

No. 769,974.

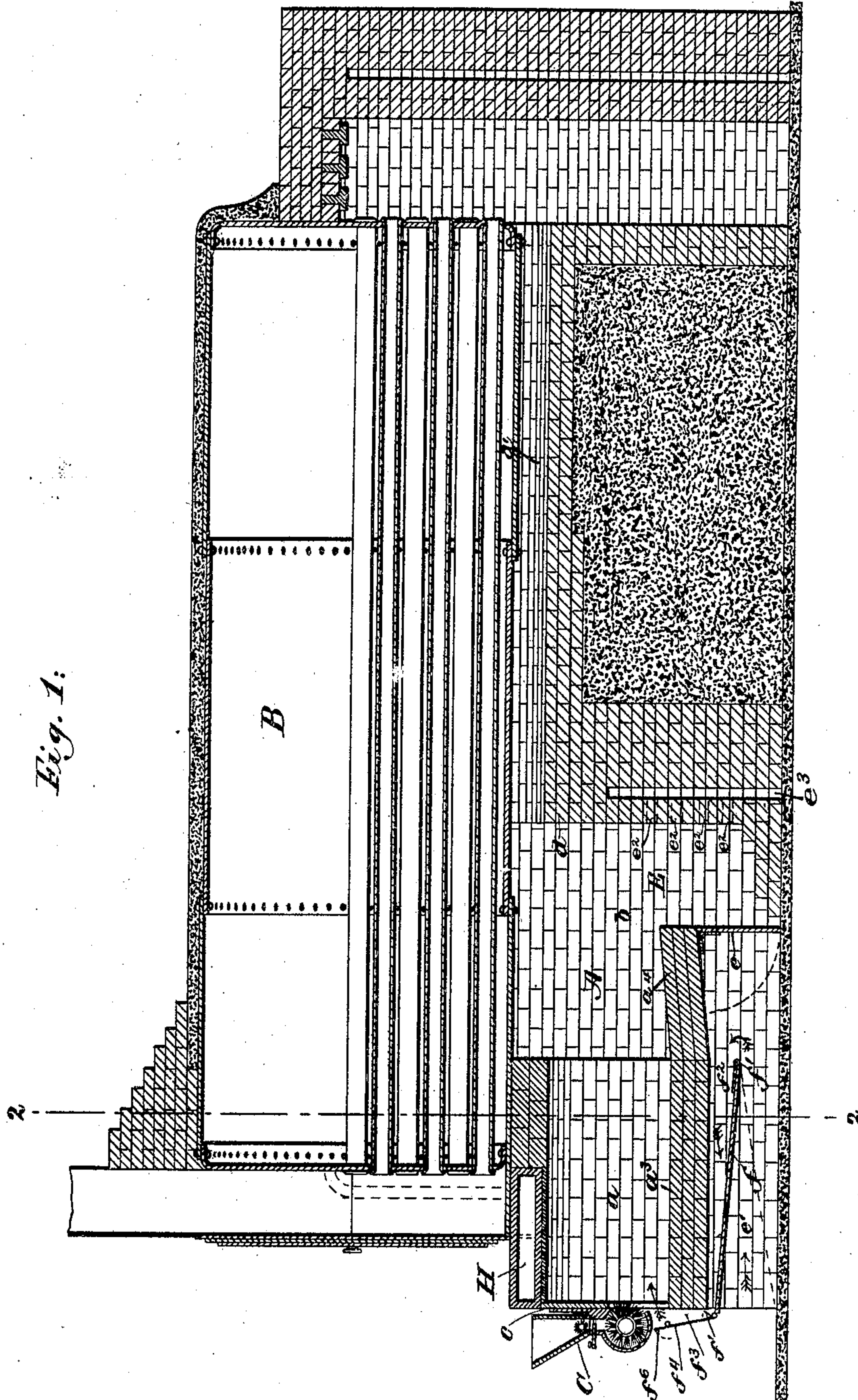
PATENTED SEPT. 13, 1904.

