Oct. 4, 1949. J. KACENA ET AL 2,483,702

DRAFT CONTROLLING FURNACE DOOR ACTUATING MEANS

Filed May 9, 1945 5 Sheets-Sheet 1

Fig. 1.

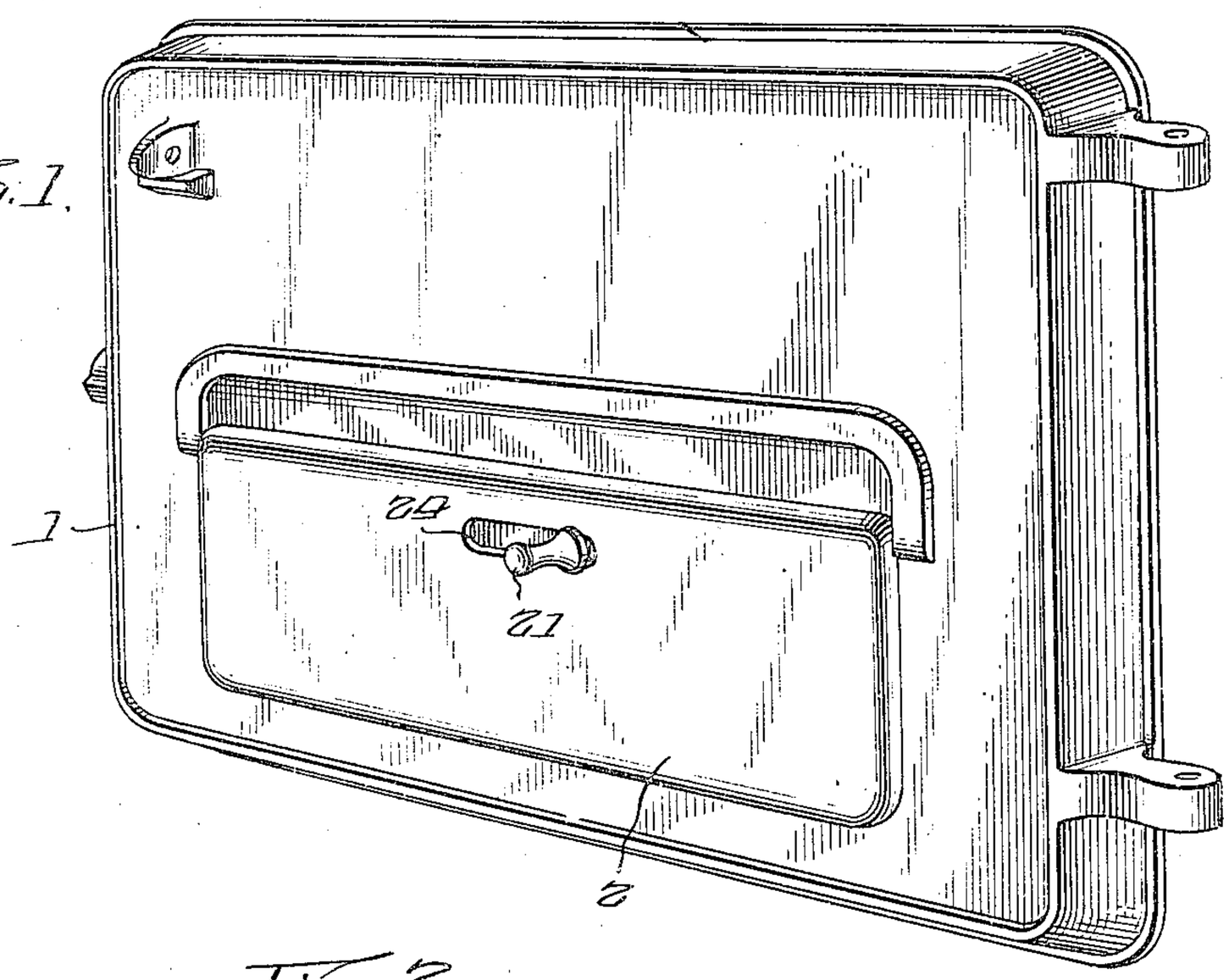
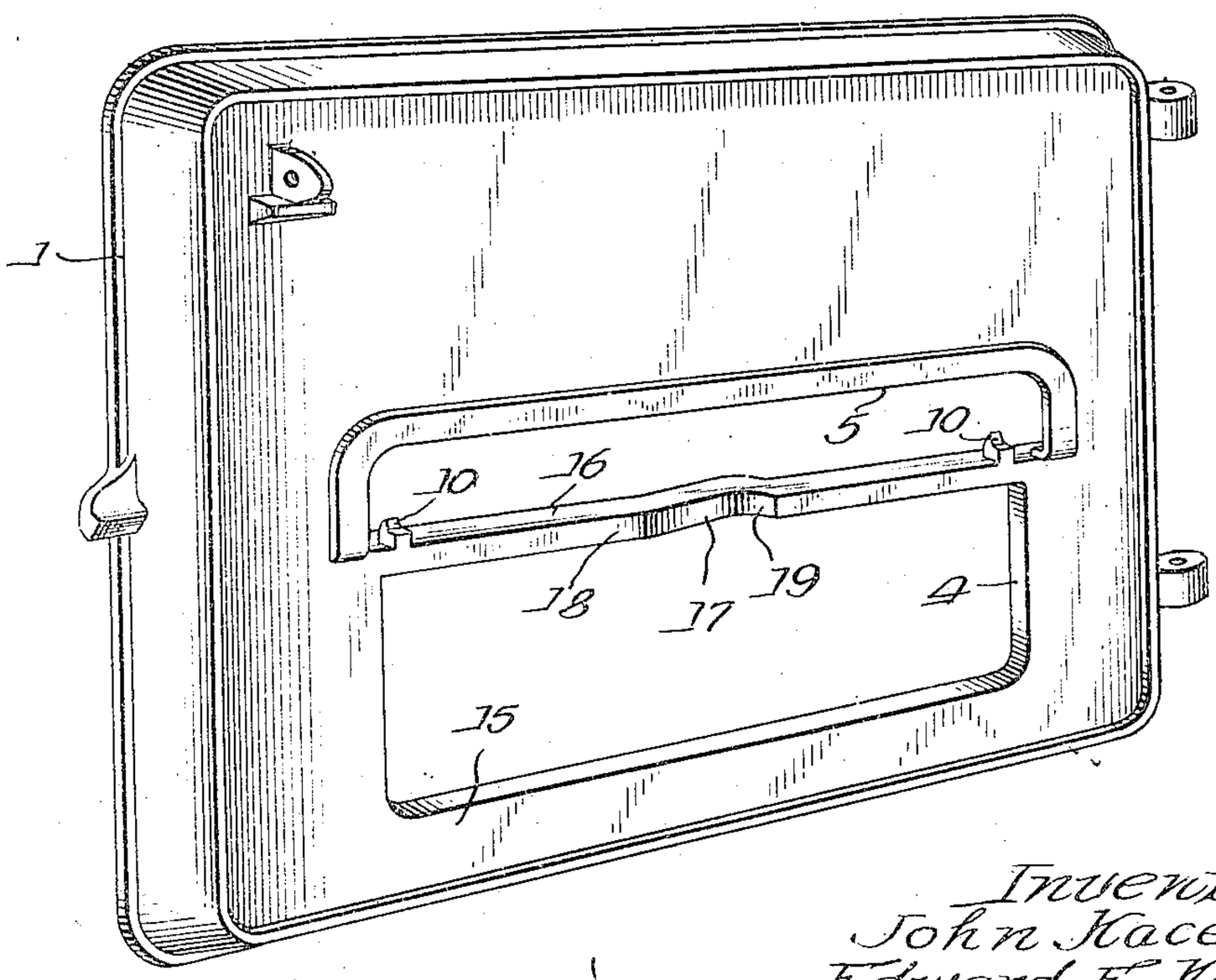


Fig. 2.



