No. 676,868. Patented June 25, 1901.

S. T. BLEYER.

FURNACE.

(Application filed Oct. 31, 1900.)

(No Model.) 4 Sheets—Sheet 1.

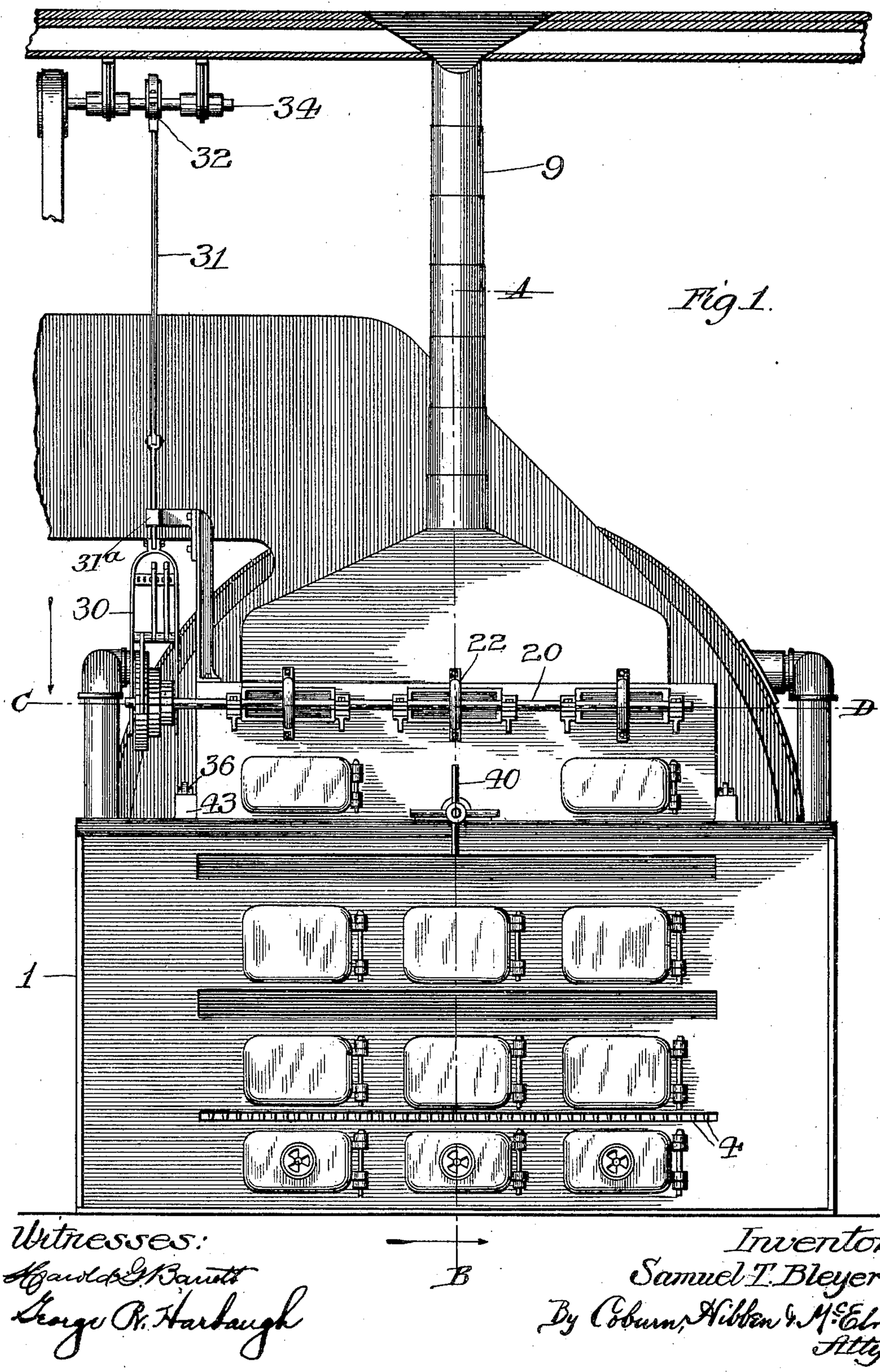

Fig. 1.

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4 Sheets—Sheet 2.

Fig. 2.

