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E. B. PARKHURST.

UPRIGHT BOILER FURNACE.

No. 573,912. Patented Dec. 29, 1896.

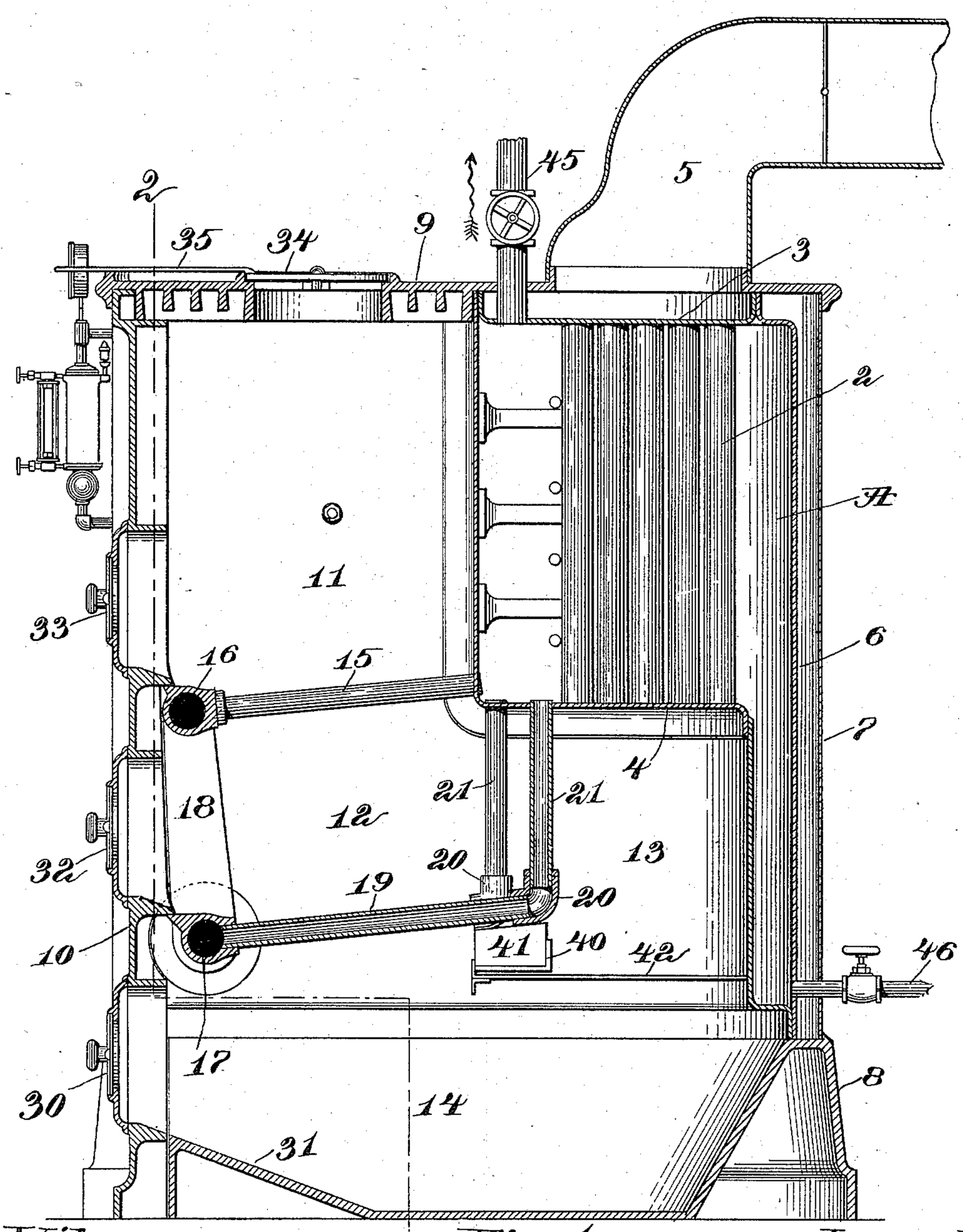

Fig: 1.