W. F. WOLFE.
PULVERULENT FUEL BURNING APPARATUS.

APPLICATION FILED DEC. 26, 1901.

NO MODEL.

2 SHEETS—SHEET 1.



Witnesses:
Elliott S. Emery
A. E. Chubb

Inventor:
Willsie F. Wolfe,
by Andrew L. Emery
Atty.

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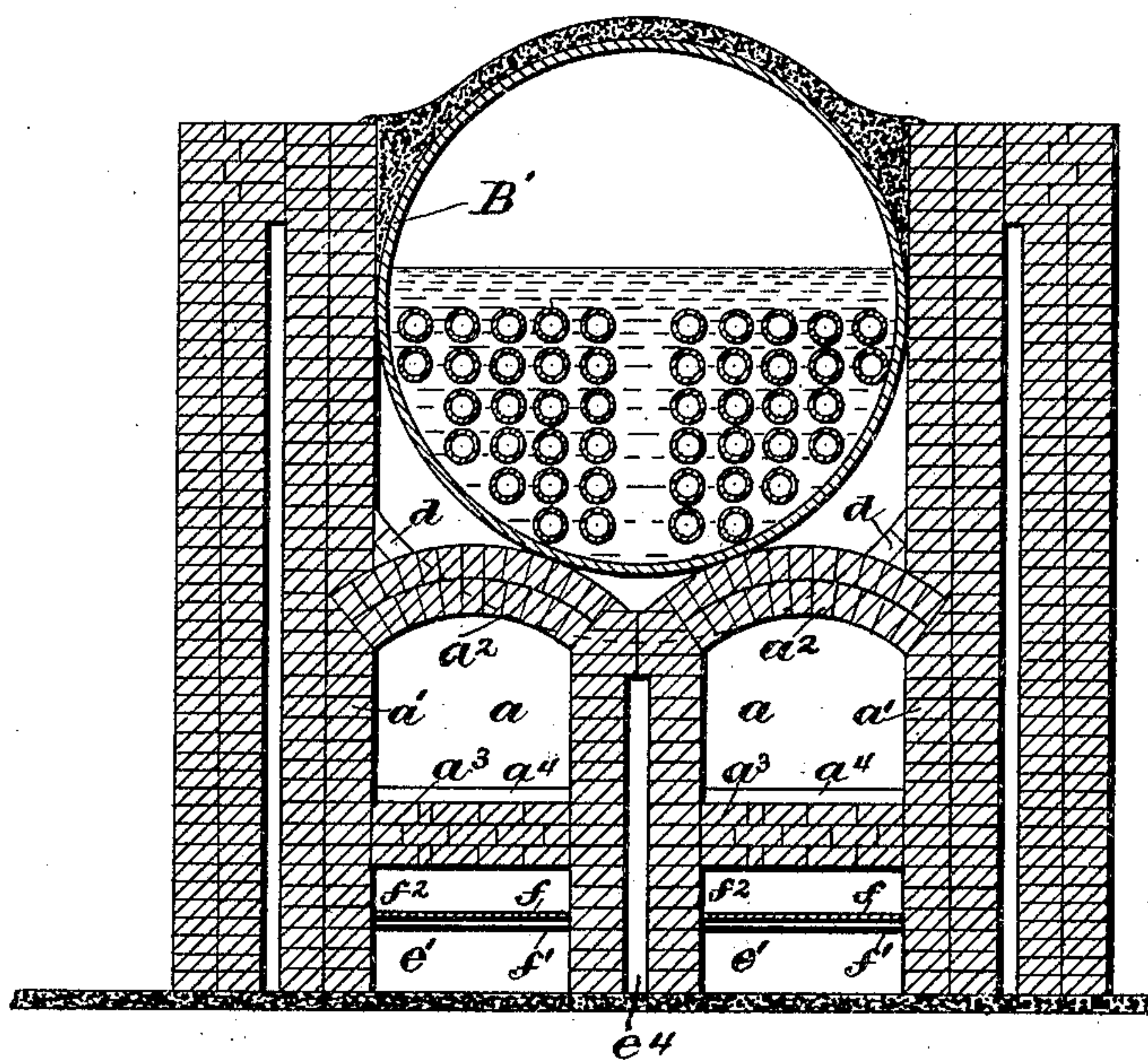
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2 SHEETS—SHEET 2.

