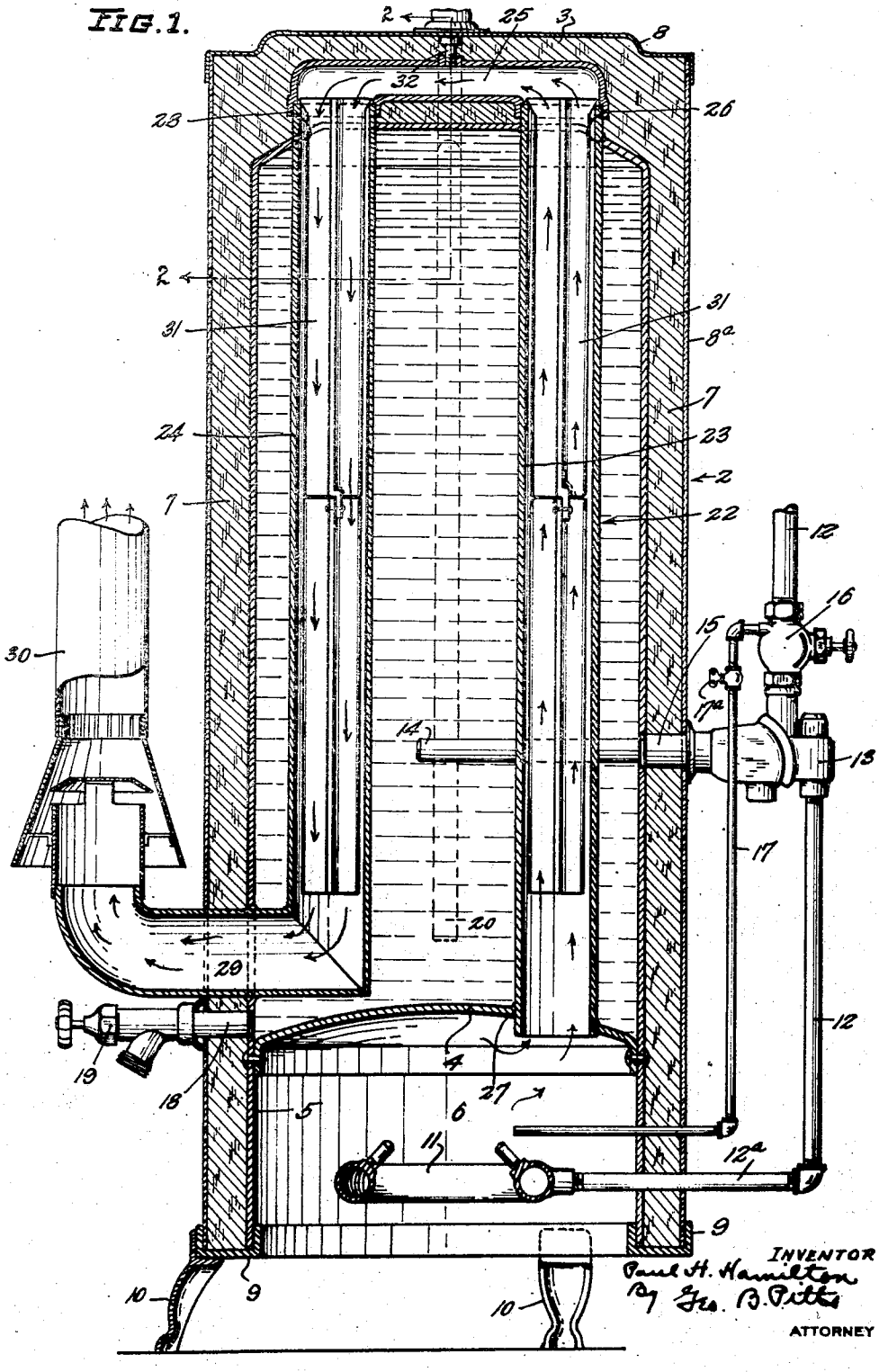
Oct. 31, 1933. P. H. HAMILTON 1,933,056

HEATER

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FIG. 1.



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FIG. 2.

