J. N. McKEE.

SMOKE PREVENTING FURNACE.

APPLICATION FILED MAR. 31, 1910.

990,368. Patented Apr. 25, 1911.

Fig. 2.

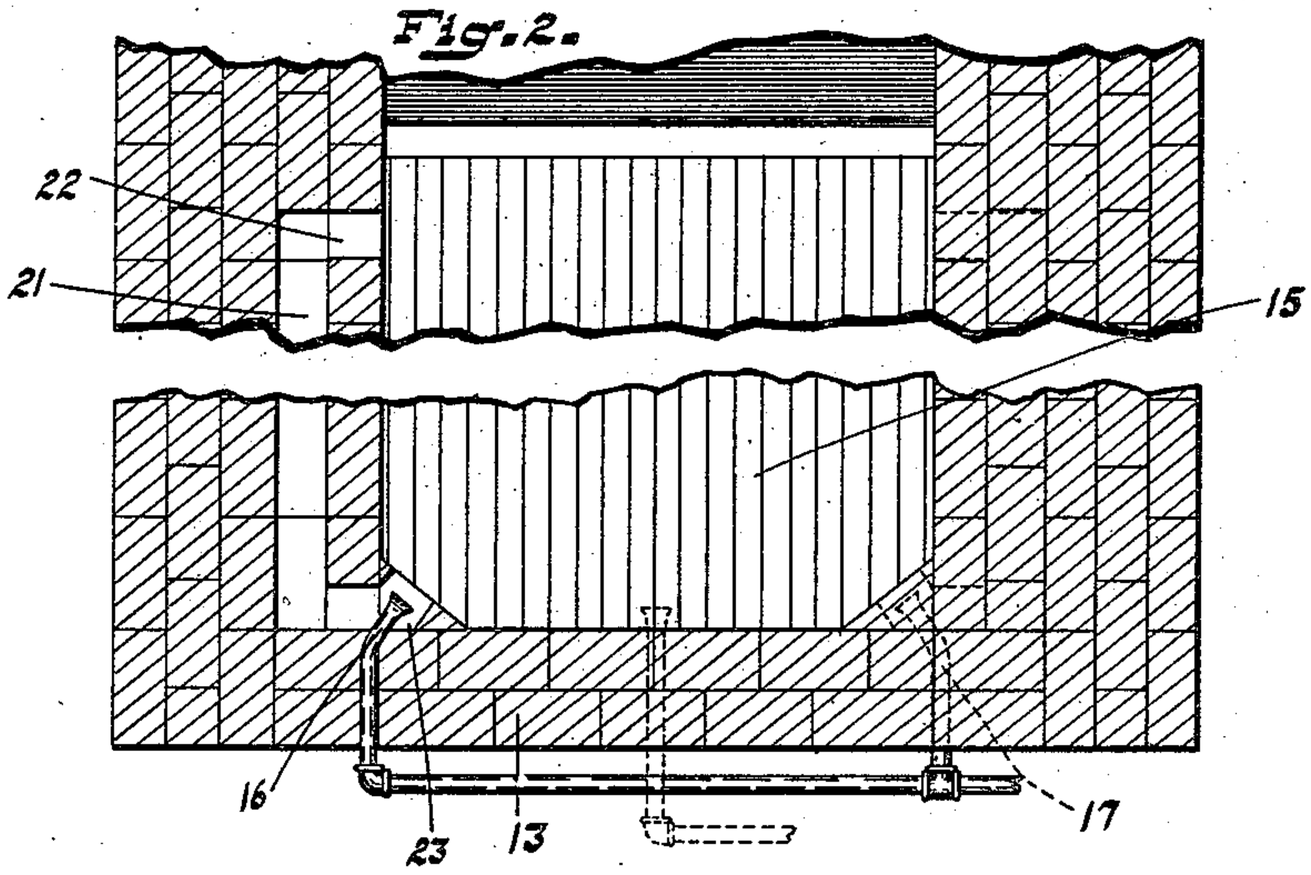


Fig. 1.

