April 5, 1927. 1,623,746

T. E. MURRAY

FURNACE AND COOLING DEVICE

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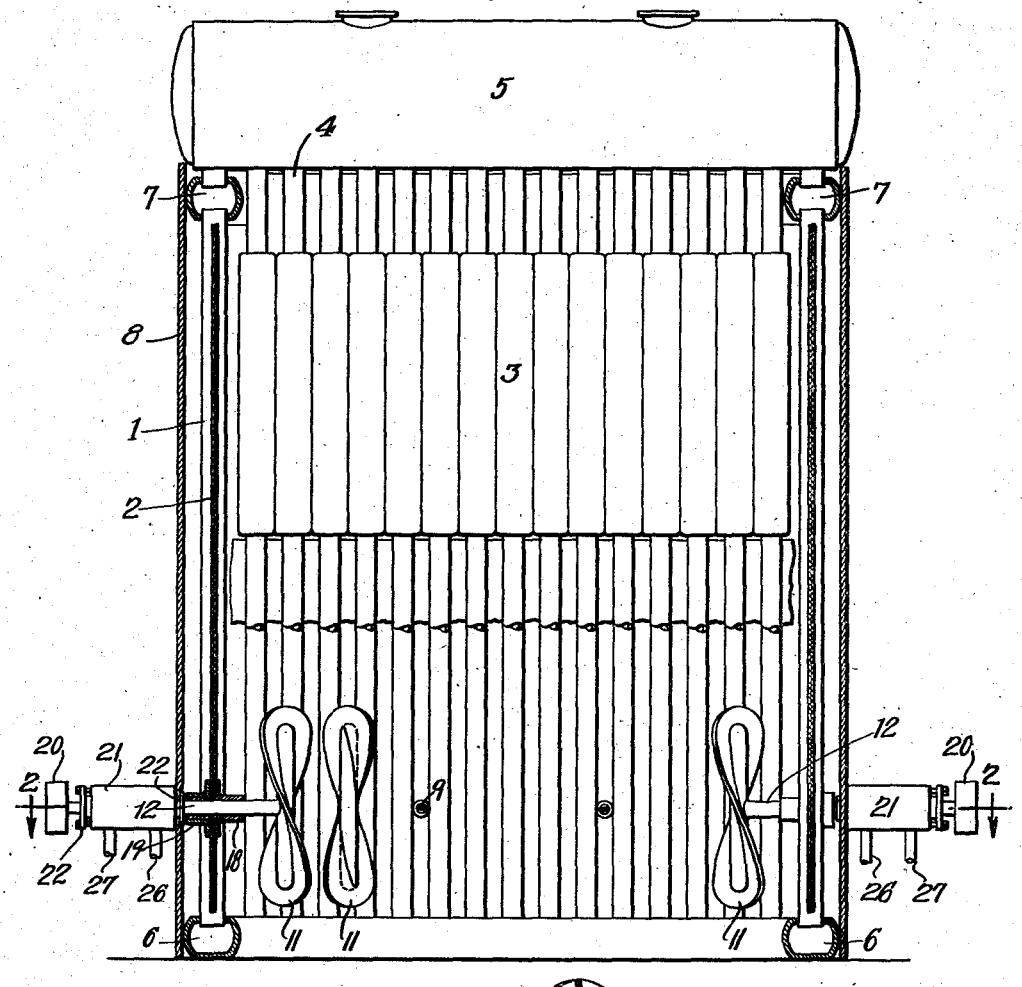
Fig. 1.



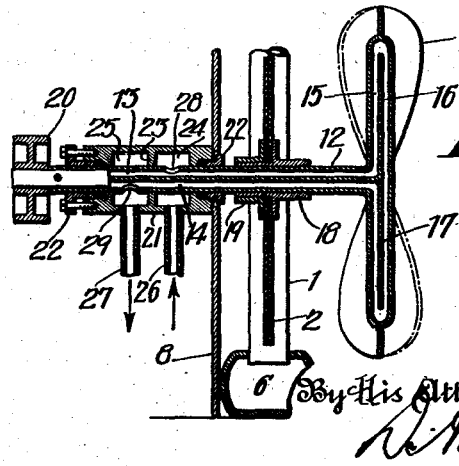


Fig. 4.

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Fig. 2.

