No. 741,069. PATENTED OCT. 13. 1903.

A. W. PUDDINGTON.

SMOKE PREVENTING FURNACE.

APPLICATION FILED OCT. 31, 1900.

NO MODEL. 3 SHEETS—SHEET 1.

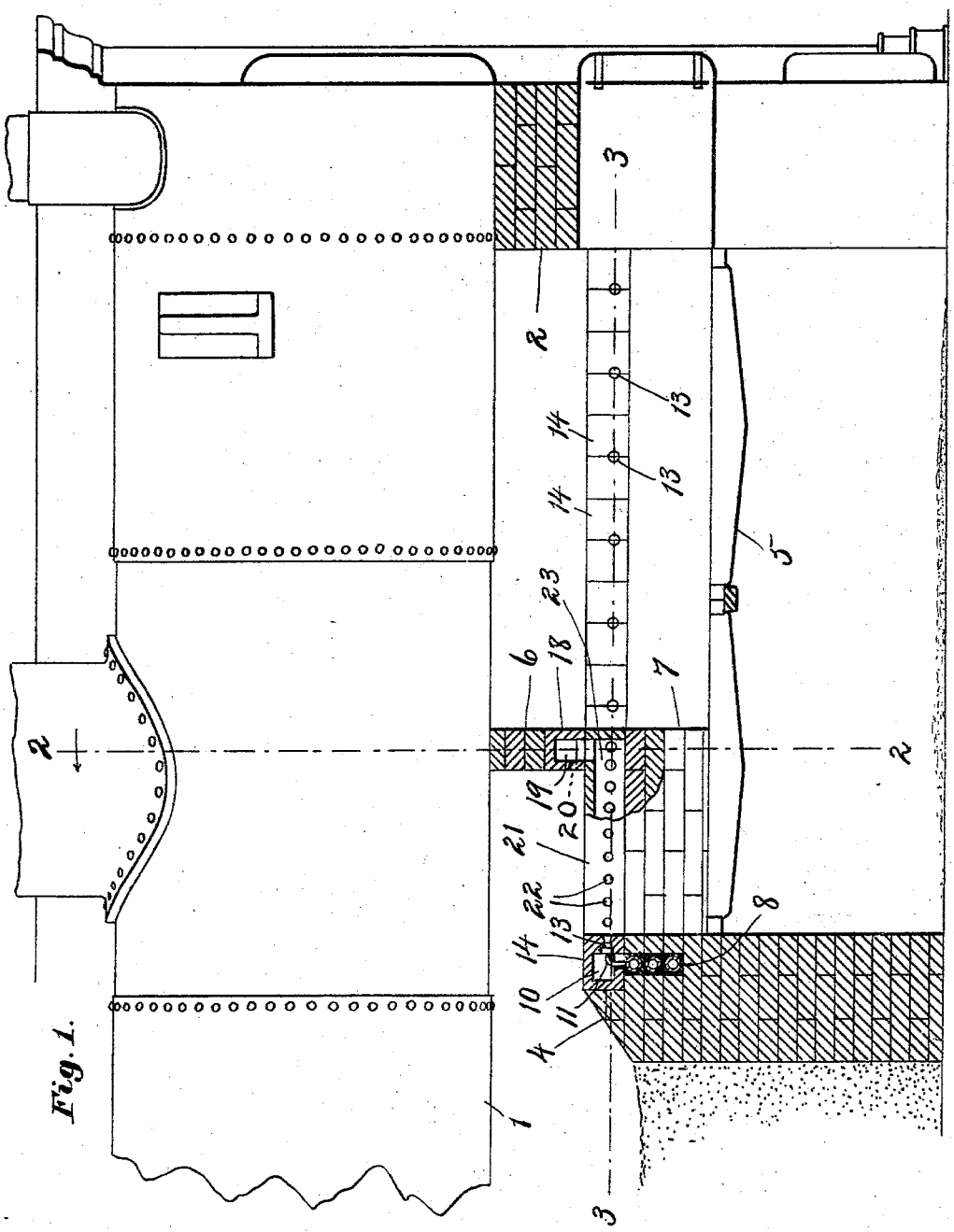

Fig. 1.