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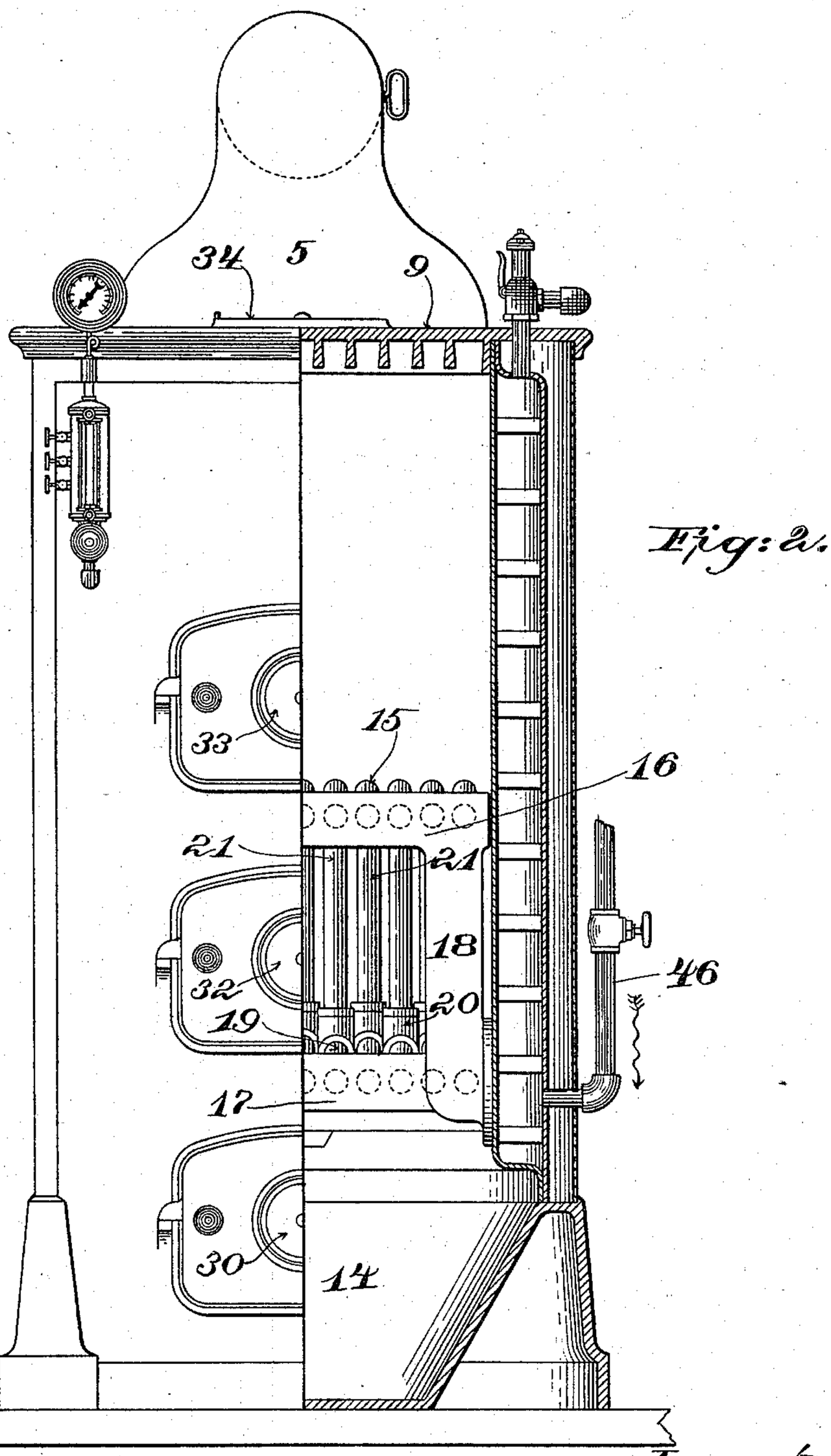

Fig: 2.

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(No Model.) 5 Sheets—Sheet 3.

