J. R. SURRELL.

BOILER FURNACE AND FEED WATER HEATER.

APPLICATION FILED NOV. 25, 1911. RENEWED MAR. 11, 1913.

1,067,494.

Patented July 15, 1913.

4 SHEETS—SHEET 1.

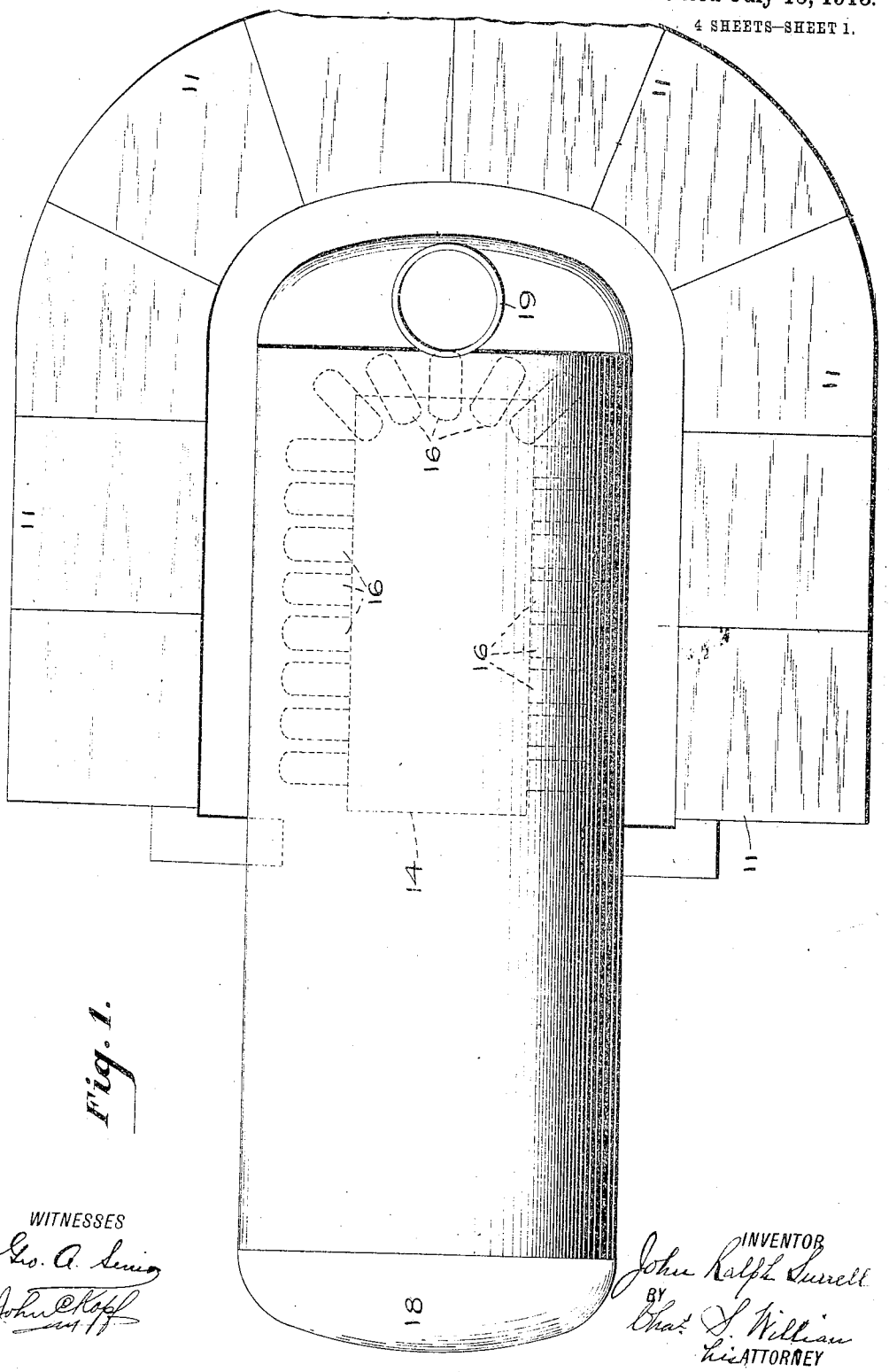


Fig. 1.

