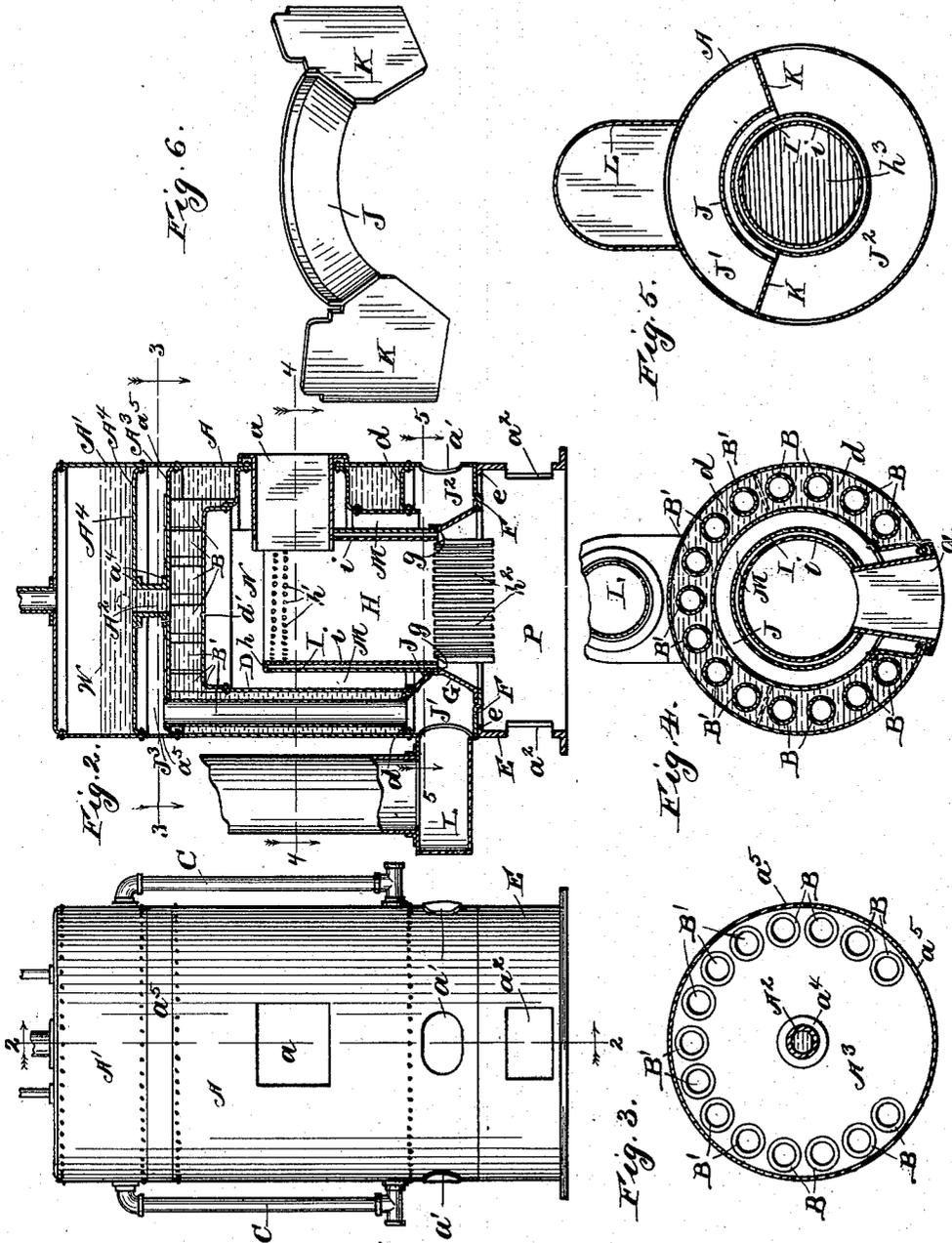


(No Model.)

D. F. MORGAN.
BOILER FOR HOT WATER OR STEAM.

No. 568,167.

Patented Sept. 22, 1896.



Witnesses:
R. J. Jaeger,
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Fig. 1.

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UNITED STATES PATENT OFFICE.

DOCTOR FRANKLIN MORGAN, OF CHICAGO, ILLINOIS.

BOILER FOR HOT WATER OR STEAM.

SPECIFICATION forming part of Letters Patent No. 568,167, dated September 22, 1896.

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To all whom it may concern:

Be it known that I, DOCTOR FRANKLIN MORGAN, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Boilers for Heating Water or Generating Steam, of which the following, when taken in connection with the drawings accompanying and forming a part hereof, is a full and complete description.

