

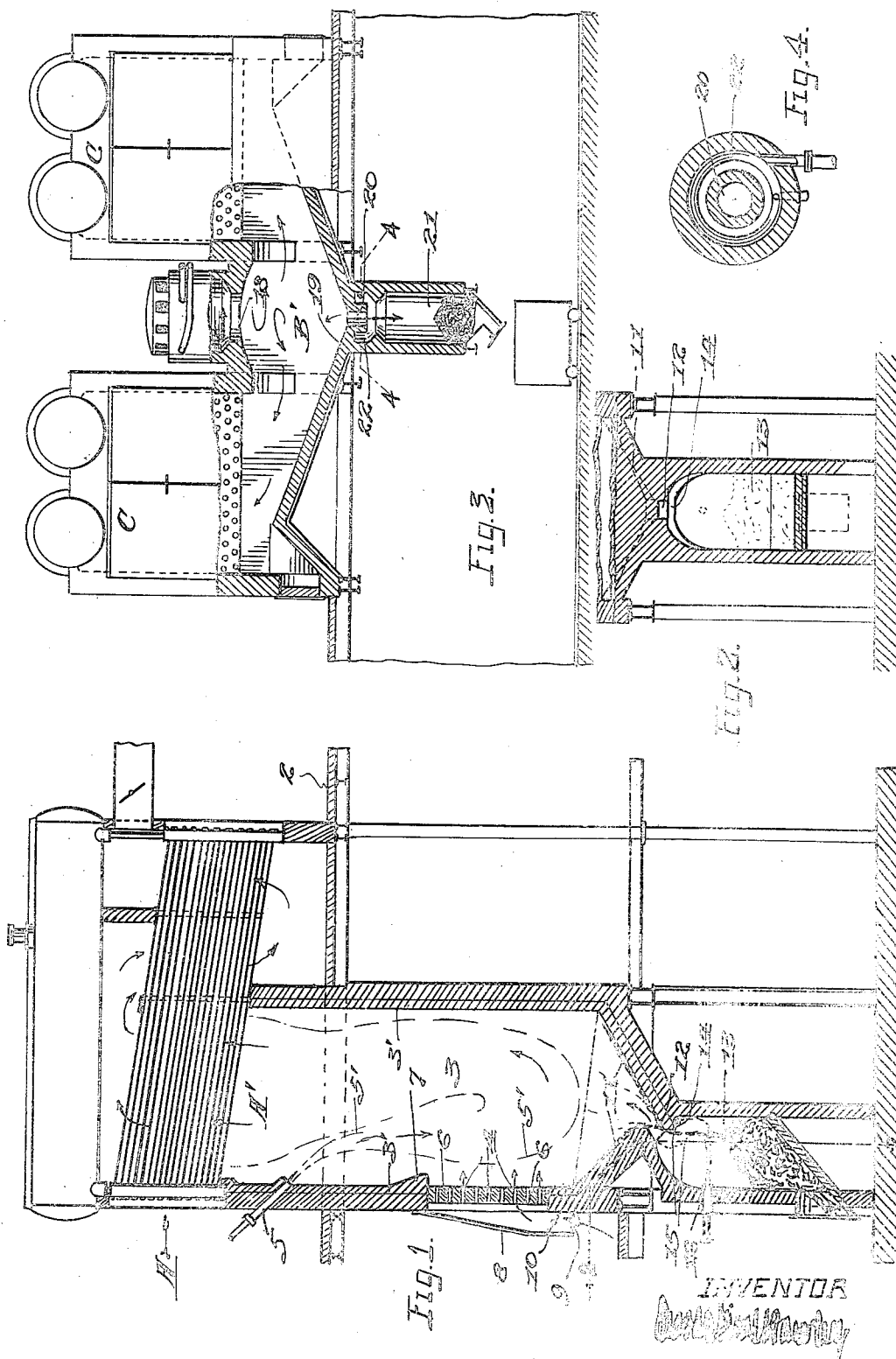
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C. G. HAWLEY

APPARATUS FOR FURNACE SLAG DISPOSAL

Filed Jan. 15, 1921



UNITED STATES PATENT OFFICE.

CHARLES GILBERT HAWLEY, OF CHICAGO, ILLINOIS.

APPARATUS FOR FURNACE-SLAG DISPOSAL.

Application filed January 15, 1921. Serial No. 437,615.

To all whom it may concern:

Be it known that I, CHARLES GILBERT HAWLEY, a citizen of the United States, and a resident of the city of Chicago, county of Cook, and State of Illinois, U. S. A., have invented certain new and useful Improvements in the Art of Combustion and Apparatus Therefor, all as set forth and claimed in the following specification, entitled Apparatus for Furnace-Slag Disposal.

This application is identified as Serial No. 437,615, and is companion to my application, known as S. N. 431,563, filed December 18, 1920, entitled Semi-suspension process of combustion and which may be referred to for an understanding of the chief objects and features of my generic invention. Therefore I shall set forth herein only the special objects, features and structures which are individual to this particular case.

When pulverized fuel is burned in suspension according to modern methods, the fuel ash is deposited upon the walls and floor of the combustion chamber in the form of slag. While it has been proposed to continuously discharge this slag from the combustion chamber the actual performance thereof has not been accomplished, with the result that wherever modern pulverized fuel burning chambers or boxes are in use it is the practice to periodically shut them down, allow them to cool off, and then to break up the accumulated slag and remove it. There are many attendant difficulties and losses.

I have succeeded in overcoming this difficulty by very simple means, to-wit, I provide a hole at the bottom or low point of the combustion chamber through which the slag may drain away and in addition I provide means for keeping the margins of the drain hole so highly heated as to prevent the freezing of the slag therein; and thus the slag-drain hole is kept open at all times.