WITNESSES

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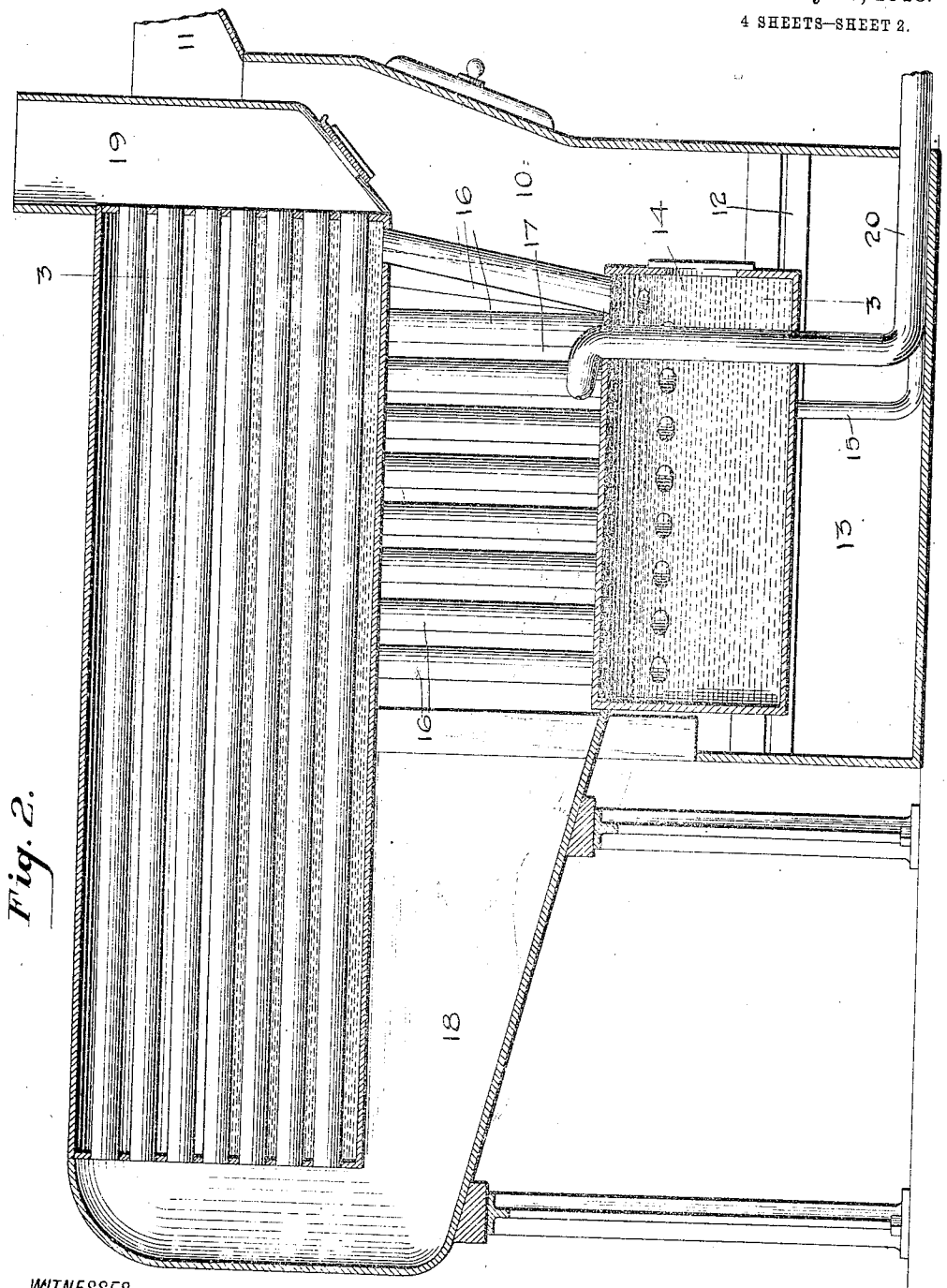


Fig. 2.

