

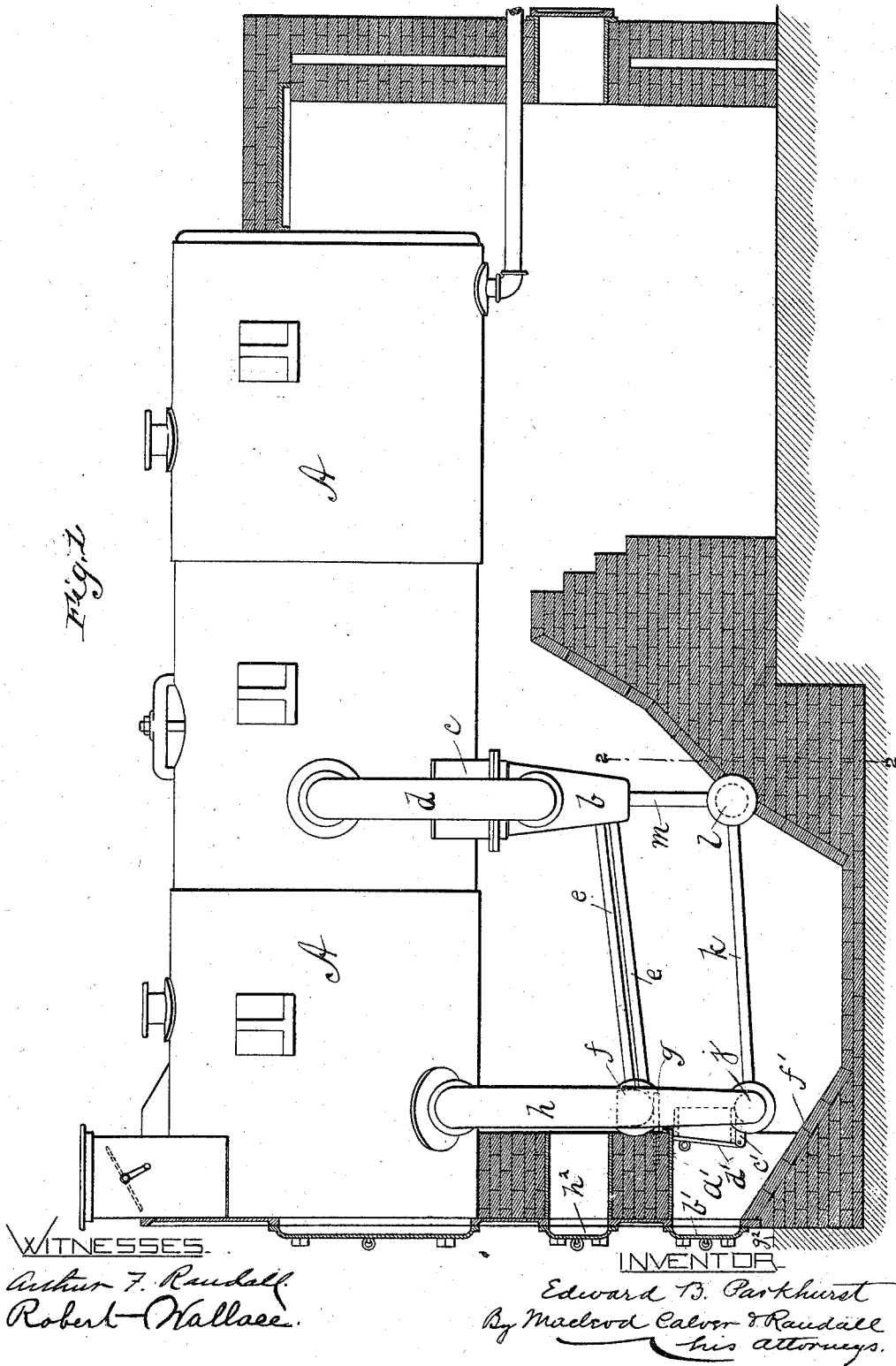
(No Model.)

2 Sheets—Sheet 1.

E. B. PARKHURST.
BOILER FURNACE.

No. 579,545.