My invention is not limited to use with pulverized fuel, but is adapted to all other furnaces wherein the fused ash or slag is deposited upon a bottom floor or hearth from which it must be discharged or drained if the furnace is to be kept in continuous operation.

The invention will be readily understood on reference to the accompanying drawings; in which Fig. 1 is a vertical longitudinal section of a steam boiler setting which includes a pulverized-fuel combustion-chamber

and my slag hole heating invention; Fig. 2 is a vertical cross-section on the line 2—2 of Fig. 1; Fig. 3 is a transverse vertical section of two steam boilers arranged to be fired by a single inverted semi-suspension combustion furnace of a type such as I have disclosed in my application, Serial No. 437,614, together with the invention specifically treated of in this application; and Fig. 4 is an enlarged horizontal section on the line 4—4 of Fig. 3.

Fig. 1 illustrates the ordinary pulverized fuel burning furnace arranged for heating a boiler, A. The boiler is supported on the floor, 2. The combustion chamber, 3, is a downward continuation of the fire space, A', directly beneath the boiler. In most cases the combustion chamber, 3, is of a depth which equals, and often exceeds, the height of the boiler. Its walls, 3', are composed of refractory brick. One or more walls contain air admission openings, 4. The fuel falls into the chamber, 3, from one or more fuel nozzles, 5. The general play of the flame developed within the chamber, 3, is indicated by the dotted lines, 5', from which it will be seen that virtually the whole box is filled with flame.

Before proceeding to the description of the slag-hole feature of this invention, I first wish to direct attention to a matter of novelty which I introduce in pulverized coal burning furnaces. In one or several walls of the chamber, 3, I provide firebrick panels, 6, containing many relatively small air feeding openings, 4. The panel, as a whole, is protected from down-flowing slag to prevent the closing of the holes, 4. The protecting means may be an overhanging ledge, 7, on the inner wall of the chamber, 3. On the outer side, the whole panel, 6, is enclosed by a shield, 8, open at the end or side, as shown at 9, for the admission of the air required to support the combustion of the fuel in the chamber, 3. The opening or duct, 9, contains a regulating damper, 10. The advantage of the described construction is that the single damper accomplishes the regulation of the inflow at all of the air feeding openings 4. Further, there are many of the small openings, 4, and these being in a hot wall of firebrick, it is obvious that air supplied by the chamber, 3, will be highly preheated before it enters the same.

I form the bottom of the chamber, 3,

in the shape of a hopper, 11, which is lined with firebrick. At the low point this hopper is provided with the slag drain-hole, 12, leading into the slag pit, 13. Preferably there is an overhanging ledge, 14, at the lower end of the hole, 12. Extremely high temperatures are obtained in the combustion chamber, 3, and all of the ash which is deposited on the hopper bottom is readily maintained in a molten state provided it is not permitted to collect thereon in any considerable quantity or depth.

Such accumulation of slag is prevented by my invention, which proceeds to the burning of a fire (indicated by dotted lines, 15), against or beneath the overhanging ledge, 14, of the slag hole, allowing the hot gases of combustion to rise into the combustion chamber, 3, through the slag hole. A small quantity of fuel, consumed in a burner such as 16, is entirely adequate to keep the margins of the slag hole at temperatures which ensure the free draining of the molten slag from the bottom of the combustion chamber. Thus it becomes possible to continue the operation of the furnace indefinitely, for this invention makes it unnecessary to shut down the furnace at any time to remove ash or slag accumulations therefrom.

By preference, I limit the inrush of air to the slag pit, lest an excess of cold air be present to cool the margins of the slag hole. It is desirable that the slag pit shall be normally sealed against the entrance of cold air in response to the chimney draft existing in the chamber, 3.

In Fig. 3 I have disclosed a desirable use of the inverted semi-suspension combustion furnace described and claimed in my Serial No. 437,614, the said furnace being positioned over a lateral fire passage, B', in such manner as to heat the adjacent steam boilers, C. C. Obviously the same arrangement is suited to a single boiler. The point of interest in the case is that with a furnace

of the type B, the flame is delivered downwardly from the furnace outlet, 18, and from said outlet, 18, the slag of combustion falls upon the floor or hearth, 19, of the fire passage, B'. To prevent the accumulation and freezing of the slag on this floor, I provide it with a slag drain-hole, 20, through which the slag may drain into a slag-pit, 21. Surrounding the walls of the hole, 20, is an annular chamber, 22, in which either a gas liquid, or solid, fuel fire may be maintained (as by the means appearing in Fig. 4) to keep the walls of the slag hole hot, as required by this present invention.

It will be found that this invention is adapted for extensive application throughout the field of fuel combustion.

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

1. The improvements herein described, comprising a combustion chamber wherein fuel ash is slagged, and having a slag drain hole in its bottom, in combination with a slag pit, and combustion means for heating the margins of said slag hole, substantially as and for the purpose specified.

2. The improvements herein described, comprising a combustion chamber wherein fuel ash is slagged, said chamber having a slag drain hole in its bottom, in combination with a slag pit, and means for maintaining a separate fire in the top of said slag pit for heating the margins of said slag hole, substantially as and for the purpose specified.

3. The improvements herein described comprising a combustion chamber wherein fuel ash is slagged, and having a slag drain hole in combination with separate heating means for heating the margins of the slag hole, substantially as and for the purpose specified.

In testimony whereof, I have hereunto set my hand this 11th day of January, 1921.

CHARLES GILBERT HAWLEY.