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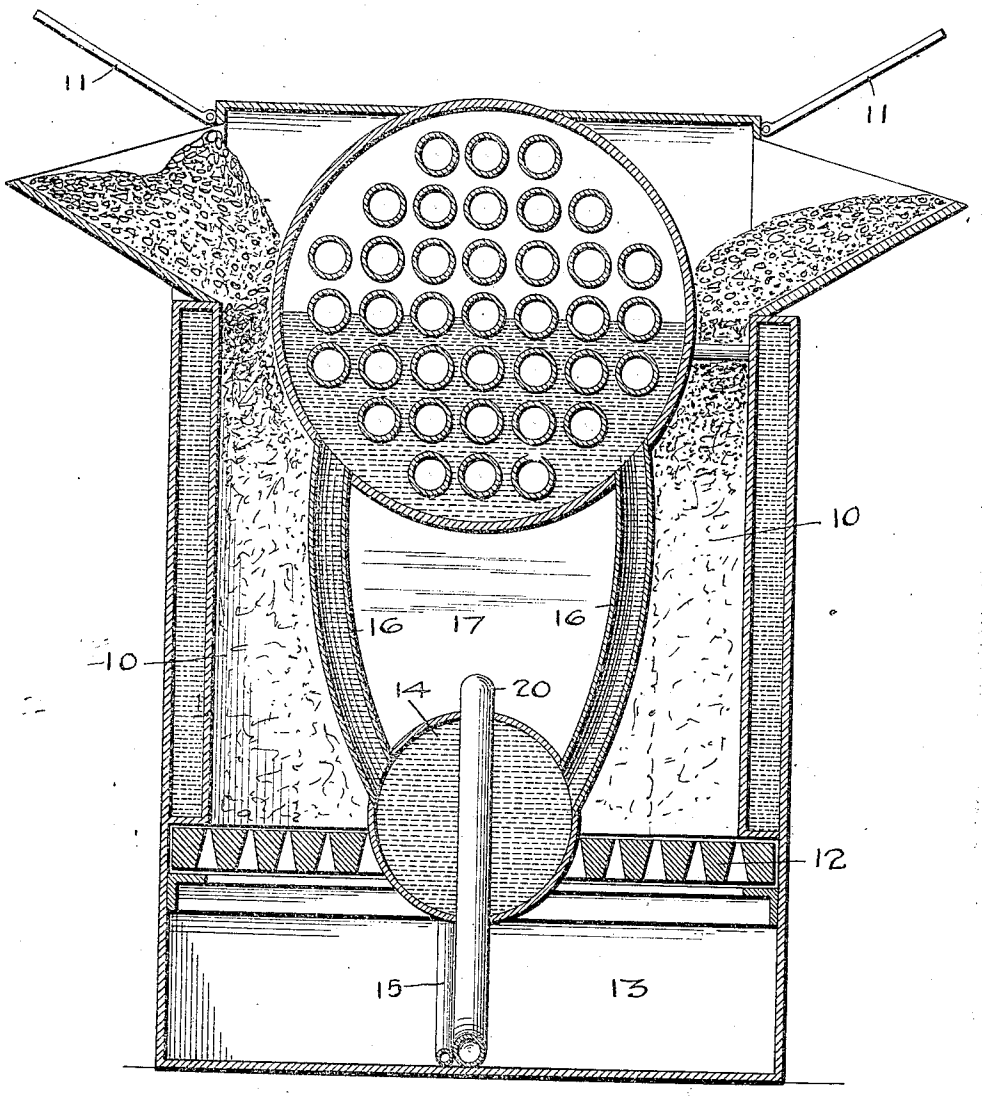
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4 SHEETS—SHEET 3.

Fig. 3.



