No. 737,726. PATENTED SEPT. 1, 1903.

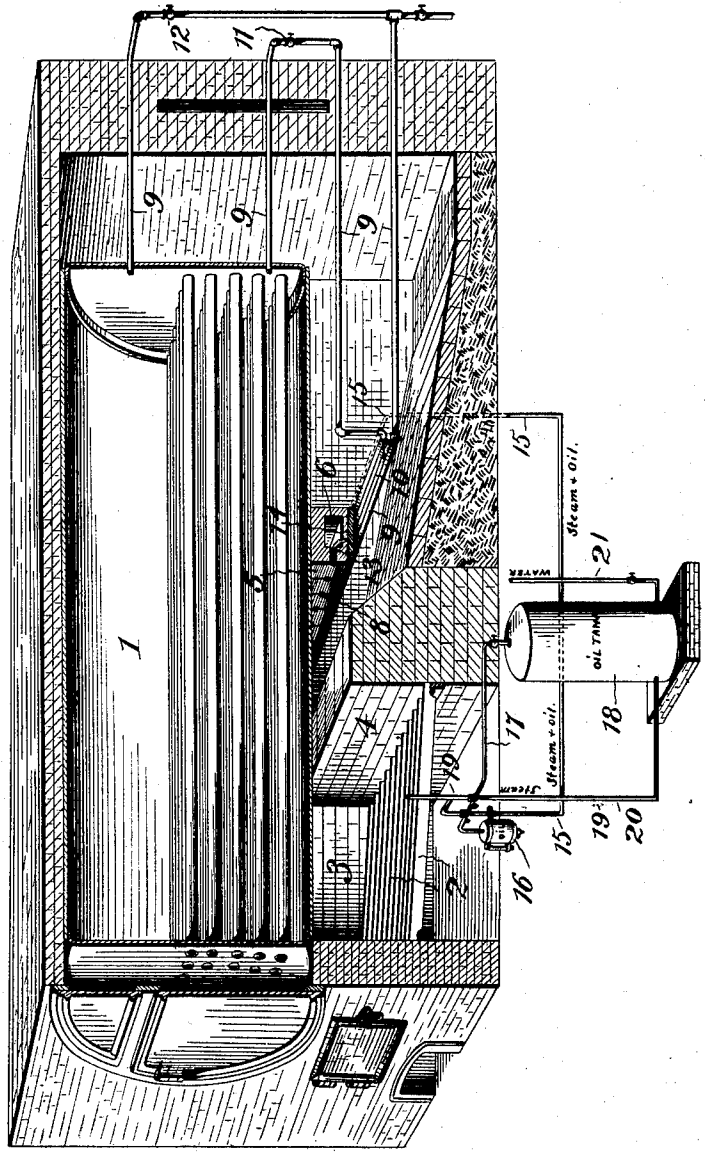
G. A. FISHER.

STEAM BOILER FURNACE.

APPLICATION FILED MAR. 30, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.



WITNESSES

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NO MODEL. 2 SHEETS—SHEET 2.