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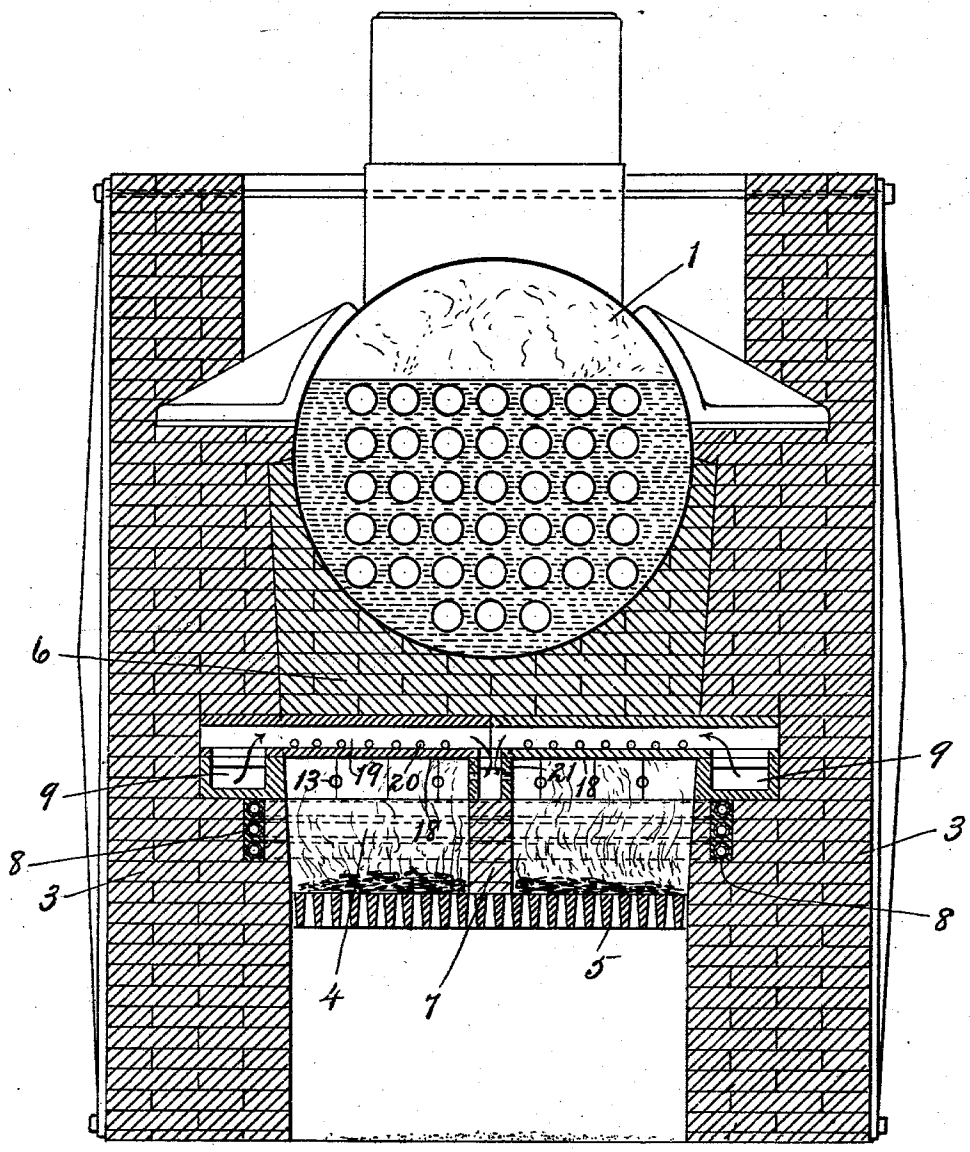
NO MODEL. 3 SHEETS—SHEET 2.

