

(No Model.)

M. A. FOSTER.
STEAM BOILER FURNACE.

No. 331,699.

Patented Dec. 1, 1885.

Fig. 1.

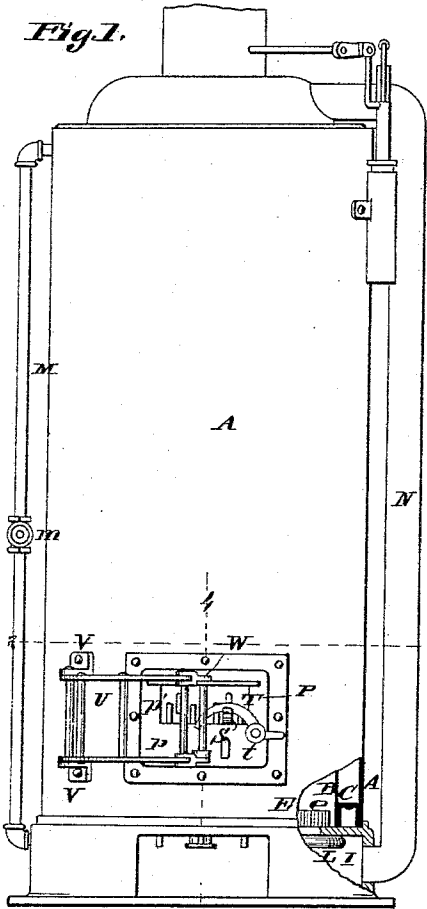


Fig. 3.

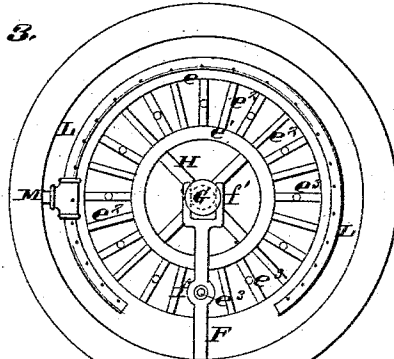


Fig. 4.

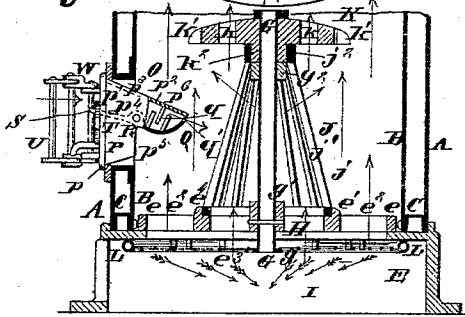


Fig. 2.

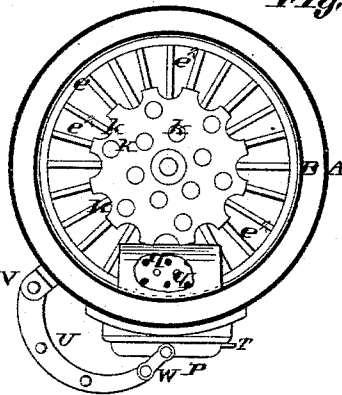


Fig. 5.

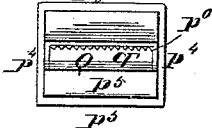


Fig. 6.

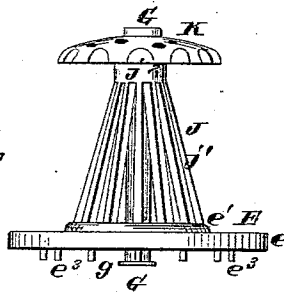
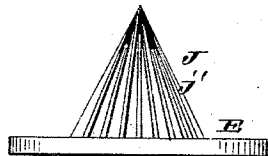


Fig. 8.



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UNITED STATES PATENT OFFICE.

MICHAEL A. FOSTER, OF ST. LOUIS, MISSOURI.

STEAM-BOILER FURNACE.

SPECIFICATION forming part of Letters Patent No. 331,699, dated December 1, 1885.

Application filed February 25, 1885. Serial No. 156,979. (No model.)

To all whom it may concern:

Be it known that I, MICHAEL A. FOSTER, of the city of St. Louis and State of Missouri, have invented a certain new and useful Improvement in Steam-Boiler Furnaces, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

The improvement applies more especially to upright cylindrical boilers, although some or all of the features may be applied to other boilers.

Figure 1 is a front view, with part broken away, showing parts of the interior in section. Fig. 2 is a horizontal section at 2 2, Fig. 1. Fig. 3 is a bottom view of the boiler. Fig. 4 is a detail vertical section at 4 4, Fig. 1. Fig. 5 is an inside view of the door. Fig. 6 is an elevation of the upright grate. Fig. 7 is a modification in elevation of the upright grate.

The boiler proper may have the usual construction found in boilers of this class, the part in proximity to the furnace having an outer shell, A, and an inner shell, B, and an annular bottom, C.

D is the base on which the boiler and furnace-grate are supported. The furnace-grate has two concentric rings, e and e' , and bars e'' between the two rings. These bars, with the rings, constitute an annular horizontal grate, E. The bars e'' are shown extending radially; but this is non-essential, as the bars may be arranged in any preferred manner. The grate E has studs e''' extending downward for engagement with a lever, F, by which the grate may be turned or shaken. The lever F has a socket at f for the reception of either of the studs e''' , and the end of the lever has a fork, f' , to engage the lower end of a tube, G, which passes through the center of a crucial frame, H, forming the middle of the grate E. The lower end of the tube G has a flange or collar, g , upon which the forked end of the lever F is supported when in use.

g' is a collar on the tube G, which bears upon the top of the frame H. The tube G extends up vertically from the frame H, and is open from top to bottom, so that air from the ash-pit I may ascend the tube and escape from the top into the furnace-space of the boiler.

