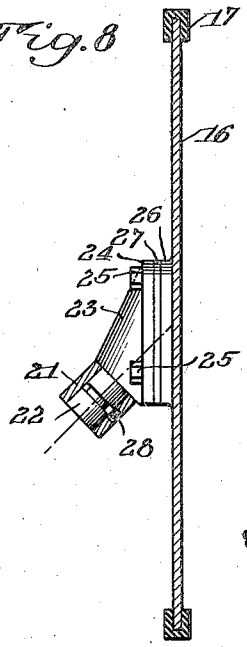


Fig. 9

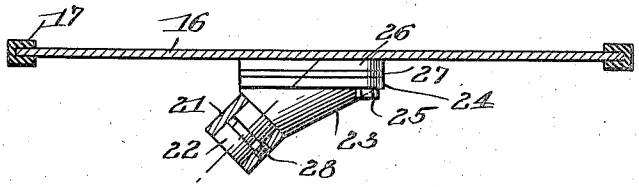


Fig. 10

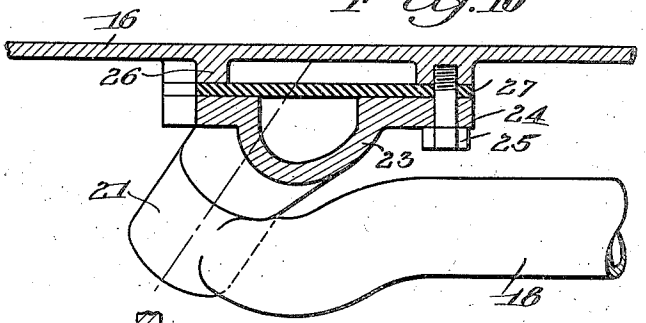


Fig. 11

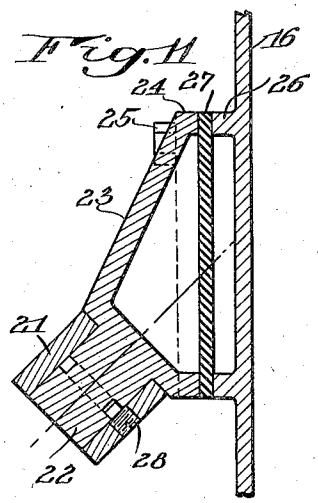
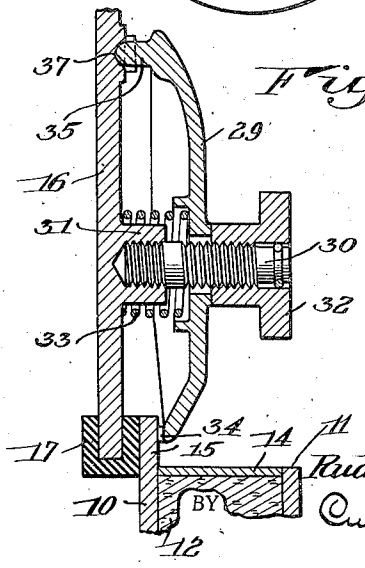


Fig. 12



INVENTOR.
Rudolph F. Goecke
BY
Cumpston & Shepard
his ATTORNEYS

Patented Nov. 22, 1938

2,137,483

UNITED STATES PATENT OFFICE

2,137,483

CLOSURE

Rudolph F. Goecke, Elyria, Ohio, assignor to The Pfaudler Co., Rochester, N. Y., a corporation of New York

Application August 21, 1937, Serial No. 160,279

8 Claims. (Cl. 220—37)

This invention relates to closures for openings in walls such as the wall of a chamber or container, and is particularly useful, for example, as applied to manhole doors of containers or tanks. Such doors are commonly of substantial size and weight, and in these and other ways are cumbersome and inconvenient to handle in moving them to open and close the manhole, especially where, as often the case, it is desirable to locate the door inside the container when closed and to open it by moving it entirely through the opening to the outside of the container. One object of the invention is to provide such a closure having a simplified form of construction and operation and capable of being manipulated with a minimum of effort.

Another object is the provision of a closure of the above character having a supporting means by which it is substantially balanced and positively guided through a simple and direct form of motion from one position to another.

