

Aug. 20, 1935.

F. P. ROESCH

2,011,911

STOKER

Filed Nov. 20, 1931

2 Sheets-Sheet 1

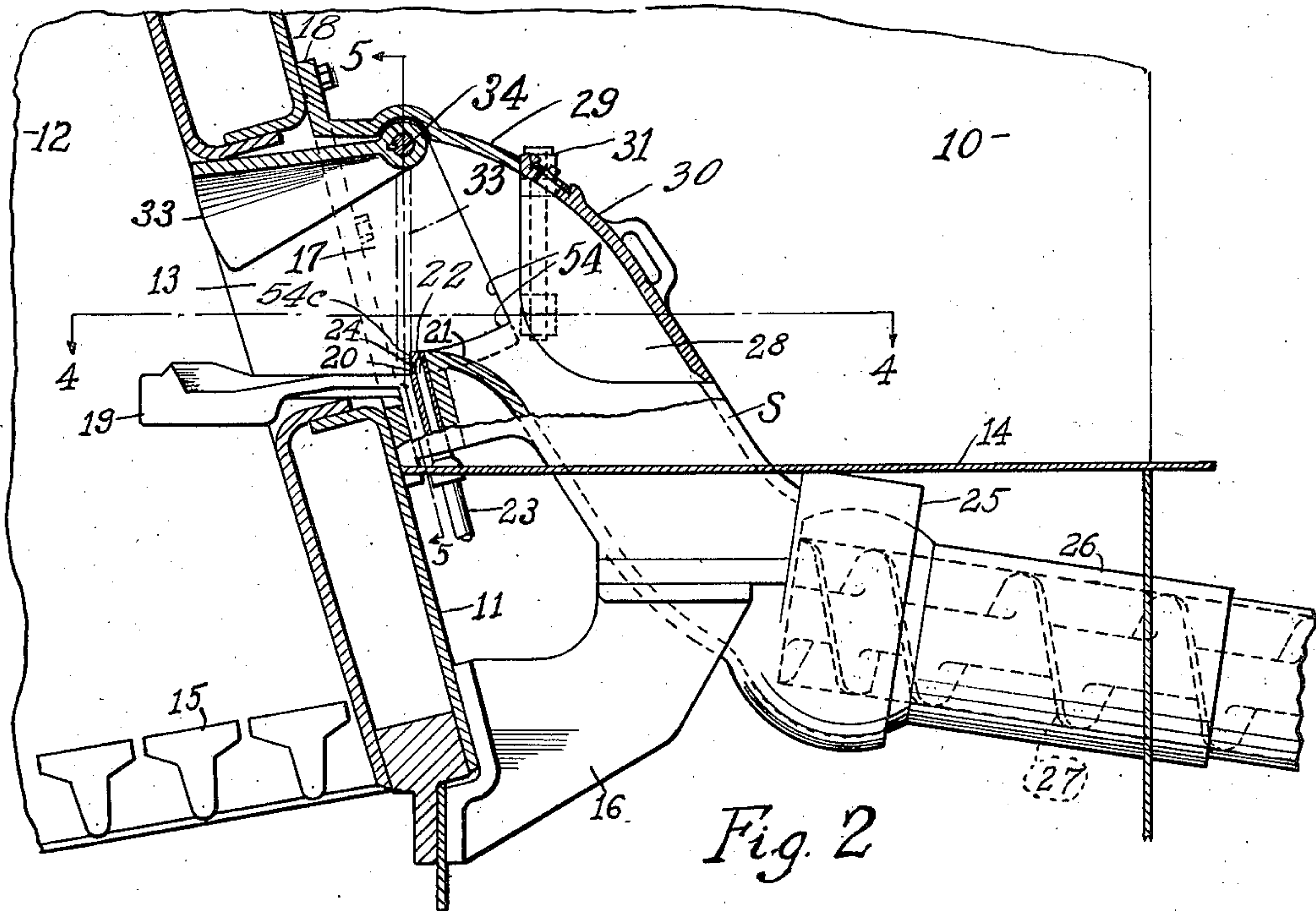


Fig. 2

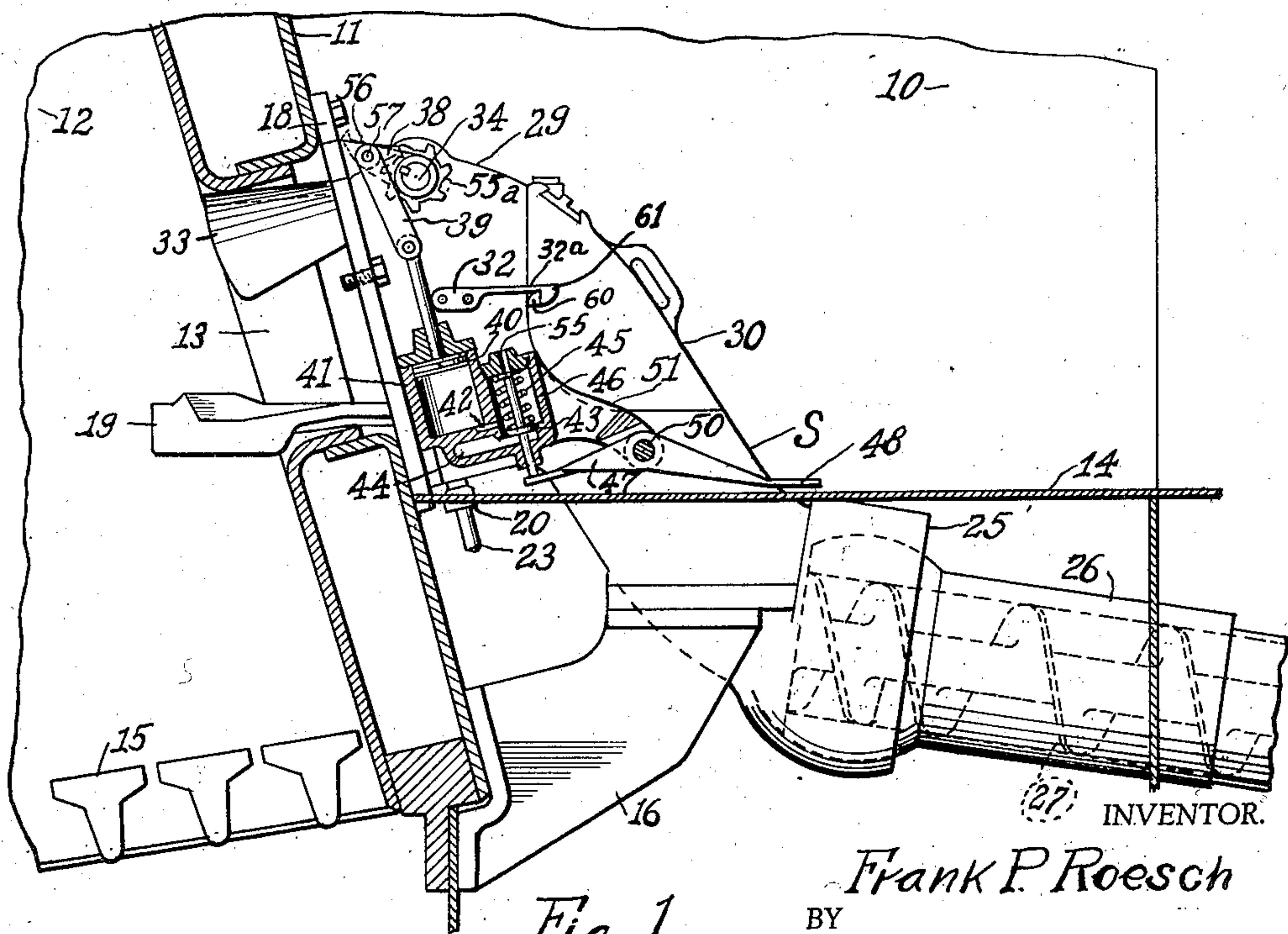


Fig. 1

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Fig. 3

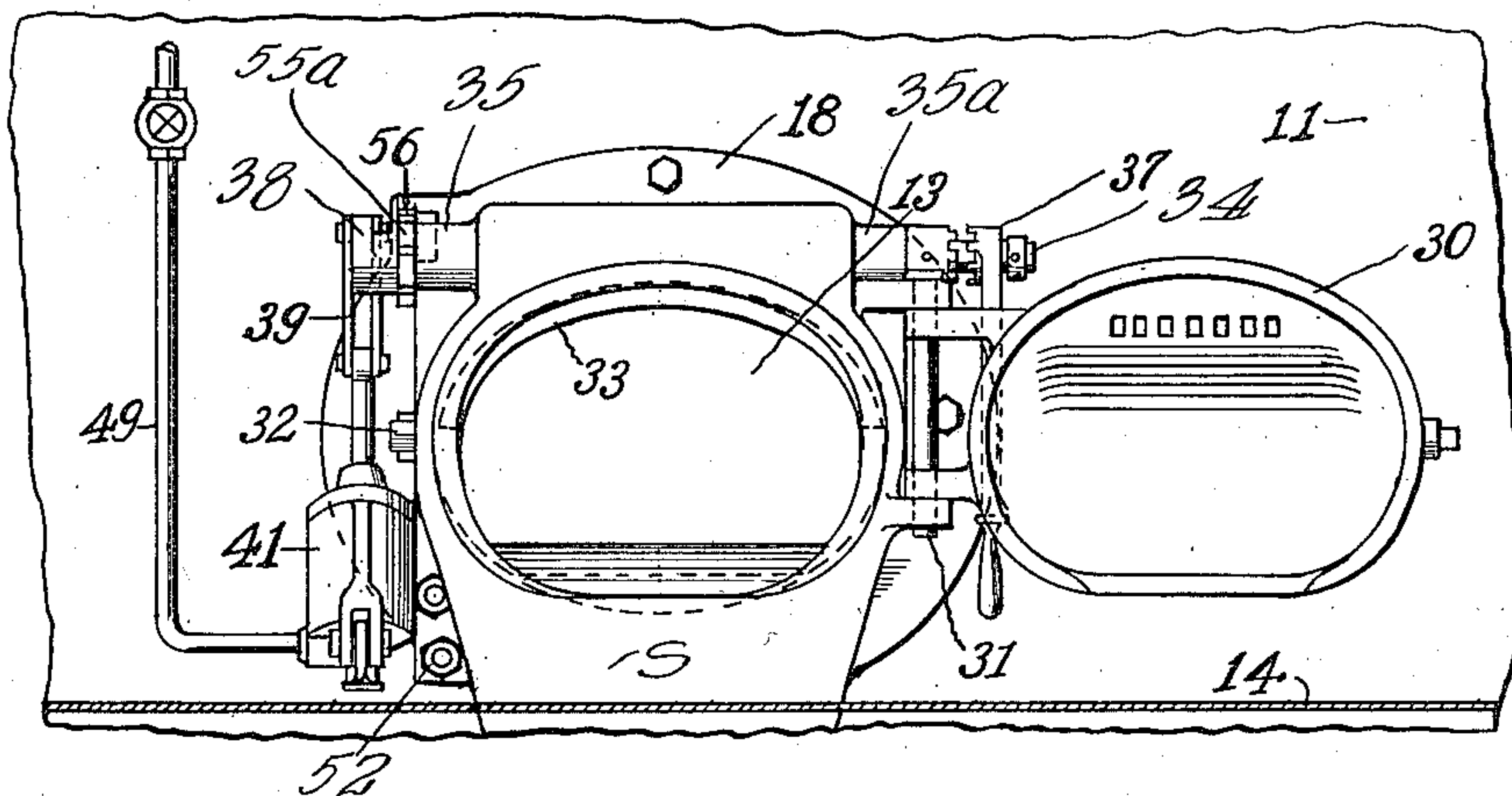


Fig. 4

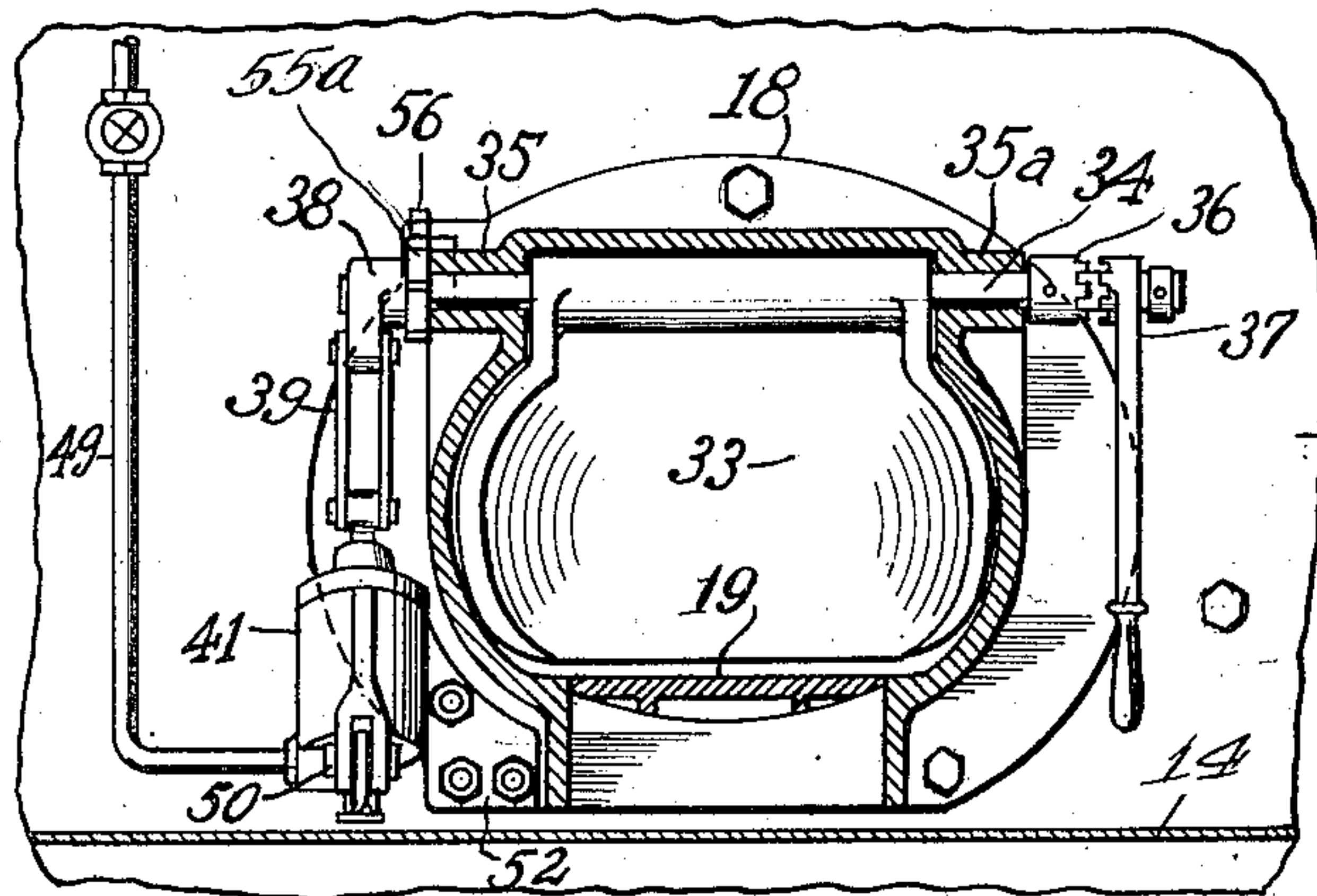
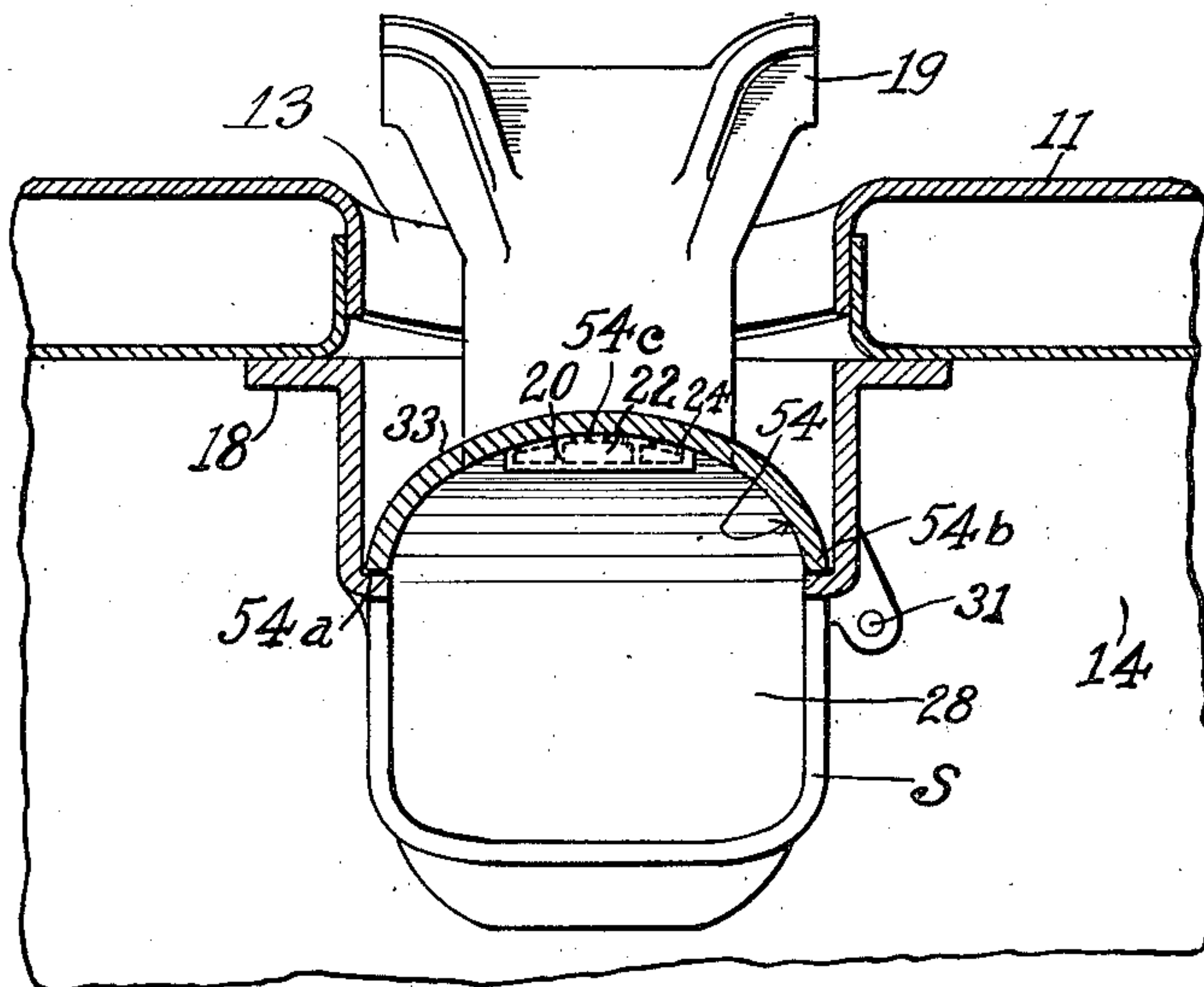


Fig. 5

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## UNITED STATES PATENT OFFICE

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STOKER