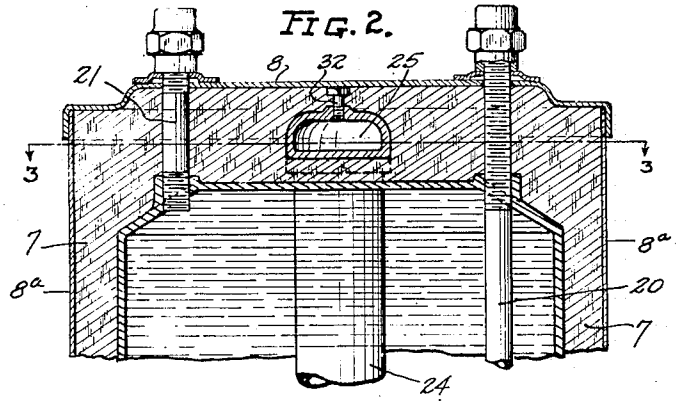


FIG. 3.

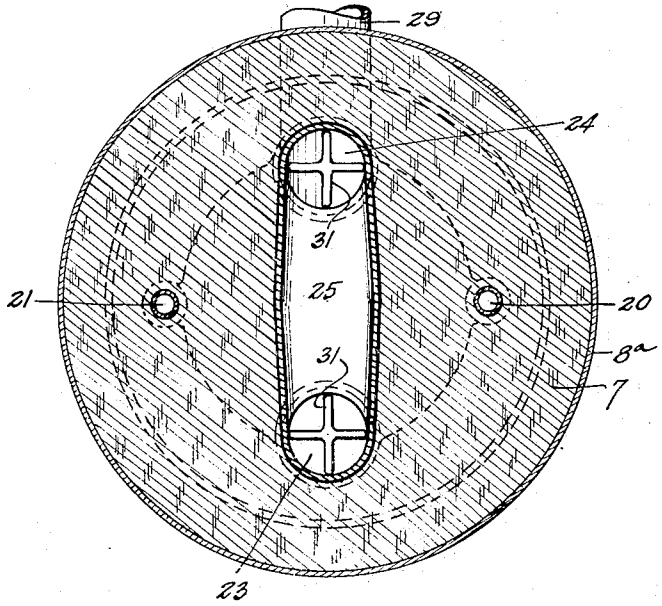


FIG. 4.



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FIG. 6.

