T. GRUENWALD.

FURNACE.

APPLICATION FILED JAN. 27, 1915.

1,176,826.

Patented Mar. 28, 1916.

2 SHEETS—SHEET 1.

Fig. 2

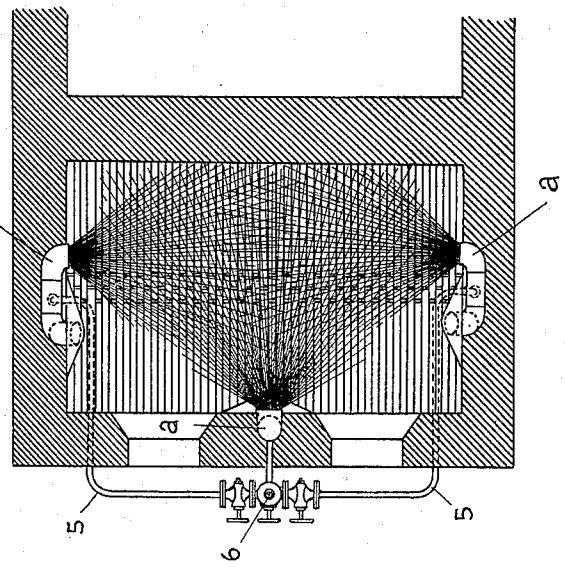


Fig. 3

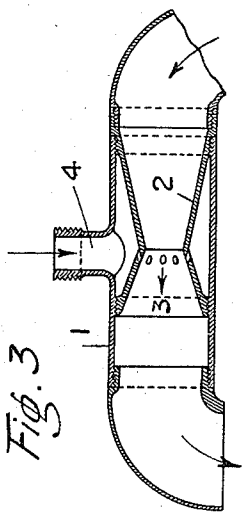
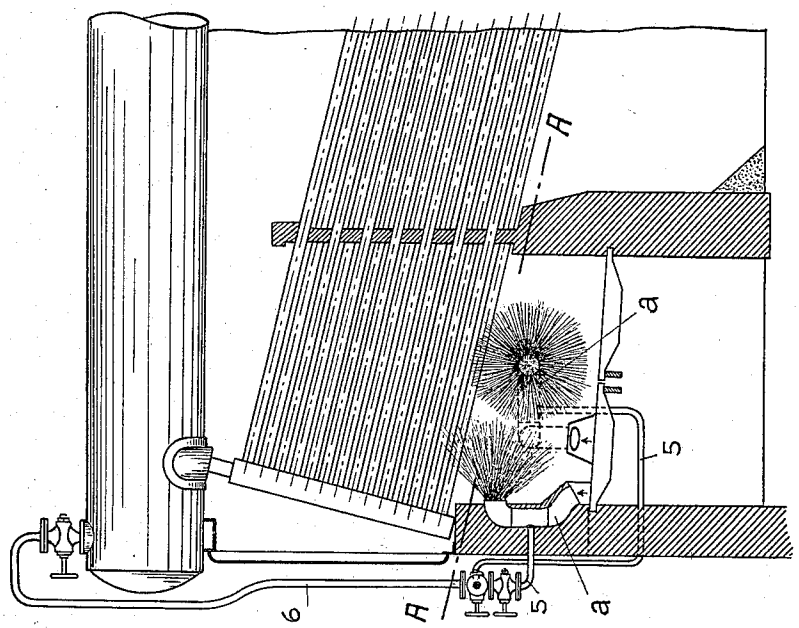


Fig. 1



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2 SHEETS—SHEET 2.

Fig. 4

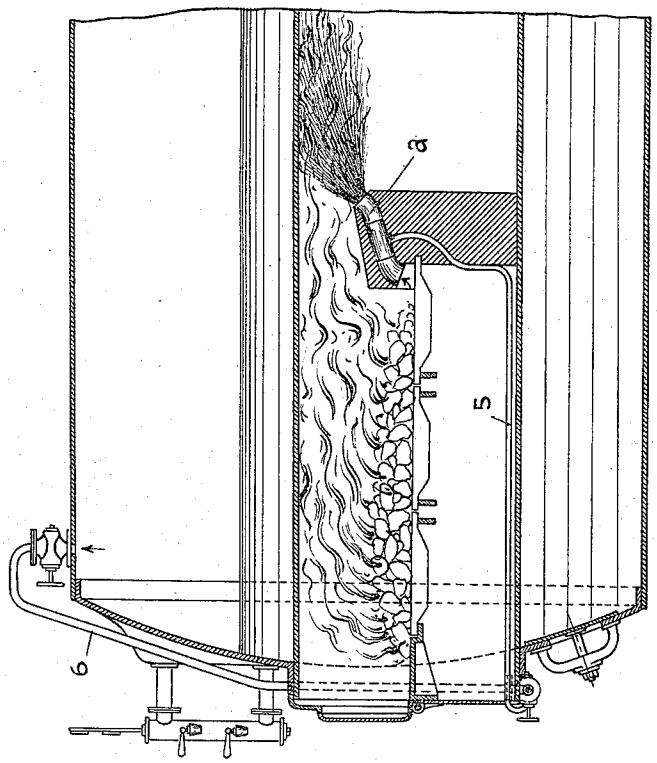
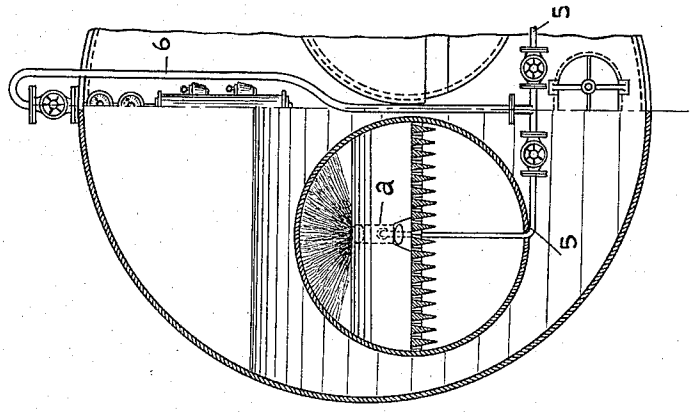


Fig. 5



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FURNACE.