J is an upright grate composed of a circular bottom ring, j , resting in a circular rabbet-groove at e' in the top of the ring e' , inclined bars j' , and a top ring, j'' , connected to the ring j by the bars j' .

K is a cap extending horizontally from the top of the grate J upon every side. This cap I prefer to make of baked fire-clay, as it is subjected to a high temperature. I prefer to make the cap with perforations k , and with notches or gaps k' at the edge, to increase the heating-surface and to allow the ascending gases to pass through the cap. The cap K has a central neck, k'' , which fits within the ring j'' and rests upon a collar, g'' , upon the tube G, the tube passing centrally through the deflecting-cap K. The air passing through the tube G tends to keep the tube cooler than it would otherwise be, and thus preserves it from the weakening and destructive effects of extreme heat.

L is a steam-pipe, which is fixed in the ash-pit beneath the level of the grate E, as shown, the steam-pipe having jet holes upon its inner side, so as to send steam-jets beneath the fire to enter the fire and assist combustion. The live steam from the boiler is fed to the steam-pipe L through a pipe, M, supplied with a valve, m .

N is a pipe through which the products of combustion may be in part returned to the ash-pit to complete the combustion of the same. No claim is, however, made herein to this device for the return of products of combustion.

O is the orifice through which fuel is fed to the fire.

P is the fire-door, which has a front plate, p , with an orifice at p' to allow the passage of atmospheric air into the furnace. The door has a hot-air chamber, p'' , with top plate, p''' , and side plates, p^1 . A part of the bottom of the chamber p'' and of the inner wall thereof is formed of fixed walls at p^5 . The air-chamber p'' has at the inner side a discharge-mouth, p^6 , formed by the top plate, p''' , and side plates, p^1 , and a movable jaw, Q, which may be raised or lowered to regulate the aperture of the mouth. The jaw turns or works on pivots at R, and has an arm, S, extending outward through the aperture p' . The weight of the jaw Q tends to keep it open, so that all that is needed is to provide a device to hold down

the arm S in the required position to regulate the aperture of the mouth to the desired size to admit a proper amount of atmospheric air through it. The inner walls of the air chamber or passage p^2 and the walls and jaw of the mouth p^6 become much heated, and so raise the temperature of the air passing through them to a high degree. To increase this heating action, the top plate, p^3 , and the jaw Q have studs q extending into the mouth, which become heated by connection with the plates and impart their heat to the air passing by them. The edge of the jaw has serrations q' , to check and break up in some degree the current of entering air.

The device I have shown for holding down the arm S consists of a cam, T, turning on a pivot, t , and having a curved form, so that by moving it upon its pivot it has the described action upon the arm.

It will be observed that the form of the door is such that it cannot be swung upon hinges at one edge, as usual. I support the door on a crane, U, which is supported upon hinges V. The free end of the crane has hinge-links W, jointed at one end to the crane and at the other end to the door. The arrangement is such that the door may be swung out on a horizontal plane, and may be inserted and removed into and out of the orifice O by straight inward and outward movements.

It will be understood that the horizontal grate E may be turned in its bearings, and that the upright grate J may be turned on the horizontal one. Thus the two grates may be both shaken at the same time, or the grate J may be shaken singly, or may be turned to bring another side to the front.

In the modification shown in Fig. 7 the tube G and cap K are dispensed with. It will be seen that the upright grate forms an opening in the middle of the fire, through which the air may enter from the ash-pit either mixed with steam from the pipe L, or without such mixture, (when the valve m is closed). There is an annular body of burn-

ing material which is presented to the action of the air passing horizontally through the door, so that the upright grate and the perforate door with heating-chamber act conjointly to cause good combustion of the fuel.

I do not claim in this application any of the improvements herein described relating to the grate, the means for shaking, or, in fact, any novel features not herein specifically claimed, for the reason that I propose to make them the subjects of subsequent applications for Letters Patent.

I claim—

1. The combination, with the door of a furnace, of a hot-air chamber formed therein having a hinged jaw, an arm projecting from said jaw through an aperture in the face-plate of the door, and a pivoted curved arm or cam for controlling the position of said arm, as set forth.

2. In a furnace-door, the combination of a hot-air space, an aperture in the outer plate of the door for the admission of air thereto, and a movable jaw on the inside for regulating the passage of air therethrough, as set forth.

3. The combination, in a furnace door, of a mouth discharging atmospheric air into the furnace, and studs extending from the top, bottom, or sides of the mouth into the air-current.

4. The combination, in a furnace-door, of an air chamber or passage, a mouth extending from said chamber or passage into the fire-space, having a fixed jaw and a movable jaw, and studs extending from the jaws into the air-current passing through the mouth.

5. The combination, in a furnace door, of an air chamber or passage in communication with the outer air, and having a mouth discharging within the furnace, and having a movable jaw with an arm extending to the outer side of the door, for the purpose set forth.

MICHAEL A. FOSTER.

In presence of—
GEO. H. KNIGHT,
SAM'L. KNIGHT.