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2,395,035

BOILER CONSTRUCTION

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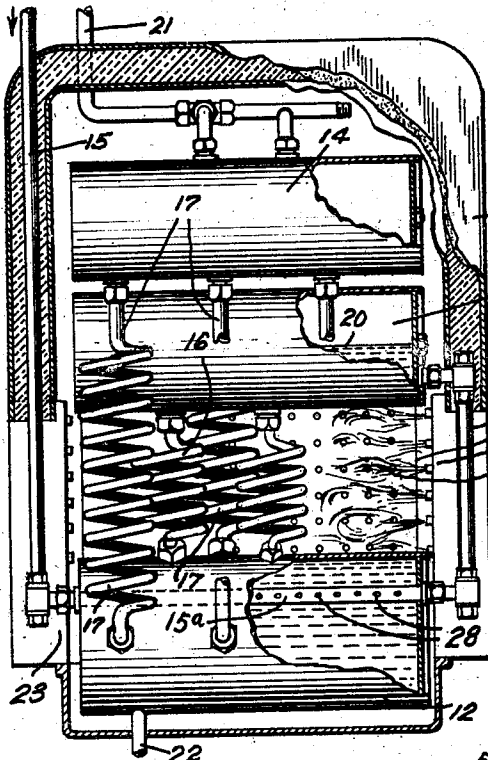


Fig. 1.

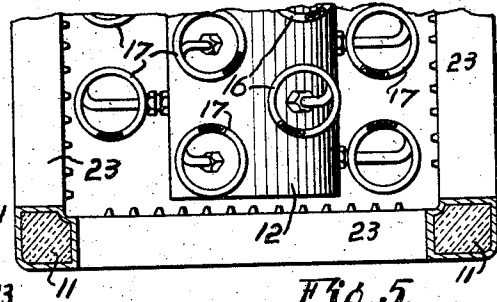


Fig. 5.

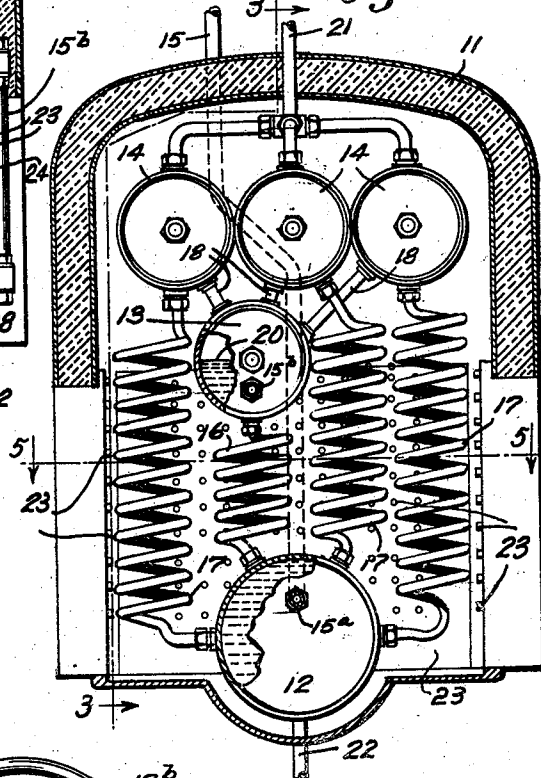


Fig. 2.

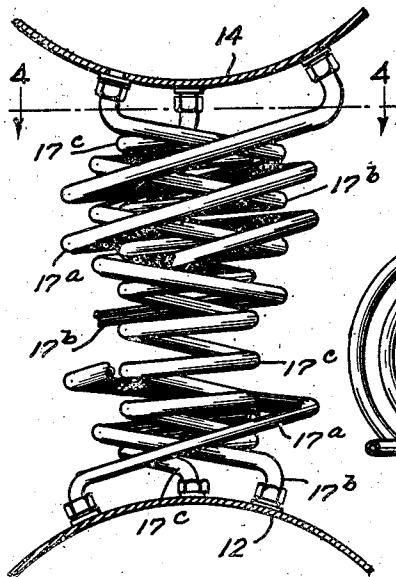


Fig. 3.

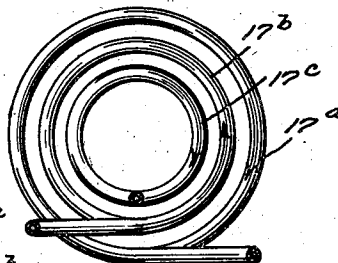


Fig. 4.

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BOILER CONSTRUCTION

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7 Claims. (Cl. 122-250)

The present invention relates to improvements in steam boilers. While the inventive concept here disclosed and claimed may be embodied in a variety of applications it is especially adapted to a steam power plant for self-propelled vehicles, such as trucks, tractors, movable power units, or even passenger vehicles.

