Aug. 14, 1923. 1,464,954

C. A. OLSON

WATER HEATER

Filed June 25, 1919 2 Sheets-Sheet 1

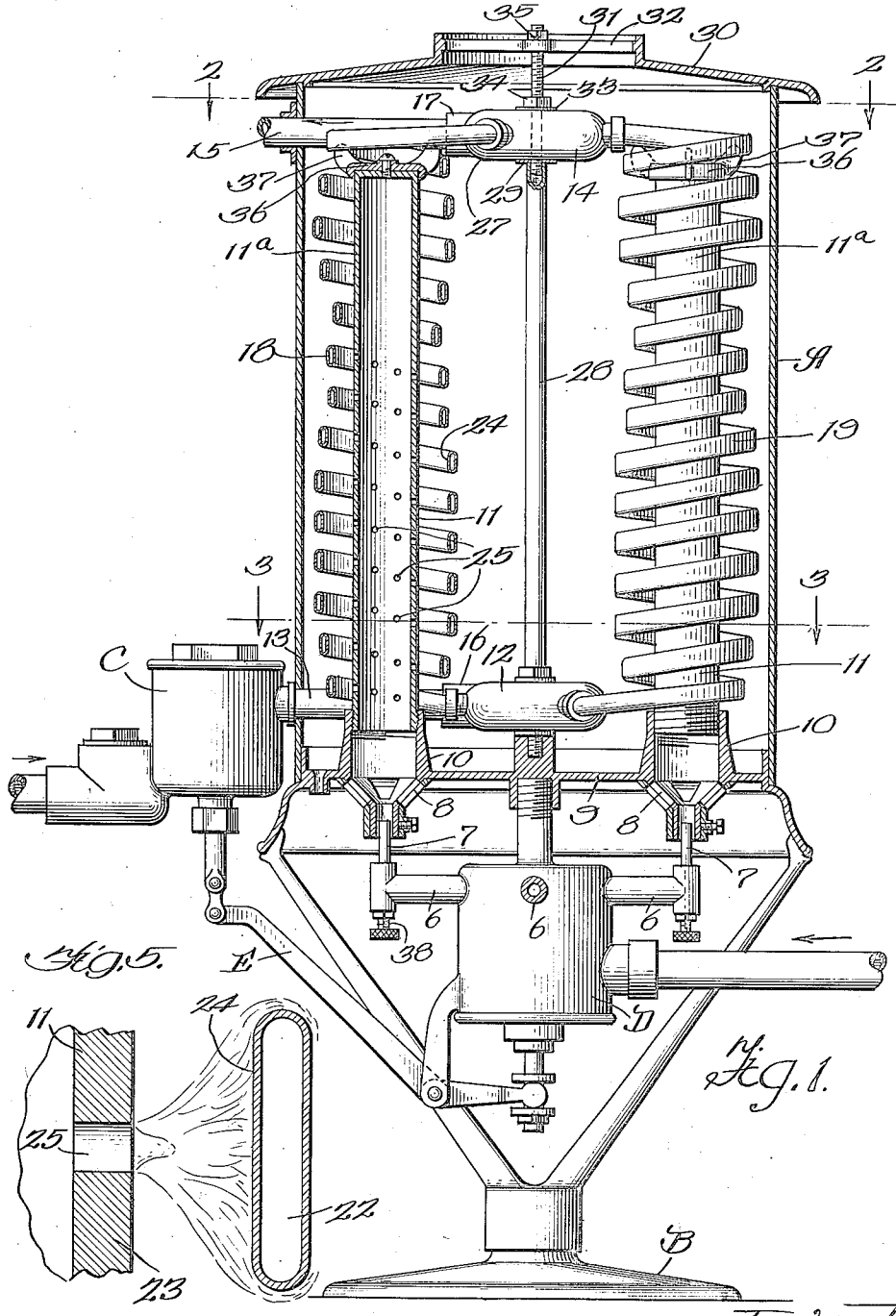


Fig. 1.

Fig. 5.

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Fig. 1.