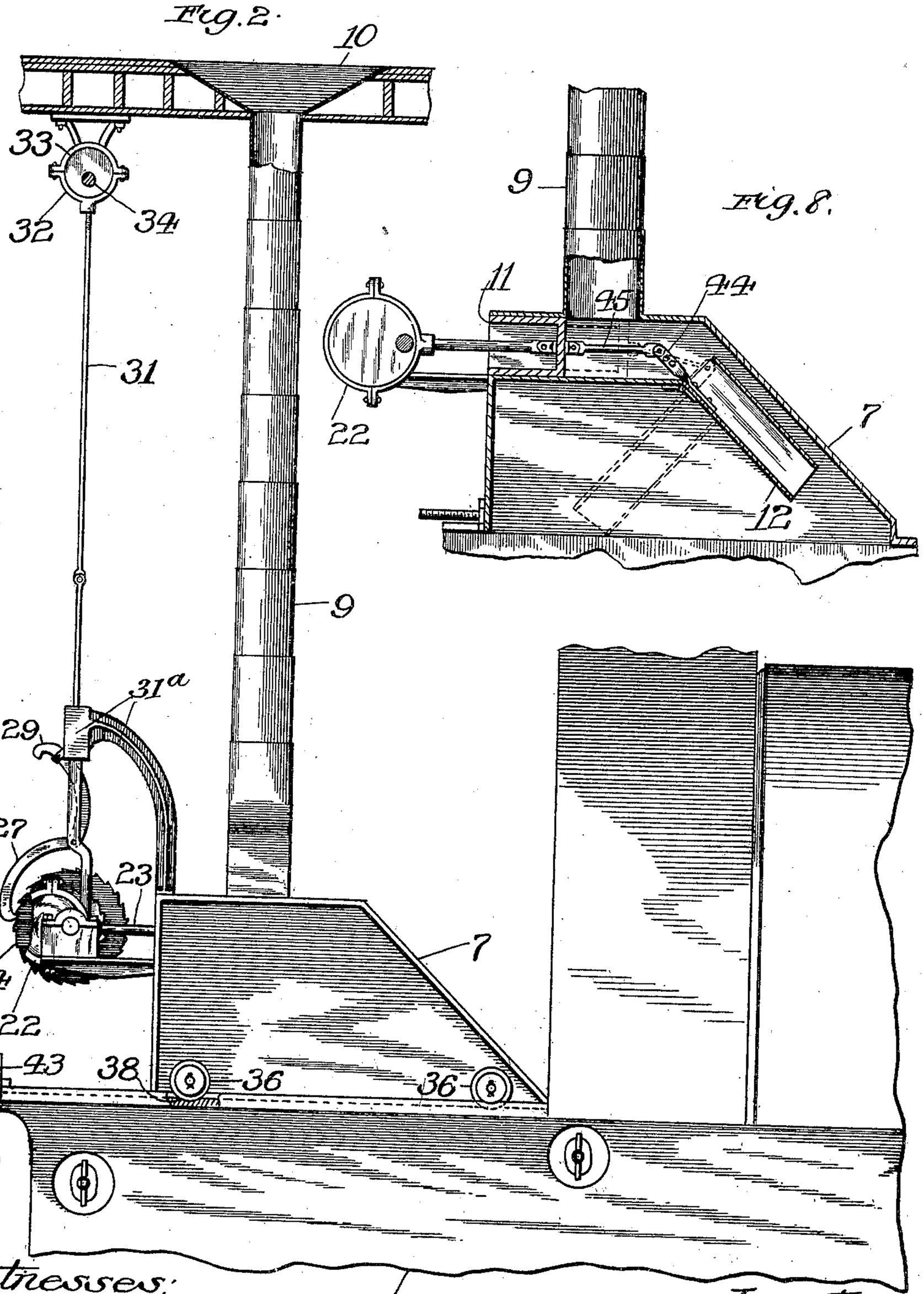

Fig. 8.