To these and other ends the invention resides in certain improvements and combinations of parts, all as will be hereinafter more fully described, the novel features being pointed out in the claims at the end of the specification.

In the drawings:

Fig. 1 is a side elevation of a wall and a manhole door therein embodying the present invention, the door being clamped in closed position;

Fig. 2 is a view similar to Fig. 1 but showing the door clamps released;

Fig. 3 is a sectional plan substantially on the line 3*a*—3*a* in Fig. 1;

Fig. 4 is a view somewhat similar to Fig. 3 but showing the clamps released and the door swung inwardly preliminary to movement to position for passage through the manhole;

Fig. 5 is a view similar to Fig. 4 but showing the door moved to position for passage through the manhole;

Fig. 6 is a view similar to Fig. 5 but showing the door in course of movement outwardly through the manhole;

Fig. 7 is a front elevation of the parts as shown in Fig. 6;

Fig. 8 is an enlarged fragmentary sectional view on the line 8*a*—8*a* in Fig. 2;

Fig. 9 is a view similar to Fig. 8 on the line 9*a*—9*a* in Fig. 6;

Fig. 10 is an enlarged fragmentary section on the line 10*a*—10*a* in Fig. 2;

Fig. 11 is a more enlarged fragmentary section on the line 8*a*—8*a* in Fig. 2, and

Fig. 12 is an enlarged fragmentary section of a door clamp on the line 12*a*—12*a* in Fig. 1.

The same reference numerals throughout the several views indicate the same parts.

In the embodiment herein disclosed by way of illustration, the invention is shown as applied to a closure, or door, for a manhole opening in the wall of a container or the like, the door being supported by a bracket arm on the wall, for movement to closed position in which it is clamped against the inner surface of the wall (Fig. 1), from which position the door may be unclamped and positioned on the bracket arm for movement through the opening (Figs. 5 to 7) to a position entirely outside the wall.

Referring more particularly to the drawings, the wall is shown as of the insulated variety commonly employed in containers or tanks, comprising spaced inner and outer metal sheets 10 and 11 (Fig. 6), with an intermediate insulating filling 12. The opening or manhole is indicated at 13 in a frame 14 and the inner wall 10 is extended beyond the frame to provide a clamping flange 15. The opening, in the present instance, is shown as of the generally elliptical shape commonly employed for manholes, of less width in the vertical than in the horizontal direction.

The door is illustrated as a plane shaped metal sheet 16 (Fig. 3) corresponding in shape to the manhole and somewhat larger so as to overlap its clamping flange 15, the door being provided with a sealing or gasket ring 17 of rubber or other suitable resilient material to afford a tight closure against the clamping flange 15 of the opening. It will thus be seen that when the door is arranged with its lesser width or axis vertical, symmetrical with the manhole, it may be placed against the manhole flange to seal the opening, as shown in Figs. 1 to 3. It is apparent, however, that the door may also be moved to a position for passage through the manhole as by swinging it into a plane transverse to that of the manhole and also swinging it in such transverse plane to bring its lesser width or axis substantially parallel with the greater width or axis of the manhole (Figs. 6 and 7), in which position it may be passed bodily from the inside to the outside of the container wall, although it will be apparent that the same resultant motion may be accomplished by other component movements about different axes.

Suitable bracket means are provided for supporting the door on the container wall, such as the arm 18 the outer end 19 of which is pivotally mounted on the wall in any suitable manner, as

between spaced lugs **20** projecting from the wall. The other or inner end of the movable support, or arm **18**, is equipped with a movable mounting for the closure or door by which it is guided for movement on the arm, from position for closing said opening, to position for passage therethrough in the manner described above.