Fig. 2:



Witnesses:

Ernest S. Emery
A. E. Chesley

Inventor:

Wiltsie F. Wolfe,
by Munnick L. Emery -
Atty.

UNITED STATES PATENT OFFICE.

WILTSIE F. WOLFE, OF NEW YORK, N. Y., ASSIGNOR TO PETER B. BRADLEY, OF BOSTON, MASSACHUSETTS.

PULVERULENT-FUEL-BURNING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 769,974, dated September 13, 1904.

Application filed December 26, 1901. Serial No. 87,158. (No model.)

To all whom it may concern:

Be it known that I, WILTSIE F. WOLFE, a citizen of the United States, residing at New York, in the county and State of New York, have invented an Improvement in Pulverulent-Fuel-Burning Apparatus, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

This invention relates to means for burning pulverulent or dust fuel; and the object of the invention is to prevent so far as possible several items of loss generally sustained in burning such fuel under present methods or by present apparatus.

It has been found in feeding pulverulent or dust fuel into a usual furnace or combustion-chamber that certain portions of the fuel in the form of coke or other combustible pass rapidly from the combustion-chamber and are deposited unconsumed on the fire-bed, the flame-bed, the rear clean-out, the boiler-tubes, at the bottom of the up-take, or it may pass still unconsumed to and out from the chimney, and in forms of furnaces other than boiler-furnaces such unconsumed products are deposited at different points along the passage-way of the products of combustion to the point of exit with the same general loss as in boiler-furnaces described. To obviate this loss, my invention comprehends, among other features, the provision of a fuel-deposit receiver, which may be in the form of a pit arranged in the vicinity of the inner end of the fire-bed or adjacent the inner end of the combustion-chamber, into which the unconsumed fuel referred to may gravitate or be deposited and in which the deposited fuel may, if desired, be permitted slowly to be consumed, giving off its heat in addition to the heat from the combustion of the pulverulent fuel in the combustion-chamber proper.

My invention also provides, in connection with the fuel-deposit receiver referred to, a suitable retarding-wall, so arranged as to facilitate the deposit of the unconsumed fuel referred to in such receiver and correspondingly to prevent so far as possible the passage of unconsumed fuel out from the com-

bustion-chamber to be deposited along the subsequent passage-way at various points, as heretofore described.

To facilitate combustion of the unconsumed fuel deposited in the receiver referred to, my invention comprehends supplying thereto a suitable quantity of air, and means are also provided for removing from the said receiver the ash and clinker resulting from the combustion of fuel therein.

My invention further comprehends in an apparatus of the class described novel means for furnishing heated air to the combustion-chamber to promote combustion of the pulverulent fuel therein.

The foregoing, with other features of my invention, will be best understood after a description of a specific embodiment thereof.

In the accompanying drawings, Figure 1, in partial longitudinal section, shows a boiler provided with pulverulent-fuel-burning apparatus, illustrating my invention; and Fig. 2, a vertical cross-section on the dotted line 2 2, Fig. 1.

