

Nov. 16, 1937.

M. A. HOFFT

2,099,522

REFUSE BURNING FURNACE

Filed Feb. 8, 1936

2 Sheets-Sheet 1

Fig. 1.

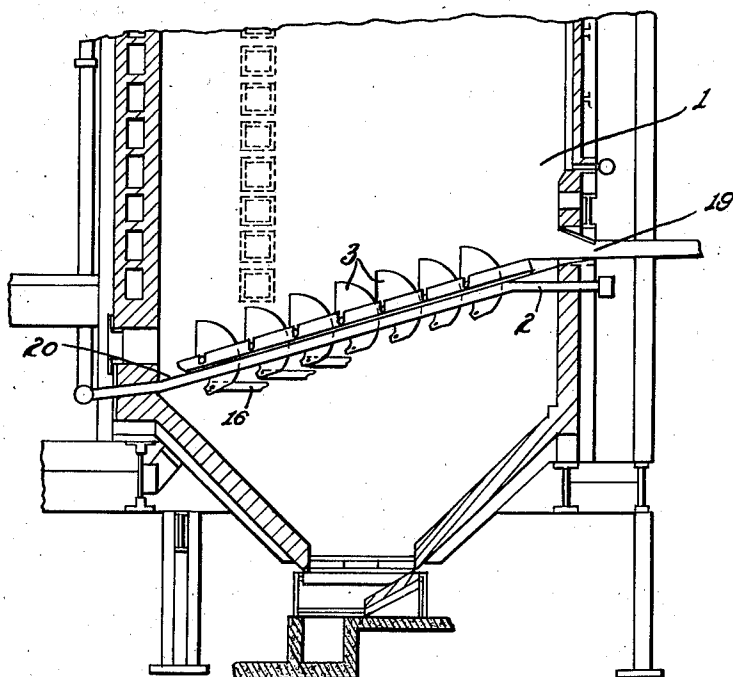
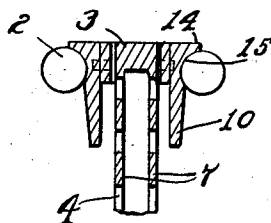


Fig. 4.



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Fig. 2.

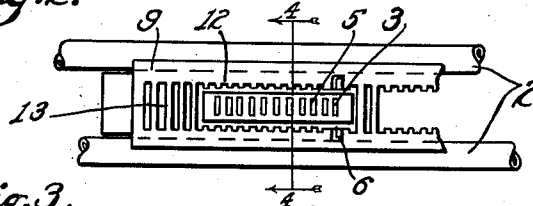


Fig. 3.

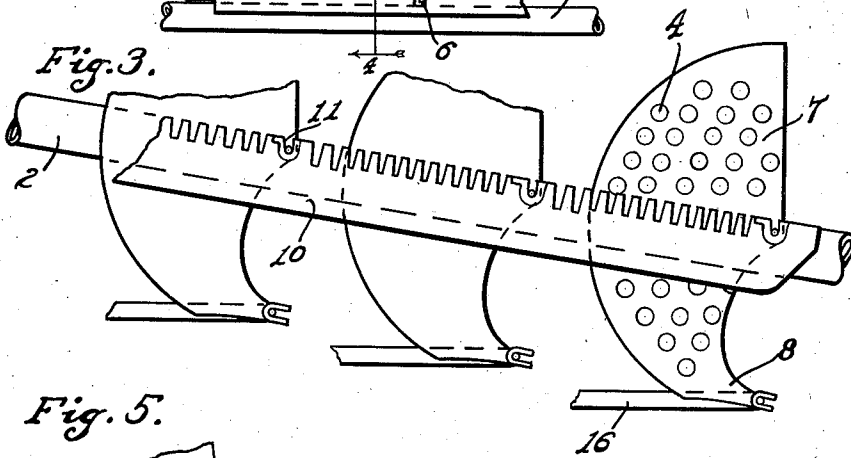


Fig. 5.

