March 15, 1932. H. S. WOODRUFF 1,849,815

FABRICATED WATER HEATING CYLINDER

Filed Dec. 31, 1930

Fig. 1.

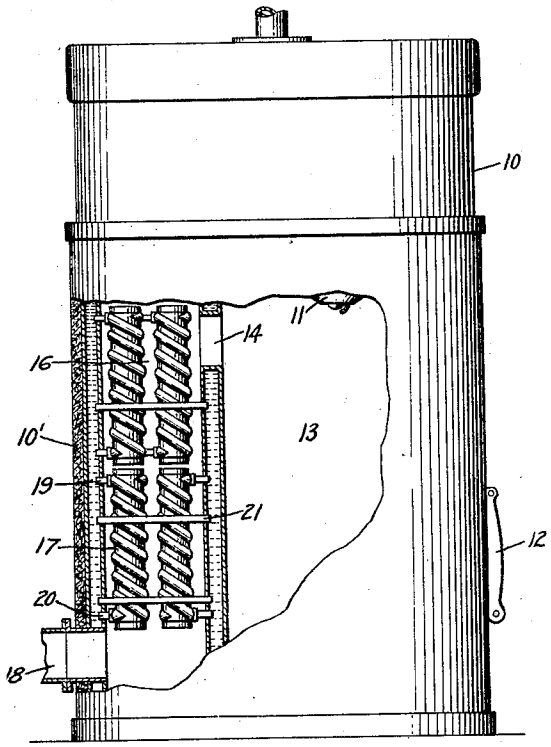
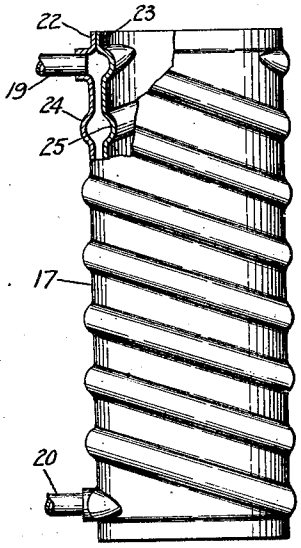


Fig. 2.



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UNITED STATES PATENT OFFICE

HENRY S. WOODRUFF, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK

FABRICATED WATER HEATING CYLINDER

Application filed December 31, 1930. Serial No. 505,834.

My invention relates to heating apparatus and more particularly to the heat absorbing water heating coils used in furnaces.

One form of water heating coil comprises a helical coil placed in the combustion chamber or in the path of the hot gases coming from the combustion chamber. These coils present a long path for the water to circulate through, and can be easily clogged by the formation of scale in the tubes due to the sluggish action of the water through the coils making it easier for the scale to deposit therein. A further difficulty with the helical types of coil is that ashes or soot become lodged in between the various coils and cleaning merely brushes the inner and outer portions of the coils without cleaning in between the coils, so that eventually a cylinder is built up having smooth sides. This reduces the heat absorbing surface of the coils rendering them still further inefficient to perform their proper function. Furthermore, it is difficult to form the helical coil.

An object of my invention is to provide a water heating coil which will present the maximum amount of heating surface and which can be easily and thoroughly cleaned.

A further object of my invention is to provide a coil which will increase the usual heat transfer from the products of combustion to the water coils by increasing the time of contact of the products of combustion with the coils.

Another object of my invention is to provide a water heating coil which is easily manufactured.

These and other objects will appear hereinafter.

The preferred embodiment of my invention consists of a hollow cylinder or tubular member open at both ends and having a hollow wall which is formed by placing two cylindrical members, which have been corrugated to simulate spiral coils, one within the other and sealing their ends. Inlet and outlet passages are provided at opposite ends of this cylinder which connect with the interior formed by the two walls of the cylinder. Due to the formation of the walls an open space is provided from one end of the cylinder to the other between the two walls, thereby making it unnecessary for the water to entirely circulate around the simulated coil formation. The water can rise from the bottom of the coil directly to the top of the coil upon being heated. This provides for quicker circulation of the water and the webs in between the simulated coils increase the heating surface of the coils and makes it impossible for soot and ashes to lodge between the coils without being easily removed. The corrugations cause a swirling action of the products of combustion as they pass through the coil thus increasing heat transfer.

Referring to the drawings, Fig. 1 shows my invention used in an oil burning furnace and Fig. 2 shows the details thereof.

In Fig. 1 an oil burner 10 is provided with a covering of heat insulating material 10′. Mounted in the top of the burner above the combustion chamber is the fuel spraying nozzle 11 for directing a flame downwardly within the combustion chamber. This combustion chamber is provided with a safety door 12. The combustion chamber 13 has an opening 14 in the top thereof which opens into the coil drum 16 down through which the gases of combustion pass upon leaving the combustion chamber. These gases are exhausted from the furnace by means of the flue 18. Coils 17 are placed within the coil drum and connected to the boiler portion of the oil burner by means of pipes such as 19 and 20 which form outlet and inlet passages for the coils supported in the coil drum. These coils absorb the heat from the products of combustion as the products of combustion pass down through the coil drum. Stay rods 21 for strengthening the walls of the furnace and boiler may take the form of pipes, as indicated, for assisting in the circulation of the water in the boiler.