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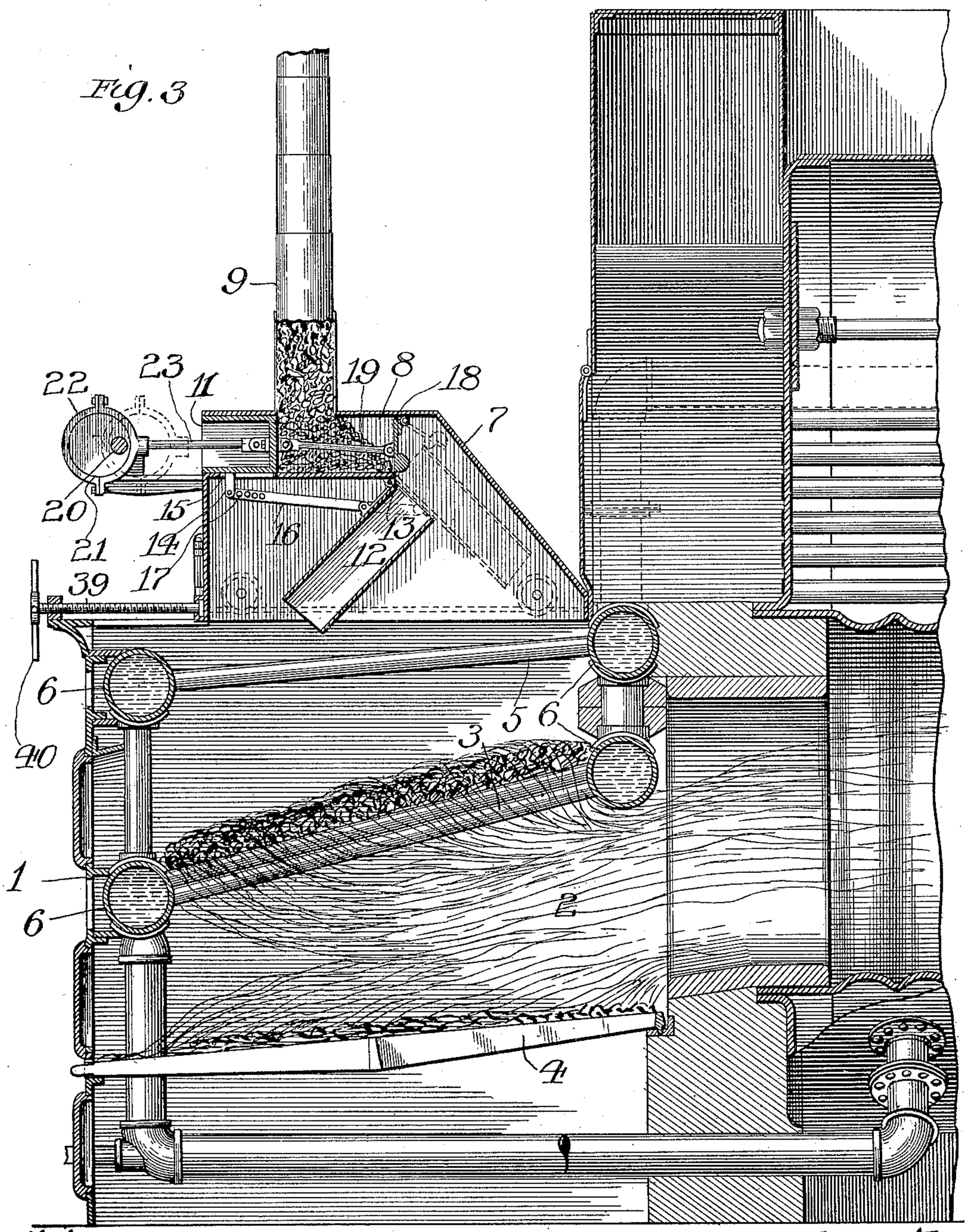
(No Model.) 4 Sheets—Sheet 3.

Fig. 3



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(No Model.) 4 Sheets—Sheet 4.