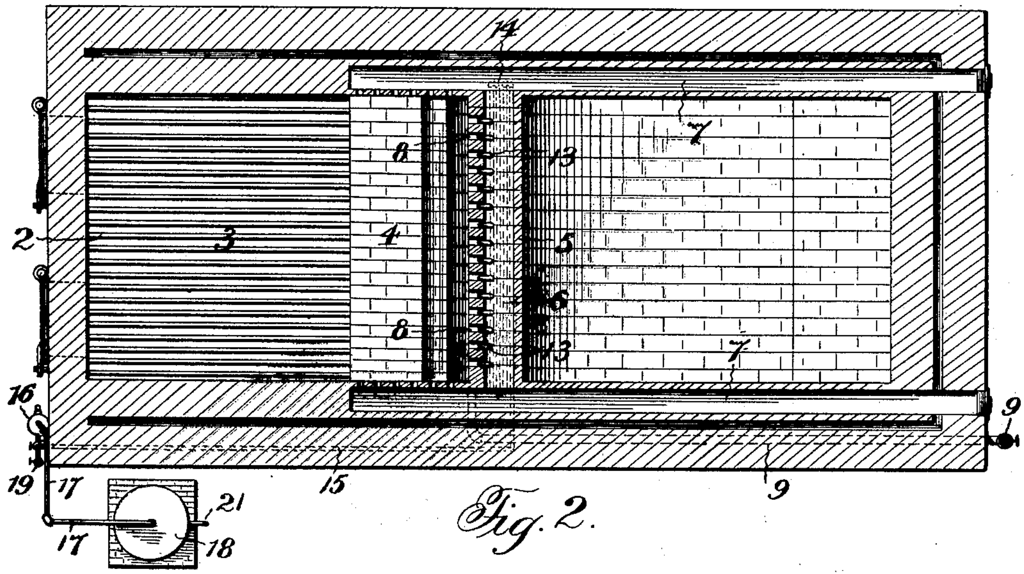


Fig. 2.

Fig. 3.

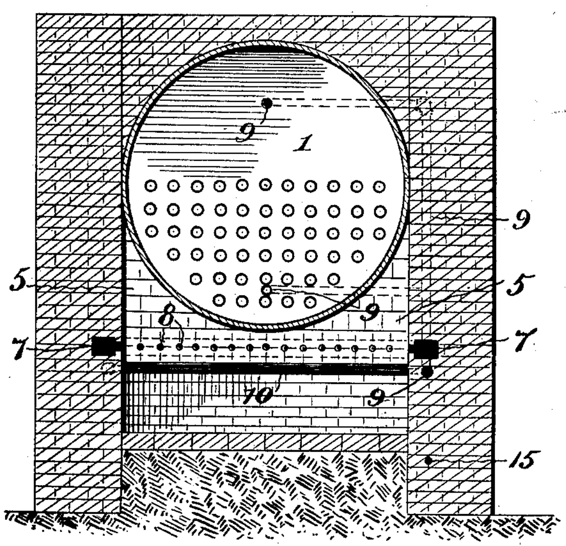
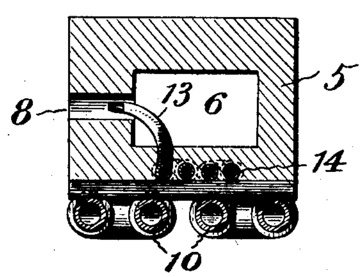


Fig. 4.



WITNESSES

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No. 737,726. Patented September 1, 1903.

UNITED STATES PATENT OFFICE.

GEORGE A. FISHER, OF PROVIDENCE, RHODE ISLAND.

STEAM-BOILER FURNACE.

SPECIFICATION forming part of Letters Patent No. 737,726, dated September 1, 1903.

Application filed March 30, 1903. Serial No. 150,239. (No model.)

To all whom it may concern:

Be it known that I, GEORGE A. FISHER, a citizen of the United States, residing at Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Steam-Boiler Furnaces; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to improvements in steam-boiler furnaces, and more particularly relates to furnaces of the smoke-consuming type.

The object of the present invention is the provision of simple and efficient means designed to be used in conjunction with furnaces ordinarily employed, but without the necessity of altering their construction, whereby the products of combustion are entirely consumed, thereby greatly increasing the heating capacity of the furnace and at the same time effecting a decrease in the normal consumption of fuel.

A further object of the present invention is the provision of simple and efficient means adapted to effect complete combustion of the unconsumed particles by the use of a gaseous mixture employed as an auxiliary to the solid fuel and introduced at such points within the furnace as to intercept the unconsumed particles and insure their absolute consumption before the same are permitted to enter the stack.

