F. S. SNYDER.

BOILER.

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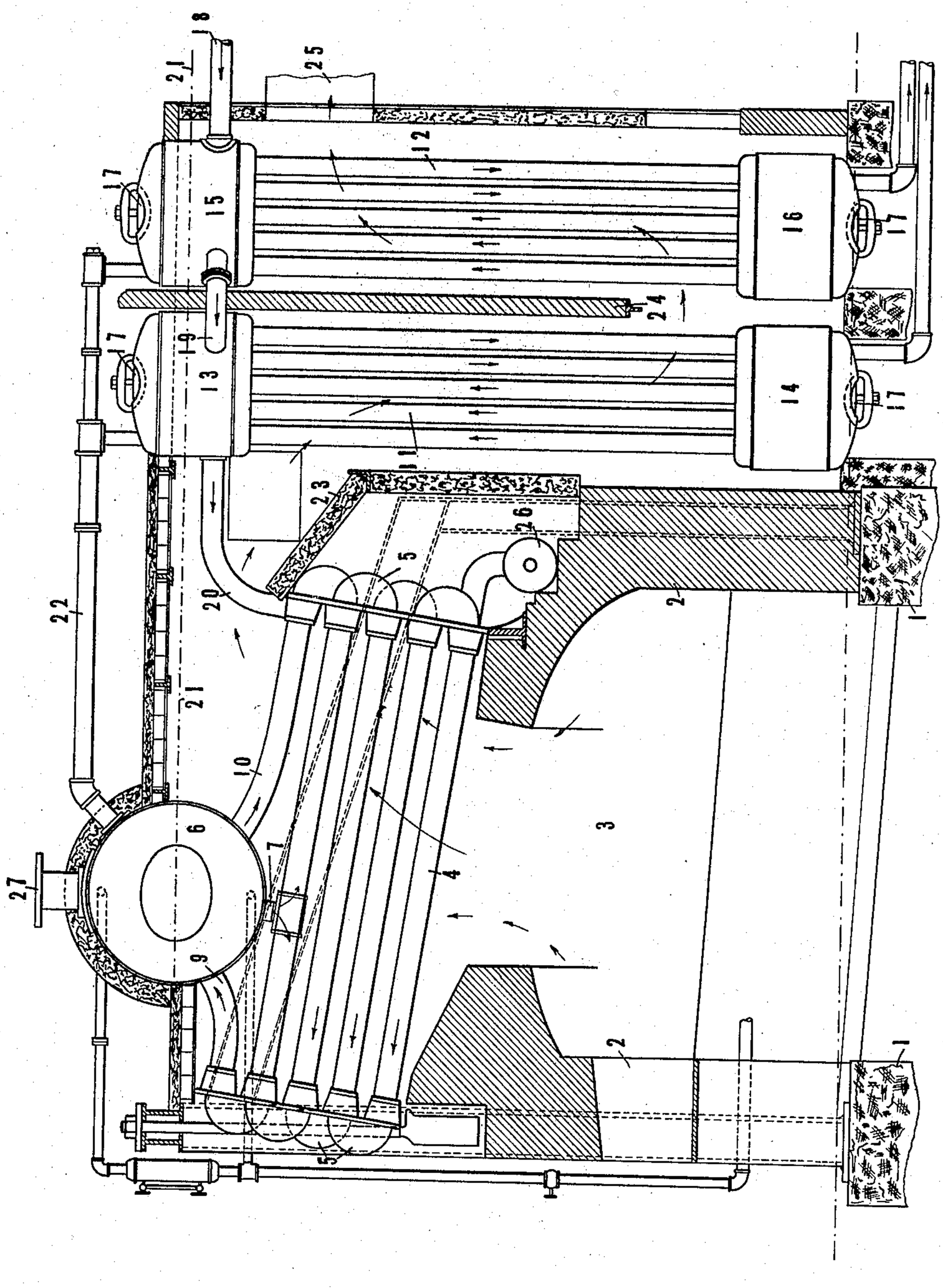
911,685.

Patented Feb. 9, 1909.



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BOILER.

No. 911,685. Specification of Letters Patent. Patented Feb. 9, 1909.