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Filed May 9, 1945 5 Sheets-Sheet 2

Fig. 3.

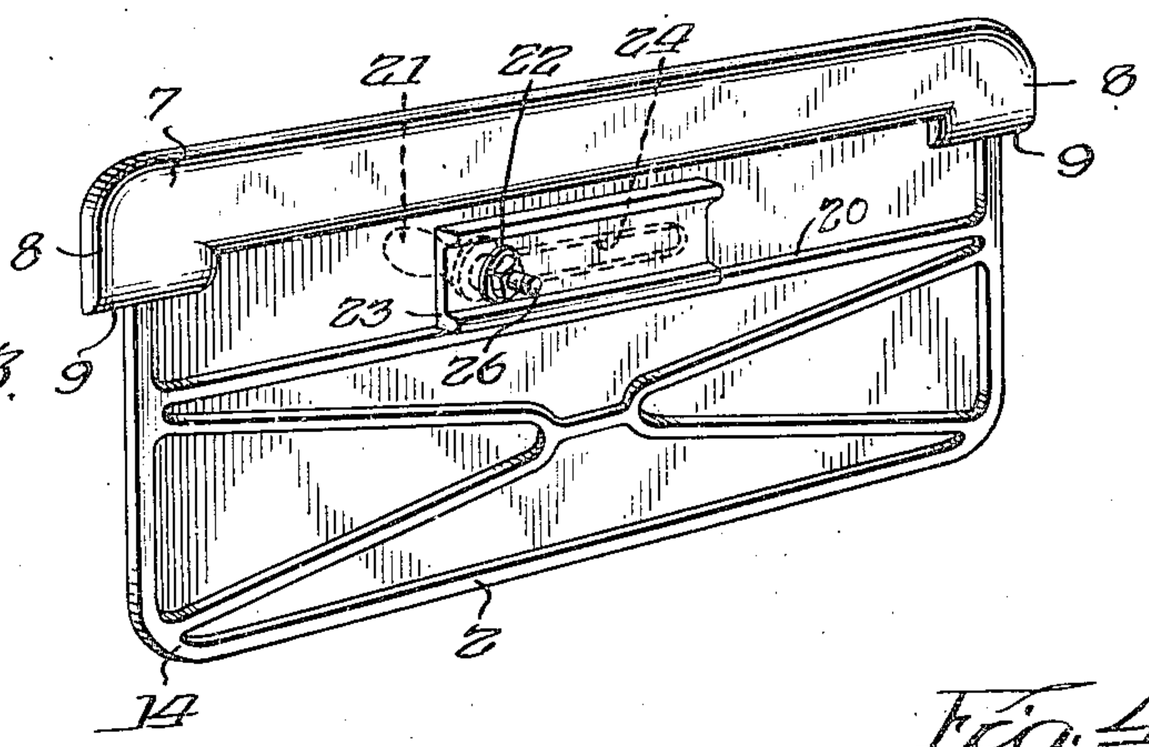


Fig. 4.

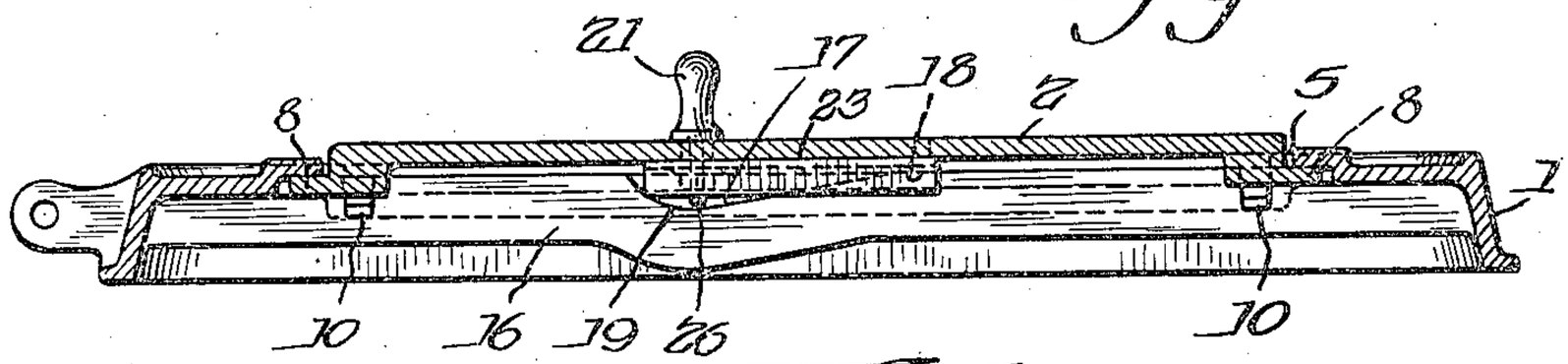
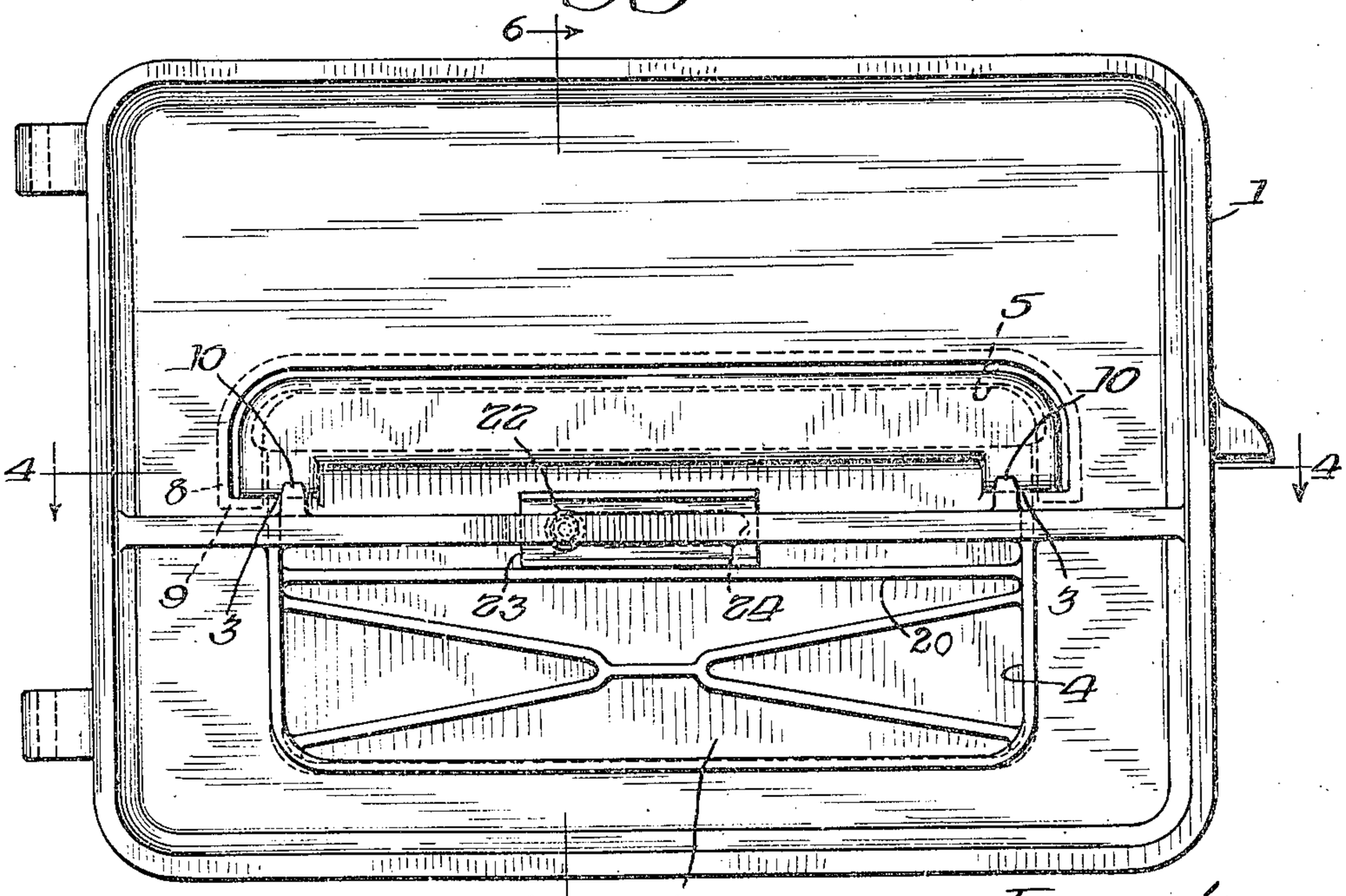