Patented Mar. 23, 1897.



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Fig. 2.

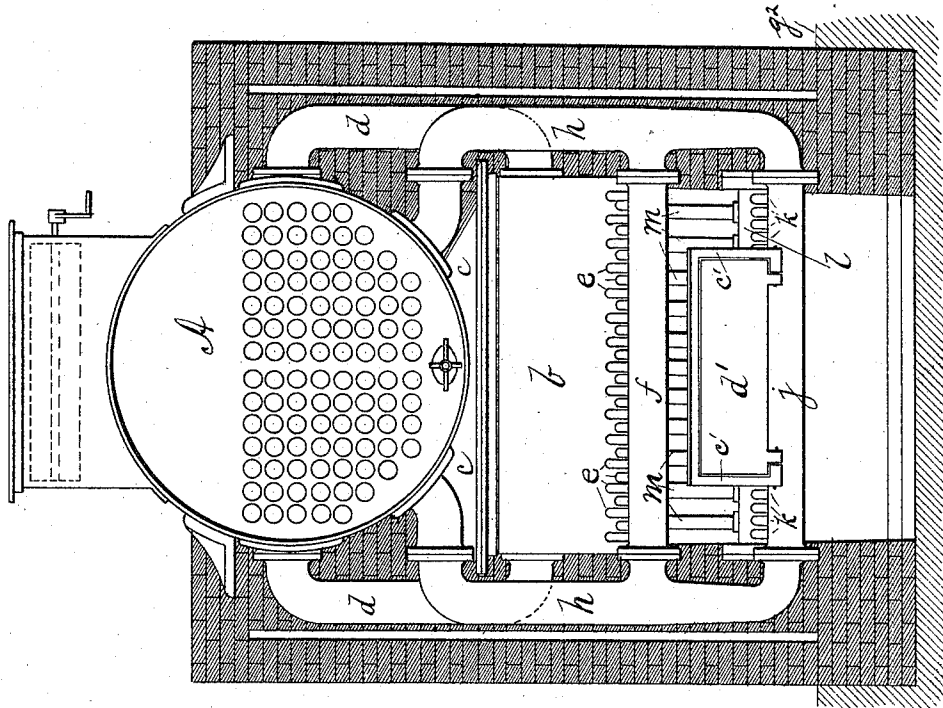
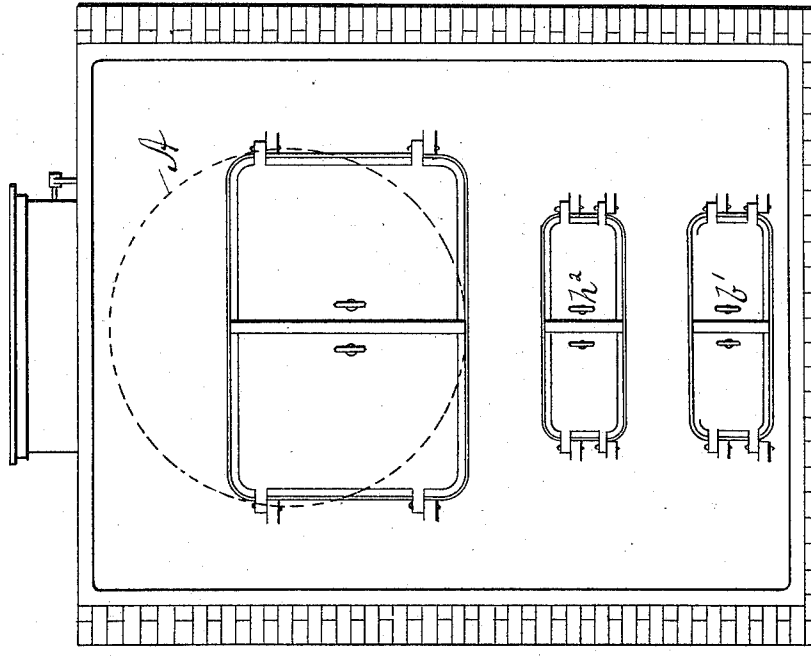


Fig. 3.