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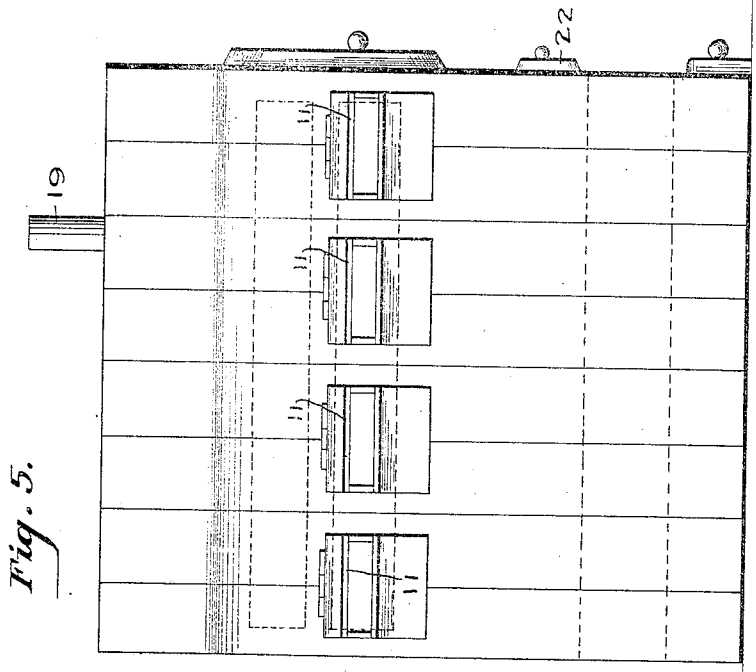


Fig. 5.

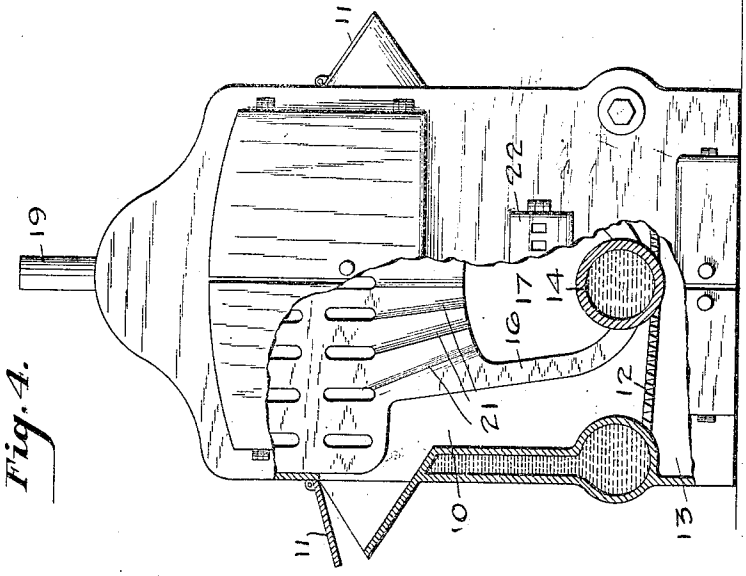


Fig. 4.

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UNITED STATES PATENT OFFICE.

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REISSUED

BOILER FURNACE AND FEED-WATER HEATER.

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1,067,494. Specification of Letters Patent. Patented July 15, 1913.

Application filed November 25, 1911, Serial No. 662,349. Renewed March 11, 1913. Serial No. 753,592.

To all whom it may concern:

Be it known that I, JOHN RALPH SURRELL, a subject of Great Britain, residing in the borough of Manhattan of the city of New York, in the county and State of New York, have invented a new and useful Boiler Furnace and Feed-Water Heater, of which the following is a specification.

My invention relates to a boiler furnace and feed water heater provided with a fuel combustion chamber fed from above having within it a set of tubes or piping which forms in its interior a chamber for air and gases, the heated water being conveyed through said pipes to the water surface of a steam boiler while the heat and flames are conveyed from the chamber for air and gases formed by said set of piping to the heat areas of the steam boiler, a suction draft being provided through the chamber for air and gases whereby a downward draft is caused in the fuel combustion chamber when the fuel combustion chamber is open at its top, no up draft being introduced from below the grate.