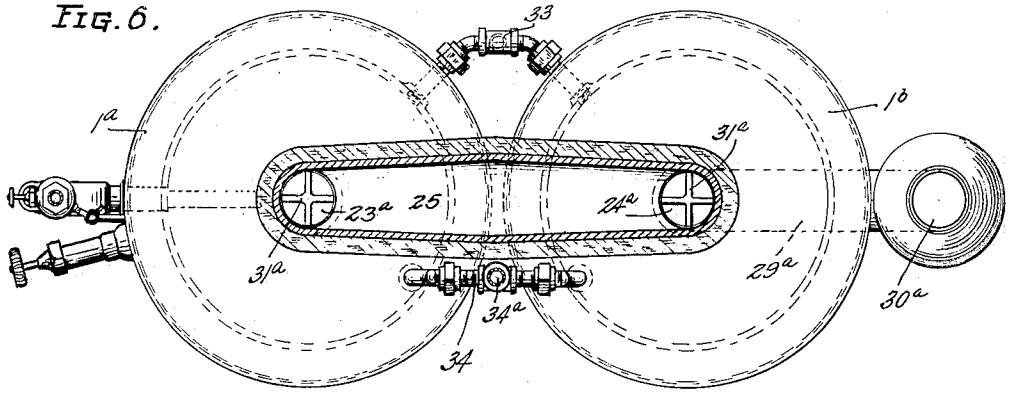
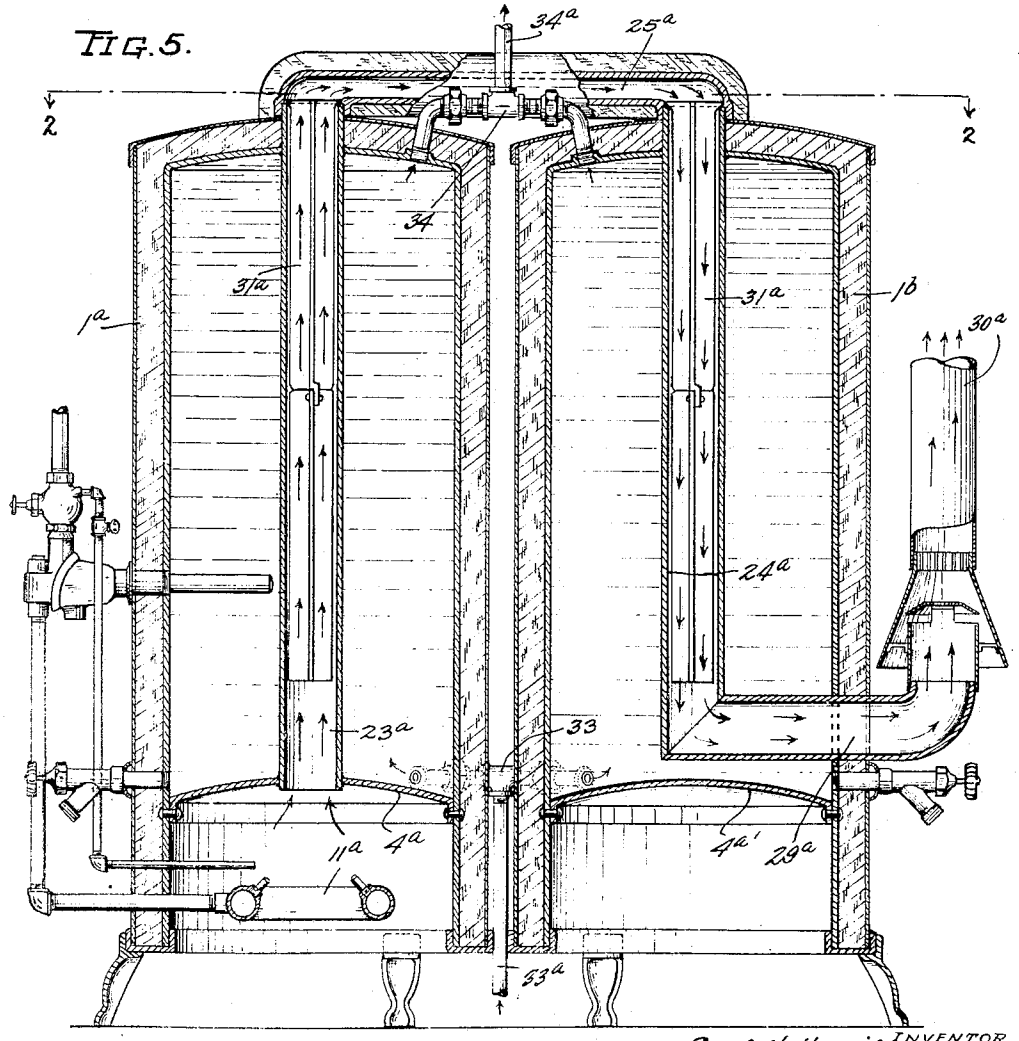


FIG. 5.



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1,933,056

HEATER

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Application January 15, 1930. Serial No. 421,002

4 Claims. (Cl. 122—17)

This invention relates to a fluid heating apparatus of the storage type.

One object of the invention is to provide an improved construction of fluid heater in which the products of combustion or heating gases are passed through the container in such manner that (*a*) their rate of flow is retarded to prevent the drawing into the flue of an undue amount of cold air which would cool the products or gases and (*b*) substantially all of the heat units are transferred to the fluid before the final escape or discharge of the products, with the result that the water is more uniformly maintained at the desired temperature, less gas is required for each re-heating after withdrawal of hot water and the total quantity of gas consumption during any predetermined period is materially reduced.

Another object of the invention is to provide a fluid storage heater having a fire chamber below its bottom and a pair of gas flues extending through the container and connected at their upper ends, one leading from said fire chamber to receive products of combustion therefrom and the other discharging at its lower end through the side wall of the container into the atmosphere, whereby the gases flow in one direction from the bottom to the top of the container and then from the top of the container to its bottom, so that the transfer of the heat units takes place in a substantially uniform manner as the gases flow through the flues.

Another object of the invention is to construct a storage heater for fluid in which there is provided an up-take exhaust flue leading from the fire chamber below the container through the bottom of the latter and a down-take exhaust flue connected to the upper end of the up-take and extending substantially to the bottom of the container, so that those portions of the heating gases or products of combustion flowing in the up-take are substantially balanced by that portion of the heating gases or products of combustion flowing in the down-take, to the end that the rate of flow of the gases is retarded to prevent the induction of an undue amount of air and allow of the transfer of substantially all of the heat units to the fluid prior to the escape of the gases or products.