Fig. 5.



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DRAFT CONTROLLING FURNACE DOOR ACTUATING MEANS

Filed May 9, 1945 5 Sheets-Sheet 3

Fig. 6.

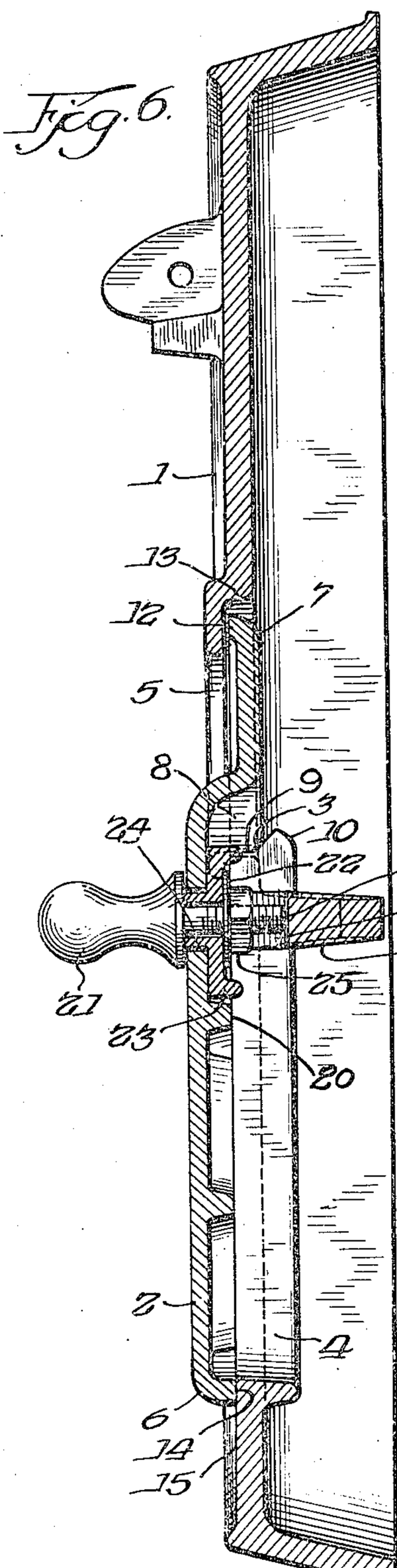


Fig. 7.