A further object contemplated by the present invention is to provide means for introducing a combined mixture of steam, oil, and air at a point for action upon the unconsumed particles which will prove the most advantageous for the complete combustion of the unconsumed particles. It is recognized that in the prior art a mixture of the character mentioned has been previously employed in attempts to render steam-boiler furnaces smokeless; but in the constructions adopted for the use of the gaseous mixture the latter has been introduced only by complicated devices and methods. The present invention aims to provide a simplified construction of apparatus for utilizing the gaseous mixture, and one which may be installed at a minimum cost and which will require no material expense for its maintenance.

With these general objects in view and others which will appear as the nature of the improvements is better understood the invention consists, substantially, in the novel construction, combination, and arrangement of parts, as will be hereinafter fully described, illustrated in the accompanying drawings, and pointed out in the appended claims.

While the form of the invention herein shown and described is what is believed to be a preferable embodiment thereof, it will be understood that the same is susceptible of various changes in the form, proportion, and minor details of construction, and the right is accordingly hereby reserved to modify or vary the invention as falls within the spirit and scope thereof.

In the drawings, Figure 1 is a sectional perspective view of a steam-boiler furnace equipped with the present invention. Fig. 2 is a sectional plan view thereof. Fig. 3 is a transverse sectional view taken at a point immediately in front of the baffle-wall. Fig. 4 is a similar view, on an enlarged scale, of the baffle-wall to disclose more clearly the air-chamber and discharge-nozzles therein.

Referring to the drawings, the numeral 1 designates a steam-boiler, 2 a series of grate-bars arranged in the fire-box 3, and 4 a bridge-wall located in the usual relation to the fire-box 3. These parts are all of the ordinary construction, and therefore require no detailed description.

In the ordinary construction of steam-boiler furnaces the unconsumed products of combustion rise from the fire-box and pass over the bridge-wall 4, whence the same pass beneath the boiler, through the flues thereof, and out into the stack. Various attempts have been made with a view to consuming the escaping products of combustion in order to render the boiler-furnaces smokeless, and to this end it is recognized that in the prior art a combined mixture of steam, oil, and air has been introduced into boiler-furnaces for action upon the products of combustion in attempts to completely consume the same. The introduction, however, of this combined mixture in many instances has been only accomplished by the use of complicated devices

and methods, and the combined mixture has also been introduced at such points as would preclude a complete consumption of the unconsumed particles. As before premised, the present invention is designed to introduce a mixture of the character mentioned at such point as will intercept the escaping unconsumed products, so that it will be impossible for the latter to pass to the stack without being acted upon by the mixture and thereby completely consumed. To this end a baffle-wall 5 is provided, said wall being arranged at a point a suitable distance in rear of the bridge-wall 4 and extending transversely of the entire furnace, the bottom of the baffle-wall 5 being slightly below the top of the bridge-wall 4, said baffle-wall extending up into contact with the bottom of the boiler 1. The object of arranging the baffle-wall 5 in the manner described is to provide a deflector for the products of combustion as they pass over the bridge-wall 4 and to compel said products to take a downward course immediately after leaving the bridge-wall 4 in their passage to the stack. Moreover, by providing the baffle-wall 5 at the point indicated is secured the most advantageous point for the introduction of the gaseous mixture, inasmuch as all of the escaping products of combustion must necessarily pass in front of the baffle-wall and thereby be subject to the action of the gaseous mixture when the same is introduced. The baffle-wall 5 may be constructed of ordinary brick, or in lieu thereof a special form of fire-brick may be utilized; but this is immaterial. The wall 5 is hollow to provide an interior air-space 6, which space communicates with side flues or channels 7, arranged in the side walls of the boiler-setting, and which flues or channels communicate with the atmospheric air, preferably at the rear of the boiler-setting, as clearly shown in Fig. 2. These rear ends may be provided with suitable dampers or other means for controlling the amount of air entering the flues. The front of the baffle-wall 5 is pierced by a multiplicity of discharge-passages 8, which passages are directed toward the bridge-wall 4, and in order that the baffle-wall 5 may be effectually supported a circulating-pipe 9 is employed. The latter is provided with a series of coils 10, which coils extend across the furnace, and upon said coils the baffle-wall 5 is arranged. One end of the circulating-pipe 9 communicates with the boiler 1 at a point near the bottom thereof, said end being provided with a controlling-valve 11, while the other end of the pipe 9 enters the boiler 1 at a point just below the water-line and is likewise provided with a controlling-valve 12, the valves 11 and 12 being employed in order to control the pressure within the pipe 9. The purpose in using the circulating-pipe 9 as a support for the baffle-wall 5 is to provide a cooling-surface for said wall in order to prevent too great expansion, which would otherwise occur were the baffle-wall supported by brick, and thus only a uniform degree of expansion, by reason of the water circulating through the pipe 9, will be imparted to the baffle-wall 5.

