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C. D. JONES

2,051,215

HEATER STRUCTURE

Filed May 13, 1935

Fig. 1.

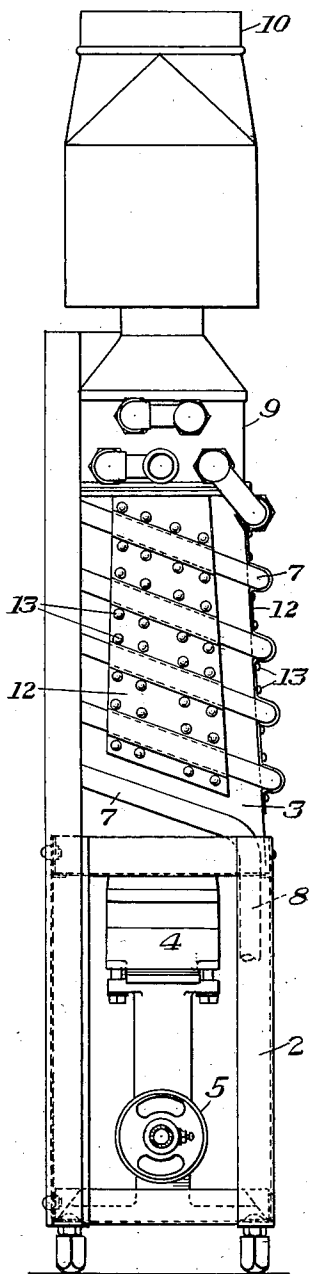
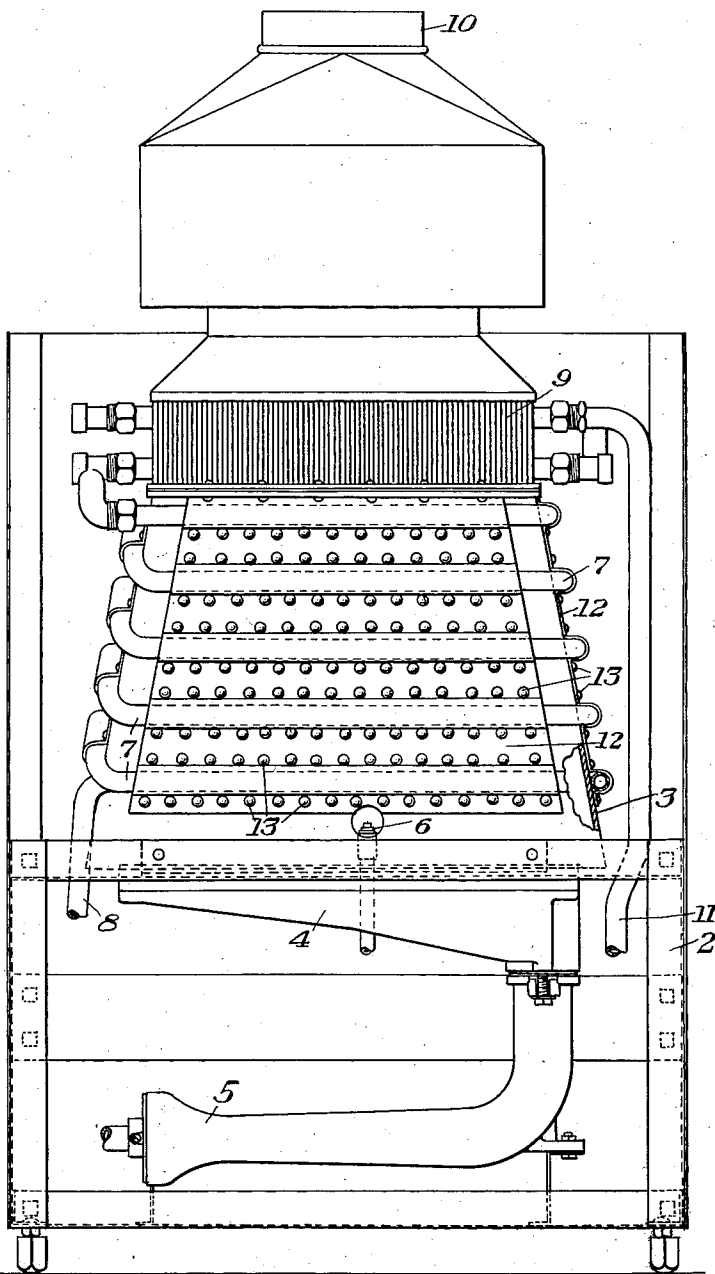


Fig. 2.



