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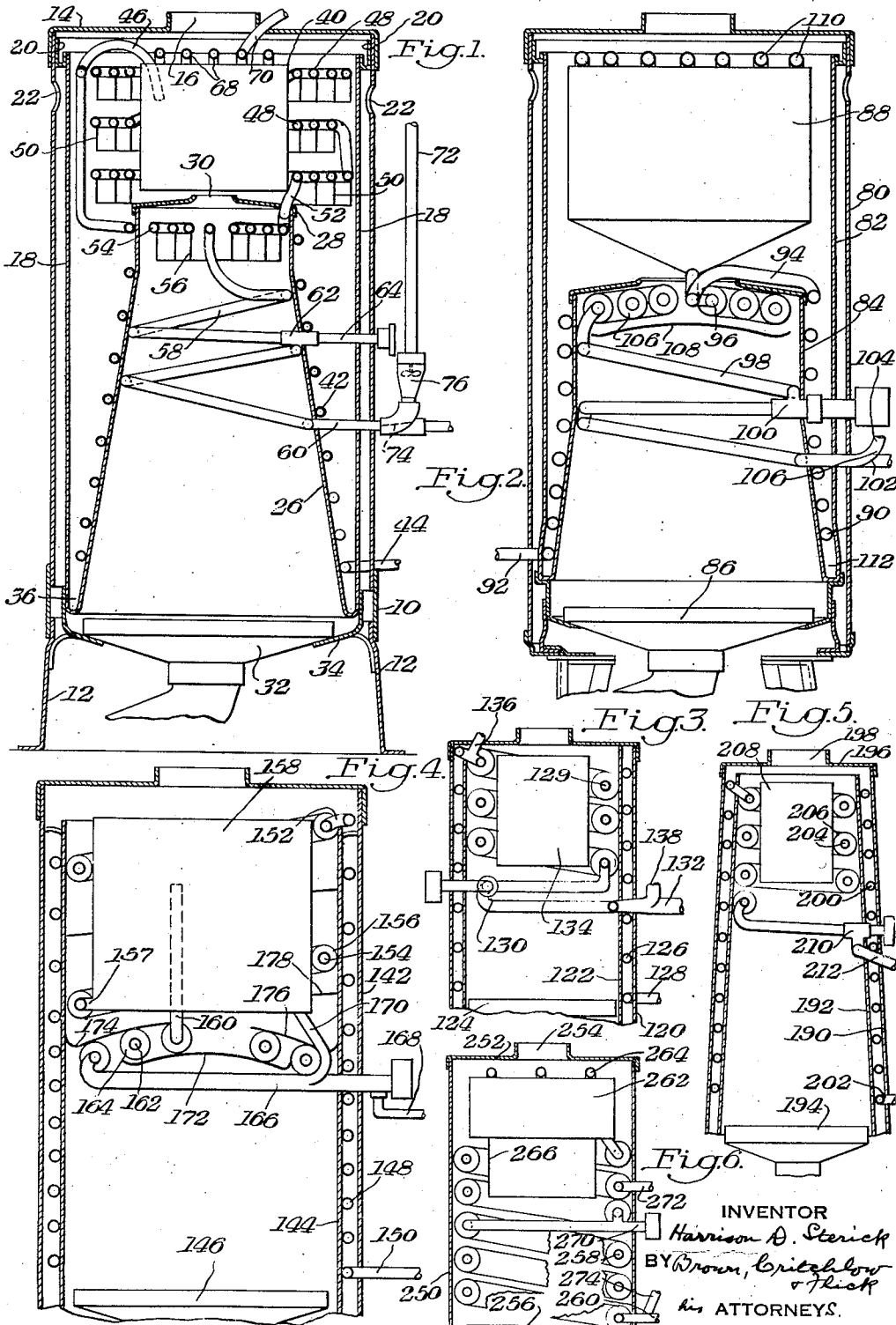
H. D. STERICK

2,342,500

FLUID HEATER

Filed Jan. 20, 1940

2 Sheets-Sheet 1



INVENTOR
Harrison D. Sterick
BY Brown, Critchlow
& Thiel
his ATTORNEYS.

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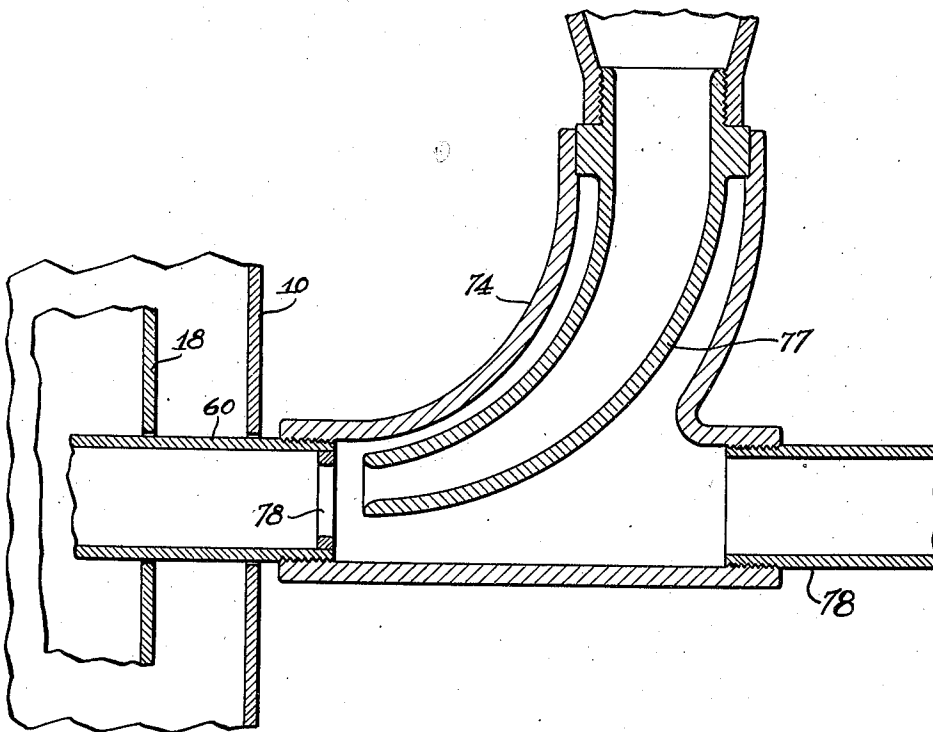
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Fig. 7.