WITNESSES.

Arthur F. Randall
Robert Wallace.

INVENTOR.

Edward B. Parkhurst.

By Macleod Calver & Randall
his Attorneys.

UNITED STATES PATENT OFFICE.

EDWARD B. PARKHURST, OF WOBURN, MASSACHUSETTS.

BOILER-FURNACE.

SPECIFICATION forming part of Letters Patent No. 579,545, dated March 23, 1897.

Application filed May 20, 1892. Serial No. 433,658. (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 Boiler-Furnaces, of which the following is a specification, reference being had therein to the accompanying drawings.

10 Downdraft boiler-furnaces which employ tubular water-grates are well known, and these have also been constructed with the grate-bars "staggered," that is, with two series of grate-bars forming the grate, the bars of one series
15 being set opposite the spaces of the other series. A considerable portion of the fuel which is used on these grates falls through the spaces between the bars, and this results in loss. To avoid this objection, a lower grate has been
20 employed, the lower grate being composed of solid bars of the usual pattern set closely together and so arranged that the draft through the lower grate will be an updraft. By this arrangement that portion of the fuel which
25 falls through the upper grate is burned on the lower grate. It is, however, very important to admit to the draft of the lower grate only the minimum amount of air, since if the amount of air admitted be large it will interfere seriously with the downdraft of the upper grate and will be fatal to the practical operation of the furnace. By the use, however, of the minimum amount of air for the draft of the lower grate the lower grate, which is
30 subjected to a very high degree of heat, is burned out and injured and must either be frequently replaced or often repaired, thus making its use very expensive and objectionable.

40 My invention has for its object to provide a downdraft water-grate furnace having a lower grate upon which the fuel which drops through the upper grate may be burned, said lower grate being at the same time durable
45 and not liable to be burned out or injured even although a comparatively small amount of air is admitted thereto; and it consists in the employment, with the upper water-grate, of a lower water-grate, the same being connected with the upper water-grate and its connections, all of which is more particularly described hereinafter and the novel features

thereof pointed out in the claims which are appended hereto and made a part hereof.

In the accompanying drawings, to which reference is made in the following description, 55 Figure 1 is a horizontal tubular boiler of ordinary construction having my improved furnace applied thereto and showing the brick setting in section to more fully show the construction of the parts. Fig. 2 is a front view with part of the brick setting removed to line 2 2, Fig. 1. Fig. 3 is a front elevation. 60

A represents the boiler, which is of ordinary construction. *b* is a water-leg, which by means of flanged connections *c*, which are riveted to the bottom of the boiler, is secured thereto. It will be noted that in securing this leg to the boiler no cutting of the boiler is necessary. The water-leg *b* is connected, preferably at either end, by means of the pipes *d* with the water-space of the boiler. The rear ends of the upper grate-bars *e* enter the water-leg, and their forward ends, which are preferably somewhat lower than their rear ends, 75 so that the bars are in an inclined position, enter a water-box *f*, which may be supported or partially supported upon pins *g*, set in the front brick setting.

The water-box *f* extends across the front of 80 the furnace and is connected at either end by means of a pipe *h* with the lower front portion of the water-space of the boiler, where the water is ordinarily the coolest. In this way a circulation is obtained from the cooler 85 portion of the water-space through the pipes *h*, water-box *f*, upper grate-bars, water-leg *b*, and pipes *d* to a portion of the water-space of the boiler where the water is warmer.

In order to provide proper connections and 90 supports for the lower water-grate, I extend the pipes *h* downwardly a proper distance, making them of smaller diameter at the lower ends, since these portions of the pipes are designed to supply the lower grates only. The 95 lower ends of the pipes *h* are secured to a water-box *j*, similar in form and construction to the water-box *f*, and with which is connected the forward ends of the lower grate-bars *k*. The lower grate-bars are preferably 100 set in one line and close together in order that the finer parts of the fuel which drop through the upper grate may be retained and burned on the lower grate. The rear ends of

the lower grate-bars k enter a rear water drum or box l , which is set preferably at the rear portion of the combustion-chamber below the water-leg b . This drum l may be supported in any suitable manner. I prefer to support it by allowing it to rest upon the brickwork at the rear of the combustion-chamber, as shown, Fig. 1. It requires to be so set as to prevent the passage under or behind it of the draft, since the draft should pass upwardly through the lower grate-bars.