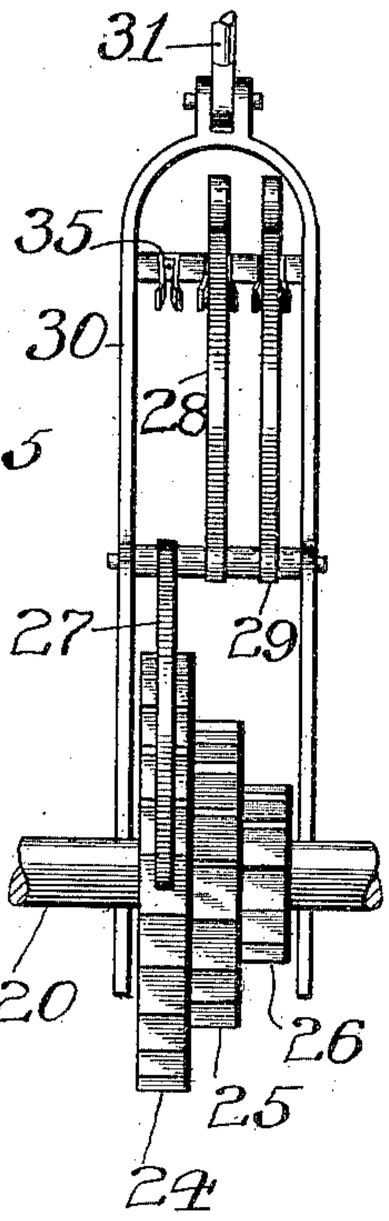


Fig. 5

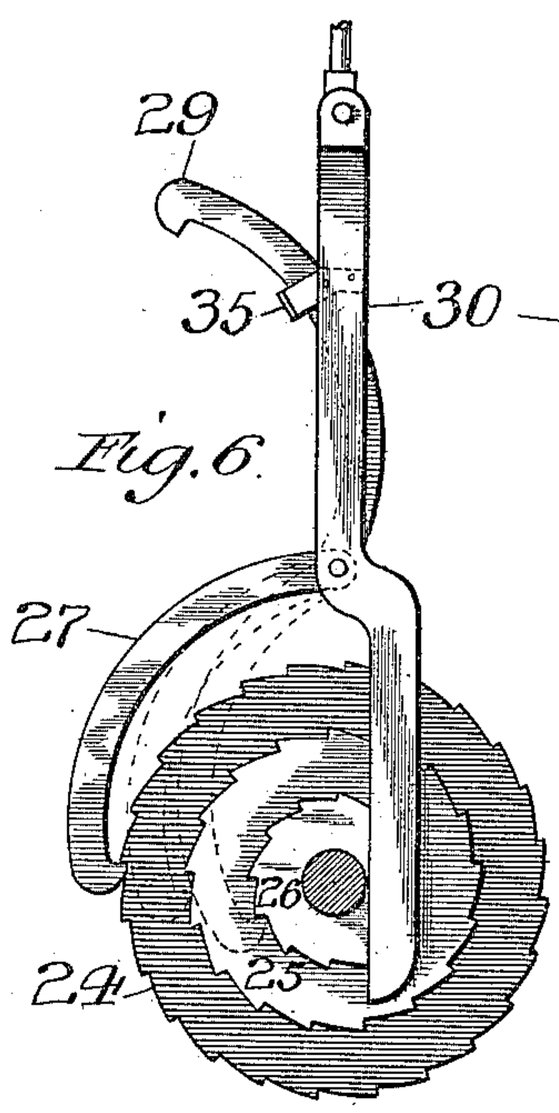


Fig. 6.