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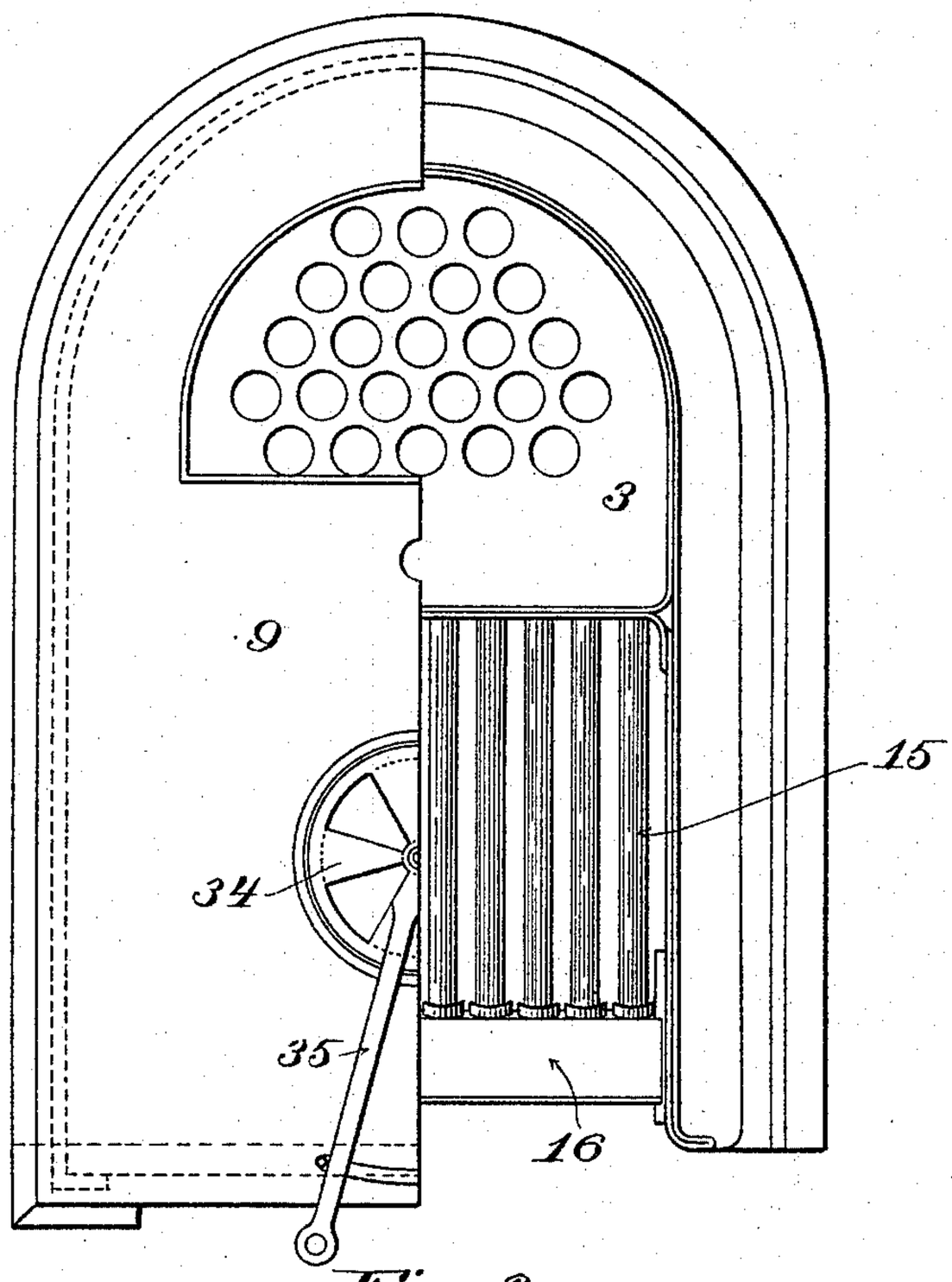

Fig: 3.

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(No Model.) 5 Sheets—Sheet 4.

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UPRIGHT BOILER FURNACE.

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Fig. 5.