1,176,826. Specification of Letters Patent. Patented Mar. 28, 1916.

Application filed January 27, 1915. Serial No. 4,703.

To all whom it may concern:

Be it known that I, TEODORO GRUENWALD, subject of the Emperor of Austria-Hungary, residing at Genoa, Italy, have invented certain new and useful Improvements in Furnaces, of which the following is a specification.

This invention relates to an improved apparatus for rendering possible a smokeless combustion of the fuel in furnaces for steam boilers and the like.

The improved apparatus for rendering possible the attainment of the above result substantially consists in that by means of a steam jet pump (injector) a part of the gaseous products of combustion of the fire box and partly consisting of so-called "semi-gases," that is to say, incompletely oxidized compounds, is drawn into said injector, which latter forces the resulting mixture of steam and hot products of combustion, into the gases ascending from the burning layer of fuel on the grate. There are already known different apparatus of this kind. The advantages of the present invention in comparison to the known apparatus consist in this that neither an aspiration pipe nor a pressure pipe is required. The whole apparatus is reduced to a tubular piece provided with a connection for steam admission which piece is bearing on its one end the aspiration opening for the combustion gases and on its other end the outlet opening for the mixture of steam and gases to be injected into the flames.

The improved apparatus is extremely simple in its design and may be mounted without any difficulty as a whole on any boiler, without its being necessary to modify the construction of the fire bridge, boiler or grate. The apparatus is mounted on the boiler in the way that the injector is entirely inclosed in the brick wall or in the bridge wall of the same with its aspiration opening near the grate surface and its delivery opening approximately in the height of the burning flames of the furnace.

Two forms of the invention as applied to a water tube boiler and to a flue boiler are shown by way of example in the accompanying drawings.

Figure 1 is a partial vertical sectional view through a Babcock Wilcox boiler, supplied with the apparatus. Fig. 2 is a horizontal section according to the line A—A of Fig. 1. Fig. 3 is a constructive detail of the steam jet pump or injector. Figs. 4 and 5 show the apparatus in its application to a Cornwall flue boiler. Fig. 4 is a partial vertical sectional view of this flue boiler and Fig. 5 is the half of a vertical cross section of Fig. 4.

The steam jet pump *a* of which Fig. 3 represents a detail consists in an outside tube 1 which ends are provided with angle or otherwise shaped tubular pieces, through which the aspiration of the combustion gases and the delivery of the mixture of injection takes place without encountering any obstacle. In this pump another tube 2 having a restricted portion in its central part is adhering with its ends against the inside wall of tube 1. Tube 2 is provided with holes 3 through which a steam jet, admitted by the connection 4, produces an aspiration of the combustion gases in the direction indicated by the arrow.

The apparatus applied to the water tube boiler (Figs. 1 and 2) provides three steam jet pumps, of which one is inclosed in the front wall and one in each side wall in a height corresponding approximately with the combustion flames. The pumps are arranged in the manner so as to be perfectly inclosed in the wall itself and so that the opening for the aspiration of the combustion gases will be located vertically toward the plane of the grate. By this location of the aspiration opening there will be aspired besides the incompletely oxidized compounds a quantity of hot fresh air from beneath the grate and thus favorably influence the process of combustion. The end of the tube by which the aspiration of the fire gases takes place in case it should project beyond the wall of the furnace may eventually be protected by brick work against the fire. The opening of the pump by which the mixture of steam and hot gases will be delivered into the flames is situated in a height corresponding with the zone of combustion of the flames. Toward the outside there is connected a steam conduit 5 to the different pumps which latter one connects by a steam conduit 6 with the boiler. In the second form of execution the pump is entirely inclosed in the bridge wall of the Cornwall boiler. The aspiration opening is also located vertically to the plane of the grate bars while the delivery opening of the pump has its opening so that the mixture of steam and hot gases may be injected into the flames

on the top of the fire bridge. The pump also connects with a steam pipe 5 partially running inside a perforation of the bridge while a pipe 6 connects the pipe 5 with the boiler.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

In combination a boiler, a combustion chamber, an ash pit, grate bars, an injector fitting located adjacent the combustion chamber and comprising a piece of metal piping having inlet and outlet openings at opposite ends thereof, an inner tube within said fitting, said inner tube having converging walls forming a contracted portion at a point intermediate of its ends, a steam inlet opening intermediate the ends of the fitting for admitting steam around the outside of the said contracted portion, and holes in said contracted portion opposite said steam inlet to permit the steam to pass through the inner tube toward one end thereof, one end of said metal piping being located at the upper side of the grate bar surface and forming the inlet, and the other end being located adjacent the space occupied by the burning gases and forming the outlet.

In testimony whereof I have affixed my signature in presence of two witnesses.

TEODORO GRUENWALD.

Witnesses:
ADOLFO WEBER,
C. A. FERRARI.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."