In Fig. 2 it can be seen that the water coil 17 comprises the two concentric cylinders 22 and 23 which have the corrugations 24 and 25 therein which are oppositely disposed in registering relationship as shown to simulate spiral coils. Two such corrugated coils are provided in interwound relationship instead of one to prevent too sharp a pitch re-

sulting from one coil which would tend to cause soot collection and which would lose a large part of its effectiveness in causing a swirl of the products of combustion. It will be noted that these two cylinders are spaced apart so as to form openings between the successive coils so that a direct path is formed from the top to the bottom of the coil. The inlet opening is connected with a conduit 20 at the bottom and the outlet opening is connected with a conduit 19 at the top of the cylindrical coil which is provided with the hollow walls.

In operation the water coil absorbs the heat from the flue gases, the corrugations causing a swirling action of the gases passing down through the coil thus causing increased heat transfer due to a longer period of contact and increased turbulence, and the water within the coil circulates directly from the bottom of the coil to the top, the coils tending to cause a slight circular movement of the water passing through the coil. This action results in a quick transfer of heat and causes a more active circulation of the water within the coil than it is possible to obtain with the usual form of coil providing the normal long travel for the water through the coil. It will be noted that due to the webbing, as it may be designated, between the simulated coils a much greater heating surface is presented to the products of combustion for absorbing the heat therefrom than in the usual form of water heating coil. Furthermore, due to these web formations in between the coils and the wide path of the coils it is easy to clean the walls of the cylinder since a cleaning brush can easily reach all of the surface of the coils and remove any soot or ashes which may have collected on the web portion of my water heating coil.

It will thus be seen that I have provided a new and unique heating coil in which a direct and quick circulating action of the water therein is obtained, increasing the speed of heat transfer from the products of combustion to the water within the boiler, increased heat transfer from the products of combustion results from the spiral corrugations, more heating surface is presented for the same space as would be occupied by a coil of similar dimensions, and it is far in advance of other types of coils in the ease with which the coil may be cleaned. All these factors tend to increase tremendously the efficiency of my heating coil over the usual type of water heating coil. Furthermore, this coil can be easily manufactured and hence is less expensive to make.

The embodiment of the invention illustrated and described herein has been selected for the purpose of clearly setting forth the principles involved. It will be apparent, however, that the invention is susceptible of being modified to meet the different conditions encountered in its use, and I, therefore, aim to cover by the appended claims all of the modifications within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States, is:—

1. A water heating device including a pair of concentric tubular members in spaced relation and having adjacent ends sealed together to form a hollow space therebetween, registering corrugations in said members for simulating a spiral coil, the outside corrugation being formed outwardly and the inside corrugation being formed inwardly of said tubular members, said coil causing increased heat transfer from the products of combustion, and conduits connected to the interior of said hollow wall at opposite ends of the coil to provide an inlet passage and an outlet passage to said device, said hollow wall providing a direct passage from one conduit to the other permitting rapid circulation of water through said device.

2. A water heating coil for a furnace including a pair of concentric cylinders sealed at their ends to form an exterior wall and an interior wall, said cylinders forming a closed hollow space therebetween and having corrugations in registering relationship to simulate spiral coils, the corrugation on said exterior wall bulging outwardly and the corrugation on said interior wall bulging inwardly of said cylinders, said spiral coils causing increased heat transfer thereto from the products of combustion due to increased turbulence and contact, and conduits connected to the interior of said hollow space at opposite ends of the water coil to provide an inlet passage and an outlet passage thereto, said space providing a direct passage from one conduit to the other to permit rapid circulation of water through said coil.

3. A water heating coil for a furnace including a pair of concentric tubular members in spaced relation and having adjacent ends sealed together to form a hollow space therebetween, said members having registering corrugations therein to simulate a plurality of helical coils with webs therebetween, said helical coils causing a swirling action of products of combustion passing through said water coil thereby causing increased heat transfer, and conduits connected to the interior of said hollow space at opposite ends of the water coil to provide an inlet passage and an outlet passage thereto, said space providing a direct passage from one conduit to the other to permit rapid circulation of the water through said water heating coil.

4. A water heating coil comprising a pair of concentric tubular members in space relation and having their ends sealed to provide a hollow space therebetween, a plurality of helical coils in interlying relationship simulated by corrugations in registering relation-

ship in the walls of said tubular members, said coils acting on products of combustion passing through said water coil to cause a swirl thereof and to increase the turbulence thereof whereby an increased heat transfer to said water coil results, and an outlet conduit and an inlet conduit connected to said water coil, said hollow walls permitting direct circulation through said water coil from said inlet to said outlet conduits.

In witness whereof, I have hereto set my hand this 30th day of December, 1930.

HENRY S. WOODRUFF.