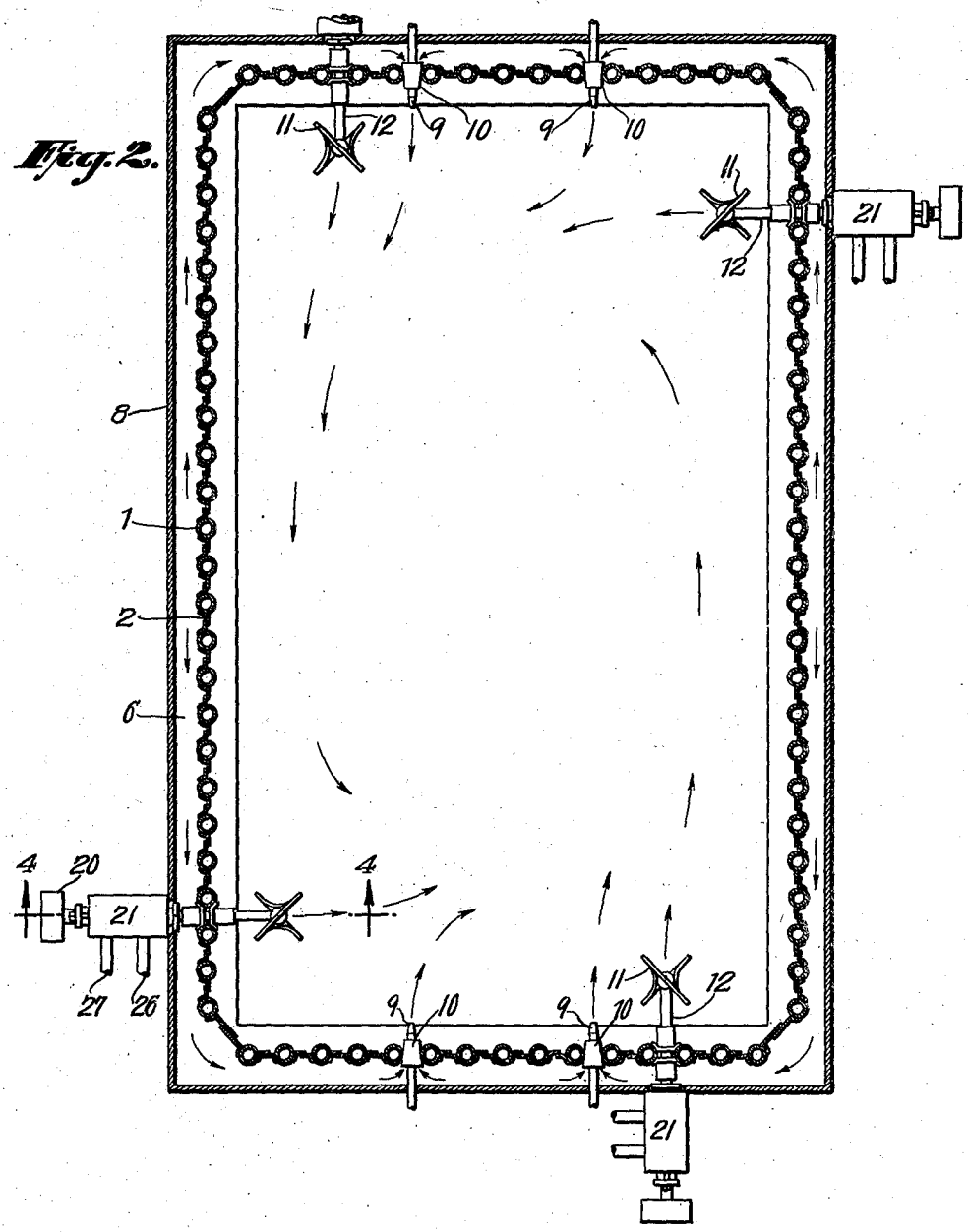
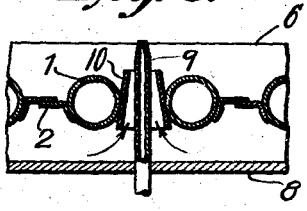


Fig. 3.



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[illegible]

Patented Apr. 5, 1927. 1,623,746

UNITED STATES PATENT OFFICE.

THOMAS E. MURRAY, OF BROOKLYN, NEW YORK.

FURNACE AND COOLING DEVICE.

Application filed May 21, 1925. Serial No. 31,857.

In a previous application No. 642,725, I have described a special type of boiler having at the sides of the furnace one or more walls made of tubes with fins or plates between them to present particularly to the radiant heat of the burning fuel a wide surface exposure in proportion to the quantity of water flowing through the tubes.

The present invention is directed to certain improvements in the furnaces of such a boiler and is applicable also to other boilers and furnaces and to a variety of other apparatus.

The accompanying drawings illustrate an embodiment of the invention.

Fig. 1 is a vertical section of a boiler and furnace embodying the invention;

Fig. 2 is a horizontal section thereof approximately on the line 2—2 of Fig. 1;

Fig. 3 is an enlarged detail of Fig. 2;

Fig. 4 is a sectional view of one of the fans shown in Fig. 1.