A further object of the invention is to provide a fluid heater in which the products of combustion are conducted through the fluid container in an improved manner to augment the heating means for the fluid, whereby (*a*) the fluid is maintained at or quickly re-heated to the desired temperature following the withdrawal of a portion or the entire quantity of fluid in the container and its replacement with cold fluid and (*b*) the cost of operation is materially reduced.

A further object of the invention is to provide a fluid heater having an up-take conduit and a down-take conduit for the heating gases, both conduits extending through the contained body of fluid and having at their upper ends exteriorly of the container a removable section, to permit access to the conduits and insertion in and removal therefrom of guides when the latter are provided.

Other objects of the invention will be apparent to those skilled in the art to which my invention relates from the following description taken in connection with the accompanying drawings, wherein

Fig. 1 is a longitudinal sectional view of a heater embodying my invention.

Fig. 2 is a section on the line 2—2 of Fig. 1.

Fig. 3 is a section on the line 3—3 of Fig. 2.

Fig. 4 is a bottom plan view of the connecting conduit member.

Fig. 5 is a vertical section of a different embodiment of my invention.

Fig. 6 is a section on the line 6—6 of Fig. 5.

In the drawings, 1 indicates a container for fluid, such as water, having a side wall 2, a top wall 3 and a bottom wall 4. By preference, the side wall 2 is extended downwardly below the bottom wall 4, as shown at 5, to form a fire chamber 6. At one side the extended side wall or skirt 5 may be provided with a suitable door (not shown) to permit convenient access to and inspection of the chamber 6. The container 1 may be constructed in any desired manner, but is preferably cylindrical in cross section and relatively long as compared to its diameter in order that the products of combustion and heating gases may have a long travel before their discharge to the atmosphere in proportion to the volumetric capacity of the container. Surrounding the side and top walls is an insulating jacket, preferably comprising hair 7 or other non-heat conducting material and sheet metal coverings 8, 8*a*, whereby the loss of heat by radiation is substantially eliminated. A channel shaped ring 9 receives the lower ends of the skirt 5, hair 7 and covering 8*a* and forms a base member to which suitable legs 10 are removably secured.

11 indicates a burner mounted in the fire chamber 6, the burner being preferably adapted to burn gaseous fuel supplied by a pipe 12 having a horizontal branch 12*a* leading through the jacket and skirt 5. The burner 11 is disposed centrally of the fire chamber and mounted at a suitable distance below the bottom wall 4 to insure proper combustion, primary and secondary air being supplied through the opening formed by the ring 9. The pipe 12 has interposed in it a casing 13 enclosing a valve to control the flow of the gas through the pipe

to the burner 11, the opening and closing of the valve being effected through a suitable operating mechanism (also mounted within the casing 13) by thermostat elements 14 which extend into the container, as shown in Fig. 1. The casing 13 has a hollow boss 15 which is threaded into an opening formed in the side wall 2 to support the casing and thermostat elements. While any desired construction of thermostat and valve mechanism may be used, that shown is preferably similar to the construction shown in Letters Patent No. 1,479,083 granted to Howard I. Morris on January 1, 1924. Above the casing 13 the pipe 12 is provided with a cut-off valve 16. 17 indicates a pipe leading from the pipe 12 above the casing 13, the pipe 17 leading through the jacket and skirt 5 and its free end being associated with the burner 11 and serving as a pilot therefor. The pipe 17 is preferably provided with a cut-off 17*a*.

18 indicates a suitable drain leading from the bottom portion of the container 1 and provided with a faucet 19. 20 indicates a cold water supply pipe leading from the supply main and serving to maintain the container 1 filled when water is drawn therefrom. The pipe 20 preferably leads through the top wall 2 and extends to the lower portion of the container, as shown in Fig. 1, so that the hot water in the upper portion thereof will not be directly affected by the cold water flowing into the container. 21 indicates a pipe leading from the upper portion of the container 1 for supplying hot water to various points of use.