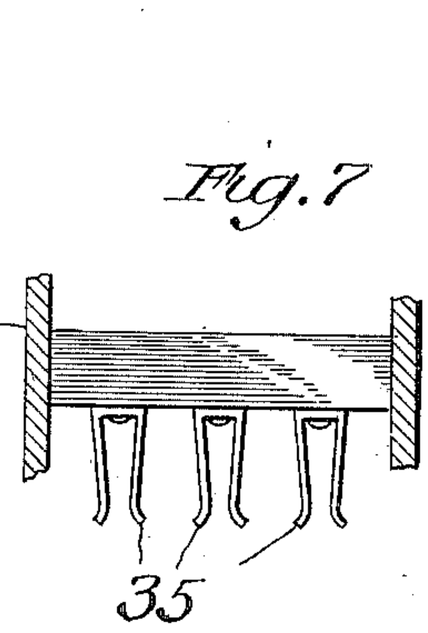
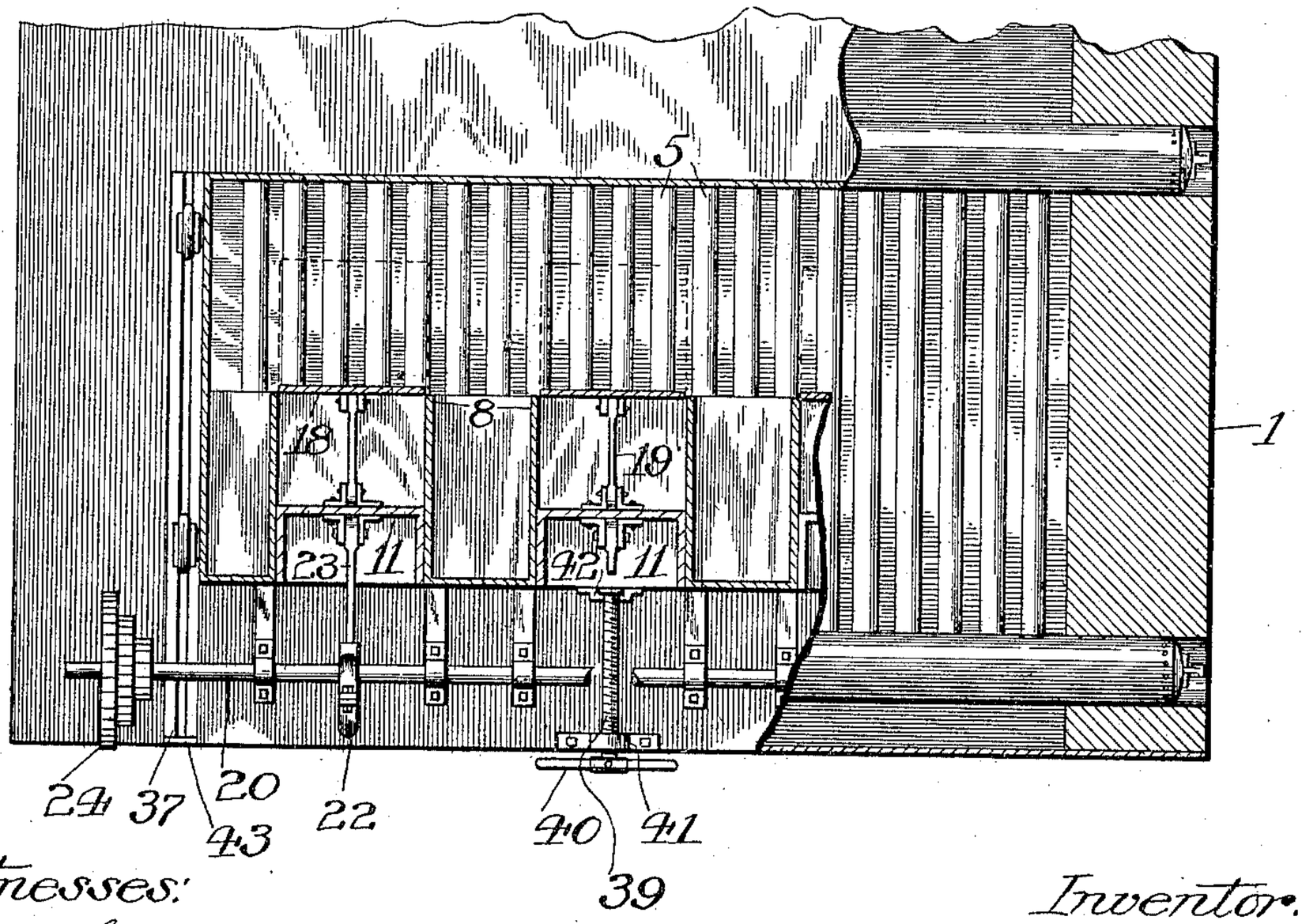


Fig. 7

Fig. 4



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UNITED STATES PATENT OFFICE.

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FURNACE.

SPECIFICATION forming part of Letters Patent No. 676,868, dated June 25, 1901.

Application filed October 31, 1900. Serial No. 35,032. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL T. BLEYER, a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Furnaces, of which the following is a specification.

My invention has relation to furnaces; and its object is to provide simple, efficient, and reliable means for feeding and distributing fuel in a furnace, the same consisting in general terms of a movable box or chute arranged within the furnace and adapted to properly feed and distribute the fuel on the fire.

In the drawings, Figure 1 is a front elevation of a furnace embodying my invention; Fig. 2, a side elevation of the upper portion thereof; Fig. 3, a section on line A B of Fig. 1; Fig. 4, a sectional plan on line C D of Fig. 1; Figs. 5, 6, and 7, detail views of a shaft-driving device; and Fig. 8, a section of a modified form of construction.

While for the purposes of a clear and exact disclosure of my invention I have chosen to illustrate and describe the same in connection with the well-known Hawley downdraft-furnace, to which it is admirably adapted, yet it is to be understood that such invention is applicable to other types of furnaces, and consequently that my invention is not limited to its connection to or association with a Hawley furnace.

The furnace selected for illustration has a wide fire-box, in which case I prefer to employ a series of the feeding devices about to be described, although by increasing the size of these devices a less number or even a single feeding device would serve the entire furnace. If a series of such feeding devices are preferred, their number will depend upon the width of the fire-box. The three feeding devices shown in the drawings are similar in construction and operation, and therefore a description of one of them will suffice for all, the corresponding parts being referred to by the same reference characters.

The Hawley furnace 1 shown in the drawings has a fire-box 2, in which is arranged the firing-grate 3, which preferably is a water-tube grate, below which is arranged the lower grate 4. Above the firing-grate is a water-arch 5, which communicates with the firing-grate through the headers 6.