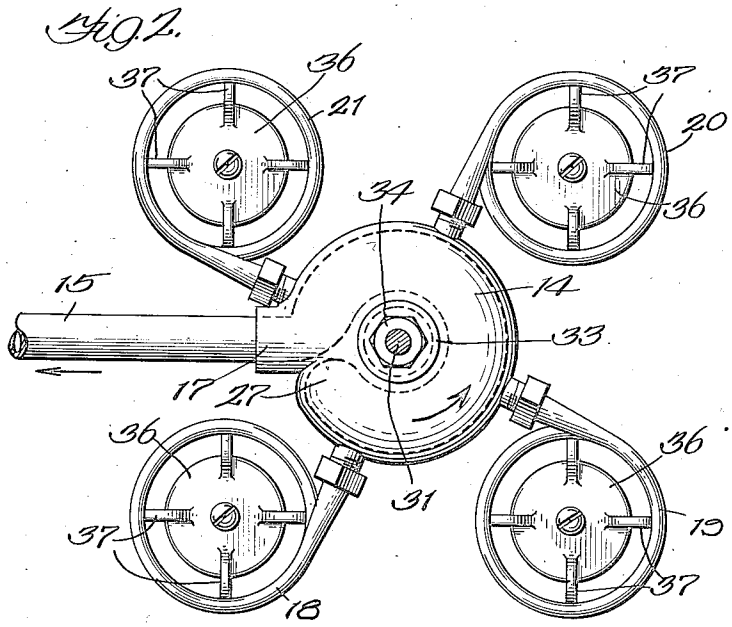


Fig. 3.

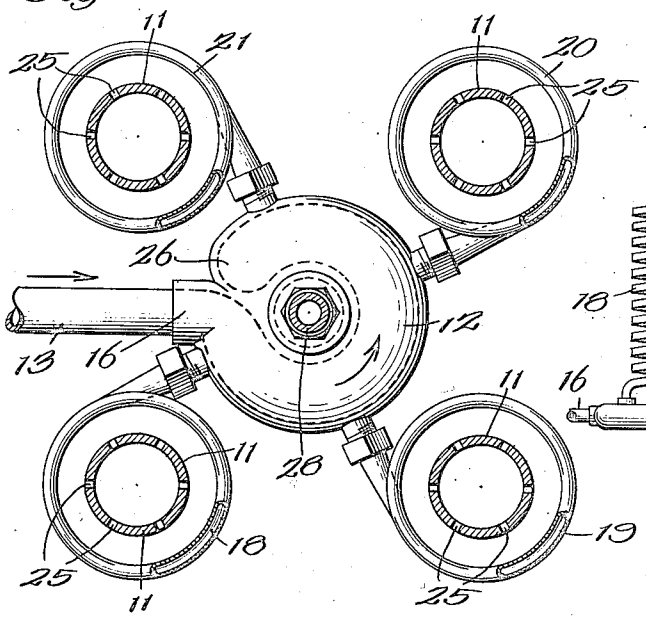
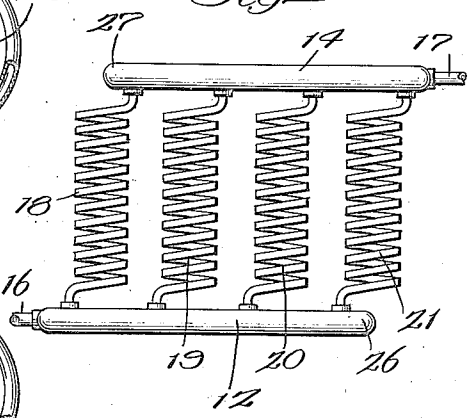


Fig. 4.



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Patented Aug. 14, 1923. 1,464,954

UNITED STATES PATENT OFFICE.

CHARLES A. OLSON, OF GENEVA, ILLINOIS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO GENEVA HEATER COMPANY, OF GENEVA, ILLINOIS, A CORPORATION OF ILLINOIS.

WATER HEATER.

Application filed June 25, 1919. Serial No. 306,685.

To all whom it may concern:

Be it known that I, CHARLES A. OLSON, a citizen of the United States, and residing at Geneva, Kane County, Illinois, have invented certain new and useful Improvements in Water Heaters, of which the following is a description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to gas water heaters, and has reference more particularly to improvements in that type of water heater employing water heating coils, one object of the invention being to improve the construction of heaters of this type so as to obtain maximum efficiency in heat absorption and transfer, approximating ninety per cent, as indicated by actual test, while keeping the fuel cost down to a minimum. Another object is the provision of a heating coil constructed with a minimum fluid space and arranged to present a maximum amount of heating surface to the gas jets of the burner within a zone of maximum temperature, thereby rendering the heater practically instantaneous in character, and wherein the velocity of the water passing through the coil is greatly increased to thereby prevent deposit of scale or other sediment. With these objects in view the invention contemplates the arrangement of a coil, as thus characterized, about a vertically positioned burner whose jet outlets are spirally arranged with reference to the flattened heating surface of the coil, the major axes of the convolutions being disposed in parallelism, or substantially so, with the vertical wall of the burner. It also contemplates an organization of a heating coil and burner structure wherein the axes of the burner is co-incident with the axis of the coil and both are substantially co-extensive in the vertical direction, the upper portion of the burner being imperforate and arranged with reference to the corresponding portion of the coil so as to baffle the ascending current of hot gases arising from the lower portion of the structure, where the gas jet flames impinge centrally upon and envelop the lower vertically spaced convolutions of the coil.