Referring to the embodiment of the invention illustrated, the furnace has an inner wall extending around four sides and composed of vertical tubes 1 each of which has flanges 2 welded thereon and projecting from opposite sides, the tubes being spaced apart with the flanges overlapping in the intermediate space so as to present a large exposure of heating surface to the burning fuel within. Above the furnace are arranged the usual inclined tubes ending in vertical headers 3 which at their upper ends communicate by pipes 4 with the steam drum 5. The water wall composed of the tubes 1 is connected for each side to a header 6 at the bottom and 7 at the top, the latter located just below the level of the steam drum. An outer wall 8 surrounds the furnace on four sides. This may be a wall of sheet metal spaced away from the tubes 1 to leave an air space or may be a masonry wall or may be of any usual or suitable material and construction.

The space between the outer wall and the tubes may communicate with the combustion chamber so as to provide pre-heated air for combustion, or may be a dead air space serving only for insulation.

The invention may be applied to furnaces burning any sort of fuel. It is most useful with nozzle burners 9 through which are forced jets of powered coal, oil or gas, mixed with air admitted through the same nozzle or through surrounding sleeves or nozzles 10. Such nozzles are shown in Fig. 2 at opposite ends of the furnace but they may be located in various other positions.

The invention is particularly designed for high pressure boilers to be operated at a high rating; that is, to generate steam at a very rapid rate in proportion to the heating surface. In boiler and other furnaces there is often a tendency of the gases to flow in regular streams or channels so that there is an irregular distribution of the heat to the different parts of the heating surface and a consequent loss of efficiency. This is particularly noticeable in boilers operated at a high percentage of rating.

To overcome this channelling tendency, I propose to introduce fans or similar apparatus which blow the gases in directions transverse to that of the natural flow so as to cause a break up of the natural channels and cause an even distribution of the burning gases. These fans may be arranged in various locations according to the shape and size of the furnace. I have shown four such fans 11 near the four corners (Fig. 2) which project the gases in tangential directions so as to produce a horizontal swirling effect across the natural vertical flow. The fans stand out from the walls a sufficient distance to permit free access of gas from the rear. The fans are of the propeller type. The blades are cast to enclose a water circulating passage by which they are protected from overheating. The stem 12 has two longitudinal passages 13 and 14 communicating with a T-head which has an inlet passage 15 extending outward in one direction, an outer passage 16 extending from one end to the other and an exit passage 17 extending from the second end to the center where it communicates with the passage 14 of the stem. The stem passes through bearing sleeves 18 and 19 mounted on the opposite faces of the furnace wall, and on its outer end carries a pulley 20 or other device by which it is rotated. The outer portion of the stem is surrounded by a fixed sleeve 21 closed at its ends by stuffing boxes 22 and having a central partition 23 forming two chambers 24 and 25 to which are connected respectively an inlet pipe 26 and an outlet pipe 27 for water, steam or other cooling medium. The stem 12 has an opening 28 registering with the chamber 24 to maintain

the latter in communication with the passage 13 and an opening 29 registering with the chamber 25 to maintain the latter in communication with the exit passage 14. The cooling fluid is fed at a sufficient rate to prevent overheating and the fans are circulated to such an extent as to effect a substantially uniform distribution of the burning gases.

This arrangement is particularly important in connection with the water wall since it distributes the incandescent gases so as to most efficiently heat the wall by radiation and thus utilize at substantially their maximum efficiency all parts of the heating surface. The boiler being operated at a high rating, the water is circulated rapidly through the tubes constituting the water wall so as to protect this from overheating and, of course, to protect the outer wall.

All the air for combustion can be fed through the nozzle burners as explained, or part of it may be admitted through the side walls where it is drawn by the draft of the boiler, or may be projected into the furnace by the fans. Instead of the fans shown, various other devices may be used for causing currents in the desired direction.

The style of device illustrated for circulating a cooling medium to the fan is capable of application to a great many other apparatus and devices which have to rotate while being cooled.

Though I have described with great particularity of detail certain embodiments of my invention, yet it is not to be understood therefrom that the invention is restricted to the particular embodiment disclosed. Various modifications thereof may be made by those skilled in the art without departing from the invention as defined in the following claims.

What I claim is:

1. A furnace having a combustion chamber with a water wall consisting of tubes exposed to the direct radiant heat of the burning fuel in said chamber in combination with fans therein for causing currents of the burning gases in a direction transverse to that of their natural flow so as to distribute them uniformly in the combustion chamber.

2. The furnace of claim 1, the fans being provided with passages for the circulation of a cooling medium.

3. A furnace having a combustion chamber in combination with fans arranged to cause currents of the burning gases in said chamber in directions angular to each other and transverse to that of the natural flow of the gases so as to distribute them in the combustion chamber and to cause a swirling movement which tends to retain them in the combustion chamber.

In witness whereof, I have hereunto signed my name.

THOMAS E. MURRAY.