The furnace has a top opening, over which fits a casing 7, in whose upper portion is arranged a fuel chamber or tube 8, having a top opening communicating with a coal-chute 9. This chute may be flexible, if desired, and communicate with a hopper 10 overhead at any desired elevation; but obviously any suitable hopper may empty directly into the chamber. Obviously the fuel-chamber may be of any desired shape and dimensions. A piston or plunger 11 travels in the chamber 8 for the purpose of operating a coal feeding and distributing device, which is here shown as a box or chute 12. This coal distributer or box is preferably substantially rectangular and open at its ends and is pivoted at its upper end to lugs 13 on the chamber. A depending arm or pin 14 is arranged on the piston and is formed separate from or integral with the piston, as may be desired. This pin passes through a longitudinal slot 15 in the chamber. A link or pitman 16 is pivotally connected at its ends to respectively this pin and to the box. In order to vary the throw or movement of the box, this pitman may be provided with a series of holes 17, to the desired one of which the pin 14 is connected. A suitable door 18 is pivoted at its upper end in the forward part of the chamber and, as shown, it is operatively connected to the piston by means of a link or pitman 19. It is evident, however, that this pitman may be dispensed with and the door caused to close entirely by gravity and be opened by the pressure of the coal, as hereinafter described. To reciprocate the piston, any suitable mechanism may be adopted. As advantageous for this purpose I have used the following mechanism: Running in front of the pistons is a shaft 20, on which is mounted an eccentric 21, one for each piston. The eccentric-strap 22 has a pivotal connection 23 with the piston. The shaft may be operated by any suitable power and in any suitable manner. As an efficient arrangement I have adopted the following: On the shaft 20 are mounted the ratchet-wheels 24, 25, and 26 of different diameters and having their respective drag-pawls 27, 28, and 29. These are pivoted at their upper ends to a frame or support 30 at the lower end of the depending vertical shaft 31, which is guided by the bracket 31^a and to whose upper end

is connected an eccentric-strap 32. This strap fits upon an eccentric 33, mounted on a shaft 34, run by any suitable power or manner. As shown, this shaft may thus be arranged overhead above the furnace and may be a part of or connected to the shafting of a shop in which the furnace may be located.

The vertical shaft 31 is reciprocated by the rotation of shaft 34, and the engagement of the pawls and the ratchet causes a rotation of the operating-shaft 20 at different speeds according to whichever pawl is in operative engagement. To hold the pawls out of engagement, they are turned upward and caught in the spring-clips 35 arranged in the frame 30. When a slow speed of the shaft 20 and a consequent slow feed of coal is desired, the pawl 27 is let down in engagement with its ratchet-wheel 24. As the pawl is lowered by the shaft it slips over the ratchet-teeth and on the upward move of the shaft it engages a tooth and rotates the wheel a partial turn, which motion is communicated to the coal feeding and distributing mechanism. When a faster feed is desired, the pawl 28 is let down in engagement with its ratchet-wheel 25, whereupon the shaft 31 imparts a faster motion to the coal-feeding mechanism. The fastest speed is obtained by engagement of the pawl 29 with the smallest ratchet-wheel 26. When this pawl 29 is in engagement, it is immaterial whether the other two pawls be up or down.

In order to provide for convenient access to the boiler for any purpose through the usual front doors, I prefer to so mount the casing 7 and its contained feeding mechanism that the same can be readily shifted forward on the top of the furnace. Various mechanical means to this end may be devised, and as a suitable construction the following may be used: Pairs of wheels 36 are journaled in the ends of the casing 7 and run in a track 37, extending from near the front of the furnace toward the back. This track has depressions or sockets 38, in which the wheels rest when the casing is in proper working position. At this time it is necessary that the casing should fit tightly on the top of the furnace; hence the use of sockets to receive the wheels, and thus lower the casing onto the furnace, these sockets also serving to locate the casing in proper position. The same result can be accomplished in other obvious ways.

As a desirable means for reciprocating the casing forward and backward I have shown a screw 39, operated by a hand-wheel or levers 40. This screw is received by a screw-threaded projection 41 on the boiler front or cornice and is swiveled at one end in a boss 42 in the front of the casing 7. By turning the hand-wheel 40 in one direction the casing is drawn forward, and by turning the same in the opposite direction the casing is forced backward. The forward movement may be limited by the projection 43 in front of the tracks, which projection may be an upward extension of the cornice or be a specially-provided stop. Upon its first forward movement the wheels are raised out of their sockets onto the track proper, thereby clearing the casing from the furnace. If it is desired to use a coal-pipe communicating with an overhead hopper, such pipe should be made flexible in order that the feeding device may be shifted, as just described, without disconnecting such pipe.