Referring to the drawings, in the embodiment of my invention selected for illustration herein B is a usual boiler, shown as of the ordinary fire-tube type and which, apart from the features to be described, may be set in any usual or desired manner. Beneath the boiler and near its front end at the left, Fig. 1, is formed the combustion-chamber A, the walls of which are preferably formed of fire-brick or other suitable material laid in suitable manner. As here shown, said combustion-chamber is composed of two parts, designated for convenience "primary" and "secondary" chambers, the primary combustion-chamber being indicated at *a* and the secondary combustion-chamber at *b*. The portion of the combustion-chamber A designated the "primary" chamber *a* is preferably built of fire-brick or other equivalent or suitable material and for the best results is formed with thick walls in the shape of one or more arched retorts. (Best shown by reference to Fig. 2, wherein the sides thereof are indicated at *a'* and the arched crowns or tops at *a''*.) The bottoms of these retort-like portions *a* are preferably in the

form of flat beds a^3 , which constitute parts of the fire-bed of the combustion-chamber. I have found a fire-bed such as here shown to produce under average conditions better results than an ordinary grate or equivalent device; but obviously my invention is not limited in this respect.

The front ends of the retort portions a of the combustion-chamber are closed in suitable manner, as by front plate c , upon which may be mounted one or more pulverulent or dust fuel feeding devices (typified at C) and which may be of suitable or desired type or construction—such, for instance, as shown and described in Letters Patent of the United States No. 655,464, to which reference may be had for a fuller description of such a device, if required, it being understood, however, that so far as my present invention is concerned any pulverulent-fuel-feeding device may be employed in connection with the furnace or combustion-chamber otherwise constructed, as here shown and described.

Referring to Fig. 1, the retort portions a of the combustion-chamber preferably extend throughout only a part of the length of said chamber, the length thereof to be determined by the varying conditions under which the apparatus is constructed and used, they being herein shown as substantially one-half the length of the chamber as a whole.

As here shown, the fire-bed a^3 is prolonged beyond the inner ends of the retort portions a of the combustion-chamber and into the secondary combustion-chamber b , said prolonged or extended portion being indicated in Fig. 1 at a^4 and preferably being inclined somewhat upwardly adjacent its inner end, as shown.

Beyond the inner end of the fire-bed a^4 referred to and between it and the usual bridge-wall d or its equivalent, to be hereinafter referred to, I have provided a fuel-deposit receiver, (designated generally by the letter E,) herein shown as dropped below the level of the fire-bed and into which the unconsumed fuel, which would otherwise pass unconsumed from the zone of combustion, may gravitate, such fuel collecting in the bottom of said receiver and being gradually consumed therein, giving off its heat in addition to the heat from the products of combustion in the zone of combustion and elsewhere. By arranging this receiver immediately in front of the bridge-wall or other retarding-wall the gases in combustion, together with the products of combustion, tending to flow from the combustion-chamber meet such bridge or retarding wall or surface and are retarded somewhat or deflected sufficiently to permit the unconsumed fuel carried in suspension thereby to gravitate or be deposited into this receiver E. The usual clinkers, &c., remaining after the combustion of this fuel in the receiver E may be removed therefrom in suitable manner, as through a suitably-located clean-out opening,

here shown at e , in the front and near the bottom of said receiver and access to which may be had through a chamber e' , extending beneath the fire-bed.

As here shown and preferably the top of the bridge-wall d and, if desired, the entire surface area of the flame-bed d' beyond are made to conform approximately to the curvature of the adjacent portion of the boiler, as best shown in Fig. 2, where the concave top of the bridge-wall is shown in full and dotted lines beyond the arches a^2 . This formation by bringing the top of the bridge-wall and the surface of the flame-bed uniformly closer to the boiler causes the gases and products of combustion to impinge more effectively upon and to heat the boiler and also enables the passage between the same and the boiler to be more readily and effectively cleaned of deposit by a steam-jet or other means. Obviously the deposit may be more easily blown out through a more or less contracted opening or passage than through a passage of larger area and presenting corners or pockets. The formation of the bridge-wall whereby it follows approximately the curvature of the boiler also adds to the effectiveness of the said wall as a deflector or retarder for the gases and products of combustion issuing from the combustion-chamber and causes the said gases and products to be retarded or deflected the more readily to deposit the unconsumed fuel carried in suspension thereby, thus adding to the effectiveness of the receiver E.