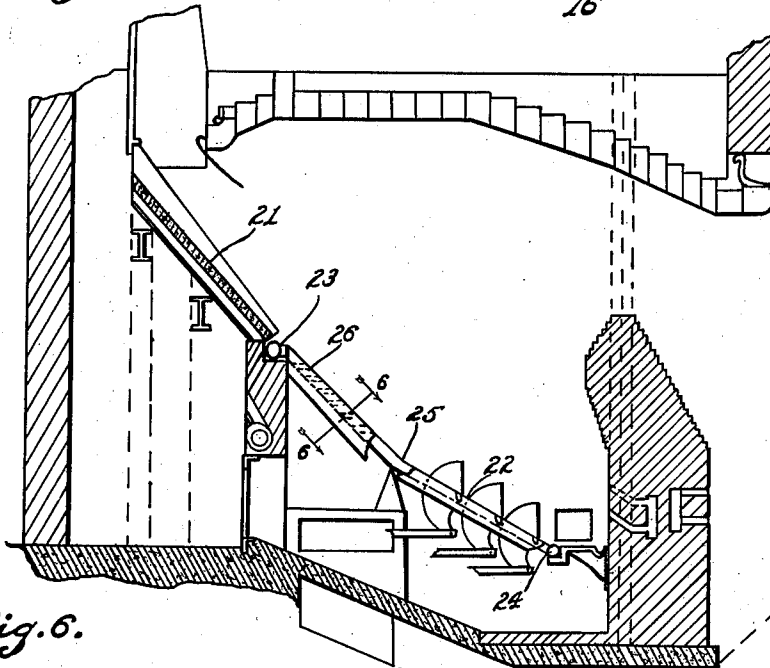
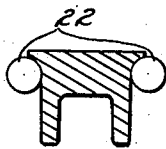


Fig. 6.



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UNITED STATES PATENT OFFICE

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REFUSE BURNING FURNACE

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Application February 8, 1936, Serial No. 62,887

3 Claims. (Cl. 122—376)

My invention relates to improvements in furnace grates and particularly to furnace grates of the pusher type, adapted primarily for burning such fuels as refuse, waste, rubbish, garbage, and other like material. More specifically my invention relates to means for water cooling furnace grates of the pusher type. In grates of this character there are certain occasions where the grates become extremely hot and as a result of the intense heat and the heating of the grates to a high temperature, certain objections arise. For instance, the grates may become warped under the intense heat, the grates may be caused to swell under the intense heat until the associated parts become stuck together, preventing the operation to a certain extent of the pushers. Furthermore, under this intense heat certain types of refuse tend to form into a hard slag almost like glass, which is extremely difficult to remove from the grates and which materially affects the operation of the grates.

By providing means for cooling these grates of the pusher type, I am enabled to reduce the temperature of the grates and grate bars to such an extent that the above difficulties are overcome.

For the purpose of disclosing my invention, I have disclosed certain embodiments thereof in the accompanying drawings in which:

Fig. 1 is a longitudinal sectional view of a boiler embodying my invention;

Fig. 2 is a detail plan view of a portion of the grate structure;

Fig. 3 is a detail side elevation of a portion of the grate structure;

Fig. 4 is a detail section on the line 4—4 of Fig. 2;

Fig. 5 is a longitudinal sectional view of a modification of my invention; and

Fig. 6 is a detail section on the line 6—6 of Fig. 5.

In the structure illustrated in Figs. 1 to 4 inclusive, the boiler 1 is provided with a plurality of water-cooled tubes 2 arranged side by side and extending from the front to the back of the furnace, the grate being inclined downwardly toward the rear of the furnace, as shown. These tubes are connected in a water circulating system. Arranged on these tubes and supported thereby, and interposed therebetween, are a plurality of pivoted pushers 3 which are preferably hollow in cross section and provided on their sides with air inlet openings 4 and on their tops with cross bars 5 to form air spaces through which the air may be admitted to the fuel. On