The object of my invention is to obtain a boiler for heating water or for generating steam in which the fire-box shall be so isolated from the water-surfaces that the combustion of fuel therein will not be retarded or prevented thereby, while at the same time the heat obtained by such combustion may be utilized for the heating of water, either to the boiling-point or beyond.

It is also the object of my invention to obtain a boiler of the kind named which shall be economical in construction and durable and whereof the parts requiring replacement can be readily removed and replaced by others.

Figure 1 of the drawings referred to is a front elevation of a boiler embodying my invention; Fig. 2, a vertical sectional view thereof on line 2 2 of Fig. 1, viewed in the direction indicated by the arrows; Figs. 3, 4, and 5, respectively, horizontal views on lines 3 3, 4 4, and 5 5, respectively, of Fig. 2, viewed in the direction indicated by the arrows; Fig. 6, a perspective view of a division-plate forming one of the elements of the stove embodying my invention, by means of which downward currents of products of combustion are deflected and made to ascend.

A letter of reference applied to a given part is used to designate such part throughout the several figures of the drawings wherever the same appears.

A A' is the outer shell or case of the boiler; *a*, the fuel-feeding door; *a'*, cleaning-doors, and *a*² the ash-pit door. A², Fig. 2, is a cylinder having flanges *a*⁴ *a*⁴ at the ends thereof. Cylinder A² rests on the top A³ of part A of shell A A' and is supported thereby, and the bottom A⁴ of part A' of the shell A A' rests upon and is supported by such cylinder A². Water in part A' of shell A A' extends through the cylinder A² into the part A of such shell

and around flues B B'. B B are flues through which the products of combustion extend upward, as will be hereinafter fully described, and B' B' are flues through which such products extend downward. C C are circulating-tubes connecting part A of shell A A' with part A' thereof.

D is a cylinder within part A of shell A A', having annular flange *d* at the bottom thereof and closed at the bottom thereof and closed at the top by the top *d'*. Cylinder D forms the inner wall of a water-leg of which annular flange *d* is the bottom, and through which water-leg and annular flange *d* the flues B B' extend. Annular flange *d* is secured to part A of shell A A'.

E is the base of the shell A A', and *e* is an annular flange on the upper edge thereof.

F is a ring resting on and supported by the annular flange *e*, and G is a casting resting on and supported by ring F.

H is the fire-pot of the boiler, having flange *h* at the upper end thereof, such flange resting on the upper edge of cylinder I, such cylinder resting on the casting G. Between the fire-pot H and the cylinder I there is the annular chamber *i*, and *h'* *h'* are apertures through the walls of the fire-pot H, through which apertures air extends from the annular chamber (or space) *i* into the products of combustion in the fire-pot as such products are about to leave such fire-pot. *h*² *h*² are grate-bars extending a short distance upward on the wall of the fire-pot H. The ordinary grate-bars *h*³ *h*³ extend across the bottom of the fire-pot.

J is a circular casting having ends K K integral therewith or secured thereto, as preferred. Such casting J extends from the top of the casting G upwardly and outwardly to contact with the cylinder D, and thereby chamber J' is formed, extending from the outlet L partially around part A of shell A A', as is shown in Figs. 1 and 5 of the drawings. Flues B' B' extend from the chamber J³ (formed by top A³ of part A, bottom A⁴ of part A', cylinder A², and wall *a*⁵ of the shell A A') downward to and into this chamber J'.

J² is an annular chamber around the lower end of the part A of shell A A' in front of the ends K K of casting J. The bottom of such chamber J² is formed by the ring F, the top

by the ring *d*, (or annular flange *d* to cylinder D,) through which flange the flues B B' extend, and by the casting G with ends K K and a portion of the part A of shell A'.

5 M is an annular space or chamber between the cylinders D and I, into which the products of combustion extend directly from the chamber or space N above the fire-pot II.

The operation of the boiler embodying my
10 invention is: The products of combustion of the fuel in the fire-box H extend upward therefrom into the space or chamber N, such products receiving, as they pass by the apertures *h' h'*, additional and heated air coming
15 through such apertures from the annular space *i*. From chamber N the products of combustion extend downward through the annular space M, combustion therein, as well as in chamber or space N, being obtained by
20 the addition of the heated air through apertures *h' h'*. The products of combustion in the annular space M extend downward into the annular space J², being prevented from passing into the chamber or space J' by casting J and ends K K thereof. From chamber
25 or space J² such products of combustion pass upward through the flues B into the chamber J³, and from thence downward through flues B' into the chamber J', and from thence to the smoke-escape L and to the chimney. The
30 shell or case A A' having water therein to about the water-line, (indicated in Fig. 2 by dotted line W,) such water extends downward through cylinder A² into the water-leg hereinbefore described and around the flues
35 B B', and circulation of such water is secured, as the same is heated, through the circulating-tubes C C.