A still further object of the invention relates to an arrangement of inlet and outlet headers with coils terminally connected therewith in a series to insure an equal flow of water through each coil unit and thereby equally distribute the work through the series. This arrangement also contemplates the utilization of standard units of coils and burners in any number desired, depending on heater capacity desired, and as such permits an interchange of the units and readily allows for repair as any unit may be disconnected and the remainder operated as before and in equal proportion.

My invention further contemplates the provision of certain novel details of construction, combination and arrangement of parts of the heater, whereby other advantages are attained, as will be more fully described hereafter or are incident to the invention.

These objects and advantages I attain by means of a construction illustrated in preferred form in the accompanying drawings, wherein—

Figure 1 is a vertical sectional view of a heater to which my invention is applied;

Figures 2 and 3 are views in horizontal section of the coil and burner groups of Figure 1 and are taken along the lines 2—2 and 3—3, respectively;

Figure 4 represents a diagrammatic view of the associated coils and headers, and to better illustrate their relation the headers normally annular, have been shown along straight lines with this purpose in view; and,

Figure 5 is an enlarged detail view in section through a jet outlet portion of a burner and its corresponding coil portion.

Referring to the drawings, the reference character A denotes a heater shell or casing having any suitable supporting base B and being preferably provided with a water casing or regulating cylinder C and a gas casing D, both of which are described more fully in a co-pending application for Letters Patent of the United States, Serial Number 299,645. Briefly stated, the gas valve (not shown here) in the casing D is opened and closed by pressure differentiation occurring in casing D upon the opening and closing of the faucet in the service line, and acting through the lever mechanism which is indicated generally by the reference character E. The gas chamber D is provided with separate radial gas conducting conduits 6 and these have outlets 7 leading to the air mixing valved members 8 which depend from the base wall 9 of the heater shell.

This wall 9 is formed with upwardly directed annular extensions 10 of the air mixing members 8, and these extensions constitute burner supports to which the burners 11 are removably attached.

Positioned one above the other within the shell are headers 12 and 14, the inlet and lower header 12 being connected at its inlet end with the water chamber C by means of a cold water supply pipe 13, while the outlet or hot water header 14 communicates at its outlet end with the outlet pipe 15 which leads through the heater shell to the service pipe (not shown).

These headers may take the form of castings having an annular contour as shown, and each embodies an elongated water passage having a closed end, the other end in the one instance being the inlet 16 and in the other the outlet 17. In the heater illustrated four coils 18, 19, 20 and 21 are shown applied to the headers, though any desired number may be employed depending upon the capacity of heater wanted, each being spirally arranged about a burner 11 and having its convolutions flattened to provide a ribbon-like water passage 22, the major axis of which is in parallelism with the wall 23 of the burner (Figure 5). It will be observed that the broad and flat spiralled heating surface 24 of the coil is so located with reference to the jet outlets 25, which are correspondingly spiralled, that the flames emanating from the latter impinge centrally upon such surface, and as the convolutions are spaced in the vertical direction they are thereupon enveloped in the flames and heated gases.

In the preferred construction the lower part of each burner 11 only is perforated to form these outlets, the upper portion 11^a, confronting the upper portion of the coil being extended so as to baffle the ascending heated gas and thereby increase the heat absorbing and transferring properties of the coil. In this connection it is considered advantageous to so shape the coil above its central position as to first contract it and then relatively increase its diametrical proportion, thereby forcing the ascending gases into a very effective contact with the upper coil part. In this manner, the coils are enabled to absorb practically all the heat (ninety per cent by test) from the flames, leaving a sufficient margin of heat to escape and afford sufficient draft to carry off the products of combustion. Thus it will be seen that I provide in each heater unit a flame contact zone and a baffle zone located between the cold and hot water headers 12 and 14, and wherein a high velocity of flow through the elongated coil passages 22 is insured to prevent deposit of scale or other sediment. The coils, furthermore, are arranged to receive the maximum amount of heat in both zones.