Application filed January 11, 1908. Serial No. 410,460.

To all whom it may concern:

Be it known that I, FRANK S. SNYDER, a citizen of the United States, residing at Newburgh, in the county of Orange and State of New York, have invented certain new and useful Improvements in Boilers, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to boiler construction, and one of the objects thereof is to provide a construction which will produce a greater quantity of steam for a given amount of heating surface than will boilers as hitherto constructed.

Another object of the invention is to provide a boiler capable of generating steam with greater rapidity than will boilers of similar types hitherto employed.

Another object is to reduce to a minimum the deposit of scale upon the heating surfaces of the boiler arranged above the combustion chamber and to provide for the ready removal of scale deposited within other parts of the boiler.

Another object is to provide a boiler structure characterized by low costs of instalment, maintenance and repair.

A further object is to provide a boiler of the above character which will consume a less quantity of fuel in the generation of a given amount of steam than will similar types of boilers now in common use.

Other objects will be in part obvious and in part pointed out hereinafter.

The invention accordingly consists in the features of construction, combinations of elements and arrangement of parts which will be exemplified in the construction hereinafter set forth, and the scope of the application of which will be indicated in the following claims.

The accompanying drawing illustrates in side elevation and partly in section one of several possible embodiments of my invention.

Referring to the drawing, 1 represents the foundation or base which supports the setting 2 of the boiler.

The combustion chamber is represented at 3, and disposed above the combustion chamber is a series or system of inclined tubes, said tubes being in the present instance connected one to another at their opposite ends by means of return bends 5, although vertical headers may be employed in this relation if desired. These tubes are arranged in position to receive the radiant heat from the fire bed and to be acted upon directly by the gases issuing from the combustion chamber. Disposed above this system of inclined tubes and, in the present instance, disposed transversely with respect thereto, is a steam and water drum 6. This drum is connected with the uppermost tubes of system 4 at their intermediate portions as at 7, and with the opposite ends of said tubes as at 9 and 10 respectively, the connections being so arranged that a circulation is set up in the system 4 as indicated by the arrows. It will be understood, of course, that the number of tubes employed in system 4 and the width and height of said system will be varied to meet the requirements as to the quantity of power to be furnished.

Disposed behind system 4, and arranged in position to be acted upon by the furnace gases, are a plurality of vertically disposed systems of tubes 11 and 12 respectively. In the present instance two of these systems are shown, although it is possible that in some cases but one will be required, and in other cases a greater number than two will be employed. The tubes comprising these vertically disposed systems are connected at their upper and lower ends by means of drums 13 and 14, and 15 and 16 respectively, said drums being provided with manholes, as at 17, of the usual form to permit of access being had to their interiors. Drum 15 of system 12, which is located most remote from the furnace, is provided with a feed connection 18 leading from any suitable source of water supply, and drums 13 and 15 are connected at their upper ends below the water-line by means of a conduit 19, drum 13 being in turn connected below the water level with system 4 by means of conduits, one of which is shown at 20. The water level of the present embodiment of the boiler is indicated by the dotted line 21. Drums 13 and 15 are provided with spaces in their upper portions to receive steam should any be generated in their respective systems, and the upper portions of said drums are connected with the steam space or drum 6. In the present instance, a common conduit 22 is employed in this relation.

A baffle 23 is disposed between systems 4 and 11, and a baffle 24 is disposed between systems 11 and 12, said baffles being dis-

posed in such manner as will compel a circulation of the furnace gases upwardly through the pipes or tubes comprising system 4, thence downward between the tubes comprising system 11, whence they pass upward between the tubes of system 12 to the flue 25 as indicated by the arrows in the drawing. A mud drum is provided at 26 for receiving the solid matter discharged into system 4 or matter precipitated from the water circulating therein.

Having thus described the construction of this embodiment of my invention, the operation thereof may now be understood. The parts being arranged as above described, the gases from the combustion chamber 3 will first come in contact with the inclined tubes comprising the system 4, which will also be in direct contact with the radiant heat emitted by the firebed. The hot gases after passing in contact with the tubes of system 4 will then be compelled to pass downward in contact with the tubes of system 11, and will operate to raise the temperature of the water contained in said tubes. The gases which now have lost some of their heat will pass upward and act upon the water in the tubes of system 12.