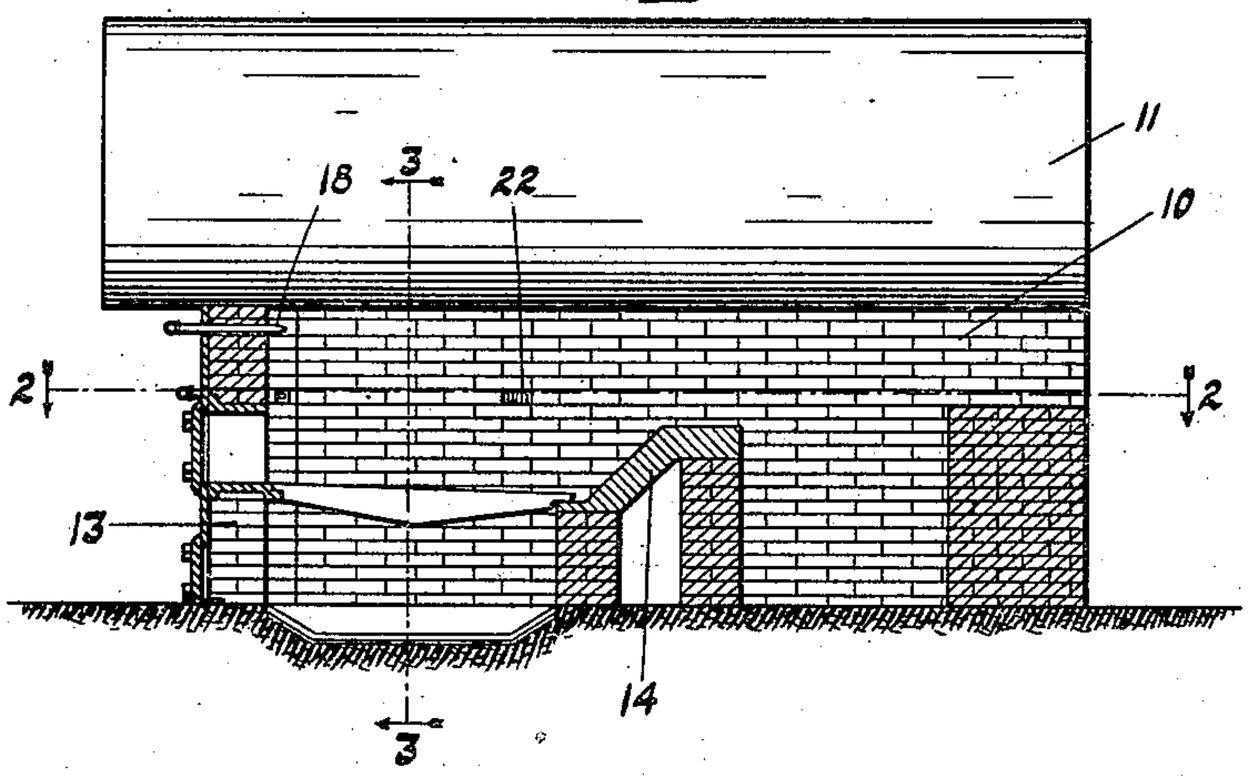
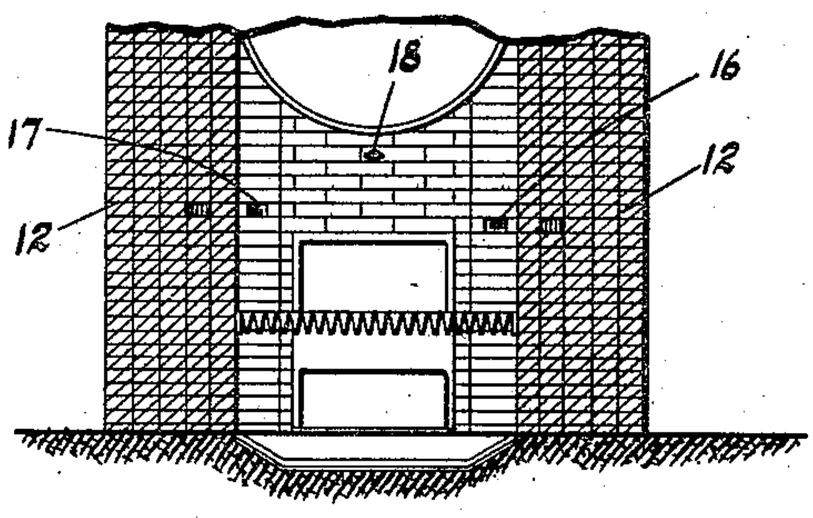


Fig. 3.



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UNITED STATES PATENT OFFICE.

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SMOKE-PREVENTING FURNACE.

990,368. Specification of Letters Patent. Patented Apr. 25, 1911.

Application filed March 31, 1910. Serial No. 552,610.

To all whom it may concern:

Be it known that I, JASPER N. McKEE, a citizen of the United States, residing at Indianapolis, in the county of Marion and State of Indiana, have invented a new and useful Smoke-Preventing Furnace, of which the following is a specification.

Heretofore many devices have been produced for the consumption of fuel under non-smoke-producing conditions and many of such devices have involved the use of steam or air jets for forcing steam or air into the combustion chamber over the fuel in order to supply the necessary amount of oxygen at proper temperature for the complete combustion of the volatile portions of the fuel. While some of such devices have been successful so far as the elimination of smoke is concerned, yet such devices have, so far as I am aware, been objectionable because of the intense heating effect upon a comparatively small portion of the boiler immediately above the grates. This has been due to the fact that the steam or air jets had been introduced into the combustion chamber under such conditions as to concentrate the combustion within the space immediately above the grates.

The object of my present invention is to provide an apparatus which will overcome the difficulty referred to.

The accompanying drawings illustrate my invention.