An object of the invention is to provide a novel steam boiler capable of developing substantially maximum steam pressure in an unusually brief period after starting.

Another object of the invention is to provide a steam boiler comprising a novel water circulation system.

Another object of the invention is to provide a steam boiler comprising, in combination with other elements, a novel arrangement of water heater tubes.

Other objects and advantages will be apparent from a study of the following specification, in conjunction with the accompanying drawing in which

Fig. 1 is a side elevational view, partly broken away and in section, and with the major portion of the housing removed to reveal internal structure, showing one embodiment of a boiler constructed in accordance with the teachings of the present invention.

Fig. 2 is an end elevational view of the boiler shown in Fig. 1, and taken from the right of Fig. 1, part of the housing being removed, and in section.

Fig. 3 is a side elevational view of a boiler tube arrangement differing somewhat from that used in the embodiment shown in Figs. 1 and 2, parts being broken away.

Fig. 4 is section taken on the line 4-4 of Fig. 3.

Fig. 5 is a fragmentary section taken on the line 5-5 of Fig. 2.

Before the present invention is described in detail it is to be understood that such invention is not limited to the details of construction and/or the specific arrangement of parts herein illustrated and/or described, as the invention obviously may take other forms. It also is to be understood that the phraseology or terminology herein employed is for the purpose of description and not of limitation.

With reference especially to Figs. 1 and 2, the embodiment of my invention there shown comprises a housing 11, generally rectangular in horizontal cross section, and containing therewithin a water sediment drum 12, near the bottom of said housing. A water manifold tank 13 is disposed within the housing at an intermediate

height therein, and a plurality of steam header tanks 14, 14 occupy the inner, upper portion of the housing.

The sediment drum 12 is fed from a suitable water supply or water source (not shown) through pipe 15, and said sediment drum is in communication with the water manifold through a series of helical coils or pipes 16, 16, as well as through a branch extension 15b of the water supply pipe 15, as will appear.

An additional series of helical coils or pipes 17, 17 connect the sediment drum 12 with one or other of the steam header tanks 14, 14. The water manifold 13 is also in communication with the steam header tanks 14, 14 through suitable pipe connectors 18, 18.

It is evident, therefore that each one of the three elements comprising, respectively, the sediment drum, the manifold, and the steam header tank assembly, is in direct communication through piping with each of the other two said elements.

I have provided an exceptionally efficient water heating arrangement. The object of the arrangement is to bring heat to bear, as uniformly as possible, on all boiler tubing below the normal operating water level, which water level is maintained approximately at the liquid surface line 20 in water manifold 13 (Fig. 2). To achieve this purpose I have disposed a series of burners 23 in peripheral arrangement around the lower portion of the housing wall, the fuel being, in this instance, oil. The burners are so situated and directed that they throw jets of flame 24 inwardly towards the center of the boiler tube assembly, the jets being positioned and regulated so that all tubing below the water level and between sediment drum 12 and water manifold 13 is substantially uniformly heated.

The operation of the boiler will be apparent from a study of Figs. 1 and 2 in conjunction with the description hereinabove. Water enters through pipe 15, impelled either by gravity or a force pump, from a water supply source not shown. An arm 15a of pipe 15 passes longitudinally through sediment drum 12, and connects therebeyond with branch 15b which feeds the water manifold 13. Arm 15a, where it passes through drum 12, is provided with a plurality of perforations 28 through which a portion of the water passes into drum 12. The balance of the water proceeds through branch pipe 15b into manifold 13, the supply of water through pipe 15 being sufficient to maintain the level in manifold 13 at about line 20, due regard being had

for the amount being converted into steam. Coils 16 are of course completely filled with water, and coils 17 are filled to approximately the same level as that of surface 20 in manifold 13. Conventional means is provided for maintaining the water surface at any desired level, the means being preferably thermoelectrical in nature, and there being thermostatic fuel control means responsive to the same water level, so that the fuel is reduced or shut off if the water level drops. This means, being conventional, is not here shown. Steam developed in coils 16 passes through manifold 13, and thence through connecting pipes 18, 18 into steam headers 14, whence it proceeds through pipe 21 and is valved to a power cylinder or other application by suitable apparatus, not shown. Steam developed in coils 17 passes directly to one or other of the steam headers 14, as apparent from the drawing. Sediment accumulating in drum 12 may be drained or blown out through drain plug 22.

Figs. 3 and 4 illustrate a modified arrangement of boiler tubing wherein a plurality of helical tubes are arranged in a concentric series about a common helical axis, each tube having its helical direction or thread reversed with relation to its immediate neighbors, as indicated by the drawing. This arrangement provides an increased steam generating capacity in a restricted space, and the assembly is permeable to a flame jet by reason of the spacing between the turns of each helix.