The objects of my invention are to provide a boiler furnace and feed water heater of great efficiency in the generation of steam by a quick burning fire with small coal consumption and the extraction of a large percentage of heat units therefrom where high steam pressure is desired, and also a boiler furnace and feed water heater for low pressure purposes, such as building heating, where a slow burning fire is desired with small coal consumption and the extraction of a high percentage of heat units therefrom. I attain these objects by the device illustrated in the accompanying drawings in which—

Figure 1, is a plan view of my boiler furnace and feed water heater. Fig. 2, is a central longitudinal section of my boiler furnace and feed water heater. Fig. 3, is a cross-section of my boiler furnace and feed water heater. Fig. 4, is a front elevation of a modification of my boiler furnace and feed water heater. Fig. 5 is a side elevation of the modification of my boiler furnace and feed water heater.

Similar numerals refer to similar parts throughout the several views.

My boiler furnace and feed water heater comprises a fuel combustion chamber, 10, having a grate, 12, and an ash-pit, 13, a water drum, 14, and a set of piping, 16. The fuel combustion chamber, 10, is arranged upon a suitable foundation in conjunction with a steam boiler and lies partly beneath and along the sides of the steam boiler and extending in circular form in front thereof, or it may lie only along the sides and partly beneath the steam boiler and terminate at its forward end in a line with the forward end of the steam boiler, the sides or walls of the fuel combustion chamber, 10, being the sides or walls of my boiler furnace and feed water heater, which, as well as the other portions thereof where necessary, are water cooled, unless the fuel combustion chamber, 10, is constructed of fire brick or other non-combustible material. The fuel combustion chamber, 10, is open at the top and adapted to be fed with fuel at that point; it is provided with opening and closing doors, 11, for the top, suitable doors for cleaning out, a grate, 12, and an ash-pit, 13, which is air tight, that is, no draft is intended to be admitted thereto, as a draft introduced into the ash-pit, 13, would interfere with the down draft through the fuel combustion chamber, 10, hereinafter described.

The fuel combustion chamber, 10, comprises in cross-section Fig. 3, the space between the interior of the sides of my boiler furnace and feed water heater and the exterior of the set of piping, 16, and the exterior of the sides of the water drum, 14.

The grate, 12, is located on or above the plane of the bottom of the water drum, 14, and below the lower ends of the set of piping, 16, the intention being to prevent the passage of fuel beneath the water drum, 14, which would interfere with the effectiveness of the downward draft through the fuel combustion chamber, 10. The water drum, 14, is arranged within the fuel combustion chamber, 10, on the middle line and extending longitudinally thereof and is provided with a water connection, 15. Water pipes, 16, are inserted or introduced at their lower ends into the upper surface of the water drum, 14, and at their upper ends into the water space or chamber of the steam boiler directly connecting the water drum, 14, with the water space of the boiler to allow the passage of hot water or steam from the water drum to the steam boiler, such

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arrangement permitting an even and effective distribution to the steam boiler.