22 indicates as an entirety a flue for the products of combustion and heating gases and radiant heat leading from the fire chamber 6. The flue 22 comprises an up-take vertical section 23. a down-take vertical section 24 and a conduit member or section 25 connecting the upper ends of the sections 23, 24, whereby the products of combustion and heating gases flow from the section 23 to the section 24. The section 23 is mounted at its upper and lower portions in and extends through suitable openings 26, 27, formed in the top and bottom walls 3, 4, respectively, the section 23, being suitably secured therein in a liquid tight manner, as by welding. The section 24 is mounted at its upper end in and extends through an opening 28 formed in the top wall 3, being secured therein in a liquid tight manner, as by welding. The section 24 extends through the container 1 substantially to the bottom wall 4, and is there connected to a lateral section 29 leading through the side wall 3 to a chimney 30. In this arrangement, the down-take section 24 is substantially as long as the up-take 23, the currents of air and radiant heat are undisturbed in the fire chamber, substantially the full area of the bottom wall 4 is exposed to the burner 11 and all of the products of combustion and heating gases flow into the flue section 23. Furthermore, this arrangement and construction provides for the connection of the up-take and down-take sections by a conduit, namely, conduit member 25, exteriorly of the container, which conduit may be removed at will to permit access to the flue sections 23, 24, for cleaning and for the assembly and disassembly of guides 31. The guides 31 preferably comprise detachably connected members having cross webs disposed at right angles to each other, the side edges of the webs loosely fitting the inner walls of the flue sections so that they can be slid endwise therein and the spaces between adjoining webs forming passages for the products. The upper end of the upper member in each flue has outwardly flaring side edges, which are adapted to engage the upper end of the flue section and thus support the guide members in position. No claim is made herein to a heater having a flue provided with guides as such form of construction forms the subject-matter of my co-pending application Ser. No. 166,966, now matured into Patent No. 1,852,157, granted April 5, 1932.

The flow of the products of combustion and heating gases through the flue 22 is indicated by the arrows.

To remove the conduit member, the top cover 8 and a portion of the insulating material are removed. This exposes an up-standing bolt 32 that is threaded centrally into the member 25 and forms a handle or gripping element. The opposite ends of the conduit member 25 are bent downwardly and provided with rabbeted rims which fit upon the upper ends of the flue sections 23, 24. The bolt 32 is rotated to adjust the height of the head above the member 25, so as to be engaged by the cover 8; accordingly, when the cover 8 is positioned, it engages the bolt head and acts therethrough to secure the conduit member 25 in position and against displacement should the heater be turned on its side, as in shipping or handling. The opposite ends of the conduit member 25 tightly fit the flue ends to prevent leakage of the products of combustion.

In my construction of flue, the tendency to rise of those portions of the products and gases flowing in the up-take 23 is substantially counterbalanced by such tendency of those portions flowing in the down-take 24, the effect of which is to retard the rate of flow of the products through the entire flue 22. This retardation prevents the generation of a strong draft or up-current in the flue section, the effect of which would be to draw into the flue a large volume of cold air. This cold air would cool the products of combustion and hence reduce their efficiency or capacity to heat the water; on the other hand, this retardation permits the products to flow at a relatively slow, steady rate and as the flue sections 23, 24, extend through the full length of the container and are surrounded by water therein, substantially all of the heat units in the products are transferred to the water before the products are discharged.

As the conduit member 25 is completely insulated between its ends, none of the heat units of the products are dissipated or lost while flowing from the flue section 23 to the flue section 24.

It will be noted that when the burner is not in operation, the heat of the contained water will induce up currents in both flue sections, but as the heating effect is the same in both thereof, a balanced condition results so that all tendency to draw cold air into the flue section 23 is eliminated.

The burner 11 preferably has a capacity for heating the water in the container to the desired temperature and maintaining it at that temperature. However, if the burner alone was relied upon to heat the water in the container, the burner would be in full operation for a considerable length of time when and upon the discharge of a large portion of the hot water from the container. In my construction I com-

bine with the container the flue 22 so arranged that the heat units contained in the products of combustion may be utilized as a supplemental or auxiliary heating means which simultaneously operate so long as the burner is in operation. As the burner and supplemental means act on the same contained body of water, the period of operation of the burner to heat the water from its lowered temperature due to discharge of hot water and replacement with cold water, to the desired storing temperature, is materially reduced. As a result, the consumption of gas for each re-heating is reduced and likewise the total consumption for any given period is reduced.

