(No Model.)

M. A. FOSTER.

STEAM BOILER FURNACE.

No. 265,794. Patented Oct. 10, 1882.

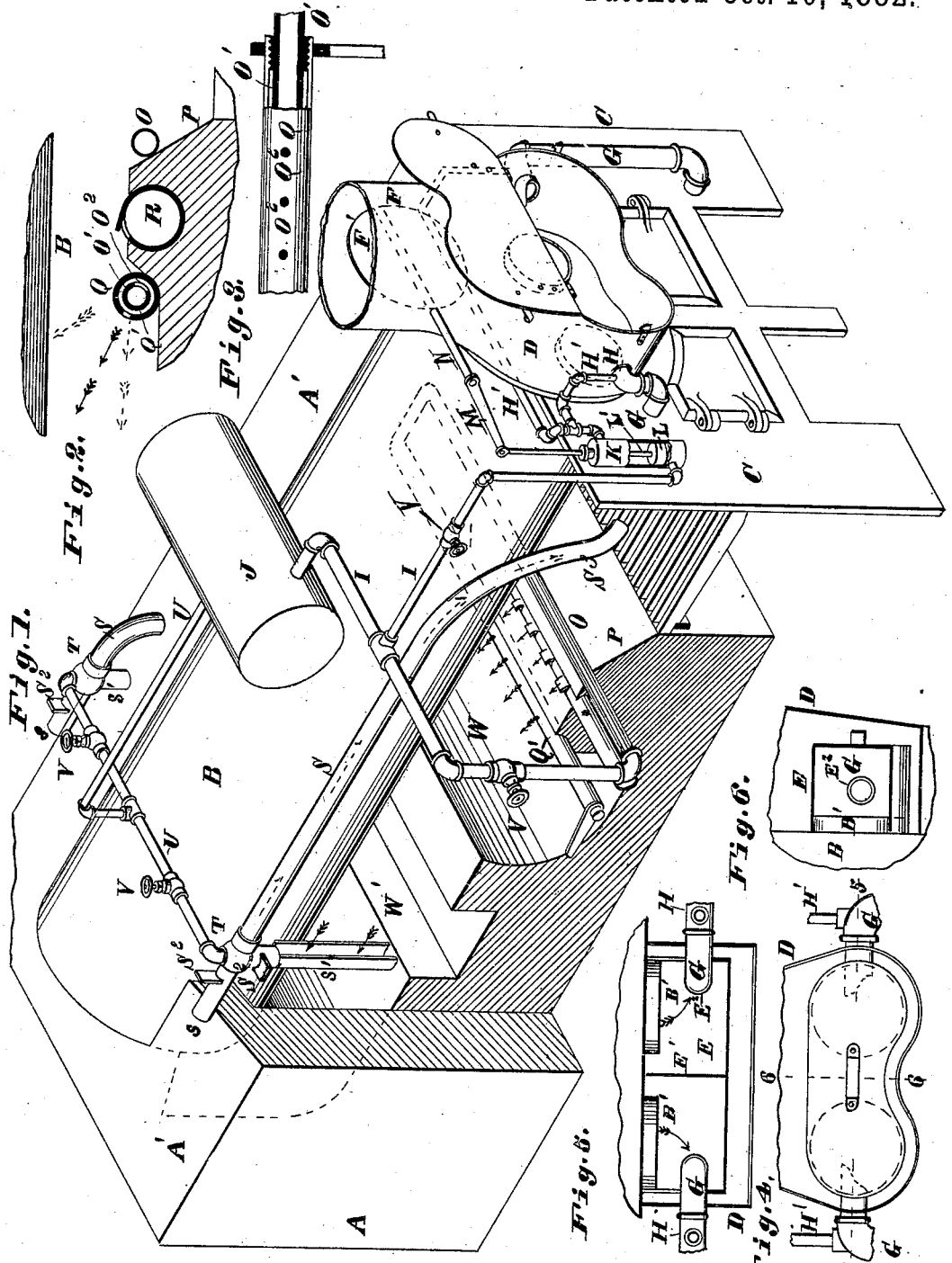

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.

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STEAM-BOILER FURNACE.

SPECIFICATION forming part of Letters Patent No. 265,794, dated October 10, 1882.

Application filed June 29, 1882. (No model.)

To all whom it may concern:

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

The present invention is an improvement on the following Letters Patent granted to me, viz: No. 126,946, dated May 21, 1872; No. 132,151, dated October 15, 1872; No. 136,497, dated March 4, 1873, and No. 138,875, dated May 13, 1873.

My present improvement consists in the construction and arrangement of the passages for the return of mingled air and combustible gases from the rear of the furnace to the fire. In Patent No. 138,875 aforesaid there are return-pipes for heated combustible gases from the rear; but no provision is made for the reception of air to mingle with the gases in the pipes, and the pipes discharge to the rear of the bridge-wall.

My present invention also applies to devices for causing smoke from the breeching to enter the furnace or ash-pit, or both. My invention also applies to other details, as set forth and claimed.

In the drawings, Figure 1 is a perspective view of the improvement with one side partly broken away. Fig. 2 is a detail longitudinal section, showing the position of the air and steam pipe in the top of the bridge-wall. Fig. 3 is a detail elevation, partly in section, of the steam-pipe at top of bridge-wall. Fig. 4 is a detail elevation of breeching. Fig. 5 is a section at 5 5, Fig. 4. Fig. 6 is a section at 6 6, Fig. 4.