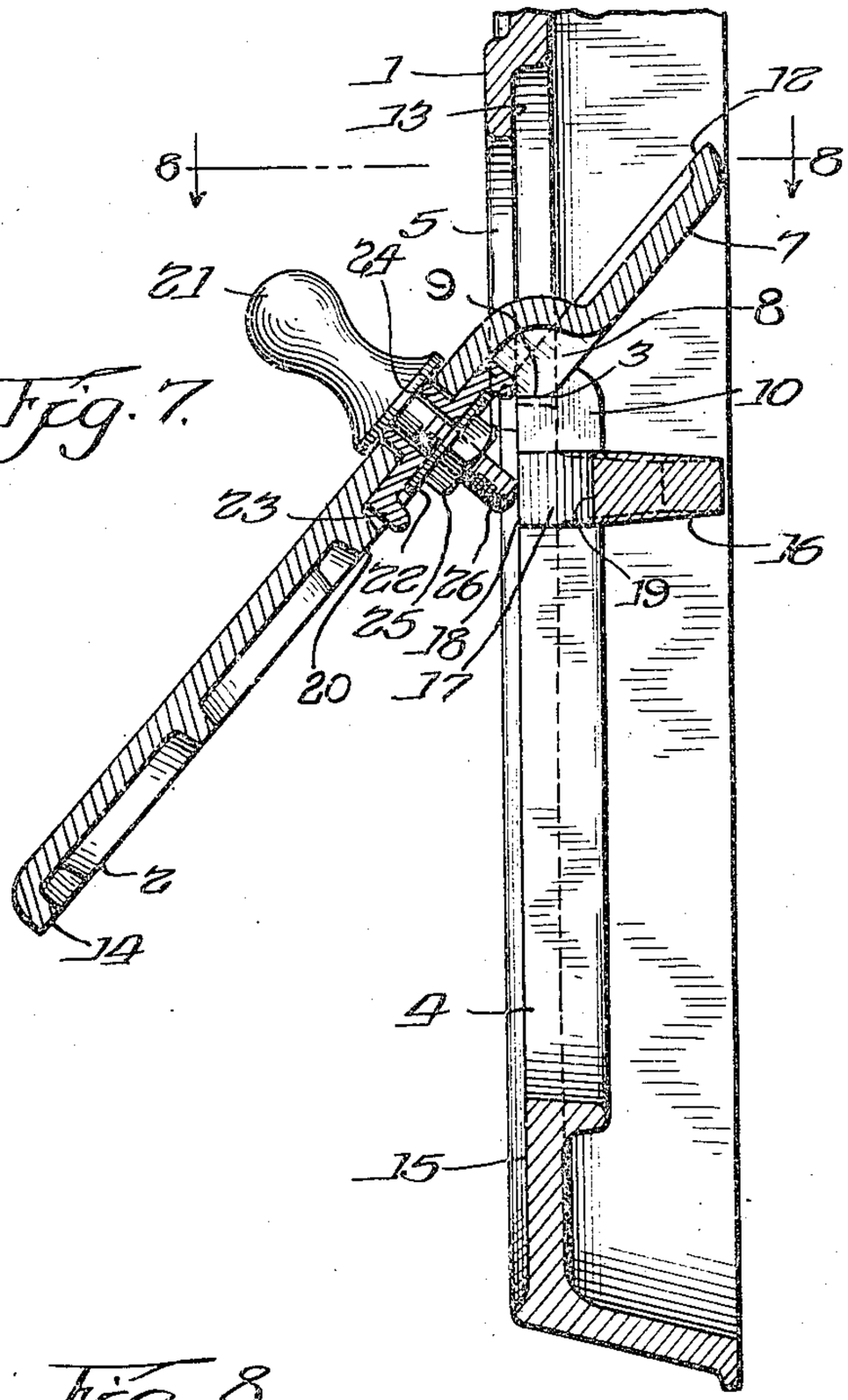
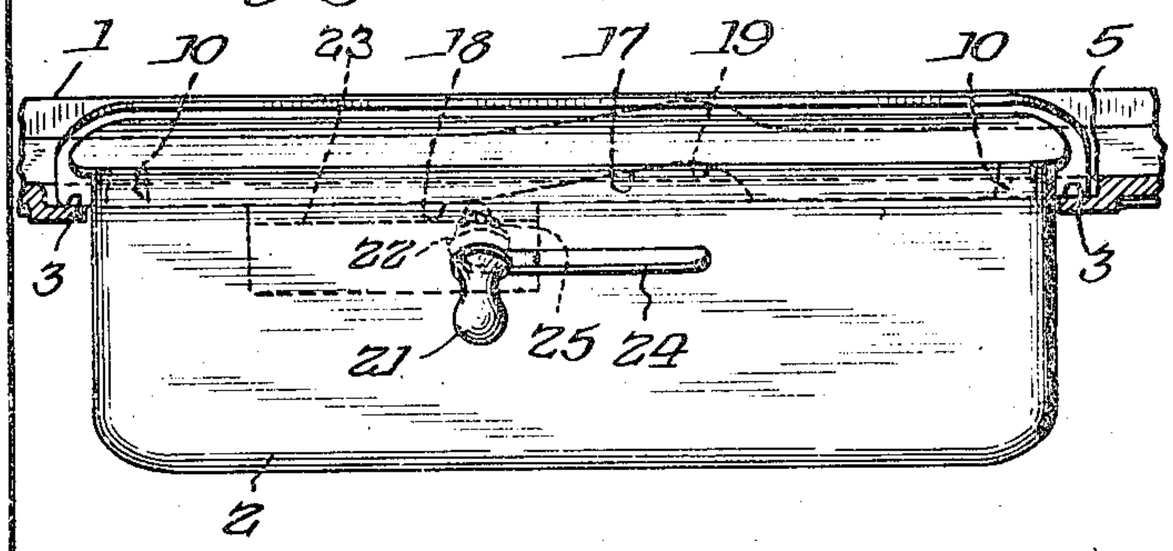


Fig. 8.



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DRAFT CONTROLLING FURNACE DOOR ACTUATING MEANS

Filed May 9, 1945 5 Sheets-Sheet 4

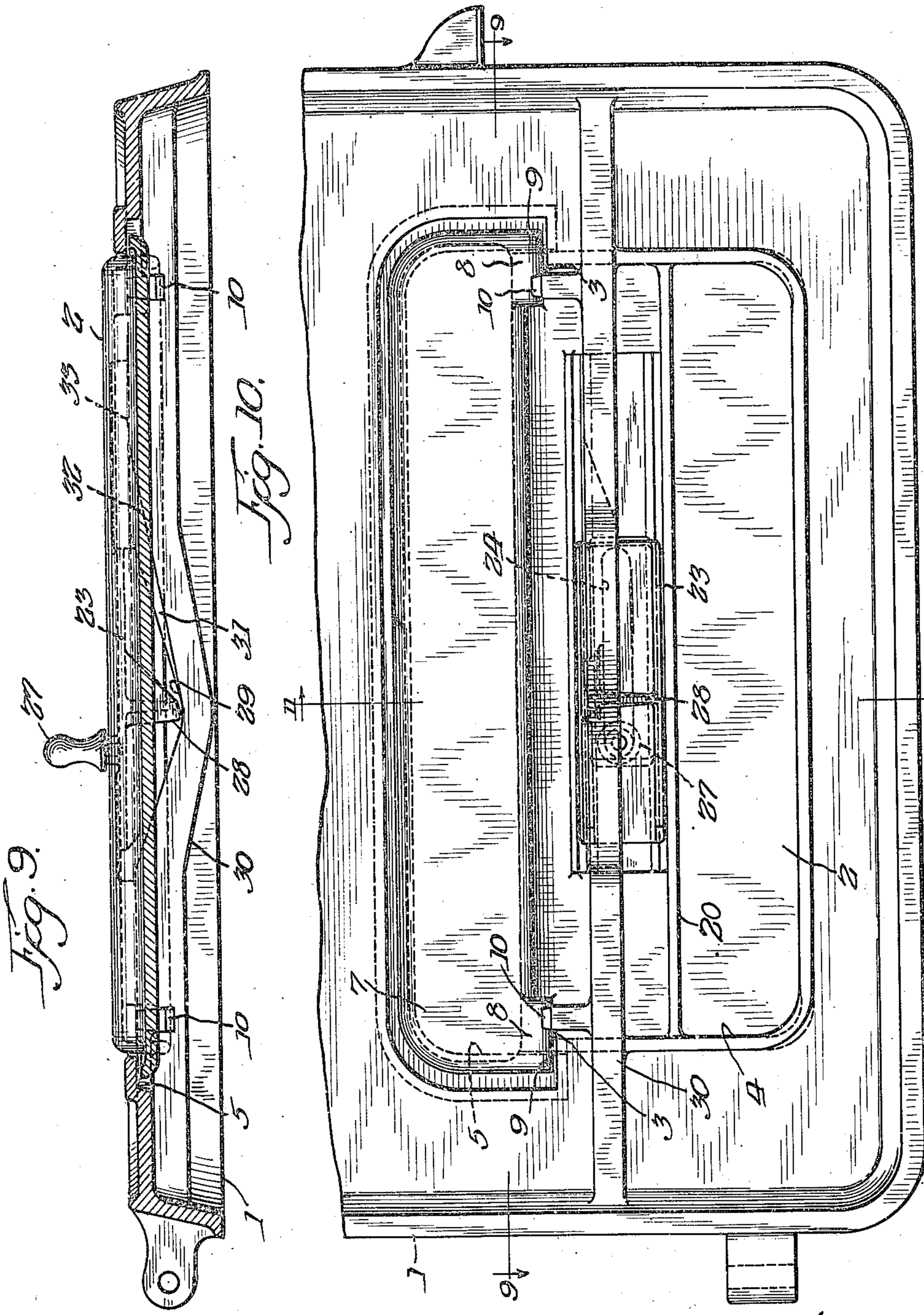

Fig. 9.