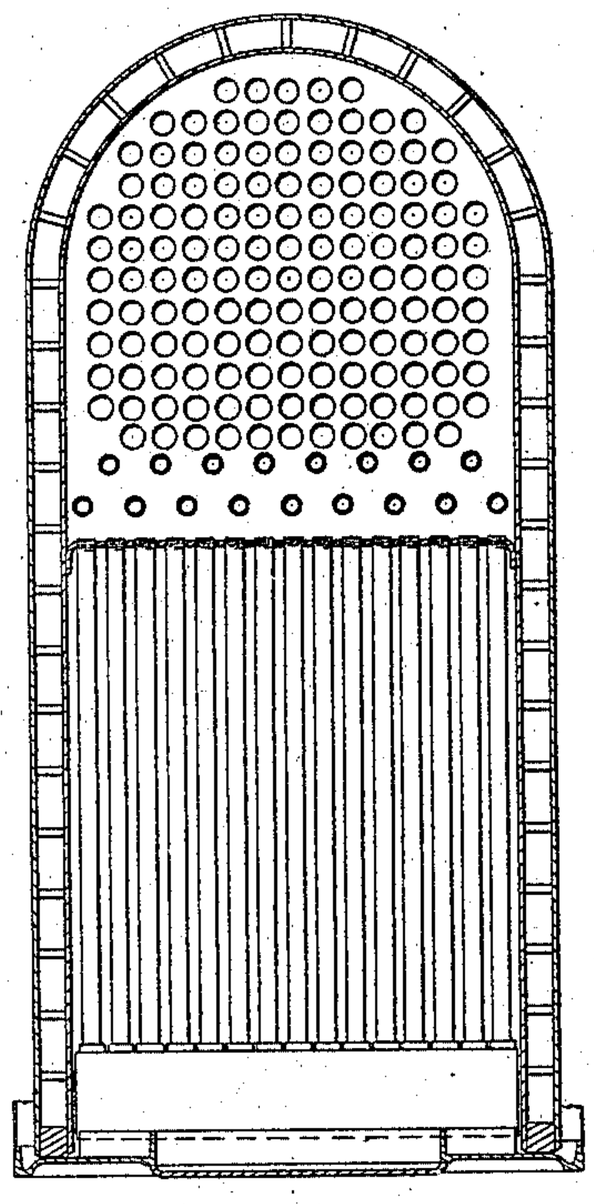
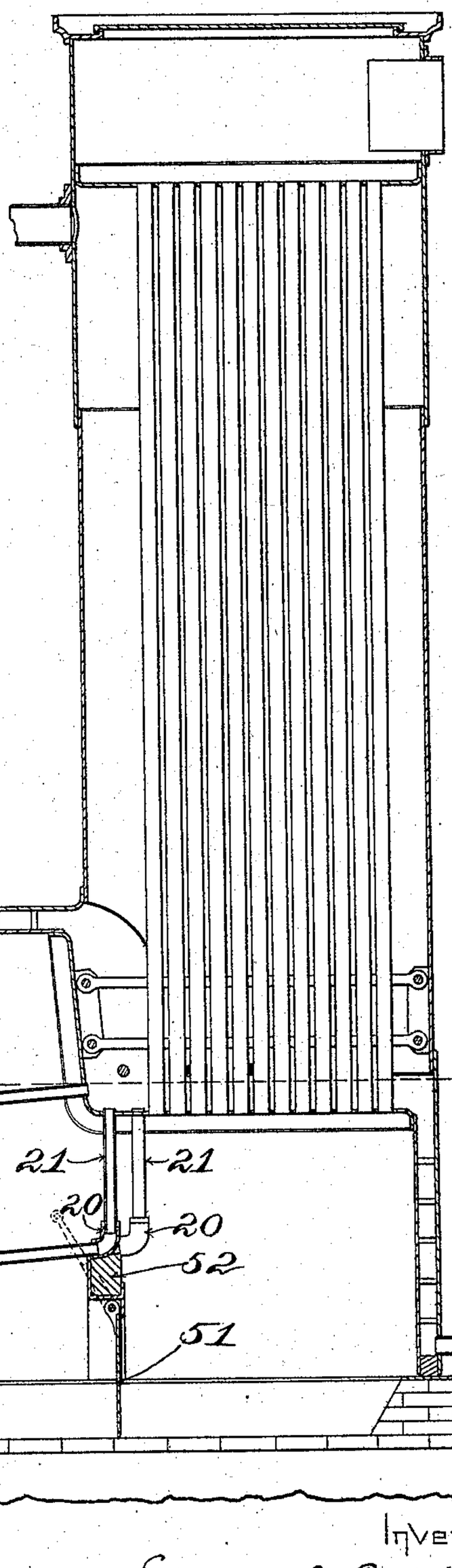


Fig. 4.



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(No Model.) 5 Sheets—Sheet 5.

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UPRIGHT BOILER FURNACE.

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Fig. 7.