The water pipes, 16, may extend around under the forward end of the steam boiler as shown in Figs. 1 and 2, or the forwardly extending portion may be omitted and the pipes lie only in a line with each side of the water drum, 14, and terminating near the forward and rear ends thereof. The water pipes, 16, are arranged in the water drum, 14, and in their connection with the water chamber of the steam boiler so that there is a small space between the exterior of a water pipe and the exterior of the adjacent water pipe to allow the passage of heat and flame between them from the fuel combustion chamber, 10, the interior space resulting from the disposition of the water pipes, 16, in the water drum, 14, and connection with the water space of the steam boiler forming a chamber, 17, for air and gases. The rear of the chamber, 17, for air and gases is connected with a heat case, 18, which may be water cooled when necessary, so that the heat from the chamber, 17, for air and gases passes under and around the end of the boiler and through the heat flues thereof to the stack, 19, a suction draft thus being produced in the chamber, 17, for air and gases and thence through the heat flues of the boiler to the stack, the effect of this suction being to produce a downward draft through the fuel combustion chamber, 10, and thence between the pipes, 16, into the chamber, 17, for air and gases, the covers at the top of the fuel combustion chamber, 10, being left open to permit this. But instead of the heat case, 18, any suitable means may be used to provide a suction draft through the chamber, 17, for air and gases, and thence through the heat flues of the boiler to the stack. In their disposition in the water drum, 14, and the steam boiler the water pipes, 16, branch outwardly, the effect being that the chamber, 17, for air and gases formed by them is wider at its top than at its bottom, the intention being to provide greater space for heat and combustion at the top of the chamber, 17, and also through the converging of the pipes, 16, at their lower ends to provide for the free and full disposition of the fuel in the fuel combustion chamber, 10, with the greater fuel space at the bottom thereof, and also preventing the passage of the fuel between the spaces between the water pipes, 16, into the chamber, 17, for air and gases, by permitting a direct fall of the fuel in the combustion chamber, 10.

An air or steam jet, 20, may be placed near the forward end of the chamber, 17, for air and gases, the jet when steam is used being connected with the boiler, or with an outside source when there is no steam pressure yet on the boiler. The jet, 20, extends through the ash-pit, 13, and through the water drum, 14, and is arranged in the chamber, 17, for air and gases so that the air or steam from the jet will have its greatest expansion or spread at the rear end of the chamber, 17, the intention being to increase the suction draft in the chamber, 17.

The modified form of my boiler furnace and feed water heater, Figs. 4 and 5, is of cast construction and is more particularly intended for low pressure purposes, such as the heating of buildings by steam. The modified form is provided with a fuel combustion chamber, 10, a water drum, 14, water pipes, 16, directly connecting the water drum, 14, and the water space of the steam boiler and forming within their interior space a chamber, 17, for air and gases, heat flues, 21, connecting the chamber, 17 and the heat areas of the steam boiler, and an outside water cooled casing, the device being composed for convenience of manufacture of connected vertical sections, each section comprising a portion of the water cooled case, two or more pipes of the set of piping, a portion of the water drum and an upward extending corrugation on each of the sides of a section which when the sections are joined together form the heat flues, 21, the sections being connected by suitable means such as horizontally extending rods and nuts, and the water cooled portions of the water drum being joined together by push nipples or other suitable means. My modified form is provided with a grate similarly arranged relative to the water drum, 14, and the pipes, 16, as in the other form of my device, an air-tight ash-pit, conveniently placed main clean out doors, and clean out doors, 22, connecting with the chamber, 17, for air and gases, having a damper which introduces air into said chamber to provide a draft through said chamber from its front toward its rear.

The operation of my boiler furnace and feed water heater is as follows: The fuel combustion chamber, 10, having been filled with fuel and lighted, the covers of the chutes, 11, being left open, the draft from the stack or chimney by means of the communication with the chamber, 17, produces a suction in the chamber, 17, which causes a downward draft through the coal in the fuel combustion chamber, 10, which passes through between the piping, 16, resulting in most efficient combustion of the fuel, the heat and flame from the fuel passing between the piping, 16, into the chamber, 17, for air and gases and thence to the heat areas of the steam boiler, while the hot water and steam in the pipes, 16, are conveyed to the water chamber of the steam boiler, the intensity and efficiency of the fire in the fuel combustion chamber, 10, being increased when desired by the introduction

of air or steam through the pipe or jet, 20. In the case of the modified form of my device the operation is similar, except that instead of using the pipe or jet, 20, for increased draft the damper in the doors, 22, communicating with the chamber, 17, for air and gases is opened. In both forms of my invention the fire is deadened by closing the covers or doors, 11, at the top of the combustion chamber and shutting off the jet, 20, or closing the damper in the doors, 22, if such jet or dampers are in use.