Means for mounting the door on the supporting arm **18** comprises preferably a pivotal connection between the two having its pivotal axis inclined obliquely to the plane of the door in such angular arrangement as to combine, in a single movement, the aforesaid component movements of the door in and transverse to its plane, for conditioning it for passage through the manhole. This is accomplished in the present instance by forming the inner end of the supporting arm **18** with an eye or ring **21** (Figs. 8 to 11 inclusive), in which is rotatably mounted a trunnion **22** projecting from a bracket **23** of the angular shape shown in the drawings, including the flange portion **24** for receiving the bolts **25** by means of which the bracket is secured to a boss **26** on the door. Preferably a cushioning member in the form of a plate **27** of rubber or other suitable resilient material is interpsed between the bracket **23** and the door, to cushion the door and afford some flexibility, in addition to its sealing ring **17**, to facilitate the seating of the door against the clamping ring of the manhole.

As stated, the pivotal mounting of the door on the supporting arm has its axis arranged to extend at such an inclination as to permit of a single rotary motion to effect such movements of the door from closed position to position for passage through the opening. It has been found suitable for this purpose to incline such pivotal axis, as shown, at an angle of approximately 45° to the plane of the door, with the projection of such axis on the door making angles of approximately 45° with the major and minor elliptical axes of the door, although, of course, such angles may be somewhat varied as desired, or as different applications of the invention may require. A set screw **28**, Fig. 11, may be employed to detachably secure the trunnion **22** for rotation in the ring **21**.

By locating the pivotal axis of the door mounting to pass substantially through the center of gravity of the door, the latter may be balanced on its mounting, thus eliminating any tendency of its weight to cause it to produce any advertent swinging movement during operation. This materially increases the ease of handling and obviates the danger of pinching and injuring the operator's hands by any inadvertent movement. But, of course, if a small bias in any direction is desired, it may be accomplished by a corresponding offset in the location of the intersection of the axis with the door in relation to the center of gravity.

The wall and the door are provided with any known or suitable cooperative means for tightly clamping the door in closed position on the wall. In the present instance clamps are provided on the door for engaging the flange **15** about the opening in the wall. Each of these clamps, in the present instance, comprises a short bar **29** (Fig. 12) pivoted on a bolt **30** fixed in a lug **31** on the door and carrying a clamping nut **32**, with a coil spring **33** interposed between the bar and the door. One end of the bar **29** is formed with a pair of clamping lugs **34** for engagement over the clamping flange **15** of the manhole. The opposite end of the clamping bar **29** is formed with a rounded, fulcrum lug **35** sliding on an arcuate boss **36** on the door and adapted to rest in detaining sockets **37** and **38** in said boss for accentuating the clamped and unclamped positions of the bar **29**. It is apparent that when the door is closed against the manhole, clamping bars **29** may be readily engaged over the clamping flange **15** and nuts **32** turned to secure the parts, the springs **33** aiding to release the clamps when the nuts **32** are retracted to release the clamps for opening the door.

To open the door it is unclamped and supporting arm **18** is moved inwardly from the position shown in Fig. 3 to the position shown in Fig. 4, to afford a sufficient clearance between the door and the wall, the arm **18** being curved, as shown, to clear the door edge. The door, being substantially balanced on its mounting, has no tendency to swing and catch the hands of the operator, but may then be readily swung by a single rotary motion on the pivotal axis of its mounting which, by its inclination, effects simultaneous movements in the two planes required to position the door as shown in Figs. 5 to 7, so that it is both swung to a transverse or horizontal plane and also rotated in its own plane to point its major axis through the opening. By swinging the supporting arm **18** on the pivotal mounting of its outer end, the door may thus be passed entirely through the manhole to the outside of the wall to clear the manhole and the inner surface of the wall and afford full access to the door itself. After the door is pushed inwardly to the preliminary position shown in Fig. 4, it may be swung, as described, to position for passage through the opening and pulled outwardly through it by substantially a single motion in which it is guided and restrained to the desired path of motion by the construction described. To close the manhole cover the door is pushed inwardly through it and then swung on its mounting on the arm **18** to the position shown in Fig. 4, after which it may be pulled forwardly and clamped to seal the opening, by a reversal of the operations described for opening.

It will thus be seen that the invention provides a closure having a simple construction and mode of operation, requiring a minimum of manipulating effort, the door being balanced and positively guided and confined to the desired path of movement with a minimum of danger to the operator's hands. After the door is unclamped and pushed inwardly to the preliminary position shown in Fig. 4, the several, rather complicated component motions required to pass it outwardly through the manhole are all accomplished by simply pulling it out through the opening by substantially a single movement, the arm **18** forming a stop for the movement of the door relative to the arm. The manipulation is thus made extremely simple and convenient for the operator, both to open the door and also to adjust it in closing it to a proper seat to seal the opening.