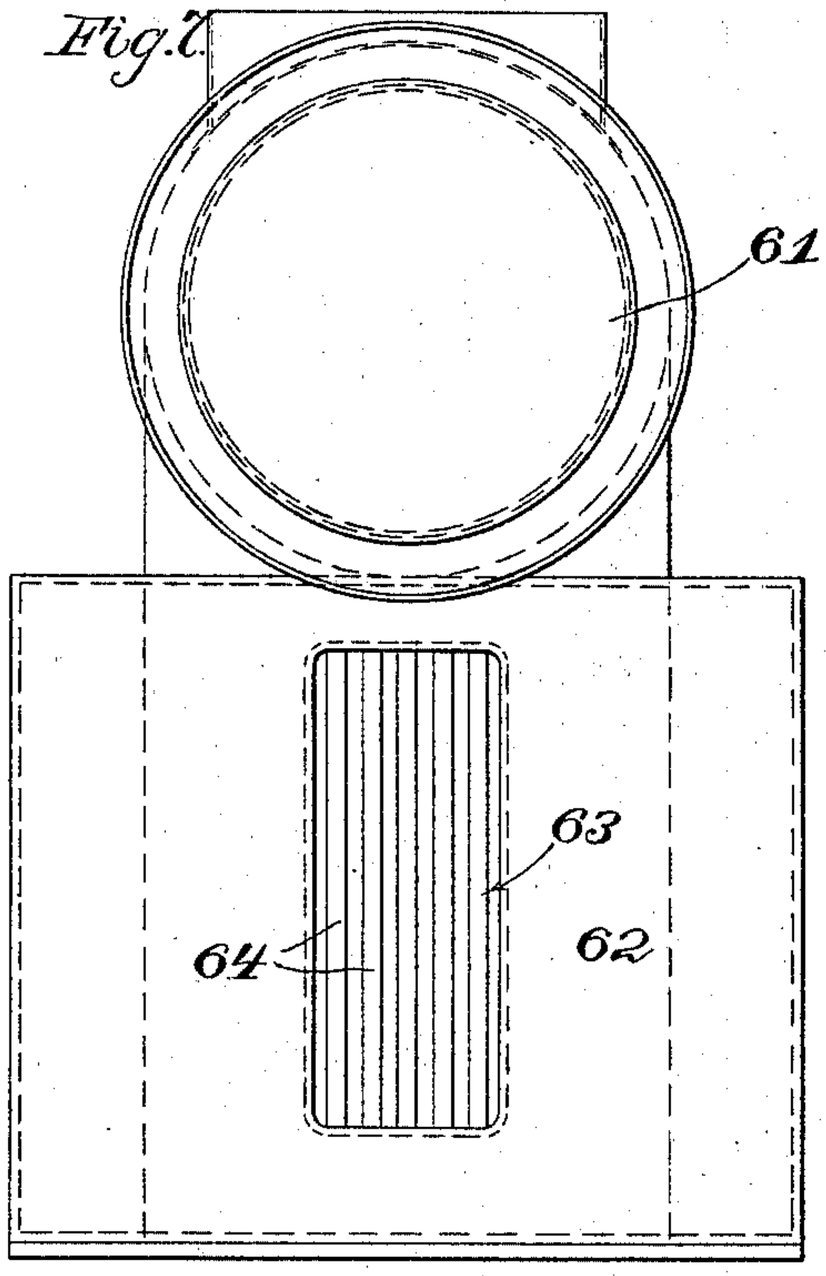
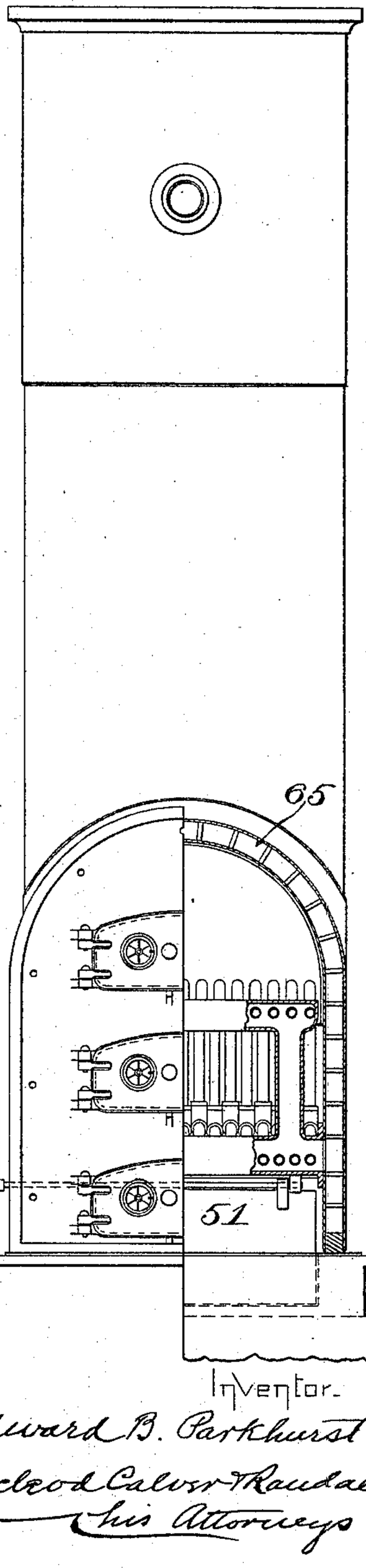


Fig. 6.