Having fully described my invention, I claim:

1. A boiler furnace and feed water heater for steam boilers having a water chamber and heat areas, said boiler furnace and feed water heater comprising a fuel combustion chamber fed from the top having a grate and an ash-pit, a water drum located within the fuel combustion chamber with the fuel therein in contact therewith, means for supplying water to the water drum, a set of piping mounted in said fuel combustion chamber with the fuel therein in contact with the exterior of said set of piping the pipes thereof connecting the water drum and the water chamber of the steam boiler for delivering the heated water directly thereto, said set of piping forming a chamber for air and gases within it, means for communication between said chamber for air and gases and the heat areas of the steam boiler whereby a suction draft is provided through the chamber for air and gases and a downward draft is provided through the fuel combustion chamber when the fuel combustion chamber is open at its top, said fuel combustion chamber comprising in cross-section the space between the interior of the sides of the boiler furnace and feed water heater and the exterior of said set of piping and the exterior of the sides of the water drum, and said ash-pit being air-tight; substantially as set forth.

2. A boiler furnace and feed water heater for steam boilers having a water chamber and heat areas, said boiler furnace and feed water heater comprising a fuel combustion chamber fed from the top having a grate and an ash-pit, a water drum located within the fuel combustion chamber with the fuel therein in contact therewith, means for supplying water to the water drum, a set of piping mounted in said fuel combustion chamber with the fuel therein in contact with the exterior of said set of piping the pipes thereof connecting the water drum and the water chamber of the steam boiler for delivering the heated water directly thereto, said set of piping forming a chamber for air and gases within it, means for communication between said chamber for air and gases and the heat areas of the steam boiler whereby a suction draft is provided through the chamber for air and gases and a downward draft is provided through the fuel combustion chamber when the fuel combustion chamber is open at its top, said fuel combustion chamber being of form in cross-section and said set of piping arranged therein to provide downwardly increasing space for the disposition of fuel between the exterior of the set of piping and the interior of the sides of said chamber, and said ash-pit being air-tight; substantially as set forth.

3. A boiler furnace and feed water heater for steam boilers having a water chamber and heat areas, said boiler furnace and feed water heater comprising a fuel combustion chamber fed from the top having a grate and an ash-pit, a water drum located within the fuel combustion chamber longitudinally thereof with the fuel therein in contact therewith, means for supplying water to the water drum, a set of piping mounted in said fuel combustion chamber with the fuel therein in contact with the exterior of said set of piping and the pipes thereof directly connecting the water drum and the water chamber of the steam boiler, said set of piping forming a chamber for air and gases within it, means for communication between said chamber for air and gases and the heat areas of the steam boiler whereby a suction draft is provided through the chamber for air and gases and a downward draft is provided through the fuel combustion chamber when the fuel combustion chamber is open at its top, said fuel combustion chamber comprising in cross-section the space between the sides of the boiler furnace and feed water heater and the exterior of said set of piping and the exterior of the sides of the water drum, said grate being located on or above the plane of the bottom of the water drum and below the lower ends of said set of piping, and said ash-pit being air-tight; substantially as set forth.

4. A boiler furnace and feed water heater for steam boilers having a water chamber and heat areas, said boiler furnace and feed water heater comprising a fuel combustion chamber fed from the top having a grate and an ash-pit, a water drum located within the fuel combustion chamber longitudinally thereof with the fuel therein in contact therewith, means for supplying water to the water drum, a set of piping mounted in said fuel combustion chamber with the fuel therein in contact with the exterior of said set of piping and the pipes thereof directly connecting the water drum and the water chamber of the steam boiler, said set of piping forming a chamber for air and gases within it, means for communication between said chamber for air and gases and the heat areas of the steam boiler whereby a suction draft is provided through the chamber for air and gases and a downward draft is provided

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through the fuel combustion chamber when the fuel combustion chamber is open at its top, means for introducing external air or steam into said chamber for air and gases from the front toward the rear thereof to provide additional suction draft through said chamber, said fuel combustion chamber comprising in cross-section the space between the interior of the sides of the boiler furnace and feed water heater and the exterior of said set of piping and the exterior of the sides of the water drum, said grate being located on or above the plane of the bottom of the water drum and below the lower ends of said set of piping, and said ash-pit being air-tight; substantially as set forth.