It is desirable that the air admitted to the combustion-chamber to promote combustion therein be heated before being admitted to such chamber, and for this purpose I have, as here shown, provided means for conducting such air along and in contact with a wall, preferably the bottom or fire-bed, of the combustion-chamber. In the embodiment of my invention shown I have provided each chamber e' beneath the fire-bed a^3 with a member f , shown as a plate hinged at its inner end at f' and normally held in suitable manner in an elevated position, as indicated in full lines, Fig. 1, so as to form between it and the adjacent overhead bottom wall of the fire-bed a conduit f^2 , through which air admitted to the chamber e' may flow toward the front of the combustion-chamber, such air passing upward through an upright conduit f^3 , formed between a vertical wall f^4 and the front of the fire-bed a^3 , thence into the combustion-chamber below the pulverulent-fuel-feed device, all as indicated by the arrows, Fig. 1. By dropping the said hinged member f into its lowermost dotted position any deposit thereon may be readily removed. The volume or quantity of heated air permitted to pass from the conduit f^2 to the conduit f^3 , thence into the combustion-chamber to promote combustion therein, may be varied in suitable manner—

as, for instance, by the hinged damper f' , which may be opened more or less, according to the requirements at any particular time.

The upper end of the wall or plate f^4 is shown as provided with a hinged portion f^6 , which may be turned outward into its dotted position to permit access to the top of the fire-bed for removing deposit therefrom and for giving the fire any necessary attention and which when turned upward into its full-line position forms a substantially closed passage from the conduit f^3 into the combustion-chamber.

By conducting the air to the combustion-chamber as described heat that would otherwise be wasted is employed for work in raising the temperature of the air before it is admitted to the combustion-chamber.

To promote combustion of the fuel deposited in the receiver E, it is desirable to admit air thereto, and while this may be accomplished in any suitable manner I have herein shown as a means therefor a series of air-inlet openings e^2 arranged in the wall of the said receiver—that is, the front of the bridge-wall—and to which air may be supplied from a suitable source, as through a duct or conduit e^3 , formed in such bridge-wall and which may be supplied directly from the outside air through an opening at either side of the boiler-setting, or, as when the boilers are arranged in batteries, such duct or passage may be supplied by a conduit e^4 , Fig. 2, entering from the front through the dividing-wall between the retort portions a of the combustion-chamber. These conduits or passage-ways may readily be cleaned by any of the usual means—such, for instance, as projecting there-through jets of steam or air.

It is sometimes necessary for the best results to extend the combustion-chamber more or less in front of the boiler, as indicated in Fig. 1 of the drawings, and as the crown of such extended portion of the combustion-chamber would cause considerable loss of heat by radiation that could not be applied for heating the boiler or its contents my present invention contemplates the utilization of this otherwise wasted heat by arranging upon or incorporating in such extended crown portion of the combustion-chamber a feed-water heater, (typified at H, Fig. 1,) which may be simply a reservoir or its equivalent, through which the feed-water may be conducted in usual manner.

In operation the pulverulent fuel projected into the primary portion a of the combustion-chamber is immediately ignited from the heat contained in the surrounding walls thereof, the gases in combustion and products of combustion, together with the unconsumed fuel, if any, passing rapidly rearward toward the bridge or retarding wall d . This wall or surface temporarily checks the flow of gases or other products or retards or deflects the same

in such manner as to furnish opportunity for the unconsumed fuel carried in suspension thereby to gravitate or be deposited in the receiver E, where it is slowly consumed, as heretofore described. The heat from this slow combustion of fuel in the receiver E is of course additional to the heat from the combustion in the combustion-chamber A, so that there is practically no waste of heat due to deposit of unconsumed fuel, as heretofore.

Obviously the more complete combustion of fuel obtained by the use of my invention produces higher efficiency from the fuel consumed and more completely eliminates smoke.

My invention is not restricted to the particular embodiment thereof here shown, but may be varied within the spirit and scope of the invention as set forth.