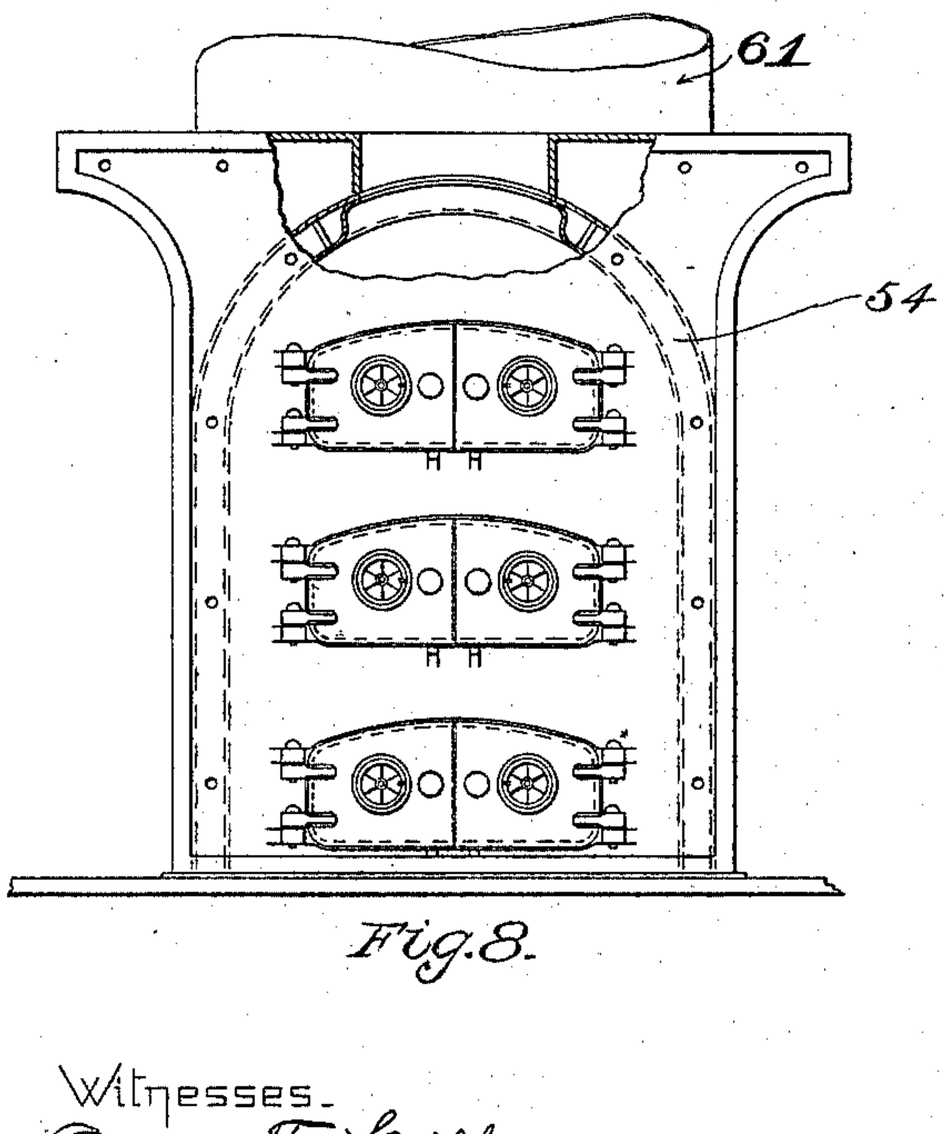


Fig. 8.

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UNITED STATES PATENT OFFICE.

EDWARD B. PARKHURST, OF WOBURN, MASSACHUSETTS.

UPRIGHT-BOILER FURNACE.

SPECIFICATION forming part of Letters Patent No. 573,912, dated December 29, 1896.

Application filed April 23, 1896. Serial No. 588,781. (No model.)

To all whom it may concern:

Be it known that I, EDWARD B. PARKHURST, a citizen of the United States, residing at Woburn, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Upright-Boiler Furnaces, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention has for its object to provide an upright boiler and furnace which shall be of high efficiency, safe, compact in construction, and relatively inexpensive.

The novel features of my invention are particularly pointed out and clearly defined in the claim at the end of this specification.

In the following description reference is made to the accompanying drawings, in which—

Figure 1 is a view in vertical central section of a boiler and furnace embodying my invention, some of the parts being shown in elevation. Fig. 2 is a front elevation thereof, one-half in section on line 2 2 of Fig. 1. Fig. 3 is a plan view thereof with one-half of the top plate removed. Figs. 4, 5, and 6 show my invention as embodied in a modified form of furnace. Figs. 7 and 8 show another modification.