Fig. 2.



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NO MODEL. 3 SHEETS—SHEET 3.

Fig. 3.

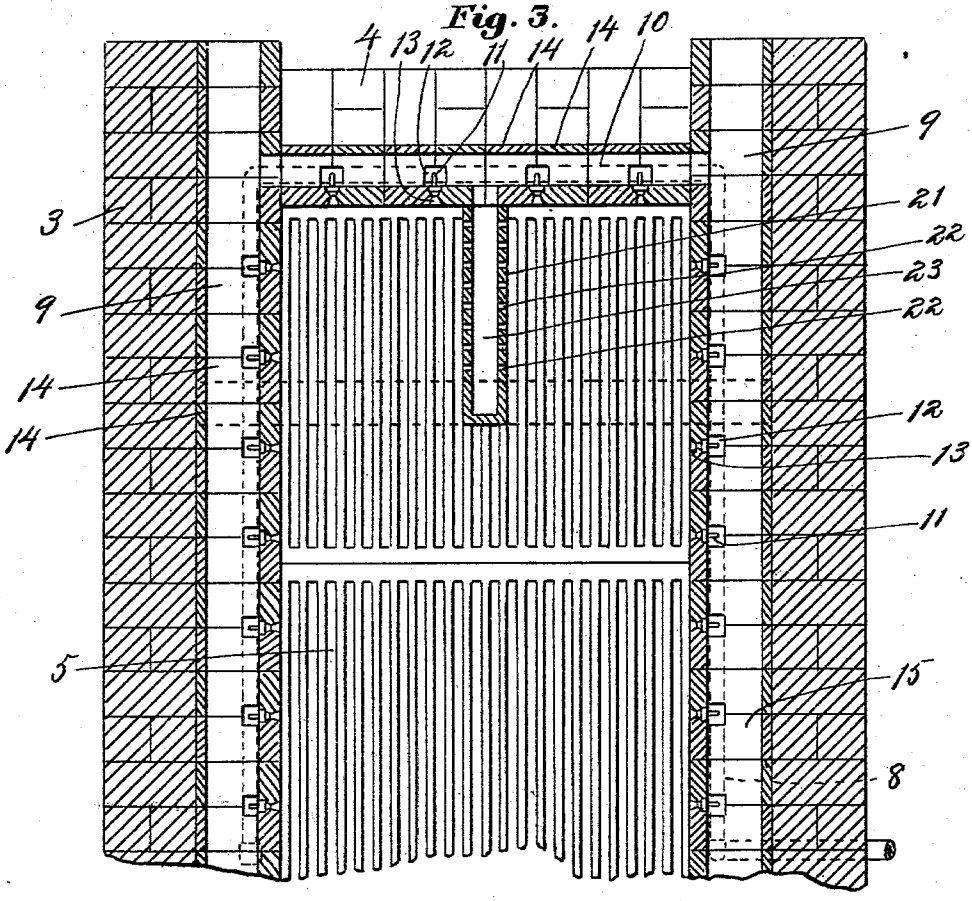


Fig. 5.

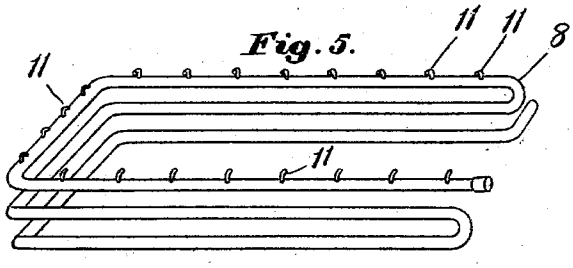
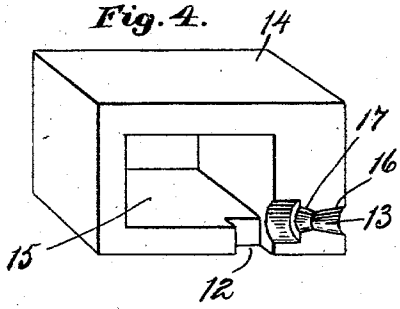


Fig. 4.