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UNITED STATES PATENT OFFICE

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HEATER STRUCTURE

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Application May 13, 1935, Serial No. 21,121

7 Claims. (Cl. 122—250)

This invention relates broadly to heater structures, and more particularly to a structure for use in heaters for transferring heat from a heat source to a fluid contained in a conduit, such, for example, as a coil. In certain of its more specific aspects the invention relates to a structure especially well adapted for use in water heaters, and more particularly instantaneous water heaters. Purely for purposes of explanation and illustration the invention will be described as embodied in an instantaneous water heater.

In instantaneous water heaters it is necessary to transfer heat rapidly from a heat source, such as a burner, to a conduit, ordinarily in the form of a coil, in which is circulated water to be heated. It has been customary in constructing instantaneous water heaters to provide a chamber adapted to receive heat from the burner and a coil surrounding such chamber and soldered thereto. Such a construction is attended with numerous decided disadvantages. Perhaps the foremost of these is the fact that due to expansion and contraction incident to operation of the heater the solder which fastens the coil to the heating chamber cracks in places, which reduces to a very great extent the heat transfer from the heating chamber to the coil and results not only in great reduction in thermal efficiency of the heater but also in possible or even probable burning out of the heating chamber. The coil is relied upon to conduct heat away from the heating chamber at such a rate that the temperature of the heating chamber, even during capacity operation of the heater, will not rise beyond a temperature which the material of the heating chamber is adapted to withstand.

A further disadvantage of a heater structure of the type mentioned is that the coil at any place along the length thereof touches the heating chamber at only one point throughout the entire periphery of the coil as the coil is tangent to the outer surface of the heating chamber. The solder conducts heat from a limited area of the heating chamber to a limited area of the coil, but even when the solder is intact the heat transfer from the heating chamber to the coil is quite limited.

Furthermore the heating chamber is relied upon, to some extent at least, as a support for the coil, and when the solder cracks this support is rendered less effective. This results in weakening of the heater structure and such weakening may, in turn, result in cracking or leakage of the coil or associated parts.

I provide a heater structure which obviates all of the disadvantages above mentioned. I provide for relative movement during expansion and contraction between the heating chamber and the coil without the detrimental results incident to the use of a structure of the type above mentioned. I preferably clamp the coil to the heating

chamber, allowing sufficient freedom of movement of the coil relative to the clamping means to permit of unequal expansion and contraction of the heating chamber and coil such as will occur in operation of the heater. The clamping of the coil to the heating chamber may be effected in various ways. I prefer to provide sheet metal outside the coil and to fasten such sheet metal to the heating chamber intermediate the convolutions of the coil in any appropriate manner, as, for example, by riveting. The sheet metal may be in the form of individual strips disposed at various points along the coil, although I prefer to use one or more relatively large sheets corrugated to receive the convolutions of the coil and fitting against the outer surface of the heating chamber intermediate such convolutions. The sheet or sheets may be fastened to the heating chamber at the portions thereof intermediate the convolutions of the coil, and improved results are obtained even though such fastening is effected by soldering, as the temperature differential between the heating chamber and the coil is greater than that between the heating chamber and the sheet or sheets. Even though the clamping means are soldered to the heating chamber this still has the effect of clamping the coil to the heating chamber as the coil has appreciable freedom of movement between the heating chamber and clamping means which it does not have if it is directly soldered to the heating chamber.

Moreover, a greatly improved heat transfer from the heating chamber to the coil is effected when the coil is fastened to the heating chamber by sheet metal means as above explained. The sheet contacts with the coil throughout a substantial area of the cross section thereof, such contact ordinarily being throughout approximately half the area of the coil. As the sheet metal lies against the heating chamber intermediate the convolutions of the coil, heat is conducted from the heating chamber into the sheet metal at such portions thereof which lie in intimate contact and thence from the sheet to the coil throughout the relatively large area of the coil with which the sheet is in contact. Actually more heat will be transmitted to the coil through the sheet than will be transmitted to the coil directly from the heating chamber despite the fact that the coil is in direct contact with the heating chamber.

Other details, objects and advantages of the invention will become apparent as the following description of a present preferred embodiment thereof proceeds.

In the accompanying drawing I have shown a present preferred embodiment of the invention, in which

Figures 1 and 2 are elevational views, taken at right angles to each other, of an instantaneous

water heater but with parts forming no part of the present invention cut away for the sake of clearness.

There is provided a supporting frame 2 on which is mounted a sheet metal structure 3, preferably of copper, forming a heating chamber. The heating chamber is in the shape of a truncated pyramid, being open at the bottom and top. Heat is supplied to the interior of the heating chamber by a burner 4 to which fuel, such as a mixture of gas and air, is supplied through the fuel inlet 5. A pilot burner is shown at 6. I have not shown an automatic operating mechanism for the instantaneous heater as this forms no part of the present invention. The operating mechanism may be of any desired or well known construction.