A is the boiler setting or brick-work. The boiler B is represented as a horizontal boiler with two flues, B′. C is the fire-front, and D the breeching. The breeching is made with a door in front to allow the introduction of a cap, E, to cover the ends of the flues within the breeching when it is desired to prevent the ascent of the smoke in the chimney F. The cap E has a central vertical partition, E′, that divides it into two chambers, each flue discharging into its proper chamber to equalize the draft through the flues. When the boiler has more than two flues, the cap E will have a separate chamber for each flue. The sides of the cap have apertures E^2 for the passage of the upper ends of descending smoke-passages G, whose lower ends discharge either into the ash-pit, the furnace, or both.

H are steam jets or injectors, forcing the smoke down the pipes G.

I is a steam-pipe, extending from the steam-drum J to the lower end of an upright cylinder, K, that contains a piston, L, whose rod L′ is connected by a rod, M, or other means to the arm N of a damper, F′, in the smoke-stack or chimney F. The arrangement is such that when the piston is in its elevated position the damper in the chimney is closed, or nearly closed, to prevent the passage of gases in any great quantity. The steam-pipe H′, by which the steam injectors or jets H are supplied, extends from the upper part of the cylinder K, the arrangement being such that when the piston is in its upper position the piston is above the opening of the pipe H′, and consequently the steam passes from the pipe I through the cylinder K to the pipe H′ and to the jets H. Thus the jets will be active when the piston is in its upper position and the damper closed. The parts will not take this position until there is a pressure of steam in the boiler sufficient to lift the piston. The piston-rod may be so loaded that the injectors will not be put in operation until the steam in the boiler has attained a certain pressure.

O is a steam-pipe, descending to about the level of the top of the bridge-wall P, and extending transversely through the furnace at the top of bridge-wall. The pipe O has a return-bend, and the part O′ passes transversely through the furnace at top of the bridge-wall. The part O′ is surrounded by a pipe, Q, concentric with it, and of such diameter as to leave an annular steam-space, Q′, between them. The ends of the pipe Q are connected to the steam-pipe O′ with steam-tight joints that allow the pipe Q to be turned on the steam-pipe O′. The simplest form of joint to meet the requirements (that I am acquainted with) is a screw-joint. (See Fig. 3.) The pipe Q has a number of steam-jet holes, Q^2, through which jets of steam escape into the combustion-chamber at the rear part of the bridge-wall top. The pipe O′ has

a long slot or a number of orifices for the passage of steam into the annular space Q′. The steam-passage is marked O^2, and is upon the side of the pipe opposite to the jet-holes Q^2, so that the steam has to travel about one-half around the pipe O′ to reach the jet-holes, and will become equally distributed. The arrangement is such that the steam becomes superheated in the pipe O and in the annular space Q′, and by escaping in jets aids in the combustion of gases passing over the bridge-wall. The inclination of the jets may be changed as desired by turning the pipe Q. Through a recess in the top of the bridge-wall extends an air-pipe, R, similar to the pipe marked D in my Patent No. 126,946, and, like it, having hooded orifices for the escape of air over the bridge-wall.

S are passages extending from the smoke-chamber beside the boiler, near its rear end, to the furnace or fire-chamber, for the return of unconsumed heated combustible gases. The rear ends of the passages S have a branch, *s*, open to the air, through which air enters and is mingled with the returning heated gases. The vertical branch *s′*, through which the smoke enters, is open all down the front side from the lower end to the tile A′. The smoke and air branches are supplied with slip-dampers S^2 to regulate the amount of smoke and gas entering through them. The smoke and air are drawn into the return-passages S by steam-injectors at T, fed by a steam-pipe, U, from steam-drum J. Thus it will be seen that a mixture of steam, air, and smoke will pass through the return-passages S. The pipes may pass forward beside the boiler, either above or below the tile A′. The front ends, S^3, of the passages S incline downward and inward and discharge into the furnace, either above the bridge-wall or in front of it. All of the steam-pipes have valves or cocks V.

W and W′ are pits in the floor of the combustion-chamber. These pits give access to the pipes or passages O O′ Q R *s′*. The pit W′, I make with vertical sides. The pit W, I make vertical on the front side and curved upon the rear side, the front side forming eddies in the current passing over the bridge-wall, and the curved rear giving a cycloidal motion to the current, and causing the heavier parts to be thrown back on the flame passing over the bridge-wall.

I claim—

1. The combination of smoke and air pipes S S, having downturned front ends, S^3 S^3, and vertical branches *s′ s′*, located on each side of the boiler, and having openings receiving smoke at or near the end of the space surrounding the boiler, the air-inlets *s s* being located above the boiler-setting and steam-injectors T T at the juncture of the smoke and air inlets, as set forth.

2. The smoke-pipes S S, provided with vertical branches *s′ s′*, open down the front sides, and the downturned ends S^3 S^3, entering the fire-chamber, the said pipes S S being located on each side of the boiler, and the vertical branches receiving the smoke before it reaches the smoke-box, as set forth.

3. The superheating steam-pipe O O′, the portion O extending transversely through the furnace at the top of the bridge-wall, within the fire-chamber, and the portion O′ extending transversely of the furnace at top of the bridge-wall, on the rear side, and the turnable pipe Q, concentric with the portion Q′ of the steam-pipe, and forming an annular chamber, Q′, the pipes O′ and Q having orifices in the opposite sides thereof to cause the steam to pass around and through the annular chamber, as set forth.

4. The combination of steam-pipe I, upright cylinder K, weighted piston L, rods L′ M, arm N, damper F′ in a chimney, F, breeching D, pipes H G, and injector H′, as set forth.

5. The combination, with the flues of a boiler, descending smoke-passages G, and injectors H′, of the cap E, formed with chambers connecting the flues with the passages, as set forth.

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Witnesses:
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