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Application November 20, 1931, Serial No. 576,247

21 Claims. (Cl. 110—101)

This invention has reference to an improved stoking apparatus of the class arranged for the delivery of fuel by manual or power means through the conventional firing opening of a boiler firebox. It is particularly applicable for use with small locomotives although it is capable of more extensive service.

Primarily, the purpose of the invention is the provision of stoking apparatus of the class described such that satisfies or compromises the conflicting requirements of the users and at the same time, complies with the interstate laws governing their use. To this end it is an object of the invention to provide a stoker conduit constituting a firedoor frame member mounted outside the firebox communicating with the conventional firing opening through which conduit fuel may be delivered manually, by power means, or both into the firing opening, and hence into the firebox, and within which conduit or frame member there is mounted a firedoor operable manually or from power means such as by suitable link and rod connections responsive to a pressure fluid controlled by the stoker operator.

Another object of this invention is the provision of a device of the character specified which forms a closure for the firebox firing opening either when firing the fuel manually or by power means thus preventing the flow of escaping steam through the firing opening should any disturbance occur in the firebox such as results from dropping of the crown sheet or burning out of the flue sheet.

A further object of the invention is the provision of a stoker conduit embodying a firedoor mounted therein to swing to and from the firebox firing opening on a substantially horizontal transverse axis.