One important feature of my invention resides in the arrangement of the coils, with respect to the inlet 16 and outlet 17 of the headers, in order to provide for an equalization of water flow through each unit, and to permit the use of standard coils and burners, thereby allowing for interchangeability of the units, or the disconnection of any unit for repair or replacement without interfering with the operation, on an equal proportionate basis, of the remainder of the units. This feature is clearly disclosed in Figures 2, 3 and 4, to which reference is now more particularly directed. Figure 4 is merely diagrammatic, the headers being extended in straight lines for a ready understanding of this feature. All of the coils are removably attached at their opposed ends to the headers at intervals along the header passages, the end coil 18 having its inlet end disposed in close proximity to the header inlet 16 while its outlet is located at the point in the header 14 most remote from the outlet 17 and adjacent the closed end 27. On the other hand the other end coil 21 has its inlet end adjacent the closed end 26 of the header 12 and its outlet end in close proximity to the outlet 17. The intermediate coils 19 and 20 are similarly arranged, that is to say, where an inlet end of one member of a series is nearer the header inlet than the other, the latter has its outlet end relatively nearer the header outlet. In other words, the present embodiment of this feature contemplates opposed or reversed headers, one an inlet header and the other an outlet header, with coils terminally arranged in a series whereby their inlets are progressively spaced in a direction away from the header inlet and their corresponding outlets are progressively positioned at intervals in a direction toward the heater outlet. In this manner the water flow of each coil unit is equalized, and consequently the efficiency of the heater is materially increased.

The reference numeral 28 designates a distance member for the headers comprising a hollow rod whose lower end is detachably associated with the header 12, and whose interiorly threaded upper end supports the header 14 by means of a disc 29 which is slightly larger than the central orifice of said header. In order to maintain the rod in a fixed relation with reference to the latter, and to removably position the hood 30, I provide a bolt 31 which terminally engages the rod 28 and the cross-bar 32 of the hood, the header 14 being gripped between the lower disc 29 and an upper disc 33 through the instrumentality of a nut 34, and the hood being clamped in position by the nut 35.

Positioning means for the upper part of each coil is provided in the shape of a disc

36 having radial lugs 37 projecting beyond the periphery of the disc to engage a convolution of the coil. This disc is detachably seated upon the upper wall portion of each burner, as shown. It will be therefore obvious that all the units and the component parts thereof may be very readily assembled and as readily uncoupled for purposes of repair or replacement. Should it become necessary to take out a coil, the corresponding needle valve 38 may be closed to thereby shut off the supply of gas to the particular burner it serves, and without affecting the operation of the other units. A very noteworthy feature of the heater is its simple and economical construction. The structure provides for rapid circulation; it affords a maximum quantity of hot water at a minimum cost; and having a minimum water space the supply of hot water is practically instantaneous, thus effecting a saving in gas and water.

Another advantage of the construction resides in the fact that it permits the rapid circulation of the hot gases over the convolutions of the coil to obtain complete combustion, thus preventing the formation of the blanket of carbon-monoxide customarily encountered in gas water heaters about the coils, and providing for an efficient transfer of heat to the water in the convolutions, which efficiency is materially increased by the elongation of the latter in the vertical direction. In other words, the structure presents at least three outstanding concurrent conditions, productive of high efficiency, i. e., rapid circulation of hot gases with complete combustion; rapid circulation of a thin water stream with maximum heat transfer; and an instantaneous supply of hot water at low cost.

I claim:—

In a water heater, the combination of a tubular inlet header of annular shape, having its ends disposed in proximity to each other, one of said ends being closed, a supply pipe connected to the open end, a tubular outlet header of annular shape with its ends disposed in proximity to each other, one of said ends being closed, an outlet pipe connected with the open end of the outlet header, a plurality of helical vertically flattened heating coils, each being of reduced diameter intermediate its ends, said coils being connected with the respective headers in multiple and in inverse order with respect to the closed ends of said headers so that the paths of flow through the various coils from said supply to said delivery pipe are of substantially equal length, and a tubular burner disposed within each coil, each burner having gas orifices below the restricted portion of the surrounding coil directly opposed to the flattened face of the surrounding coil and being imperforate above said restricted portion of the coil to provide a baffle zone above the flames issuing from said orifices.

CHARLES A. OLSON.