The water from the source of supply first passes into drum 15 and will naturally settle and pass downward through certain of said tubes to drums 16, and then upward through other tubes as shown by the arrows. This water, the temperature of which has been raised by its coming in contact with the gases, then passes through conduit 19 into drum 13, whereupon a circulation analogous to that of system 12 is set up, the temperature of the water being further increased by reason of its contact with the hotter furnace gases. From drum 13 the hot water may pass into the system of inclined tubes 4 through the tubes 20, and then circulate in said system as indicated by the arrows. Any steam generated in tubes 4 passes upward through said tubes into the steam and water drum 6, from which it may be delivered to the utilizing devices by means of a conduit 27 leading from the upper portion of the steam and water drum.

It will be observed that water will not flow into system 12 from the feed connection, or from said system into system 11, or from system 11 into system 4 until a demand is made by the reduction of the volume of water in the forward part of the boiler, and that each of the systems is provided with a constant independent circulation, thus providing for a more thorough extraction of the heat from the furnace gases passing from the combustion chamber to the flue; and it will be further observed that the water in the several systems is at different temperatures, the hottest water in each system passing into the next arranged in advance thereof. Any steam generated in the tubes comprising systems 11 and 12 will be received in the space provided in the drums 13 and 15 and will pass from these spaces into a similar space of drum 6 through the conduit 22. As will be noted, all the systems are connected above and below the water line, so that all parts of the boiler are under the same pressure.

It will accordingly be seen that I have provided a boiler of the above type characterized by simplicity, efficiency and compactness in the arrangement of the parts constituting the same, and a boiler which will attain, among others, all the ends and objects above enumerated. Should any of the tubes of the system arranged above the combustion chamber need repair or replacement, such operations can be effected without drawing the water from the vertically disposed tubes, and similar operations can be effected in the vertically disposed system of tubes without disturbing the water in the inclined tubes. By reason of the fact that the water in the several systems is at different temperatures, gradually increasing toward the forward end of the boiler, the hottest water is acted upon by the hottest gases, and the cooler water flowing from the point of feed is acted upon by the cooling furnace gases passing toward the flue, thus providing for an economical and thorough extraction of the heat carried by said gases, the extraction of the heat from the furnace gases being facilitated by reason of the fact that the several systems have independent circulations.

Another advantage inherent in my improved construction resides in the fact that the water delivered to the system of tubes arranged above the combustion chamber is heated to a high temperature, resulting in a rapid formation of steam. It will be apparent that nearly all the sediment and precipitate will remain in the lowermost drums of the vertically disposed tubes from which they may be readily removed.

As many changes could be made in the above construction and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense. It is also to be understood that the language used in the following claims is intended to cover all of the generic and specific features of the invention herein described and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. In boiler construction, the combination

with the furnace and a system of inclined tubes disposed above the same, of a steam and water drum arranged above said tubes and connected therewith, a system of vertically-disposed tubes arranged behind said inclined tubes, said vertically-disposed tubes being connected at their upper and lower ends, whereby an independent circulation is provided, a connection extended between said system of vertically-disposed tubes and the steam-space of the steam and water drum, a connection extended between the upper portion of said system of vertically-disposed tubes and the system of inclined tubes below the water line, and a feed connection for the system of vertically-disposed tubes at the point thereof most remote from the furnace.

2. In boiler construction, the combination with the furnace and a system of inclined tubes disposed above the same, of a steam and water drum arranged above said tubes and connected therewith, a plurality of systems of vertically disposed tubes arranged at different distances from the furnace behind said inclined tubes, the tubes comprising each of said latter systems being connected at their upper and lower ends whereby independent circulations are provided, connections between said independent systems at their upper portions below the water line, a connection between each of said latter systems and the steam space of the steam and water drum, a connection between the upper portion of one of said systems of vertically disposed tubes and the system of inclined tubes below the water line, a feed connection for the system of vertically disposed tubes most remote from the furnace, and baffles arranged between said systems.

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

FRANK S. SNYDER

Witnesses:
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