Still another object of this invention is the provision of a combined fuel feeding and firedoor apparatus which adapts itself very economically and advantageously to the assembly of the parts as a unit for convenient installation to the different forms of fireboxes and for application to the locomotive type of firebox without the necessity of enlarging the existing firing opening.

In addition to the several objects above set forth, the invention contemplates the provision of a firedoor frame member carrying a pivotal door combined with a distributing means at the firebox firing opening to which means fuel is supplied manually for spreading over the firebox grate, the firedoor being operable from power means controlled by the operator. In carrying out this object it is not necessary that power

means be provided also for supplying fuel to the distributing means.

Many other advantages and more specific objects of the invention will be apparent to those skilled in the art from the following description when read in connection with the accompanying drawings, in which

Fig. 1 is a central vertical longitudinal sectional view of the rear portion of a locomotive firebox with the stoking apparatus of the invention shown thereon in elevation with some parts in section;

Fig. 2 is a view similar to Fig. 1 showing the delivery end of the stoker and its combined firedoor in central vertical longitudinal section;

Fig. 3 is a fragmentary end elevation of the structure shown in Fig. 1 with the hinged manual firing opening of the stoker conduit shown open;

Fig. 4 is a plan sectional view on the line 4—4 of Fig. 2 showing the firedoor in closed position; and

Fig. 5 is a transverse vertical section on the irregular section line 5—5 of Fig. 2, with the firedoor in closed position.

These figures illustrate the invention as applied to a small locomotive and it will be so described, however, it will be understood the invention is not limited to such use and may serve equally as well on larger locomotives and similar steam generating devices.

Referring now more particularly to Figures 1 and 2, it will be seen the stoker conduit or riser section S is mounted within the locomotive cab 10 on the backwall 11 of the firebox 12 in a manner to surround the conventional firing opening 13 which is disposed in the backwall a little above the cab deck 14, and a sufficient height above the firebox grate 15 to permit spreading the fuel from the opening in aerial paths above and over the grate. Preferably, although not necessarily, the conduit S is carried on the backwall 11 and may be fixed thereto adjacent its lower end by the bracket 16 and at its upper end or mouth portion 17 by the lateral flange 18 which extends about the conduit. The mouth portion 17 corresponds substantially in form and size to the firing opening 13 with which it directly communicates.

In the mouth portion a distributing means is mounted for receiving the fuel therefrom and projecting it through the firing opening 13, spreading the same over the firebox grate 15. This distributing means comprises the distributor plate 19 and the distributor head 20. The plate in effect forms a detachable continuation of the



forward wall 21 of the conduit S extending in and through the lower portion of the firing opening 13. It may be secured in place in any desired manner that will permit of its ready removal. Likewise, the distributor head 20 located rearward of the plate 19 and extending thereabove may be fastened in position in any suitable manner or if preferred, it may be formed as an integral part of the forward wall 21 of the conduit S. Chambers 22 in the distributor head 20 supplied with pressure fluid from supply lines as at 23 lead to horizontally directed jet openings 24 in the front face of the head slightly above the plate 19, through which jet openings the pressure fluid discharges over the distributor plate for propelling the fuel therefrom.

From the distributing means the conduit or riser S slopes rearwardly and downwardly to a point below the cab deck 14. There its lower open end 25 receives the front end of a conduit section 26 leading from a source of fuel supply such as the locomotive tender not shown.

Any suitable power means may be utilized for advancing the fuel through the conduit sections S and 26 onto the distributing means. For this purpose a screw conveyor 27 is rotatably mounted within the conduit section 26. The screw may be driven from its rearward end or intermediate its ends in any manner well known in the art. Thus, by action of the screw 27, fuel is mechanically fed from a source of supply to the firing opening 13, the conduit S forming an enclosed passage 28 between the conduit section 26 and the firing opening 13 and hence a closure between the firing opening and the cab 10 above the deck 14.

In order that fuel may be supplied manually onto the distributing means or into the firebox 12 through its opening 13, the rear wall 29 of the conduit S is provided with a removable section 30 diametrically opposite the firing opening. Preferably, the wall section 30 is hinged as at 31 to one side of the conduit S permitting the section to swing laterally from the conduit in effect forming a hinged door which when closed is securely held in position by the spring lock 32 fixed to a wall of the conduit opposite the door hinge. The spring lock 32 comprises a relatively thin portion 32a which is flexible so that it may be manually bent upward whenever it is desired to open the wall section 30. Upon returning the wall section 30 to its original position, the arcuate face 60 thereof forces the corresponding face 61 of the lock 32 upwardly and thus permits the spring lock 32 to firmly lock the wall section to the conduit S. During normal operation of the stoker power conveying means, the section 30 is closed but when it is necessary or desired to resort to manual firing it is thrown open and remains open until the fuel is again delivered by the power means.

With the wall section or hinged door 30 open, fuel may be manually fed through the conduit mouth portion 17 onto the distributing means or directly through the firing opening 13 into the firebox. When fired manually, the fuel is supplied into the firebox a scoopful at a time and during the lapse of time between successive scoops it is desirable to close the firing opening 13 to prevent the rush of cold air into the firebox, and to comply with the interstate laws affecting locomotive firing it is necessary that the closure be a power actuated door. To this end a pivotal firedoor 33 is mounted within the mouth portion 17 to swing to and from the firing opening 13 on

the substantially horizontal rocker shaft 34 extending transversely of the conduit mouth portion and the firing opening.