For many purposes, as, for example, in heating buildings and the like, a relatively inexpensive, safe, and compact boiler-furnaec, which may be either portable or may be set in a brick setting or the like, is desired. I have shown my present invention in the accompanying drawings as embodied in such a boiler-furnace.

At A is shown the boiler, which is formed with an upper central portion, (shown more clearly in Fig. 1,) it being provided also with water-walls or side portions projecting downwardly below the upper central portion above referred to, around the combustion-chamber 13, which is located beneath said central portion of the boiler, and also forwardly on opposite sides of the fuel-chambers 11 and 12. The flue-tubes are shown at 2. They extend, preferably, between the upper tube-sheet 3 and the lower tube-sheet 4. The flue or stack is shown at 5. The shell of the boiler is shown at 6, it being protected by an outer shell 7. The parts above mentioned rest on a base 8, which, in the case of a portable furnace, preferably is of cast metal. If a brick setting were employed, the base 8 might be dispensed with. A top plate, preferably of cast-iron, is shown at 9, and a front plate at 10. The furnace proper comprises an upper fuel-chamber 11, a lower fuel-chamber 12, and a combustion-chamber 13, and below the furnace, within the base 8, is the ash-pit 14. The grates employed are tubular water-grates. The upper grate comprises a series of tubular grate-bars 15, the rear ends of which enter the front side or shell of the main water-space of the boiler near the lower edge thereof, as will be clear from Fig. 1. These tubular grate-bars preferably are slightly inclined from the rear downwardly to the front, their forward ends entering the upper portion 16 of a water-box or manifold. The upper portion of said water-box or manifold is connected with the lower portion 17 thereof by vertical side connections 18, one of which is shown in Fig. 2, so that the parts 16, 17, and 18 constitute one manifold or water-box.

Below the upper grate-bars 15 and substantially parallel therewith I provide a lower grate composed of a series of tubular water-grate bars 19, the forward ends of which enter the lower portion 17 of the water-box or manifold. The rear ends of the lower grate-bars 19 are provided with elbows or bent connections 20, by means of which they are connected with the lower ends of the vertical connections 21. The upper ends of said vertical connections 21 enter the lower tube-sheet 4 near the front edge thereof. If the vertical connections 21 were all set in the same transverse vertical plane, there would not be sufficient space between them to permit the drafts from the upper and lower grates to pass. To avoid this difficulty, I make each alternate lower grate-bar somewhat longer than the others, so that the vertical connections 21 are set in two lines or planes, those in one line or plane being slightly behind those in the other line. By this arrangement sufficient space is obtained between connections 21 to permit of the drafts of the upper and lower grates to pass. The lower portion 17 of the water-box or manifold is connected at the ends thereof directly with the forwardly-projecting side water-walls of the boiler, as shown. The water

in the boiler is therefore allowed to circulate freely, the movement being from the lower portions of the forwardly-projecting side water-walls, where the water is coolest, into the manifold or water-box, part of the water passing thence through the lower grate-bars 19 and vertical connections 21 to the main water-space of the boiler. The other part of the water passes through the upper grate-bars 15 to the main water-space of the boiler. As the vertical connections 21 are subject to the fiercest heat of the fire, a very rapid circulation is insured. Instead of the elbows or bent connections 20 a manifold or water-box might be employed, into which the lower ends of the lower grate-tubes would enter. This manifold would, however, require to be of sufficient size to accommodate the staggered arrangement of the vertical connections 21. I prefer to use the bent connections or elbows, since sediment is less likely to accumulate therein than in a water-box, and for other reasons.

It will be noted that in the form shown, Figs. 1, 2, and 3, there is no crown-sheet having a water-space above it, and that the main water-space is entirely at the rear of the main fuel-chamber 11, and thus all danger of explosion resulting from the water rising in the boiler and suddenly overflowing a hot crown-sheet is obviated. The combustion-chamber 13 is immediately beneath the said main water-space, while the water-walls extend around the said combustion-chamber and laterally on opposite sides of both the fuel-chambers 11 and 12. Thus the highest possible efficiency in heating and steam-producing with a great economy of fuel are secured.

The ash-pit door is shown at 30, and the forward portion of the ash-pit floor is inclined, as shown at 31, to permit the easy withdrawal of the ashes. The door through which fuel is supplied to the lower grate is shown at 32, and the fuel-door of the upper grate at 33.