The feeding devices being constructed as hereinbefore set forth operate as follows: The coal in the supply-pipe 9 always keeps the chamber filled with coal in front of the piston, as indicated in Fig. 3, at which time the distributer or box 12 is in the position shown in full lines in that figure. When the eccentric reciprocates the piston inwardly, the coal-supply is practically cut off by the piston and the coal in front of the piston is forced forward and expelled from the chamber into the box which receives the coal and conducts it downward into the furnace. By reason of the connection between the box and piston their movements are synchronous, the movement of the latter swinging the lower end of the box toward the back end of the furnace at the same time that coal is being delivered to it, so that the coal is evenly distributed upon the firing-grate from front to rear thereof. The coal drops upon and through the series of tubes in the water-arch, which thus assists in the effectual distribution of the coal. The inward movement of the piston causes the opening of the door 18 by reason of its connection therewith; but it is evident that the pressure of the coal itself might be sufficient for the purpose, in which latter case the door would swing closed by gravity after the coal has been expelled from the chamber. Consequently the device would be operative either with or without the pitman 19, and either construction is within the scope of my invention. The object of the door is to absolutely avoid any possibility of the gases passing through the coal in the chamber or starting combustion there in case the feeding mechanism was not operated continuously, but at intervals only.

It is preferred, but not essential, that the piston at its forward limit of stroke should not completely close off the connection with the supply, leaving a slight opening, as shown in Fig. 8 of the drawings. Any large pieces of coal will thus not be liable to be caught and cause injury to the parts. On the return stroke of the piston or plunger the box will be restored to the position shown in full lines in Fig. 3 and the chamber in front of the piston will again be filled with coal from the supply. The speed of the coal-feed may be varied by putting the proper pawl in engagement with its wheel and the feed may obviously be either continuous or intermittent, as desired.

When a plurality of the feeding devices is

employed, they may be caused to feed simultaneously, or by shifting the position of the eccentrics they may feed consecutively.

In Fig. 8 is shown a modified form of construction of the coal feeding and distributing mechanism. In this form the coal distributer or box is pivoted as before, but provided with a projecting operating-arm 44, connected to the piston by a link or pitman 45. The arm 44 has a series of holes, whereby the throw or swing of the box may be varied as desired. When the piston is on its outer stroke, as shown in Fig. 8, the coal-box is in a position the reverse of that of the other form, inasmuch as the operating connection here is above the pivotal point instead of below. When the piston moves toward the back of the furnace, the coal will be expelled from the chamber and fall into the box, which will move toward the front of the furnace to the position shown in dotted lines.

It will be evident that by changes in details of mechanical construction my invention may be applied to other furnaces and associated with other kinds or types of boilers without departing from the spirit or principle thereof.

I claim—

1. In a furnace, the combination with a downdraft-furnace having the usual firing-grate, of automatic means arranged above such grate and in a plane passing transversely and centrally through the grate for simultaneously dropping and distributing the fuel upon the grate.

2. In a furnace, the combination with the furnace proper, and a source of fuel, of a pivoted chute arranged in communication with the furnace to swing in a substantially vertical plane passing substantially through the center of the furnace proper and adapted to distribute the fuel simultaneously with its reception from said supply, and means for simultaneously swinging said chute and supplying it with fuel.

3. In combination with a furnace, a fuel-feeder therefor comprising a chute pivoted in the furnace, a chamber also arranged therein and communicating with a source of fuel, the chute receiving fuel from the chamber, a piston for forcing the fuel from the chamber and means for moving the chute simultaneously with the piston.

4. In combination with a furnace, a fuel-feeder therefor comprising a pivoted fuel-chute, a chamber communicating with a source of fuel, a piston therein for forcing the fuel from the chamber into said chute and a connection between the piston and such chute for moving the latter simultaneously with the piston.

5. In combination with a furnace, a fuel-feeding device therefor comprising a chamber communicating with a fuel-supply, a piston therein and means operating synchronously with the piston for distributing within the furnace the fuel expelled from the chamber by the piston.

6. The combination with a downdraft-furnace, of a fuel-feeding device therefor comprising a fuel-chamber arranged in communication with the furnace, and also in communication with a fuel-supply, a piston in said chamber adapted to expel fuel from the chamber and means coöperating with said fuel-chamber for distributing over the grate-surface the fuel so expelled.

7. In combination with a furnace, a chamber arranged therein and open at its forward end, such chamber communicating with a supply of coal, a piston in the chamber, a coal-distributer pivoted in front of such open end of the chamber to receive and distribute coal expelled from the chamber by the piston and means for operating such distributer.