Surrounding the heating chamber is a coil 7 which is ordinarily of copper. Cold water enters the coil at 8 and passes round and round the heating chamber and finally through the fin unit or superheater 9 at the top of the heating chamber through which the products of combustion pass to the flue 10. The hot water passes out through the pipe 11. The heating chamber serves at least partially to support the coil. The coil lies directly in contact with the exterior of the heating chamber. Cooperating with each flat side of the heating chamber and disposed outside the coil is a corrugated copper sheet 12 shaped to receive within the corrugations thereof the convolutions of the coil and to lie flat against the heating chamber intermediate such convolutions. The corrugations in the sheets are preferably so formed that the sheets closely embrace the convolutions of the coil throughout approximately half of the circumference of the coil, serving effectively to transfer heat thereto. The sheets are riveted to the heating chamber by rivets 13 suitably disposed between the convolutions of the coil, preferably in rows as shown. In place of the rivets other fastening means such as solder, welding, bolts, etc., may be used.

The coil is free to move relatively to the heating chamber within the sheets 12 upon expansion and contraction during operation of the heater and there is practically no danger that the sheets will break loose from the heating chamber. The heat differential between the sheets and the heating chamber is relatively small. The efficiency of the heater is greatly increased, as heat passes readily through the heating chamber to the portions of the sheets lying flat thereagainst intermediate the convolutions of the coil and thence through the material of the sheets to the coil at the portions of the sheets surrounding the convolutions of the coil. Thus a heater having great advantages from both the structural and thermal standpoints is provided.

While I have shown and described a present preferred embodiment of the invention, it is to be distinctly understood that the same is not limited thereto but may be otherwise variously embodied within the scope of the following claims.

I claim:

1. Heater structure, comprising heating means, heat transmission means adapted to receive heat from one side from said heating means, conduit means for containing a substance to be heated disposed at the opposite side of said heat trans-

mission means, and means including a continuous metal sheet having successive portions extending in surface contact about successive portions of the conduit means and having successive portions mating in continuous contact with the heat transmission means for fastening the conduit means to the heat transmission means.

2. Heater structure, comprising heating means, heat transmission means adapted to receive heat from one side from said heating means, conduit means comprising a plurality of coils for containing a substance to be heated disposed at the opposite side of said heat transmission means, and means including a continuous metal sheet in mating engagement with and substantially entirely covering the heat transmission means and the conduit means at said opposite side of the heat transmission means.

3. Heater structure, comprising heating means, heat transmission means adapted to receive heat from one side from said heating means, conduit means comprising a plurality of coils for containing a substance to be heated disposed at the opposite side of said heat transmission means, and means including a continuous metal sheet in mating engagement with and substantially entirely covering the heat transmission means and the conduit means at said opposite side of the heat transmission means, said sheet serving to fasten the conduit means to the heat transmission means and to transmit heat from the heat transmission means directly to portions of the conduit means remote from the heat transmission means.

4. In a heater structure, the combination of a tubular shell, a pipe coil having spaced turns and in contact with the outer surface of said shell, a plate having corrugated recesses to receive the spaced turns of the pipe coil, said plate mating in continuous surface contact with the shell between said corrugations, and means for securing the plate to the shell continuously along lines on either side of each of said corrugations.

5. In a heater structure, the combination of a tubular shell, a pipe coil having spaced turns and in contact with the outer surface of said shell, a plate having substantial semicircular corrugations arranged to snugly fit the spaced turns of the pipe coil, said plate mating in continuous surface contact with the shell and between said corrugations, and means for securing the plate to the tubular member substantially continuously along either side of each of said corrugations.

6. In a heater structure, the combination of a tubular shell, a pipe coil having spaced turns and in contact with the outer surface of said shell, and a plate secured in flat surface contact with the wall of the shell intermediate of the turns of the pipe coil to prevent buckling of the wall of the shell due to high temperatures.

7. In a heater structure, the combination of a tubular shell, a pipe coil arranged about said shell, and means for supporting the coil on the shell and for preventing inward buckling of the shell comprising a continuous metal member having spaced corrugations engaging the turns of the coil and intermediate portions secured to the shell.

CHESTER D. JONES.

CERTIFICATE OF CORRECTION.

Patent No. 2,051,215.

August 18, 1936.

CHESTER D. JONES.

It is hereby certified that the name of the assignee in the above numbered patent was erroneously written and printed as "Pittsburgh Water Heater Corporation" whereas said name should have been written and printed as Pittsburg Water Heater Corporation, of Pittsburgh, Pennsylvania, a corporation of Pennsylvania, as shown by the records of assignments of this office; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 20th day of October, A. D. 1936.

Leslie Frazer

Acting Commissioner of Patents.

(Seal)