5. A boiler furnace and feed water heater for steam boilers having a water chamber and heat areas, said boiler furnace and feed water heater comprising a fuel combustion chamber fed from the top having a grate and an ash-pit, a water drum located within the fuel combustion chamber longitudinally thereof with the fuel therein in contact therewith, means for supplying water to the water drum, a set of piping mounted in said fuel combustion chamber with the fuel therein in contact with the exterior of said set of piping and the pipes thereof directly connecting the water drum and the water chamber of the steam boiler, said set of piping forming a chamber for air and gases within it, means for communication between said chamber for air and gases and the heat areas of the steam boiler whereby a suction draft is provided through the chamber for air and gases and a downward draft is provided through the fuel combustion chamber when the fuel combustion chamber is open at its top, means for introducing external air or steam into said chamber for air and gases from the front toward the rear thereof to provide additional suction draft through said chamber and means for controlling the passage of said external air or steam through the same, said fuel combustion chamber comprising in cross-section the space between the interior of the sides of the boiler furnace and feed water heater and the exterior of said set of piping and the exterior of the sides of the water drum, said grate being located on or above the plane of the bottom of the water drum and below the lower ends of said set of piping, and said ash-pit being air-tight; substantially as set forth.

6. A boiler furnace and feed water heater for steam boilers having a water chamber and heat areas, said boiler furnace and feed water heater comprising a fuel combustion chamber fed from the top having a grate and an ash-pit, a water drum located within the fuel combustion chamber longitudinally thereof with the fuel therein in contact therewith, means for supplying water to the water drum, a set of piping mounted in said fuel combustion chamber with the fuel therein in contact with the exterior of said set of piping and the pipes thereof directly connecting the water drum and the water chamber of the steam boiler, said set of piping forming a chamber for air and gases within it, means for communication between said chamber for air and gases and the heat areas of the steam boiler whereby a suction draft is provided through the chamber for air and gases and a downward draft is provided through the fuel combustion chamber when the fuel combustion chamber is open at its top, doors in the front of the boiler furnace and feed water heater communicating with the chamber for air and gases having dampers, said fuel combustion chamber comprising in cross-section the space between the interior of the sides of the boiler furnace and feed water heater and the exterior of said set of piping and the exterior of the sides of the water drum, said grate being located on or above the plane of the water drum and below the lower ends of said set of piping, and said ash-pit being air-tight; substantially as set forth.

7. A boiler furnace and feed water heater for steam boilers having a water chamber and heat areas, said boiler furnace and feed water heater comprising a fuel combustion chamber fed from the top having a grate and an ash-pit, a water drum located within the fuel combustion chamber longitudinally thereof with the fuel therein in contact therewith, means for supplying water to the water drum, a set of piping mounted in said fuel combustion chamber with the fuel therein in contact with the exterior of said set of piping and the pipes thereof directly connecting the water drum and the water chamber of the steam boiler, said set of piping forming a chamber for air and gases within it, means for communication between said chamber for air and gases and the heat areas of the steam boiler whereby a suction draft is provided through the chamber for air and gases and a downward draft is provided through the fuel combustion chamber when the fuel combustion chamber is open at its top, doors in the front of the boiler furnace and feed water heater communicating with the chamber for air and gases having dampers, said fuel combustion chamber comprising in cross-section the space between the interior of the sides of the boiler furnace and feed water heater and the exterior of said set of piping and the exterior of the sides of the water drum, said grate being located on or above the plane of the water drum and below the lower ends of said set of piping, and said ash-pit being air-tight, the boiler furnace and feed water heater being of sectional construction with

means for connecting the sections, each section comprising a portion of the case or side of the boiler furnace and feed water heater, two or more of the pipes of the set of piping a portion of the water drum and an upward extending corrugation on each side of a section forming when the sections are joined together heat flue connections to the heat areas of the steam boiler; substantially as set forth.

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Witnesses:
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