8. In combination with a furnace, a chamber arranged in communication therewith and open at its forward end, such chamber communicating with a supply of coal, a piston in the chamber, a coal-distributer pivoted in front of such open end of the chamber and receiving coal expelled therefrom, and a pitman connection between such arm and the piston whereby the movements of the distributer are synchronous with those of the piston.

9. In combination with a furnace, a coal feeder and distributer therefor comprising a chamber communicating with a coal-supply and open at its forward end, a piston in the chamber, a chute open at its ends to receive coal from the chamber and pivoted at its upper end in front of the chamber and means for swinging such chute as the coal is delivered to it.

10. In combination with a furnace, a coal feeding and distributing device therefor comprising a chamber communicating with a coal-supply and open at its forward end, a piston therein, a chute pivoted at its upper end to such open end of the chamber and an adjustable connection between the piston and such chute.

11. In combination with a furnace, a coal feeder and distributer therefor comprising a chamber communicating with a coal-supply and open at its forward end, such chamber having a longitudinal slot, a piston therein, a chute pivoted to the chamber to receive coal therefrom, an arm on the piston and passing through such slot and a pitman connection between such arm and said chute.

12. In combination with a furnace having an extension above its top, a coal feeder and distributer arranged in such extension and comprising a chamber, a piston therein, a coal-distributer pivoted in front of the chamber to receive coal therefrom, means for moving the distributer synchronously with the piston, and an eccentric for reciprocating the piston.

13. The combination of a furnace having a casing 7 communicating therewith, a cham-

ber 8 therein, a supply 9 communicating with the chamber, a piston 11, a chute 12 pivoted to the chamber, an arm or pin 14 on the piston and an adjustable pitman connection 16 between such arm and the chute and means for reciprocating the piston.

14. The combination with a furnace having a firing-grate and a series of tubes forming a water-arch thereabove, of a coal feeder and distributer arranged above the arch and comprising a chamber into which coal is fed, a piston for forcing the coal from the chamber and a coal-distributer swinging above the arch and receiving the coal from the cylinder and distributing it on top of the arch from front to rear through which it falls upon the firing-grate.

15. In combination with a furnace, a fuel feeder and distributer arranged above the furnace-grates but outside the fire and comprising a chamber having an openable end and communicating with a fuel-supply, a piston for forcing the fuel from the openable end of the chamber, and a door upon such end of the chamber for normally closing the same.

16. In combination with a furnace, a fuel feeder and distributer arranged above but outside the fire and comprising a chamber having a normally closed end and communicating with a fuel-supply, a piston for forcing the fuel from such end of the chamber, and a door hinged at its top at such chamber end to close the same.

17. In combination with a furnace, a fuel feeder and distributer arranged above but outside the fire and comprising a chamber having a normally closed end and communicating with a fuel-supply, a piston for forcing the fuel from such end of the chamber, a door hinged at its top at such chamber end to close the same, and an operative connection between such door and the piston.

18. In a furnace, the combination with the furnace, of a fuel-distributing device arranged above but outside the fire and comprising a pivoted chute, a chamber arranged adjacent thereto and communicating with a source of fuel, a piston in the chamber for expelling the fuel therefrom into the chute, mechanism for swinging such chute and means for varying the speed of such mechanism.

19. In a furnace, the combination, with a furnace proper, of a fuel tube or chamber having a top opening, a fuel-supply in communication with such opening, and a piston operating in such chamber, said opening being so located as to be partially but not entirely closed by such piston.

20. The combination with a furnace having a firing-grate and a series of tubes forming a water-arch thereabove, of automatic means comprising a pivoted fuel-chute arranged above such arch for feeding fuel through such arch and onto the firing-grate.

21. The combination, with a furnace, of a fuel-feeding device therefor comprising a stationary chamber communicating with a fuel-supply, a piston therein adapted, when reciprocated, to expel fuel from the chamber and a pivoted chute movable in a substantially vertical plane and receiving and distributing the fuel so expelled.

22. In a furnace, the combination, with a furnace of the downdraft type having a stationary grate, of a casing arranged in connection with such furnace and communicating with a fuel-supply from above and with the furnace from below, and a device arranged in such casing for feeding and distributing the fuel in the furnace over the whole grate-surface, such device being arranged above but outside the fire.

23. In a furnace, the combination, with a furnace of the downdraft type having a top opening, of a casing arranged on top of the furnace to normally close such opening and communicating with a fuel-supply from above and with the furnace from below, such casing being movable on the furnace, and a fuel feeder and distributer arranged in such casing.

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