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UNITED STATES PATENT OFFICE.

ARTHUR W. PUDDINGTON, OF PROVIDENCE, RHODE ISLAND, ASSIGNOR TO UNITED STATES FUEL-SAVING AND SMOKE CONSUMING COMPANY, OF PROVIDENCE, RHODE ISLAND.

SMOKE-PREVENTING FURNACE.

SPECIFICATION forming part of Letters Patent No. 741,069, dated October 13, 1903.

Application filed October 31, 1900. Serial No. 34,999. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR W. PUDDINGTON, of Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Smoke-Preventing Furnaces, of which the following is a specification.

This invention relates to smoke preventing or comsuming furnaces for use in heating steam-boilers or in similar situations; and its object is to attain in a higher degree than heretofore the results for which furnaces of this character are designed.

The invention involves the employment of a deflecting-wall projecting downwardly from the boiler or heated structure and spanning the rear portion of the grate, this wall in an ordinary furnace being located in front of the bridge-wall, so as to deflect downwardly the products of combustion which are about to pass over said bridge-wall, together with means for supplying a supporter of combustion to the space behind this deflecting-wall. By such an arrangement the smoke and unconsumed combustible gases distilled off from the front of the bed of fuel on the grate are caused to pass close to the rear portion of said bed of fuel, which is in an incandescent state, whereby their temperature is raised to the point of ignition, and when in this condition an additional supply of air from an extraneous source or an injection of combustible gases, such as oxygen and hydrogen, resulting from the decomposition of steam is intermixed with the gases and smoke, and a very intense and complete combustion ensues.

Of the accompanying drawings, Figure 1 represents a longitudinal vertical section of a furnace constructed in accordance with my invention. Fig. 2 represents a section on line 2 2 of Fig. 1. Fig. 3 represents a section on line 3 3 of Fig. 1. Fig. 4 represents a detail perspective view of a special form of brick making up the air-conduit. Fig. 5 represents a detail perspective view of the retort employed.

The same reference characters indicate the same parts in all the figures.

Referring to the drawings, I have represented my invention employed in connection with a shell-boiler 1, although it is applicable to various other types of boiler. 2 is the front wall of the furnace, built beneath said boiler, 3 3 are the side walls, 4 is the bridge-wall, and 5 is the grate, all constructed in the usual manner and the said front, side, and bridge walls constituting the furnace-inclosure. At a point preferably nearer the bridge-wall than to the front wall a deflecting-wall or baffle 6 spans the furnace transversely above the grate 5, being built downwardly from the boiler 1 and its lower edge being located at or near the level of the upper edge of the bridge-wall 4. This deflecting-wall may be unsupported from below; but in the drawings, for the purpose of supporting said wall and for the additional purpose of dividing the space above the rear portion of the grate into two compartments I have shown a short longitudinal wall 7 built directly upon the grate 5 and extending forward from the bridge-wall 4 to the deflecting-wall 6, the middle part of the latter resting on the longitudinal wall 7. This wall 7 may be termed a "truncated" wall, inasmuch as it does not extend to the top of the furnace or combustion-chamber. The effect of the deflecting-wall 6 is to intercept the smoke and gases arising from the front part of the bed of fuel and pass them down underneath its lower edge, thereby causing said smoke and gases to pass close to the incandescent rear portion of said bed of fuel. The reference to this incandescent portion of the fuel-bed will be well understood, inasmuch as it is well known that in stoking furnaces the fresh fuel is added at the front of the grate and the partially-consumed portion is raked back from time to time onto the rear part of the grate, the said rear portion of the fuel-bed being therefore normally in a much hotter state than the front portion, where the fresh fuel is added. Although the provision of a deflecting-wall, such as the wall 6, will improve combustion in the manner stated, when used alone it is not effective in preventing smoke, particularly when fresh fuel is added. In addition I provide means for supplying from an extraneous source a combus-