The water-drum l is connected by means of a series of vertical outlet-pipes m with the lower end of the water-box b , and thus a circulation is established through the supply-pipes h , water-box j , lower grate-bars k , water-box l , and outlet-pipes m . The outlet-pipes m are less in number than the grates k , but their united capacity should equal or substantially equal that of the grates. They must also be so spaced as to permit of the free passage of the air which passes through both sets of grates, that is, the air-spaces, as also the capacity of the grates and connections, must bear a proper relation to each other, as will be obvious and as may easily be determined in a given case by any person skilled in the art.

I have shown the outlet-pipes m , which allow the water to pass from the lower rear water-box l to the box or leg b , as disposed in a row or series across the draft-passage at the rear of the furnace-chamber. This construction I deem preferable, as it exposes the water circulating through these pipes to a very high degree of heat. The pipes m may, however, be varied in number or dispensed with and one or more large pipes or connections used in their place.

The supply-pipes and the main outlet-pipes d may be constructed as shown more clearly in Fig. 2, and are preferably set in the side brick setting, as there shown. It is necessary that the fire on the lower grate be reached for the purpose of raking and the like, and at the same time the draft must pass under and come up through the lower grates. To provide for these conditions, I extend the ash-pit opening a' upwardly above the lower grate-bars and locate the door b' thereof about on a level with the fire on the lower grate. I then provide a door-frame c' and a door d' in front of the fire on the lower grate and inside the ash-pit door, as shown, Fig. 1, and by opening the ash-pit door and the door d' entrance is had to the fire on the lower grate. The door d' is normally closed, and the draft for the lower grate passes under the front lower drum j and up through the grate. By making the front portion of the ash-pit sloping, as shown at f' , the ashes may be readily raked out or withdrawn, while at the same time the ash-pit does not extend in front of the boiler and the floor of the boiler-room is not changed, but may remain at the ordinary level, which

is indicated by the line g^2 . The fuel-door is shown at h^2 .

Such a device as I have shown and herein described may be constructed and applied to boilers such as are in common use, and the advantages of an increased steam-forming capacity, as also the power to consume the smoke, and other products of combustion are gained.

I do not claim herein, broadly, a furnace employing an upper and a lower water-grate, since I have made that claim in another application filed of even date herewith and showing a different specific construction; but

What I claim is—

1. A boiler-furnace having upper and lower water-grates, said upper and lower grates being connected with the same supply-pipes and the discharge connections of the lower grate being connected with those of the upper grate by a series of pipes located within the combustion-chamber, substantially as shown and described.

2. A boiler-furnace having upper and lower water-grates a water-box with which the forward ends of the upper grate-bars connect, and a water-leg with which the rear ends of said grate-bars connect, and suitable connections between said water-box and water-leg and the water-space of the boiler, front and rear lower water-boxes, with which the forward and rear ends respectively of the lower grate-bars connect, the front lower water-box being connected with the water-box at the forward ends of the upper grate-bars and the rear water-box of the lower grate-bars being connected with the water-leg of the upper grate-bars, the latter connection consisting of a series of pipes extending across the rear end of the combustion-chamber in the path of the draft, substantially as shown and described.

3. A boiler-furnace having upper and lower water-grates and suitable connections therefor with the water-space of the boiler at the front and rear of the furnace, the rear connections including a series of pipes located in the combustion-chamber, the bars of the upper grate being in two series set alternately, the bars of one series being opposite the spaces of the other series, substantially as set forth.

4. The combination in a boiler-furnace with the upper and lower grates and suitable connections therefor with the water-space of the boiler, of a series of pipes m located in the draft-passage and serving to connect the lower grate-bars with the boiler connections of the upper grate, substantially as set forth.

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

EDWARD B. PARKHURST.

Witnesses:

WM. A. MACLEOD,
ROBT. WALLACE.