Referring particularly to Fig. 4 it is apparent that, as seen from the top, the outer turns of the helix 17a descend in a clockwise direction, the intermediate turns 17b run counterclockwise, and the inner turns 17c are arranged in a clockwise helix, the arrows in Fig. 4 graphically indicating this fact. Such a concentric helical assembly may be substituted in a series of tubular groups for any or all of the single helices shown in Figs. 1 and 2.

The boiler assembly hereinabove described, and shown in the attached drawing is so compact and efficient that it is especially adapted for its preferred purpose, namely as part of the power plant for a self-propelled vehicle. The water system, comprising means for supplying both the sediment drum and the water manifold, assures an adequate amount of water in all boiler tubes. The peripheral arrangement of the fuel burners produces rapid and uniform steam generation in all said tubes.

What I claim is:

1. In a steam boiler, a sediment drum, a water manifold, a series of helically coiled tubes, each communicating at one end with said sediment drum and at the other end with said water manifold, and a water supply pipe passing through said sediment drum and communicating therebeyond with said water manifold, that portion of said pipe within said drum being perforated whereby a portion of the water passing through said pipe enters said drum and the remaining portion flows to said manifold.

2. In a steam boiler, a sediment drum, a water manifold, a series of helically coiled tubes, each communicating at one end with said sediment drum and at the other end with said water manifold, and a water supply pipe passing through said sediment drum and communicating therebeyond with said water manifold, that portion of said pipe within said drum being perforated whereby a portion of the water passing through said pipe enters said drum and the remaining

portion flows to said manifold and heating means entirely surrounding said series of helical tubes whereby heat is brought to bear on said tubes from all sides thereof.

3. In a steam boiler, a sediment drum, a water manifold, a steam header, a series of helically coiled tubes each communicating at one end with said drum and at the other end with said manifold, a second series of helically coiled tubes each communicating at one end with said drum and at the other end with said header, a water supply pipe passing through said drum and communicating therebeyond with said manifold, that portion of said pipe within said drum being provided with a plurality of spaced perforations whereby a portion of the water passing through said pipe enters said drum through said perforations, and the remaining portion flows to said manifold.

4. In a steam boiler, a sediment drum, a water manifold, a steam header, a series of helically coiled tubes each communicating at one end with said drum and at the other end with said manifold, a second series of helically coiled tubes each communicating at one end with said drum and at the other end with said header, a water supply pipe passing through said drum and communicating therebeyond with said manifold, that portion of said pipe within said drum being provided with a plurality of spaced perforations whereby a portion of the water passing through said pipe enters said drum through said perforations, and the remaining portion flows to said manifold, and heating means entirely surrounding both said series of helical tubes whereby heat is brought to bear on said tubes from all sides thereof.

5. In a steam boiler, a sediment drum, a water manifold, and a steam header, a series of helically coiled tubes each communicating at one end with said sediment drum, and at the other end with said steam header, a second series of helically coiled tubes communicating at one end with said sediment drum, and at the other end with said water manifold, pipe means communicating at one end with said water manifold and at the other end with said steam header, and heating means consisting of a plurality of burners disposed peripherally in spaced relationship around said first and second series of helically coiled tubes whereby flames from said burners are directed inwardly against said tubes from all sides thereof.

6. In a steam boiler, a sediment drum, a water manifold, a series of distinct groups of tubes each group consisting of a plurality of helically coiled tubes of respectively varying helical diameters, the several helices of each group being disposed concentrically one within another, each said helical tube communicating at one end with said manifold, and at the other end with said drum, and the turns of each said helix being reversed in clockwise direction with respect to the helix next concentrically adjacent thereto and heating means consisting of a plurality of burners disposed peripherally in spaced relationship around said series whereby flames from said burners are directed inwardly against said groups of tubes from all sides thereof.

7. In a steam boiler, a sediment drum, a water manifold, a series of distinct groups of tubes, each group consisting of a plurality of helically coiled tubes of respectively varying helical diameters, the several helices of each group being disposed concentrically, one within another, each said helical tube communicating at one end with

said manifold and at another end with said drum, and the turns of each said helix being reversed in clockwise direction with respect to the helix next concentrically adjacent thereto, a water supply pipe passing through said drum and communicating therebeyond with said manifold, that portion of said pipe within said drum being provided with perforations whereby a portion of the water passing through said pipe enters said drum

through said perforations, and the remaining portion flows to said manifold, and heating means consisting of a plurality of burners disposed peripherally in spaced relationship around said series whereby flames from said burners are directed inwardly against said groups of tubes from all sides thereof.

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