Fig. 10.

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Oct. 4, 1949. J. KACENA ET AL 2,483,702

DRAFT CONTROLLING FURNACE DOOR ACTUATING MEANS

Filed May 9, 1945 5 Sheets-Sheet 5

Fig. 11.

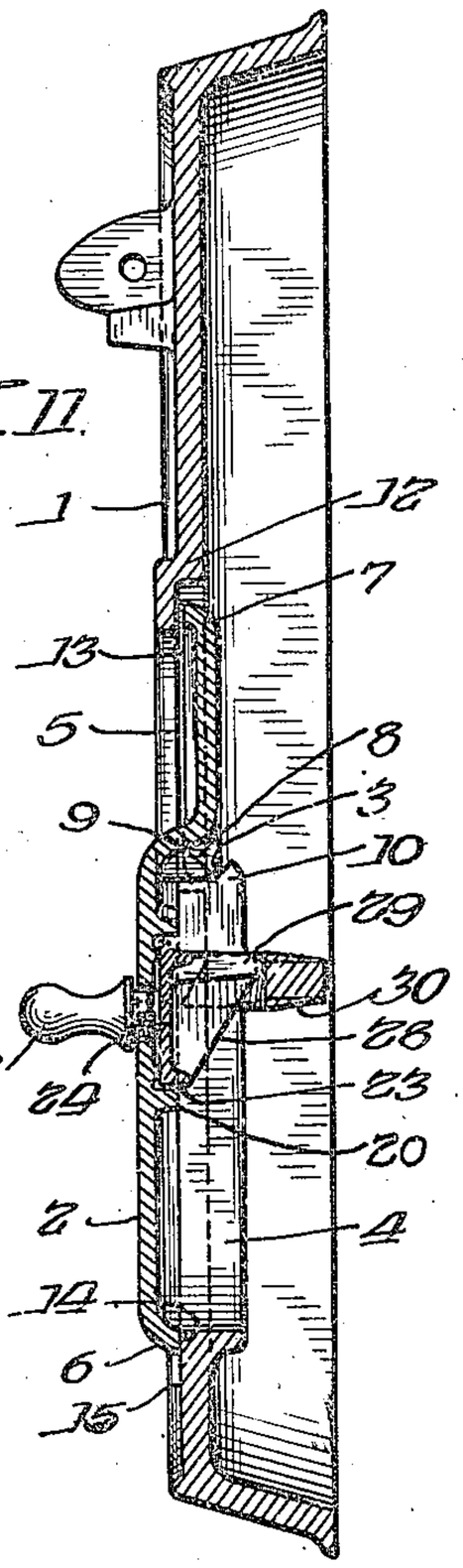


Fig. 12.

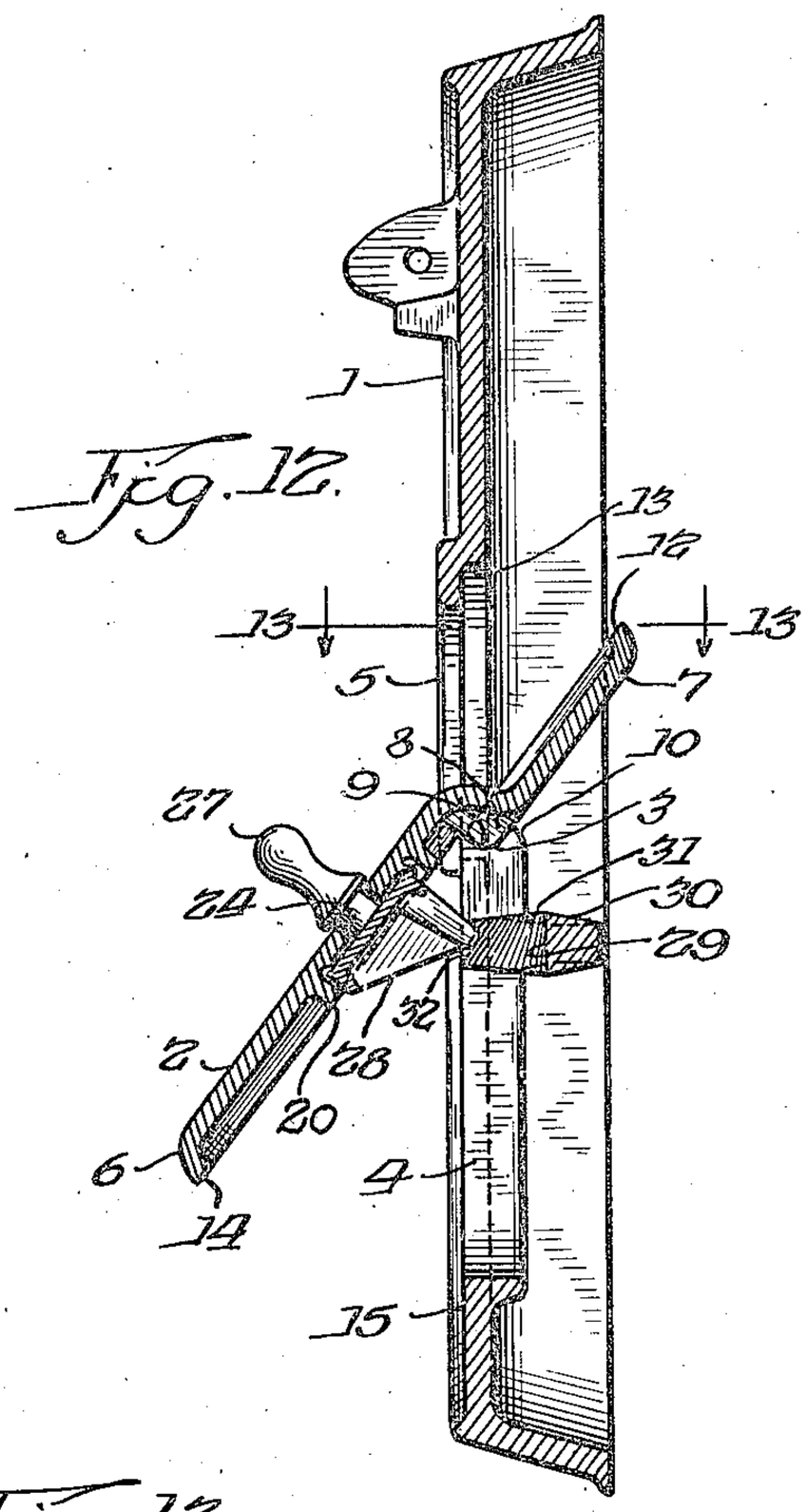
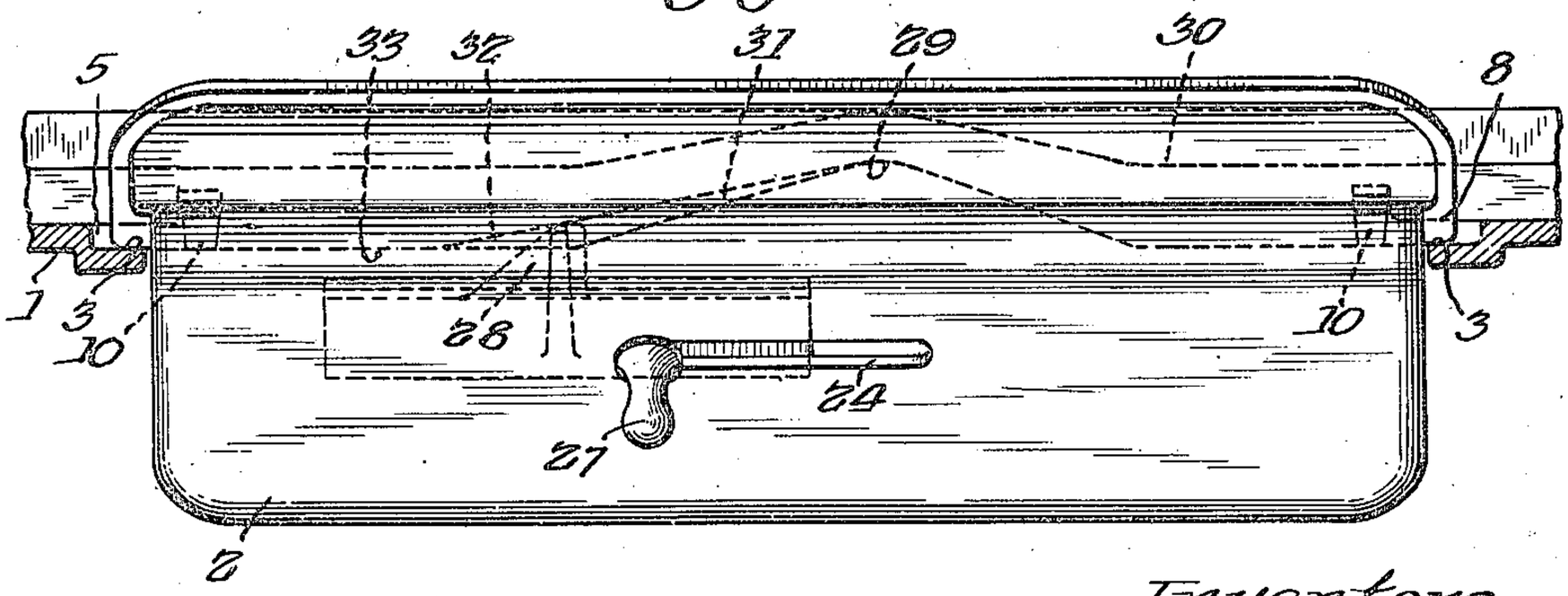