Having described my invention and without limiting myself to details, what I claim, and desire to secure by Letters Patent, is—

1. The combination with a pulverulent-fuel-feed device of a primary retort-like combustion-chamber having a path through which substantially all the products of combustion pass, leading therefrom, having a fuel-deposit receiver out of but adjacent to said path to receive the unconsumed fuel particles passing from said combustion-chamber, a deflecting-wall beyond said receiver to deflect therein such unconsumed particles and means to supply air to said receiver to promote the combustion of the unconsumed fuel particles therein.

2. The combination with a pulverulent-fuel-feed device of a combustion-chamber, a bridge-wall in the rear thereof, a fuel-deposit receiver in front of said bridge-wall, an air-supply duct in said wall and supply-openings leading therefrom into said receiver.

3. The combination with a pulverulent-fuel-feed device of a combustion-chamber provided at its inlet end with a plurality of retort primary chambers, a secondary chamber in the rear of said primary chambers and in communication therewith, a bridge-wall, a fuel-deposit receiver arranged in front thereof, an air-supply passage in said wall, a supply-conduit therefor arranged in the wall between said retort-chambers and outlets opening into said receiver.

4. The combination with a pulverulent-fuel-feed device of a combustion-chamber provided with a fire-bed, a fuel-deposit receiver adjacent the inner end thereof, a chamber beneath said fire-bed communicating with the receiver, and an air-conduit member for supplying air to said combustion-chamber mounted therein, the position of said member being changeable to permit of cleaning the fuel-deposit receiver through said chamber.

5. The combination with a pulverulent-fuel-feed device of a combustion-chamber having a fire-bed, a bridge-wall beyond said fire-bed, a fuel-deposit receiver adjacent the inner end

of said fire-bed and between the same and said bridge-wall, a cleaning-chamber arranged beneath said fire-bed and in communication with said receiver, and means to open and close said communication at will.

6. The combination with a pulverulent-fuel-feed device of a boiler, a combustion-chamber provided adjacent its inner end with a fuel-deposit receiver and a bridge-wall arranged in the rear thereof, separated at its top somewhat from said boiler but shaped substantially to conform to the curvature thereof, to cause the gases to impinge substantially uniformly upon the exposed boiler-surface.

7. The combination with a pulverulent-fuel-feed device of a combustion-chamber provided with a fire-bed, a fuel-deposit receiver adjacent the inner end thereof but out of the path through which substantially all of the products of combustion pass, and an air-supply conduit or conduits leading to said receiver and adjacent the walls of said combustion-chamber whereby air admitted to said receiver receives preliminary heat from the said combustion-chamber.

8. The combination with a pulverulent-fuel-feed device of a combustion-chamber provided with a fire-bed, a fuel-deposit receiver adjacent the inner end thereof, means for supplying air to said receiver, and a cleaning-conduit beneath said combustion-chamber for removing ashes from said receiver.

9. A pulverulent-fuel-feeding furnace hav-

ing a retort-like combustion-chamber provided with a fire-bed having an upward inclination toward its rear end, a bridge-wall in said combustion-chamber, an arch or crown above the initial end of said combustion-chamber but terminating short of said bridge-wall, means to deliver pulverulent fuel at the initial end of said combustion-chamber and cause the travel thereof through the same, a fuel-deposit receiver between said bridge-wall and the inner end of said fire-bed, and means for supplying heated air to said fuel-deposit receiver to promote the combustion of the unconsumed particles of fuel therein.

10. A pulverulent-fuel-feeding furnace having a retort-like combustion-chamber provided with a fire-bed having an upward inclination toward its rear end, a bridge-wall in said combustion-chamber, an arch or crown above the initial end of said combustion-chamber but terminating short of said bridge-wall, means to deliver pulverulent fuel at the initial end of said combustion-chamber and cause the travel thereof through the same, and a fuel-deposit receiver between said bridge-wall and the inner end of said fire-bed.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILTSIE F. WOLFE.

Witnesses:

FREDERICK L. EMERY,
A. E. CHESLEY.