Arranged within the air-space 6 is a series of discharge-nozzles 13, one of said nozzles being provided for each of the discharge-passages 8, and said nozzles are connected to one end of a coiled retort 14, which is preferably arranged in the bottom of the baffle-wall 5. The nozzles 13 are so directed as to discharge through the passages 8, and it is obvious that in lieu of arranging the retort 14 at the bottom of the baffle-wall 5 the same might as effectually be applied to the upper portion thereof. The retort 14 is connected to a feed-pipe 15, said pipe extending down through the furnace and under the grate-bars 2 and emerging from the front of the boiler-setting, at which point said feed-pipe is connected to a feed-regulator 16. Also connected to the feed-regulator 16 is a conducting-pipe 17, which is connected to the upper end of a reservoir 18, the latter being designed to hold a supply of oil to be fed therefrom by the regulator 16 through the pipe 15 to the retort 14. However, in order to accomplish such feeding a steam-pipe 19, connected to the boiler at a suitable point, is also connected to the regulator 16, and thus the steam acting as a motive force causes the quantity of oil fed by the regulator 16 to pass through the pipe 15 to the retort 14. It will thus be seen that the steam and oil combined are fed to the retort 14, and passing through the latter the mixture of steam and oil becomes superheated, so that when the same emerges from the discharge-nozzles 13 such mixture will combine with the air within the baffle-wall, and the combined mixture of steam, oil, and air is thus discharged through the passages 8 directly in front of the baffle-wall 5 toward the bridge-wall 4 and into the escaping products of combustion as the same pass over the bridge-wall 4.

To effect a proper flow of the oil from the reservoir 18 to the regulator 16, a pipe 20 may be connected to the steam-pipe 19 and enter the bottom of the reservoir, or in lieu thereof a pipe 21, leading to a source of water-supply, may be utilized for the same purpose, which pipe 21 also enters the bottom of the reservoir 18, and thus the oil within the reservoir is caused to rise upwardly and the feeding of the same from the tank 17 is insured. It will of course be understood that the various pipes are provided with suitable controlling-valves, as indicated, whereby the fluids flowing therethrough may be regulated, and it will also be observed at this point that the invention contemplates an automatically-acting feed-regulator 16, so that the quantity of oil fed thereby into the pipe 15 may be automatically gaged in accordance with the conditions to be met in the fire-box.

From the foregoing description the operation of the herein-described apparatus will be