Where it is desired to reduce the rate of consumption of the gas, a smaller size burner may be used, in which event a longer period of time will be required for each re-heating.

In the preferred construction I mount the pilot jet below and in juxtaposition to the inlet end of the up-take flue 23. In such arrangement, the products of combustion from the jet rise vertically into the flue 23 and are utilized as they flow through such flue and the flue 24 to maintain the water at the desired temperature to off-set drop in temperature due to radiation or to the withdrawal of relatively small quantities of hot water.

In Fig. 5 I illustrate a modified form of construction but embodying my invention. In this form of construction I provide two containers 1*a*, 1*b*, having a fluid connection 33 between their lower portions and a fluid connection 34 between their upper portions to provide for a circulation from one container to the other, so that upon the application of heat to the fluid in one container a circulation will result and thus effect heating of the fluid in both containers. In this form of construction, a burner 11*a* is mounted below the bottom 4*a* of one container (1*a*) and an up-take flue 23*a*, which is mounted centrally of such container, extends from the fire chamber upwardly through the container; also, a down-take flue 24*a* is mounted centrally of the container 1*b* and extends downwardly from its top to a point adjacent its bottom 4*a'*, being connected at its lower end to a branch outlet 29*a*, which is connected to a chimney 30*a*. The upper ends of the flue sections 23*a*, 24*a*, are connected by a conduit member 25*a* to convey the products of combustion or gases rising in the section 23*a* to the section 24*a*. The member 25*a* removably fits the upper ends of the sections, to permit access thereto. The member 25*a* is preferably insulated as shown. 31*a* indicates guides mounted in the flue sections 23*a*, 24*a*, being similar in construction to the guides 31 and mounted in the same manner. The thermostat elements 14 may extend into either container.

The fluid connection 33 is provided with a T-member to which the cold water supply pipe 33*a* is connected and the fluid connection 34 is provided with a T-member to which the service pipe 34*a* is connected.

It will be noted that in this form of construction the gases are controlled in the same manner as when mounted within a single container as shown in Figs 1, 2 and 3.

To those skilled in the art to which my invention relates many changes in construction and widely differing embodiments and applications of my invention will suggest themselves without departing from the spirit and scope of the invention. My disclosure and the descriptions herein are purely illustrative and are not intended to be in any sense limiting.

What I claim is:

1. A storage heater for fluid comprising a container, a fire chamber therebelow, a burner in said chamber, and a flue having up-take and down-take sections extending vertically through said container and the top wall thereof, a conduit connecting the upper ends of said flue sections exteriorly of said container, the up-take section leading from said fire chamber through the bottom of said container and the down-take extending to the lower portion of the container and having an exit connection in the side wall thereof above the bottom of said container.

2. A storage heater for fluid comprising a container, a fire chamber therebelow, a burner in said fire chamber a flue having up-take and down-take sections extending vertically through said container the up-take leading from said fire chamber through the bottom of said container and the upper ends of said flue sections extending through the top of said container, and the down-take extending to a point adjacent the bottom of said container and having an exhaust connection leading through the side wall of said container, and a conduit member for connecting the upper ends of said flue sections together, whereby the products of combustion flow from one to the other, and means for insulating said conduit member.

3. A storage heater for fluid comprising a container and a fire chamber therebelow, a burner in said fire chamber in operative relation to the bottom of said container, and a flue for the products of combustion having an up-take section leading from said fire chamber upwardly through the top wall of said container and a down-take section extending through the top wall of said container and leading vertically through said container, said sections being connected at their upper ends exteriorly of said container, whereby the products flowing through the down-take retard the rate of flow of the products flowing through the up-take, said down-take having an exit through the side wall of said container above its bottom.

4. A storage heater for fluid comprising a container and a fire chamber therebelow, a burner in said fire chamber in operative relation to the bottom of said container, and a flue for the products of combustion having up-take and down-take sections leading through said container and the top wall thereof, said up-take section having at its lower end communication with said fire chamber and said down-take section leading to a point adjacent the bottom of said container and having an exhaust connection leading through the side wall thereof, a conduit for connecting the upper ends of said sections exteriorly of said container, whereby the products flowing through the down-take retard the rate of flow of the products flowing through the up-take, and a pilot jet for said burner arranged below and adjacent to the inlet end of said up-take section.

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