The rocker shaft 34 is journaled in the bearings 35, 35a in the sidewalls of the conduit S and at each end extends therebeyond. The shaft extension to the right of the conduit as best shown in Figure 5 has fixed therein the clutch member 36 and loosely carries the clutch lever 37. By engaging the clutch lever with the fixed clutch member the firedoor 33 may be moved manually. The rocker shaft extension to the left of the conduit has fixed thereon the rocker arm 38 which is connected with power actuating means as will now be described.

Referring particularly to Figures 1, 3 and 5, a link 39 connects the rocker arm 38 with the rod of the piston 40 mounted in the air cylinder 41. Admission of air to the cylinder through its port 42 is controlled by valvular means consisting of the valve 43 controlling the passage of air from a supply chamber 44 into the cylinder port 42, the valve spring 45 in the valve chamber 46 and a rocker lever 47 receiving its motion from a pedal 48. Compressed air, or any other suitable pressure fluid, is supplied to the supply chamber 44 through the pipe 49. The rocker lever 47 is pivoted at 50 in the arm 51 extending from the air cylinder which is bolted as at 52 to the conduit S.

All of this actuating mechanism is so arranged that when the pedal 48 is pushed down air will be admitted under pressure below the piston 40 and will move the piston upward acting through the link 39 to push upward on the rocker arm 38 and that in turn will rotate the rocker shaft 34 swinging the firedoor 33 forward and upward in the firing opening 13. When the pedal is permitted to rise, the spring 45 closes the valve 43 and the firedoor will swing downwardly of its own weight away from the firing opening to form with the seat 54 of the conduit S a closure for the firing opening. The downward movement of the firedoor is cushioned by the restricted discharge of the air from the cylinder 41 through the vent 55 of the valve chamber 46.

Inasmuch as the conventional form of firing opening 13 is elliptical, the firedoor 33 is given an arcuate shape in transverse cross section corresponding to the shape of the upper portion of the firing opening so that the door when raised may closely fit the opening to provide the maximum size opening above the distributing means for either manual or power feeding of the fuel. Due to this arcuate shape of the firedoor, the front face of the seat 54 in the conduit S is shaped similarly as will be seen in Figure 4. This seat comprises the ledges 54a, 54b in the sidewalls of the conduit S and the arcuate face 54c of its bottom wall 21. A portion of the face 54c is made in the distributor head 20 above the jet openings 24. Thus when the firedoor 33 is in closed position in the seat 54, as shown conventionally in Figure 2, its lower marginal edge is above the jet openings 24, hence, above the distributor plate 19. Thus it is possible if desired to have the pressure fluid from the distributor head blowing over the distributor plate when the firedoor is closed as well as when it is open.

As a convenient means to hold the firedoor 33 open when it is not in use as a closing door, there is provided a simple pawl and ratchet mechanism comprising the ratchet 55a fixed on the left side extension of the rocker shaft 34, see Figs. 1 and 5, between the bearing 35 and the rocker arm 38,



and the pawl 56 hinged at 57 to the flange 18 of the conduit S. Engagement of the pawl with the ratchet as shown in Fig. 1 will hold the firedoor 33 in its maximum open position. By engaging the pawl with any one of the teeth on the ratchet to the right of the one shown in engagement, the firedoor 33 may be held in any desired angular position intermediate its end positions to serve as a top deflector for the distributing means acting to guide that portion of the fuel downwardly and forwardly that has a tendency to rise as it enters the firing opening.

When it is desired to disengage the pawl and ratchet mechanism this can be done by raising the firedoor 33 manually by use of the clutch lever 37 to relieve the weight of the door from the pawl 56 which can then be thrown back out of engagement with the ratchet. The firedoor will then swing downward and backward to its closed position ready for actuation by the pressure fluid actuating mechanism heretofore described.

In the broader aspects of the invention the conduit S may be considered a firedoor frame member on the firebox backwall arranged to permit the delivery therethrough into the firing opening 13 of fuel manually and, or by power means or both. On very small locomotives the power conveying means may not be necessary and in this event the conduit S or its upper portion can be utilized as a frame member carrying the distributing means and pivotal firedoor, which door may be power actuated as herein described to permit manual firing of fuel onto the distributing means or directly through the firing opening into the firebox. This arrangement would eliminate the labor necessary to scatter the fuel manually over the fire.

While only one embodiment of the invention is disclosed it is capable of modification within the scope of the appended claims.

I claim:

1. In combination with a firebox having a backwall with a firing opening therein, a stoker riser conduit on the outside of said backwall with a mouth portion surrounding said firing opening, a distributing means at the mouth portion of the conduit disposed in the lower portion of said firing opening, means for advancing fuel through said conduit onto the distributing means, the rearwall of said conduit having a hinged section opposite said firing opening, a firedoor within said conduit mouth portion mounted to swing to and from said firing opening on a substantially horizontal transverse axis, a seat in said conduit rearward of said distributing means for said door preventing movement thereof outwardly from said backwall beyond its normal closed position, means responsive to a pressure fluid for opening said door, and means holding said door in open position above said distributing means during normal operation of the means for advancing fuel through the conduit.