tible gas, which is introduced into the space in the rear of the deflecting-wall, and air, whereby the smoke and gases heated by the incandescent fuel are caused to burn and become completely consumed. As shown in the drawings, I embed a retort 8 in the side and bridge walls 3 4 above the grate, said retort preferably consisting of a pipe bent into a series of convolutions, as shown in Fig. 5, and above this retort, in the side and bridge walls, I locate an air-conduit. This conduit is composed of longitudinal air-passages 9 9 in the side wall, having suitable air-inlets at their rear ends, and a cross-passage 10, connecting said passages 9 and located at the crest of the bridge-wall. The upper convolution of the retort 8 is provided with a series of jets or nozzles 11 11, projecting upwardly through holes 12 12 in the lower wall of the air-conduit and turned over at right angles, so as to direct their orifices inwardly toward the interior of the furnace-inclosure. The air-conduit is provided with a series of outlets 13 13, leading to the interior of the furnace, and the jets or nozzles 11 are directed into said outlets. The nozzles and air-outlets are located in the bridge-wall and preferably also in the two side walls of the furnace.

The air-conduit is formed in a course of bricks 14 14, one of which is shown in detail in Fig. 4. Each brick is provided with a through-aperture 15, and the laying of the bricks side by side connects these apertures and forms a continuous conduit. The openings 12 and 13 are formed between adjacent bricks, the brick being molded so that half of each opening is in one brick and the other half in the adjacent brick. Steam or a mixture of steam and oil is supplied to the lower end of the retort 8, and passing through the convolutions thereof it becomes highly heated from the heat of the furnace and decomposes. The resulting combustible gases are projected into the furnace through the nozzles 11, and the streams from the nozzles in their passage through the outlets 13 from the air-conduit cause a suction or draft of air through said outlets, which air becomes mixed with the gases from the retort and assists in supporting their combustion.

The retort 8 is preferably embedded in and closely surrounded by refractory material, so that the heat of the furnace-walls is readily communicated to it. It will be noted that the nozzles 11, located within the air-conduit, have a free circulation and passage of air around them, which air tends to cool said nozzles and prevent their destruction by the intense heat from the furnace. An improved construction is given to the air-outlets 13 by flaring them at both their outer and inner ends, as shown at 16 17, and locating the orifices of the nozzles 11 at the inner ends of said outlets. This peculiar construction of the outlets gives a greatly-improved draft and insures a maximum air-supply.

Further results of the above-described arrangement of parts are that I am thereby enabled to locate the retort close to the interior of the furnace, so as to obtain the maximum desirable heating effect for the vaporization of the oil, while at the same time retaining the proper length for the nozzles to permit them to act in their capacity of ejector-nozzles and to interpose between the retort and the furnace interior a solid wall of refractory material free from heat-retarding pockets or chambers and destructible nozzles.

The lower course of the deflecting-wall 6 is formed by two perforated hollow elongated bricks or tiles 18 18, whose outer ends rest on the side wall course of bricks 14 and their inner ends on the upper edge of the truncated wall 7, at the outer end of the latter. These tiles inclose an air-conduit 19, which connects with the air-passage 9 in the side walls and is provided with a series of outlets or holes 20 20 near its lower edge on the rear side of the wall 6. The upper course of the truncated wall 7 is formed by an elongated brick or tile 21 of inverted-U section, having a series of outlets or perforations 22 on both sides. Said tile incloses an air-conduit 23, which connects at its ends with the bridge-wall air-conduit 10 and the conduit 19.