Fig. 13.



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UNITED STATES PATENT OFFICE

2,483,702

DRAFT CONTROLLING FURNACE DOOR ACTUATING MEANS

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Application May 9, 1945, Serial No. 592,900

10 Claims. (Cl. 110—175)

1

This invention relates particularly to door actuating means.

More specifically it pertains to a novel application to a fire door, panel or the like for use with a boiler or furnace provided with a secondary air draft door.

In connection with the use of the latter openings for boilers, it has long been a problem to obtain sufficient secondary air area through the conventional slotted slide damper operated fire doors, making it necessary frequently to develop an entirely new and enlarged fire door arrangement in order to provide ample secondary air area.

In the past, it has been accomplished by designing a fire door or other suitable panel member with a butterfly type of secondary draft door, the general construction of which is similar to the U. S. Patent #2,342,619, granted February 22, 1944, of which one of these applicants is a co-inventor.

As a novel point of distinction, however, from the construction disclosed in the aforesaid patent, an unusual means of actuation has been accomplished in the current construction in which a contact member or slider block operating in collaboration with an inclined plane or warped surface, as it is sometimes termed, is used to actuate the butterfly type of secondary door in the closed or opening directions.

Another important object of this construction is to provide a door actuating arrangement whereby size for size a greater volume of secondary air can be admitted than through the conventional slotted slide damper heretofore used.

A further object is to provide a construction of the secondary door hereinafter described in which more accurate and relatively fine adjustment can be obtained.

Another object is to provide means for effecting substantial areas through the door opening, the latter opening being divided by a portion of the means employed to accomplish actuation of the door.

A still further object is to provide a structure in which the door is of substantially streamline form and is free of objectionable projections which might otherwise be easily broken.

Another object is to provide in this type of construction an air inlet door or the like in which it functions also as a means for relieving sudden expansion due to puff-backs or to explosions within a fire chamber or similar enclosure.

A further object is to provide a structure which

2

is relatively simple and economical to manufacture, avoiding the necessity of employing special machining or dry sand cores and in which the doors and the dampers may be easily molded entirely from green sand.

Other objects and advantages resulting from the construction will become apparent upon proceeding with the description and disclosure in light of the accompanying drawings and the following specification, the invention being shown in a preferred form in the drawings and as hereinafter more fully described.

In the drawings:

Fig. 1 is a perspective view of the front portion of a door or the like to which this invention is applied.

Fig. 2 is a fragmentary perspective view of the door described in connection with Fig. 1 and with the auxiliary door removed.

Fig. 3 is a rear perspective view of the auxiliary door embodying this invention.

Fig. 4 is a fragmentary sectional view taken on the line 4—4 of Fig. 5.

Fig. 5 is a rear elevational view of the door embodying the invention.

Fig. 6 is a vertical sectional view taken on the line 6—6 of Fig. 5.

Fig. 7 is a view similar to Fig. 6, but with the auxiliary door shown in the open position.

Fig. 8 is a fragmentary sectional view taken on the line 8—8 of Fig. 7.

Fig. 9 is a horizontal sectional view taken on the line 9—9 of Fig. 10 of a modified form of the invention.

Fig. 10 is a rear fragmentary elevational view of the modified door construction.

Fig. 11 is a vertical sectional view taken on the line 11—11 of Fig. 10.

Fig. 12 is similar to Fig. 11 except that the modified door construction is shown in the open position.

Fig. 13 is a fragmentary sectional view taken on the line 13—13 of Fig. 12.

Similar reference characters refer to similar parts in the several views.

As more clearly shown in Fig. 1, the reference numeral 1 indicates generally the fire door or the like onto which the auxiliary door 2 of our invention is mounted vertically as indicated at 3 for pivotal movement supported by the lug 10 preferably integral therewith. Of course the auxiliary door 2 may be mounted in a manner other than upon a door or panel without detracting from its merit. The door 1 is provided with lower and upper air openings or apertures 4 and 5, re-

spectively, over which is mounted the auxiliary door 2 for control of the secondary air admission therepast. As indicated in Fig. 6 at 6 and 7, respectively, the auxiliary door 2 is preferably made with an offset or stepped portion having the ends 8 with the corners rounded as at 9 for journaling engagement with the sockets 10 to thereby hingedly support the secondary door 2 securely upon the panel of the door 1. By reason of the latter mounting, it will be apparent that the upper portion of the door 2 in its closed position will normally contact at 12 with the interior surface 13 of the main door 2 while the surface 14 will similarly make contact with the outer surface 15 of the main door 2. The mounting is thus provided in a simple manner to allow for free pivotal movement of the door 2 responsive to pressure or positive actuation, and also allows for its easy removal by simply swinging and tilting the lower portion thereof upwardly and clearing the upper limits of the lugs 10. Therefore, in addition, the current contribution provides for a novel arrangement of actuating means which is useful in the event that it is found necessary to positively actuate the secondary air door 2.