For the purpose of supplying air to the fire in the upper fuel-chamber 11 I provide a circular damper 34, which is provided with a handle 35, extending to the front of the furnace and by means of which the damper may be opened or closed. By locating this damper on the top plate, as shown, the damper in the fuel-door 33 may be closed and the supply of air which is required may be obtained through the said damper 34. In this way there is no opening in front of and in close proximity to the fire and the danger of hot coal getting out of the fuel-chamber 11 accidentally is reduced to a minimum. This is important, especially in the use of the furnace in private houses. As will be clear, the draft passes downwardly through the upper grate and rearwardly between the vertical connections 21 to the flue-tubes 2. The draft of the lower grate passes upwardly therethrough and rearwardly between the vertical connections 21 to the flue-tubes 2. To prevent the draft on the lower grate from passing rearwardly below and behind the said grate, I provide a supporting-piece 40, which extends across the furnace from side to side thereof and is rigidly secured in place. The supporting-piece 40 is of the cross-section shown in Fig. 1, and on the rear horizontal portion of this supporting-piece I place a series of bricks 41 or a mass of other suitable non-conducting material, which will serve to protect the supporting-piece from the direct heat of the fire. The bricks form a partition extending across the furnace and filling the space below the elbows 20 and the lower horizontal portion of the supporting-piece. Directly below the supporting-piece I provide a damper 42, of sheet-iron or the like, which extends from side to side of the furnace, and also rearwardly from the front of the supporting-piece 40 to the rear wall of the furnace—that is, to the front shell of the rear portion of the downwardly-projecting water-wall. The damper 42 is arranged to slide forwardly and rearwardly. By this arrangement the draft of the lower grate is prevented from passing below and behind the same and is compelled to pass upwardly through said grate and thence rearwardly between the vertical connections to the flue-tubes 2. By forming the damper 42 so that it may be slid forwardly any accumulation of ashes or the like which forms thereon may be easily removed, it being necessary only to draw the damper 42 forward by means of a poker, when the ashes thereon will be forced off and allowed to drop into the ash-pit.

The arrangement of this boiler is particularly advantageous for house-heating and the like in that the pipes which pass to the various portions of the building may be so connected with the boiler as to insure a very perfect circulation therethrough. The ends of the systems of pipes which would be employed in a building are indicated in the drawings. The end through which the steam passes out from the boiler (or water if the system of heating is one employing hot water) is shown at 45. This it will be observed is directly above the point at which the hottest water in the boiler is to be found. The return end of the system of pipes is shown at 46, and this enters the boiler directly opposite the point at which the coolest water passes into the manifold or water-box. As the water rushes into the manifold or water-box from the water-walls constantly when the boiler is in use, the circulation being necessarily very rapid, the movement of the water into the manifold or water-box and past the end of the return-pipe 46 serves to draw the water out of the return-pipe, as will be clear, and thus insures a comparatively rapid circulation through the system of pipes in the building.

In the modification shown in Figs. 4, 5, and 6, Fig. 4 is a vertical section, Fig. 5 is a horizontal section on the line 5 5 of Fig. 4, and Fig. 6 is a front elevation, one-half in section. In this modification the damper 51, which extends across the furnace from side to side be-

neath the partition-wall 52, is hinged instead of sliding, affording better facilities for access to the rear chamber.

In the modification shown in Figs. 7 and 8, Fig. 7 is a top plan and Fig. 8 is a front elevation. 61 represents the upright boiler, 62 the top plate of the furnace, and 63 the fuel-opening in the top plate, which is kept constantly open, no cover or door being required. 64 are the tubular grate-bars. In the modifications shown in Figs. 4 to 8 the water-walls 54 and 65, respectively, are carried over above the fuel-chamber.

What I claim is—

An upright boiler having the main water-space thereof entirely at the rear of the main fuel-chamber, and the combustion-chamber beneath the said water-space, and also having vertical water-walls extending down around the said combustion-chamber and forward on opposite sides of the fuel-chambers, an upper series of water-grate bars entering the front side or shell of the said main water-space near the lower edge of the said front side, a lower series of water-grate bars having their rear ends joined to vertical connections entering the lower tube-sheet, and a water-box or manifold having upper and lower portions which are connected with each other and also with the front ends of the water-grate bars of the two series, respectively, the said water-box or manifold also communicating with the water-walls, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

EDWARD B. PARKHURST.

Witnesses:
WM. A. MACLEOD,
ALICE H. MORRISON.