2. In combination with a firebox having a backwall with a firing opening therein, a stoker riser conduit on the outside of said backwall with a mouth portion surrounding said firing opening, a distributing means at the mouth portion of the conduit disposed in the lower portion of said firing opening, means for advancing fuel through said conduit onto the distributing means, the rearwall of said conduit having a hinged section opposite said firing opening, a firedoor within said conduit mouth portion mounted to swing to and from said opening on a substantially horizontal transverse axis, a seat in said conduit rearward

of said distributing means for said door preventing movement thereof outwardly from said backwall beyond its normal closed position, means responsive to a pressure fluid for opening said door, and means adjustable for holding said door in any one of a plurality of predetermined positions intermediate its end positions in angular relation to and above said distributing means.

3. In combination with a firebox having a backwall with a firing opening therein, a stoker riser conduit on the outside of said backwall having a mouth portion communicating with said firing opening, a distributing means at the conduit mouth portion and extending forwardly therefrom in the lower portion of said firing opening, power means for advancing fuel through said conduit onto the distributing means, said conduit having a removable wall portion opposite said firing opening to permit manual firing of fuel, a firedoor movable in said conduit between its removable wall section and said firing opening, means holding said door open during normal operation of the means for advancing fuel through the conduit to permit delivery of the fuel from the conduit on to the distributing means, and means responsive to a pressure fluid for opening said firedoor during manual firing of the fuel into said firing opening through the wall of the conduit at times when the said power means for advancing fuel through the conduit is not in motion.

4. A stoker riser conduit terminating in an open mouth portion directed horizontally comprising a hinged rear wall section opposite its open mouth and a door pivoted in said mouth portion forming a movable closure therefor.

5. A stoker riser conduit terminating in an open mouth portion directed horizontally comprising a removable wall section opposite the open mouth portion and a door pivoted in said mouth portion forming a closure therefor.

6. A stoker riser conduit terminating in an open mouth portion directed horizontally comprising a removable wall section opposite the mouth portion and a door mounted in said mouth portion to swing on a substantially horizontal transverse axis.

7. In combination, a stoker riser conduit terminating in an open mouth portion directed horizontally comprising a hinged rear wall section opposite its open mouth portion, a door pivoted in said mouth portion forming a movable closure therefor, and means responsive to a pressure fluid for actuating said door about its pivot, said means being secured to said conduit.

8. In combination, a locomotive having a cab and a cab deck, a firebox having a wall with a firing opening therein above the level of the deck, a fuel riser casing mounted against said wall and surrounding said firing opening, means for advancing fuel through said casing, said casing forming a seal against exposure of said firing opening to the cab space, said casing having a rearwall with an aperture therein approximately the size of said firing opening permitting access to the firebox to be gained therethrough and permitting manual delivery of fuel therethrough, a removable covering forming a closure for said aperture, a firedoor pivoted in said casing forming a closure between said firing opening and said casing and means in said casing adjacent the lower marginal edge of said firing opening for projecting the fuel through said firing opening into the firebox.

9. In combination, a locomotive having a cab and a cab deck, a firebox having a wall with a fir-



ing opening therein above the level of the deck, a fuel riser casing mounted against said wall and surrounding said firing opening, means for advancing fuel through said casing, said casing forming a seal against exposure of said firing opening to the cab space, said casing having a rear wall with an aperture therein approximately the size of said firing opening permitting access to the firebox to be gained therethrough and permitting manual delivery of fuel there-  
 10 through, a removable cover forming a closure for said aperture, a fire door within said casing mounted to swing to and from said firing opening on a substantially horizontal transverse axis, and a  
 15 seat in said casing for said door preventing movement thereof outwardly from said backwall beyond its normal closed position.

10. In combination, a locomotive having a cab and a cab deck, a fire-box having a wall with  
 20 a firing opening therein above the level of the deck, a fuel riser casing mounted against said wall and surrounding said firing opening, means for advancing fuel through said casing, a distributor plate extending from said casing forwardly in the  
 25 lower portion of said firing opening, said casing forming a seal against exposure of said firing opening to the cab space, said casing having a rear wall with an aperture therein approximately the size of said firing opening permitting access  
 30 to the firebox to be gained therethrough and permitting manual delivery of fuel therethrough, a removable cover forming a closure for said aperture, a fire door pivoted in said casing for movement over said plate fore and aft with respect to  
 35 said firebox, a seat in said casing above said plate forming a stop for said fire door against movement outwardly from the firebox, and means arranged with said casing for discharging a blast of pressure fluid across said plate at a point below the  
 40 bottom of said fire door when in closed position.

11. In combination with a firebox having a wall with an opening therein, a stoker riser conduit mounted against said wall, said conduit terminating in an open mouth portion communicating  
 45 with said firing opening, said conduit having a removable wall section opposite its open mouth portion arranged to permit delivery of fuel therethrough into said opening, and a door movably mounted in said mouth portion forming a movable  
 50 closure between said opening and said mouth portion.

12. In combination with a firebox having a backwall with a firing opening therein, a stoker riser conduit terminating in an open mouth  
 55 portion directed horizontally and communicating with said firing opening, said conduit having a removable wall section opposite its open mouth portion and said firing opening, a door pivoted in said mouth portion forming a closure between  
 60 said firing opening and said mouth portion and means operable by a pressure fluid for opening said door.