each side of the pusher bars at their fore ends, I provide a trunnion 6 by which the pusher may be supported in position. The hollow pushers, in effect, have spaced apart side plates 7 through which the openings 4 are adapted to be formed and these side plates are substantially triangular in elevation, having forwardly extending lower ends 8. The pushers are supported in grate bar members 9 which are provided with side webs 10 extending a considerable distance downward and having trunnion receiving slots 11 formed in the upper face thereof. Transversely extending fingers 12 are formed on the inner faces of the side bars 10 adjacent the pushers and the trunnion receiving slots are sufficiently spaced apart to provide a certain spacing from front to back of the pushers. This spacing is provided with transversely extending webs 13 extending between the side webs 10. The structure thus described constitutes in effect a grate bar provided with means for supporting therein a plurality of pushers, one disposed behind the other from front to back of the furnace. These grate bars are supported upon and at least partially cover the tubes 2 and to this end, each of the grate bars on its sides is provided with a laterally extending flange 14 having formed on its under face an arcuate surface 15 which fits over and receives a tube 2. This flange 14 may, if desired, be extended a sufficient distance to cover the tube to the center thereof so that when all of the grate bars are in position, the entire surface of the tubes will be covered, or it may be short, as is illustrated, to leave a certain portion of the top of each tube exposed. The lower end of each of the pushers which, while having been described as having been substantially triangular, is as a matter of fact somewhat arcuate in shape, and is connected to an operating rod 16 extending out through the furnace wall in order that the pushers may be manipulated from the exterior of the furnace. There are a series of these grate bars with their pushers arranged between each pair of longitudinally extending tubes and the pushers are preferably arranged so that transversely of the furnace, parallel rows of pushers are provided. By this arrangement, the lower ends of each of the transversely extending rows of pushers may be connected to a single operating rod, in turn connected to the operating bar 16 so that each of the series of pushers may be operated simultaneously although from front to back of the furnace, the series of pushers may be operated independently and as a matter of fact, are operated progressively.

In the structure illustrated in Figs. 5 and 6, I have shown a modified form of furnace. In this structure, the initial portion of the grate is preferably formed of tile as at 21 and this portion of the grate has an angle of inclination of about fifty degrees. The next portion of the grate preferably consists of longitudinally extending tubes 22, preferably connected respectively at one end with a header 23 and at the other end with a header 24. That portion of the tubes next adjacent to the hearth portion 21 of the grate is preferably given an inclination of about forty-five degrees. These tubes 22 are bent at their lower ends so that the lower end of the grate will have an angle of inclination of about thirty degrees. The tubes may be bent at the point 25 to give this change in angle of inclination or, if desired, a header may be inserted at this point. Supported on the tubes are the pushers and grate bars of the construction heretofore described and above this portion, I preferably mount stationary grate bars 26 which, as will be seen in cross section, are provided with webs embracing the sides of the tubes.

In this arrangement, the material is first dumped upon the hearth section 21 and because of its wetness and therefore being slow to move, the inclination of the hearth section advances the material. As it gets down to the next section which has a less inclination it has become somewhat dried and, therefore, will have a tendency to move more rapidly. Due to the difference in the angle of inclination, however, the movement is maintained at about the same speed. As it finally reaches the lowermost section of the grate, it will have become more or less coked and comparatively dry so that on this section the inclination is less than the other two sections, and this section is provided with pushers not only for the purpose of breaking up the coked material but also for the purpose of moving it on down to the delivery end of the grate.

It is quite obvious that while I have shown round tubes, tubes having other cross sectional configuration may be used, such, for instance, as rectangular tubular constructions or the like.

It is also obvious that the headers for the ends of the tubes may be of any suitable construction, either rectangular or round or of any other desired configuration.

I claim as my invention:

1. In a furnace, in combination, a plurality of water tubes extending longitudinally of the furnace from front to back, a plurality of grate bars, each having comparatively deep vertical side walls having notches in their upper edges to receive pusher finger trunnions and connected on their top faces by a series of cross bars and having on their inner walls transversely extending fingers, said grate bars occupying the space between said tubes and pusher fingers mounted in the spaces between said inwardly projecting fingers and having trunnions pivotally supported in the trunnion notches in the grate bars.

2. In a furnace, in combination, a plurality of water tubes extending longitudinally of the furnace from front to back and spaced apart, a plurality of grate bars occupying the space between and supported upon said water tubes and each comprising a pair of vertical side walls comparatively deep, having recesses extending longitudinally thereof to receive said water tubes, the top surface of said side walls being connected together at spaced longitudinal intervals by cross bars, inwardly projecting fingers on said side walls, said side walls having trunnion notches in the top face surface thereof and pusher fingers disposed between said side walls and between said fingers and having laterally extending trunnions pivotally engaging in said trunnion notches.

3. A grate bar for filling the space between laterally spaced water tubes of a furnace, comprising vertical side walls comparatively deep, said side walls being connected together at longitudinally spaced intervals by cross bars and being provided with inwardly projecting fingers, the side walls being provided on their upper faces with trunnion notches, and pusher fingers fitting between the side walls and having laterally extending trunnions pivotally engaging in said trunnion notches.

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