I claim:

1. A closure for a wall opening of less width in one direction than the width in one direction of said opening and capable of passage therethrough, a movable support, and a pivotal connection between said support and closure having its axis inclined to said directions and to the general plane of said closure by which said closure is guided for movement on said support from position to close said opening directly to position for passage therethrough.

2. A closure for a wall opening of less width in one direction than the width in one direction of said opening and capable of passage therethrough, a support having a single pivotal con-

nection with said closure with its axis obliquely inclined to the general plane of said closure to guide the same for movement about said axis, to position for passage through said opening, and means for movably attaching said support to said wall.

3. A closure for a wall opening of less width in one direction than the width in one direction of said opening and capable of passage therethrough, a support connected with said closure by pivotal means having its axis inclined obliquely to said directions and to the plane of said closure to afford a single swinging movement thereof composed of movements about each of different axes, for moving said closure from closing position on one side of said wall to position for passage through said opening to the other side of said wall, and means for attaching said support for pivotal movement on said wall.

4. A closure for a wall opening of less width in one direction than the width in one direction of said opening and capable of passage therethrough, means for detachably clamping said closure to said wall to close said opening, a supporting arm, cooperating pivotal bearings on said closure and arm with the axis thereof inclined obliquely to said directions and to the plane of said closure, to afford a single swinging movement of said closure composed of movements about each of different axes, for moving said closure from closing position on one side of said wall to position for passage through said opening to the other side of said wall, and means for movably attaching said arm to said wall.

5. A closure for a wall opening of less width in one direction than the width in one direction of said opening and capable of passage therethrough, an arm having adjacent one of its ends a substantially pivotal connection with said closure with its axis obliquely inclined to said directions and to the plane of said closure and passing substantially through the center of gravity of said closure, to guide said closure for a single swinging movement to position for passage through said opening, and means for movably attaching said arm adjacent the other end thereof to said wall at a point spaced from said opening, said arm being curved intermediate its ends so that said arm and closure may be moved to clear said wall during said closure swinging movement.

6. A closure for a wall opening of less width in one direction than the width in one direction of said opening and capable of passage therethrough, an arm having adjacent one of its ends a pivotal connection with said closure with its axis obliquely inclined to said directions and to the plane of said closure, to guide said closure for a single swinging movement to position the same for passage through said opening, means for movably attaching said arm adjacent the other end thereof to said wall at a point spaced from said opening, said arm being extended in the path of movement of said closure to act as a stop for arresting said swinging movement thereof in position for passage through said opening.

7. A closure for a wall opening of less width in one direction than the width in one direction of said opening and capable of passage therethrough, means for detachably clamping said closure to said wall to close said opening, a supporting arm, cooperating pivotal bearings on said closure and arm with the axis thereof inclined obliquely to said directions and to the plane of said closure, to afford a single swinging movement of said closure composed of movements both in and transverse to the plane thereof, for moving said closure to position for passage through said opening to the other side of said wall, means for movably attaching said arm to said wall, and cushioning means interposed between said pivotal bearings and said closure to facilitate adjusting and clamping said closure in closed position.

8. A closure for a wall opening of less width in one direction than the width in one direction of said opening and capable of passage therethrough, means for detachably clamping said closure to said wall to close said opening, a supporting arm, cooperating pivotal bearings on said closure and arm with the axis thereof inclined obliquely to said directions and to the plane of said closure, and passing substantially through the center of gravity of said closure, to guide said closure in a single swinging movement composed of movements about each of different axes, for moving said closure to position for passage through said opening to the other side of said wall, means for movably attaching said arm to said wall, said arm being formed to provide a stop in the path of movement of said closure to arrest said swinging movement thereof in position for passage through said opening, and cushioning means interposed between said pivotal bearings and said closure to facilitate adjusting and clamping said closure in closed position.

RUDOLPH F. GOECKE.