13. In combination with a firebox having a backwall with a firing opening therein, a stoker riser conduit mounted against said backwall, said conduit terminating in an open mouth portion directed horizontally and surrounding said firing  
 65 opening, said conduit having a removable wall section opposite its open mouth portion and said firing opening, a door pivoted in said mouth portion adjacent the upper portion of said firing opening and intermediate said firing opening and  
 70 said removable wall portion and means responsive to a pressure fluid for swinging said fire door

about its pivot fore and aft with respect to said firebox.

14. In combination with a firebox having a backwall with a firing opening therein, a stoker riser conduit terminating in an open mouth portion directed horizontally and communicating  
 5 with said firing opening, fuel projecting means adjacent said opening, said conduit having a removable wall section opposite its open mouth portion and said firing opening and a door pivoted  
 10 in said mouth portion movable in said opening fore and aft with respect to the firebox forming a closure between said firing opening and said mouth portion, said door when open permitting unrestricted passage of fuel through said conduit into the zone of action of said projecting  
 15 means.

15. In combination with a firebox having a backwall with a firing opening therein, a stoker riser conduit mounted against the backwall, said  
 20 conduit terminating in an open mouth portion directed horizontally and communicating with said firing opening, said conduit having a rear wall with an opening therein opposite its open mouth portion and said firing opening, a removable  
 25 closure for said opening and a pivoted door mounted in said mouth portion movable fore and aft with respect to the firebox forming a closure for the opening between said firing opening and the riser conduit mouth portion.

16. In combination with a firebox having a backwall with a firing opening therein, a stoker riser conduit mounted against the backwall, said conduit terminating in an open mouth portion directed horizontally and communicating with  
 35 said firing opening, said conduit having a rear wall with an opening therein opposite its open mouth portion and said firing opening, a removable closure for said opening, a cover for the opening in said rear wall hinged to said conduit and movable laterally with respect thereto, a  
 40 fire door pivoted in said mouth portion between said cover and said firing opening and means responsive to a pressure fluid for swinging said fire door about its pivot fore and aft with respect to said firebox.

17. In combination with a firebox having a wall with a firing opening therein, a stoker riser conduit mounted against said wall, said conduit terminating in an open mouth portion directed  
 50 horizontally and communicating with said firing opening, said conduit having a removable wall section opposite its open mouth portion and said firing opening providing access to said opening for manual firing, a fire door pivoted in said  
 55 mouth portion to swing fore and aft in said opening, means holding said door in its open position during delivery of fuel into said firebox through said riser conduit and means responsive to a pressure fluid for opening said door during  
 60 manual feeding of fuel through the opening formed by removing said wall section.

18. In combination with a firebox having a backwall with an elliptical firing opening therein, a stoker riser conduit terminating in an open mouth portion communicating with said firing  
 65 opening, said conduit having a removable wall section opposite its open mouth portion and said firing opening, a door pivoted in said mouth portion movable in said opening fore and aft with respect to the firebox arranged to provide a  
 70 closure between said firing opening and said mouth portion, said door when open being disposed horizontally adjacent the upper marginal edge of said firing opening, the surface of said



door adjacent the upper marginal edge of the firing opening being curved concentric therewith, said door when open permitting unrestricted passage of fuel through said conduit and through the opening formed by removing said removable wall section.

19. In combination with a firebox having a backwall with an elliptical firing opening therein, a stoker riser conduit terminating in an open mouth portion communicating with said firing opening, said conduit having a removable wall section opposite its open mouth portion and said firing opening, and a door pivoted in said mouth portion movable in said opening fore and aft with respect to the firebox arranged to provide a closure between said firing opening and said mouth portion, said door when open being disposed horizontally adjacent the upper marginal edge of said firing opening, the surface of said door adjacent the upper marginal edge of the firing opening being curved concentric therewith, said door when open permitting unrestricted passage of fuel through said conduit and through the opening formed by removing said removable wall section.

20. In combination with a firebox having a backwall with a firing opening therein, a stoker riser conduit having a mouth portion surrounding said opening, a distributing means at the mouth portion of the conduit disposed in the lower portion of said firing opening, means for advancing fuel through said conduit onto the

distributing means, the rearwall of said conduit having a removable section opposite said firing opening, a firedoor within said conduit mouth portion mounted to swing to and from said firing opening on a substantially horizontal transverse axis, said door when closed forming a closure between said firing opening and said stoker and when open permitting unrestricted passage of fuel through said conduit and said firing opening.

21. In combination with a firebox having a backwall with a firing opening therein, a stoker riser conduit having an open mouth portion communicating with said firing opening, said conduit having a removable wall section opposite its open mouth portion through which fuel is delivered into the firebox through said firing opening, a distributor plate extending from said mouth portion forwardly in the lower portion of said firing opening, a firedoor pivoted in said mouth portion for movement over said plate fore and aft with respect to said firebox, a seat in said conduit above said plate forming a stop for said firedoor against movement outwardly from the firebox, means arranged with said conduit for discharging a blast of pressure fluid across said plate at a point below the bottom of said door when closed, said firedoor forming a movable closure between said firing opening and said mouth portion, and means responsive to a pressure fluid for opening said firedoor.

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