apparent, but, briefly stated, is as follows: The oil passing from the reservoir 18 is fed in predetermined quantities through the regulator 16 into the pipe 15, combined with the steam from the pipe 19, and the steam thereby forces the oil to the retort 14, where superheating takes place, and in discharging through the nozzles 13 the combined steam and oil again mixed with the air within the baffle-wall 5, which admixture discharges through the passages 8 directly in front of the baffle-wall. The unconsumed particles of the escaping products of combustion passing over the bridge-wall 4 are directly intercepted by the gaseous mixture so produced, and by said products said mixture becomes ignited with a resultant combustion of the unconsumed particles by the ignited mixture. Consequently there remain no unconsumed particles; but a very intense heat is produced, and this heat passing through the boiler is discharged into the stack in the usual manner. By discharging the gaseous mixture toward the bridge-wall such mixture is forced in a positive manner against the escaping products of combustion and the draft in contradistinction to flowing in the same direction taken by the draft and the products of combustion, and the latter are thereby retarded by the gaseous mixture, thus insuring a complete consumption of the escaping products by said mixture. The amount of air within the baffle-wall 5 may be regulated by the dampers at the rear of the channels or flues 7, so that a proper quantity of air may always be fed to produce the desired gaseous mixture to be discharged from the baffle-wall. Water from the boiler 1, circulating through the pipe 9 and the coils 10 thereof, acts to cool the baffle-wall 5 and prevent excessive expansion thereof, and the water in said pipe is in turn highly heated by the intense heat produced at the baffle-wall, so that the same is returned to the boiler in a more highly heated state than when withdrawn therefrom. Through the medium of the pipes 20 and 21 either steam or water pressure may be employed for forcing the oil from the reservoir 18 to the regulator 16, and through said media a uniform pressure on the oil within the tank is insured.

By the use of the present invention furnaces of the ordinary construction may be equipped for the prevention of smoke, and the heating capacity of the furnace is greatly increased and at the same time a decrease in the normal fuel consumption is effected.

Having thus described the invention, what is claimed as new, and desired to be secured by Letters Patent, is—

1. In a steam-boiler furnace, the combination with the fire-box and bridge-wall thereof, of a baffle arranged in rear of said bridge-wall and at a point to intercept the products of combustion in their passage to the stack, said baffle being hollow to provide an air-space therein and having an air-inlet, a retort for oil and steam inclosed by one of the walls of the baffle, and means for discharging the oil, steam and air from the baffle and toward the bridge-wall into the path of the escaping products of combustion in their passage to the stack.

2. In a steam-boiler furnace, the combination with the fire-box and bridge-wall thereof, of a baffle arranged in rear of said bridge-wall and at a point to intercept the products of combustion in their passage to the stack, said baffle being hollow to provide an air-space therein and having an air-inlet, a retort for oil and steam inclosed by one of the walls of the baffle, means for discharging the oil, steam and air from the baffle and toward the bridge-wall into the path of the escaping products of combustion in their passage to the stack, and a circulating-pipe provided with a series of coils, said coils forming a support for the baffle.

3. In a steam-boiler furnace, the combination with the fire-box and bridge-wall thereof, of a baffle arranged in rear of said bridge-wall and at a point to intercept the products of combustion in their passage to the stack, said baffle being hollow to provide an air-space therein and having an air-inlet, said baffle also having a series of discharge-passages directed toward the bridge-wall, a retort for oil and steam inclosed by one of the walls of the baffle, and a series of discharge-nozzles connected with said retort and arranged in said discharge-passages for discharging the oil, steam and air through the latter and toward the bridge-wall into the path of the escaping products of combustion.

4. In a steam-boiler furnace, the combination with the fire-box and bridge-wall thereof, of a baffle arranged in rear of said bridge-wall and at a point to intercept the products of combustion in their passage to the stack, said baffle being hollow to provide an air-space therein and having an air-inlet, said baffle also having a series of discharge-passages directed toward the bridge-wall, a retort for oil and steam inclosed by one of the walls of the baffle, a series of discharge-nozzles connected with said retort and arranged in said discharge-passages for discharging the oil, steam and air through the latter and toward the bridge-wall into the path of the escaping products of combustion, and a circulating-pipe provided with a series of coils, said coils forming a support for the baffle.

5. In a steam-boiler furnace, the combination with the fire-box and bridge-wall thereof, of a baffle arranged in rear of said bridge-wall and at a point to intercept the products of combustion in their passage to the stack, said baffle being hollow to provide an air-space therein and having an air-inlet, said baffle also having a series of discharge-passages directed toward the bridge-wall, a retort for oil and steam inclosed by one of the walls of the baffle, a feed-pipe connected to said retort, an oil-reservoir connected to said feed-pipe,

a steam-pipe also connected to said feed-pipe, whereby the oil and steam combined are fed to said retort, and a series of discharge-nozzles connected with said retort and arranged in said discharge-passages for discharging the oil, steam and air through the latter and toward the bridge-wall into the path of the escaping products of combustion.