In the operation of the furnace the chimney-draft creates an outflow of air through the perforations 20 22, which air mixes with the smoke and gases passing up from underneath the deflecting-wall 6 and supplies the oxygen necessary to their complete combustion. This combustion becomes very intense in view of the fact that said smoke and gases have just had their temperature raised by the incandescent body of fuel on the rear portion of the grate. The jets from the bridge-wall nozzles serve to further raise the temperature of the smoke and gases and also have the effect of retarding their escape over the bridge-wall and permitting the thorough intermixture of the extraneous air and gas with the said smoke and gases. The division of the rear part of the furnace-space into two compartments by the longitudinal wall 7 and the projection into said space of air-jets from both sides of the upper edge of said wall insure an ample supply of oxygen to the whole of the space above the rear of the grate.

I claim—

1. In a furnace, the combination with the furnace inclosure or chamber having a grate, of a retort embedded in the wall of said chamber above the grate close to the inner side of said wall, an air-conduit located in said wall above the retort and having outlets directed into the furnace-chamber, and a series of discharge jets or nozzles projecting upwardly from said retort into the air-conduit and directed into said outlets.

2. In a furnace, the combination of the furnace-inclosure having a grate, a bridge-wall,

and a transverse deflecting-wall spanning the furnace-inclosure above the grate in front of the bridge-wall, and means associated with the bridge-wall to forcibly project forward therefrom into the unconsumed fuel-bed gases, a mixture of easily-inflammable gas and air to retard said fuel-bed gases in their escape over the bridge-wall and secure their ignition.

3. In a furnace, the combination of the furnace-inclosure having a grate, a bridge-wall, and a transverse deflecting-wall spanning the furnace-inclosure above the grate in front of the bridge-wall, means associated with the deflecting-wall to supply air to the unconsumed fuel-bed gases downwardly deflected thereby, and means associated with the bridge-wall to forcibly project forward therefrom into said gases, an easily-inflammable gas to retard their escape over the bridge-wall and secure their ignition.

4. In a furnace, the combination of the furnace-inclosure having a bridge-wall at the back thereof, a grate, a deflecting-wall spanning the furnace-inclosure in front of the bridge-wall, above the grate, and adapted to deflect the products of combustion downwardly, a series of discharge-outlets associated with said deflecting-wall and adapted to discharge into the products of combustion deflected thereby, and a series of jets or nozzles associated with the bridge-wall and directed toward said deflecting-wall.

5. In a furnace, the combination of the furnace-inclosure having a bridge-wall at the back thereof, a grate, a deflecting-wall spanning the furnace-inclosure in front of the bridge-wall, above the grate, and adapted to deflect the products of combustion downwardly, a series of discharge-outlets distributed along the lower edge of the deflecting-wall and directed toward the bridge-wall, and a series of discharge-outlets distributed along the upper edge of the bridge-wall and directed toward said deflecting-wall.

6. In a furnace, a grate, a bridge-wall, a deflecting-wall spanning the furnace above the rear portion of the grate, in front of said bridge-wall, and adapted to deflect the products of combustion downwardly, a retort having a series of jets or nozzles in the bridge-wall directed forwardly, and an air-conduit associated with the deflecting-wall and having a series of rearwardly-directed outlets.

7. In a boiler-furnace, the combination of the boiler, the furnace-inclosure having a bridge-wall at the back thereof, a grate, a longitudinal truncated wall extending upwardly from the grate and forwardly from the bridge-wall, a substantially vertical transverse deflecting-wall extending downwardly from the boiler and resting on the front end of said longitudinal wall, and a series of outlets directed into the space on either side of said truncated wall between the bridge-wall and deflecting-wall and adapted to supply a gaseous or vaporous fluid to assist combustion.

8. In a furnace, the combination with a furnace-inclosure, of a transverse bridge-wall, a grate, a transverse deflecting-wall spanning the furnace-inclosure above the grate and in front of the bridge-wall, a longitudinal wall extending from the bridge-wall to the deflecting-wall above the grate, and connecting air-conduits in said bridge, longitudinal, and deflecting walls, each having a series of discharge-outlets directed into the space between said walls.

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

ARTHUR W. PUDDINGTON.

Witnesses:
P. W. PEZZETTI,
A. D. HARRISON.