More specifically, as shown in Figs. 4 and 5, the rear or inner surface of the door 1 is preferably provided with the bridge member or extension 16 which spans the width of the combined apertures 4 and 5. Thus it serves as a division therebetween and also functions as a means for tying in and reinforcing the secondary door aperture. It will also be apparent that the member 16 serves as a foundation for the actuating means as hereinafter described.

Preferably the bridge member 16 is located adjacent to and functions as the supporting means for the lugs 10 within which the secondary door 2 is supported and hingedly mounted. As indicated more clearly in Figs. 2 and 4, the bridge member 16 is provided with an outwardly inclined vertical surface 17 adjacent the outer limits of the door 1, which surface at one end portion slopes outwardly to meet or merge with the vertical surface 18 while at the opposite end thereof a filleted or curved surface 19 is provided. The handle 21 with its means 22 for attachment to the slider block member 23 is slidably movable within the slot 24, the slider block 23 being apertured to permit fixed attachment to the handle 21 by means of the threaded shank and the lock nut 25. The end projection 26 of the threaded shank of the handle 21, as shown more clearly in Fig. 4, makes slidable cam-like contact with the respective surfaces 17, 18 and 19 encountered as the handle 21 is moved transversely across the door within the limits defined by the slot 24. Thus when the secondary door 2 is in its closed postion (see Fig. 6), the end portion 26 of the threaded shank of the handle 21 contacts the rounded or filleted surface 19. As viewed in Fig. 4, it will now be apparent that as the handle 21 is moved to the right transversely across the door 2 and guided within the slot 24, the end portion 26 of the handle 21 will contact and travel upward upon the inclined surface 17. The slider block 23 is further guided in its transverse movement and held against rotational or tilting movement by means of the supporting rib 20 preferably integral with the rear portion of the door 2. Thus, by reason of the cam motion accordingly effected, the door 2 will be gradually opened, pivoting at the rounded bearing 8 within the lug support 10. Preferably, it will be satisfactory to provide the cam surface 17 relatively

smooth, but if desired, it may be roughened slightly or notched in order to frictionally maintain the handle 21 in desired positions or increments and to prevent it from moving freely down the surface incline 17. Ordinarily, it has been found that the friction alone between the bridge surfaces respectively designated 17, 18 and 19 and the end 26 of the handle 21 will be sufficient to prevent the occurrence of such involuntary closing. It will thus be apparent that the inclined vertical surface 17 allows for simple, quick and accurate adjustment of the opening position of the door 2 and also its rapid and positive closing. In addition, it is evident that the novel manner of actuating the door hereinabove disclosed permits the latter member to be freely pivotable at all times in response to such internal pressures encountered during the course of service.

Referring now to the modified construction shown in Figs. 9 to 13 inclusive, it will hereinafter become apparent that the important difference from the previous construction described lies in the provision for the bridge member 16 having what is termed a warped surface or one having a plurality of inclined planes on a side wall and with which the modified handle 27 is made separate and distinct from the threaded shank portion 26 above described by employing a lug 28 preferably made integral with the slider block 23. The handle 27 may be threadedly or otherwise attached directly to the slider block 23, being movable therewith in the slot 24, the slider block being guided by the rib 20. It has been found that in some instances in accelerating the pivotal opening movement of the auxiliary door 2 it may be desirable to replace the rounded or filleted surface 19 earlier referred to with a surface 29 substantially vertically extending which changes its angle of inclination to merge with a surface 31 further inclining inwardly from the vertical plane and continuing longitudinally across the bridge member 30 forming the tapered surface 32 to ultimately meet with the vertical surface 33. As indicated in Fig. 12, the action in opening the door may be slightly accelerated by contact of the lug 28 with the combined variable tapered surfaces 31 and 32. Depending upon the angle of inclination employed, the integral lug 28 will normally tend to remain in the intermediate positions between opening and closing with decreased tendency to slide and close due to the weight of the door. In other respects the action of the door opening and closing movement is the same as that described in connection with the construction illustrated in Figs. 1 to 8 inclusive. For example, when viewed as in Fig. 9, upon moving the handle 27 together with the slider block 23 and its integral lug 28 slidably across the surfaces respectively designated 29, 31, 32 and 33, the secondary door 2 will be opened as desired and as shown in Fig. 12. It will of course be apparent that by reversing the direction of the handle movement transversely across the door 2 the closing of the secondary door is accomplished in the same manner as previously described with the other form of the device.

It will of course be also apparent that the numerous details of construction may be varied throughout a wide range without departing from the principles disclosed herein.

We claim:

1. Door actuating means, the combination comprising a substantially vertical wall member having an aperture therein, a substantially vertically suspended door having an inwardly projecting

movable portion within the aperture of the said wall member, supporting means on the wall member for the said door, said supporting means having shoulders for engaging the said vertically suspended door whereby the latter member is pivotally mounted upon said wall member on a horizontal axis above the center of gravity of the door, bridge means spanning the apertured portion of the said wall member, the said bridge means having an inclined surface directed toward the door inclined in a longitudinal direction thereof from a point spaced rearwardly away from the door forwardly to a point more nearly adjacent the door for sliding engagement by the said inwardly projecting portion on the said door, means transversely movable relative to the said door for actuation of said inwardly projecting movable portion relative to the inclined surface of the said bridge means, whereby upon transverse movement of the said door actuating means the said door is swingable about said pivot axis away from the vertical plane to uncover the wall member aperture.

2. Door actuating means of the character described, the combination comprising a substantially vertically suspended pivotally mounted door with an inwardly projecting movable portion, an apertured supporting panel therefor having means for journally engaging end portions of the said vertically suspended door and for receiving the inwardly projecting portion of the door, bridge means spanning the apertured portion of the said panel, the said bridge means having a side inclined surface directed toward the door for engagement by the inwardly projecting movable portion of the said door, means on the door providing for actuation of said inwardly projecting movable portion, the latter means being transversely movable relative to the door and longitudinally to the inclined surface of the said bridge means, whereby upon predetermined movement of the said door actuating means relative to the said door and to the said bridge means the said door is movable about said pivot axis away from the vertical plane position to uncover the aperture of the said supporting panel, the side inclined surface of the said bridge means extending in a longitudinal direction from a point spaced rearwardly away from the door to a point more nearly adjacent the door, the said movable projecting portion being of a length to engage the inclined surface when moved toward the end of such surface which is nearest the door.