6. In a steam-boiler furnace, the combination with the fire-box and bridge-wall thereof, of a baffle arranged in rear of said bridge-wall and at a point to intercept the products of combustion in their passage to the stack, said baffle being hollow to provide an air-space therein and having an air-inlet, said baffle also having a series of discharge-passages directed toward the bridge-wall, a retort for oil and steam inclosed by one of the walls of the baffle, a feed-pipe connected to said retort, an oil-reservoir connected to said feed-pipe, a steam-pipe also connected to said feed-pipe, whereby the oil and steam combined are fed to said retort, a series of discharge-nozzles connected with said retort and arranged in said discharge-passages for discharging the oil, steam and air through the latter and toward the bridge-wall into the path of the escaping products of combustion, and a circulating-pipe having a coil formed therein to provide a support for the baffle.

7. In a steam-boiler furnace, the combination with the fire-box and bridge-wall thereof, of a baffle arranged in rear of said bridge-wall and at a point to intercept the products of combustion in their passage to the stack, said baffle being hollow to provide an air-space therein and having an air-inlet, said baffle also having a series of discharge-passages directed toward the bridge-wall, a retort for oil and steam inclosed by one of the walls of the baffle, a feed-pipe connected to said retort, an oil-reservoir connected to said feed-pipe, a steam-pipe also connected to said feed-pipe, whereby the oil and steam combined are fed to said retort, a series of discharge-nozzles connected with said retort and arranged in said discharge-passages for discharging the oil, steam and air through the latter and toward the bridge-wall into the path of the escaping products of combustion, means for controlling the flow of the oil and steam to the feed-pipe, and a circulating-pipe having a coil formed therein to provide a support for the baffle.

8. In a steam-boiler furnace, the combination with the fire-box and bridge-wall thereof, of a baffle arranged in rear of said bridge-wall and at a point to intercept the products of combustion in their passage to the stack, said baffle being hollow to provide an air-space therein and having an air-inlet, said baffle also having a series of discharge-passages directed toward the bridge-wall, a retort for oil and steam inclosed by one of the walls of the baffle, a feed-pipe connected to said retort, an oil-reservoir connected to said feed-pipe, a steam-pipe also connected to said feed-pipe, whereby the oil and steam combined are fed to said retort, a series of discharge-nozzles connected with said retort and arranged in said discharge-passages for discharging the oil, steam and air through the latter and toward the bridge-wall into the path of the escaping products of combustion, and a feed-regulator connected to the oil-reservoir and the steam-pipe for controlling the flow of the oil and steam to the feed-pipe.

9. In a steam-boiler furnace, the combination with the fire-box and bridge-wall thereof, of a baffle arranged in rear of said bridge-wall and at a point to intercept the products of combustion in their passage to the stack, said baffle being hollow to provide an air-space therein and having an air-inlet, said baffle also having a series of discharge-passages directed toward the bridge-wall, a retort for oil and steam inclosed by one of the walls of the baffle, a feed-pipe connected to said retort, an oil-reservoir connected to said feed-pipe, a steam-pipe also connected to said feed-pipe, whereby the oil and steam combined are fed to said retort, a series of discharge-nozzles connected with said retort and arranged in said discharge-passages for discharging the oil, steam and air through the latter and toward the bridge-wall into the path of the escaping products of combustion, a feed-regulator connected to the oil-reservoir and the steam-pipe for controlling the flow of the oil and steam to the feed-pipe, and a circulating-pipe having a coil formed therein to provide a support for the baffle.

In testimony whereof I affix my signature in the presence of two witnesses.

GEORGE A. FISHER.

Witnesses:
H. H. SHERMAN,
C. A. PHILLIPS.