Figure 1 is a longitudinal vertical section of a boiler setting constructed in accordance with my invention; Fig. 2 a horizontal section, on an enlarged scale, on line 2—2 of Fig. 1; Fig. 3 a section on line 3—3 of Fig. 1.

In the drawings, 10 indicates a setting for an ordinary fire tube boiler 11, said setting being, in its general features, the same as any ordinary setting and comprising the side walls 12, 12, front wall 13 and bridge wall 14, the drawings being intended merely as a typical illustration.

Leading through the front wall 13 of the setting at the front corners of the combustion chamber 15 are two nozzles 16 and 17 of any desired type but conveniently formed of ordinary piping with horizontally flattened ends, as indicated, in order to deliver a substantially horizontal fan-shaped blast. These two nozzles are directed toward the rear middle of the combustion chamber and in practice I find that it is desirable to have the two streams from the nozzle converge at a point about one-third of the distance in front of the bridge wall, the exact distance depending to some extent upon the length of the boiler and setting. It is not desirable however that the two streams actually converge but that, instead, one pass beneath the other and as a consequence one of the nozzles is properly set slightly lower than the other, as indicated in Fig. 3.

With the two nozzles 16 and 17 alone I find that a whirl or vortex of burning gases is produced which, while it materially increases the combustion within the chamber and thoroughly mixes the volatile materials of the fuel with the incoming air or steam so as to practically prevent smoke, yet such action so concentrates the combustion as to practically produce a strong jet of high temperature against the shell of the boiler immediately above the grate bars, the temperature being so high as to soon burn out the shell of the boiler. Such an action is very undesirable and, in many cases, is thoroughly impractical because of the expense of "up keep". In order therefore to overcome this objection I provide a middle nozzle 18 which is arranged somewhat above the planes of the nozzles 16 and 17 quite close to the lowest plane of the boiler shell, as indicated in Figs. 1 and 2. The blast from the nozzle 18 operates somewhat as a blanket for the high temperature jet produced by the whirling gases resulting from the action of nozzles 16 and 17 and directs the entire volume of burning gases rearwardly under the boiler shell and over the bridge wall. This results in a distribution of the heat along the entire length of the shell so as to protect the shell against burning, but without decreasing the actual heating effect upon the water so that the steaming capacity of the boiler is not in any way diminished.

By this arrangement there is some slight tendency toward the production of smoke-producing gases at the rear corners of the combustion chamber. In order to overcome this slight difficulty I form horizontal passages 21 in each side wall 12. At its rear end each of these passages 21 opens at 22 into the combustion chamber a short distance in front of the bridge wall and its forward end opens into the combustion chamber at 23 immediately around the nozzle 16 or 17, the nozzle being placed slightly within the passage so as to produce upon the passage an aspirator effect which will

draw a considerable quantity of unconsumed gases from the rear corners of the combusion chamber and discharge them again into the forward corners of the combustion chamber. These gases, which are drawn forwardly through the passages 21, are at a very high temperature but are lacking in oxygen. The consequence is that they will superheat the steam issuing from the nozzles 16 and 17 (if steam is used) and thus deliver dry steam into the combustion chamber, and the steam will deliver a sufficient quantity of air to the gases to cause them to ignite.

I claim as my invention:—

1. The combination, with a combustion chamber having a suitable outlet and a pair of gas passages formed at each side of the chamber and communicating with the chamber at their front and rear ends, of a pair of blast nozzles arranged within the front ends of the gas passages and directed rearwardly into the combustion chamber from the forward corners thereof at different levels so as to produce converging overlapping streams, a third blast nozzle directed rearwardly into the forward end of said combustion chamber between the two first nozzles and at a higher level, and means for supplying a blast to said nozzles.

2. The combination, with a combustion chamber having a suitable outlet, of a pair of blast nozzles directed rearwardly into the combustion chamber from the forward corners thereof at different levels so as to produce converging overlapping streams, a third blast nozzle directed rearwardly into the forward end of said combustion chamber between the two first nozzles and at a higher level, and means for supplying a blast to said nozzles.

3. The combination, with a combustion chamber having a suitable outlet and a pair of gas passages formed at each side of the chamber and communicating with the chamber at their front and rear ends, of a pair of blast nozzles arranged within the front ends of the gas passages and directed rearwardly into the combustion chamber from the forward corners thereof so as to produce converging streams, a third blast nozzle directed rearwardly into the forward end of said combustion chamber between the two first nozzles and at a higher level, and means for supplying a blast to said nozzle.

4. The combination, with a combustion chamber of a pair of blast nozzles directed rearwardly into the combustion chamber from the forward corners thereof so as to produce diagonal overlapping blast streams, means for supplying said nozzles with a suitable blast, and means for producing a rearwardly directed blanket-blast above the said pair of blast nozzles.

In witness whereof, I have hereunto set my hand and seal at Indianapolis, Indiana, this 29th day of March, A. D. one thousand nine hundred and ten.

JASPER N. McKEE. [L. S.]

Witnesses:
ARTHUR M. HOOD,
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