3. Door actuating means, the combination comprising a substantially vertical wall member having an aperture therein, a substantially vertically suspended slotted door having an inwardly projecting movable portion within the aperture of the said wall member, supporting means on the wall member for the said door, said supporting means having means for engaging the said vertically suspended door whereby the latter member is pivotally mounted upon said wall member on a horizontal axis above the center of gravity of the door, the said door being disposed to close the aperture when it lies in a substantially vertical plane, bridge means spanning the apertured portion of the said wall member, the said bridge means having an inclined surface directed toward the door inclined in a longitudinal direction thereof from a point spaced rearwardly away from the door forwardly to a point more nearly adjacent the door for sliding engagement by the said inwardly projecting portion on the said door, the said door having means exteriorly accessible and transversely movable relative to the said door in the slotted portion thereof for actuation of said inwardly projecting movable portion relative to the inclined surface of the said bridge means, whereby upon transverse movement of the said door actuating means within the slotted portion the said door is swingable about said pivot axis away from the vertical plane to uncover the wall member aperture.

4. Actuating means for a pivotally mounted door, the combination comprising a substantially vertically suspended pivotally mounted door having on its inner side an inwardly projecting slider block, guide means for the said block, an apertured supporting panel therefor having means for journally engaging the said vertically suspended door and for receiving the inwardly projecting portion of the door, bridge means spanning the apertured portion of the said panel, the said bridge means having a longitudinally extending side inclined surface directed toward the door for engagement by the inwardly projecting slider block, actuating means on the door providing for movement of said inwardly projecting slider block, the latter means being movable across at least a portion of the door along the longitudinal axis of the inclined surface of the said bridge means, whereby upon predetermined movement of the said actuating means relative to the said door and to the said bridge means the said door is movable about said pivot axis away from the vertical plane position to uncover the aperture of the said supporting panel.

5. Door actuating means of the character described, the combination comprising a substantially vertically suspended pivotally mounted door with an inwardly projecting movable portion, an apertured supporting panel therefor having means for journally engaging the said vertically suspended door and for receiving the inwardly projecting portion of the door, bridge means spanning the apertured portion of the said panel, the said bridge means having a vertically relieved portion forming an inclined surface opposite the inner surface of the door for engagement by the inwardly projecting movable portion of the said door, a slidable handle on the door movable with and providing for actuation of said inwardly projecting movable portion, the said slidable handle being movable transversely relative to the door but substantially immovable axially relative thereto, whereby upon transverse movement of the said handle across a portion of the said door the said door is displaced arcuately around said pivot axis away from the normal vertical plane position, one portion of the door relative to the pivot axis moving inwardly of the vertical plane and the other portion of the door relative to the pivot axis moving outwardly to uncover respective portions of the aperture of the supporting panel.

6. Door actuating means, the combination comprising a substantially vertical wall member having an aperture therein, a substantially vertically suspended door having an inwardly projecting movable portion within the aperture of the said wall member, supporting means on the wall member for the said door, said supporting means including shoulder portions for engaging the said vertically suspended door whereby the latter member is pivotally mounted upon said wall member on a horizontal axis above the center of gravity of the door, means spanning the apertured portion of the said wall member,

the said spanning means having an inclined surface directed toward the door inclined from both horizontal and vertical axes from a point spaced rearwardly away from the door forwardly to a point more nearly adjacent the door for engagement by the said inwardly projecting portion on the said door, means transversely movable in guided relation to the said door for actuation of said inwardly projecting movable portion relative to the inclined surface of the said spanning means, whereby upon transverse movement of the said door actuating means the said door is arcuately movable in opposite directions relative to the pivot axis substantially defined by the center of gravity of the door.

7. Door actuating means of the character described, the combination comprising a substantially vertically suspended pivotally mounted door with an inwardly projecting movable portion, an apertured supporting panel therefor having means for journally engaging end portions of the said vertically suspended door and for receiving the inwardly projecting portion of the door, bridge means spanning the apertured portion of the said panel to divide the aperture into upper and lower sections, the said bridge means having a side inclined surface directed toward the door for engagement by the inwardly projecting movable portion of the said door, means transversely movable relative to the door and simultaneously with the inwardly movable projecting portion, whereby upon movement of the said door actuating means relative to the said door and to the said bridge means the said door is movable about said pivot axis away from the vertical plane position to uncover simultaneously both sections of the aperture of the said supporting panel, the side inclined surface of the said bridge means extending in a longitudinal direction from a point spaced rearwardly away from the door to a point more nearly adjacent the door, at least a portion of the door being movable pivotally outwardly as an expansion door in response to sudden increases in internal pressure on an inner side of the supporting panel.

8. Door actuating means, the combination comprising a substantially vertical wall member having an aperture therein, a substantially vertically suspended door having shouldered portions and an inwardly projecting movable portion within the aperture of the said wall member, supporting means on the wall member for the said door, end projecting means on said supporting means for engaging said shouldered portions of the said vertically suspended door whereby the latter member is pivotally mounted upon said wall member on a horizontal axis above the center of gravity of the door, means spanning the apertured portion of the said wall member, the said spanning means having an inclined surface directed toward the door inclined in a longitudinal direction thereof from a point spaced rearwardly away from the door forwardly to a point more nearly adjacent the door for sliding engagement by the said inwardly projecting portion on the said door, means transversely movable relative to the said door for actuation of said inwardly projecting movable portion relative to the inclined surface of the said spanning means, whereby upon transverse movement of the said door actuating means the said door is pivotable about an axis located approximately in the plane of the upper surface of the spanning means.

9. Door actuating means of the character described, the combination comprising a substantially vertically suspended pivotally mounted door having rounded portions and with an inwardly projecting movable portion, an apertured supporting panel therefor having end recesses for journally engaging the rounded portions of the said vertically suspended door and for receiving the inwardly projecting portion of the door, bridge means spanning the apertured portion of the said panel, the said bridge means having a central relieved portion and a side inclined surface directed toward the door in oppositely disposed directions to converge at said central relieved portion of the said bridge means for engagement by the inwardly projecting movable portion of the said door, means on the door providing for actuation of said inwardly projecting movable portion, the latter means being transversely movable relative to the door and longitudinally to the inclined surface of the said bridge means, whereby upon predetermined substantially transverse movement of the said door actuating means in either direction relative to the said door the said door is movable about said pivot axis away from the vertical plane position to uncover the aperture of the said supporting panel, the side inclined surface of the said bridge means extending in a longitudinal direction from a point spaced rearwardly away from the door to a point more nearly adjacent the door.

10. In a door actuating means, a substantially vertical wall member having an aperture therein, a substantially vertically suspended door having an inwardly projecting movable portion within the aperture of the said wall member, supporting means on the wall member for the said door comprising interlocking lug members on the wall and door members whereby the latter member is pivotally mounted upon said wall member on a horizontal axis above the center of gravity of the door, bridge means spanning the apertured portion of the said wall member to divide the apertured portion into a pair of apertures of unequal size, the said bridge means having an inclined surface directed toward the door inclined in a longitudinal direction thereof from a point spaced rearwardly away from the door forwardly to a point more nearly adjacent the door for sliding engagement by the said inwardly projecting portion on the said door, exterior means slidably movable relative to the said door for actuation of said inwardly projecting movable portion relative to the inclined surface of the said bridge means, whereby upon transverse movement of the said door actuating means the said door is arcuately movable about said pivot axis away from the vertical plane to uncover simultaneously both the large and small wall apertures.

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The following references are of record in the file of this patent:

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