It will be observed that in a boiler constructed as hereinbefore described no water
40 is in contact with the back of the fire-pot H, but, on the contrary, there is surrounding such fire-pot the annular space *i*, between the fire-pot and cylinder I, into which space air is
45 freely admitted from the ash-pit P, and also the space or annular chamber M, into which the heated products of combustion are delivered from space or chamber N. By this construction I am able to obtain very complete
50 combustion of the fuel in the fire-pot, and by the admission of the additional and heated air through apertures *h' h'* to the products of combustion about leaving such fire-pot I obtain still further increase in combustion. I find that without the apertures *h' h'*,
55 or even the annular space *i*, remarkably good results are obtained by me in this boiler, although I prefer to include both the space *i* and the apertures *h' h'* in a boiler completely
60 embodying my invention.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

65 1. A fire-pot having double walls, an annular space between such walls, an additional annular space between the fire-pot and the wall surrounding it, means for admitting air

to the annular space between the walls of the fire-pot and means for delivering such air to
70 the gaseous products of combustion obtained in the fire-pot before the same enter the second annular space, to which they are delivered over the rim of the fire-pot; substantially as described.

2. A fire-pot having double walls, an annular
75 space between such walls and an additional annular space around the fire-pot communicating therewith, flues communicating with the outer annular space, means for admitting air to the annular space between the
80 walls of the fire-pot and means for delivering such air to the gaseous products of combustion obtained in the fire-pot before the same enter the flues; substantially as described.

3. A fire-pot surrounded by a water-leg, 85
such fire-pot having an annular space between the walls of the fire-pot and the water-leg, to which space the products of combustion are delivered over the rim of the fire-pot,
90 and down which such products pass before entering the tubes of the water-leg and having an additional annular space between it and the first-named annular space, means for
95 supplying air to the last-named annular space and means for discharging air therefrom to the products of combustion leaving the fire-pot; substantially as described.

4. A fire-pot surrounded by a water-leg,
such fire-pot having two annular spaces or
100 chambers surrounding it, one of such annular spaces communicating with the ash-pit and the other thereof communicating with the fire-pot, to which last-named annular chamber or space the products of combustion
105 are delivered over the rim of the fire-pot and, down which such products pass before entering the tubes of the water-leg; substantially as described.

5. A fire-pot surrounded by a water-leg,
such fire-pot having two annular spaces or
110 chambers surrounding it, one of such annular spaces communicating with the ash-pit and to the fire-pot through apertures near the top thereof and the other thereof communicating with the fire-pot, to which last-named
115 annular chamber or space the products of combustion are delivered over the rim of the fire-pot and down which such products pass before entering the tubes of the water-leg; substantially as described. 120

6. A vertical boiler having a circular water-leg, flues extending through the boiler and
water-leg, a second boiler above the first-named one, a chamber between the boilers
125 with which chamber the flues communicate and a passage-way for water between the boilers, in combination with a fire-pot having an annular space or chamber between it and the water-leg, and a partition extending partly
130 around the fire-pot at the bottom of the annular space or chamber, whereby the products of combustion from the fire-pot extending therefrom and down the annular space will be deflected into some of the flues in the

water-leg and extend upward therethrough into the chamber between the boilers and from thence will extend downward through the remaining flues and to the chimney; substantially as described.

5 7. A vertical boiler having a circular water-leg, flues extending through the boiler and water-leg, a second boiler above the first-named one, a chamber between the boilers
10 with which chamber the flues communicate and a passage-way for water between the boilers, in combination with a fire-pot having more than one annular space or chamber between it and the water-leg, the inner space
15 communicating with the ash-pit and with the fire-pot near the top of such fire-pot and the outer one having a partition at the bottom

thereof extending partly around the boiler and communicating at its upper end with the fire-pot, whereby the products of combustion 20 from the fire-pot extending therefrom into such outer annular space and down the same will have fresh and heated air delivered thereto as it leaves the fire-pot and after extending through such annular space will be 25 deflected into and extend upward through some of the flues into the chamber between the boilers and from thence will extend downward through the remaining flues and to the chimney; substantially as described.

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Witnesses:

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