INVENTOR.

BY *Harrison D. Sterick*
Brown, Britchlow & Flick
his ATTORNEYS.

UNITED STATES PATENT OFFICE

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FLUID HEATER

Harrison D. Sterick, Pittsburgh, Pa.

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11 Claims. (Cl. 122-250)

This invention relates to fluid heaters, and is more particularly concerned with water heaters of the instantaneous type, and with combination heaters adapted to supply hot water to a faucet system and concurrently or intermittently supply hot water at a higher temperature to a heat radiating system.

Heretofore it has been the standard practice in homes, offices, factory buildings, and the like to have one heater for heating the hot water which comes from the faucets, and a second heater for heating the hot water to be supplied to radiators or other heat radiating system. This practice requires separate burners, boilers, and heat exchange means and is obviously expensive. Again, the ordinary hot water heater which employs gas is often inefficient and much of the useful heat in the burnt gas may go up the chimney or be wasted in other ways. For example, it is usually impossible to place one's hand on the outside of a water heater, which means that heat is escaping directly by radiation, conduction and convection from the water heater. Moreover, the usual water heater of the instantaneous type is particularly inefficient in that a large volume of gas is burnt quite rapidly adjacent a relatively small body of water without adequate heat transfer means being provided so as to prevent escape of useful heat.

The usual water heater, whether for heating faucet water or radiator and the like water, is generally open to the objection that the heat exchange means are placed directly in the flames or adjacent other heating means so that deposits of soot and the like occur on the heat exchange means which reduces their efficiency. Still again, the ordinary heat exchange means is not properly constructed or arranged so as to effect the greatest degree of heat transfer, and as a result it often becomes necessary to use heat exchange conduits of considerable length with the attendant increase in heater costs. Further, many heaters are complicated to install and maintain in operation or are bulky and undesirable for other reasons.

It is the general object of my invention to avoid and overcome the foregoing and other difficulties attending the manufacture, maintenance and use of fluid heaters by the provision of an improved heater which is relatively simple and inexpensive, but which is adapted to operate at high efficiency over long periods of use substantially without attention.

Another and more particular object of my invention is the provision of a fluid heater, and

particularly a water heater, which is adapted to supply fluid or water at two different temperatures from a single apparatus whereby the requirements for faucet water and heat radiating fluid can be supplied with a minimum of expense.

Another object of my invention is the provision of a rugged, long-lived, inexpensive, efficient, and easily installed and maintained hot water heater having a single heating chamber, heating means, and heat exchange means adapted to supply water at two different desired temperatures.

Another object of my invention is the provision of a fluid heater, such as a water heater, in which the heat exchange means are so constructed and arranged as to utilize substantially all of the heat inherent in the heating means with little or no dissipation or loss of heat beyond that requisite to obtain a stack draft.

Another object of my invention is the provision of an improved fluid heater including thermostat control for automatically maintaining the relation between the heating means and the fluid outlet regardless of whether the heater is employed to supply fluid at a plurality of different temperatures.

The foregoing and other objects of my invention are achieved by the provision of a fluid heater comprising a heating chamber, heating means in the chamber, heat exchange means associated with the heating chamber, a conduit connected to one portion of the heat exchange means and adapted to extend to a faucet piping system, a second conduit connected to another portion of the heat exchange means and adapted to extend to a heat radiating system, a third conduit connected to the first conduit and adapted to extend to the return from a heat radiating system, and a thermostat associated with the heat exchange means for turning on the heating means when the return fluid from the radiating system is too cold or when the outlet fluid to the faucet system is too cold.

In accordance with the objects of my invention I provide a fluid heater comprising a heating chamber, heating means positioned adjacent the bottom of the heating chamber, a conduit of substantially helical shape surrounding the heating chamber and adapted to be connected at its bottom end to a cold fluid supply, heat exchange means inside the heating chamber, a connection between the heat exchange means and the upper end of the conduit, an outlet conduit connected to the heat exchange means and adapted to be connected to a piping system, and a thermo-

stat associated with the outlet conduit and adapted to turn on the heating means when the fluid passing out of the outlet conduit falls below a desired temperature.

For a better understanding of my invention reference should be had to the accompanying drawings wherein Fig. 1 is a vertical cross-sectional view of one embodiment of a combination heater constructed in accordance with the principles of my invention; Figs. 2 and 3 are views similar to Fig. 1 of modified forms of combination heaters; Figs. 4 and 5 are vertical cross-sectional views of two embodiments of fluid heaters which do not incorporate the combination feature; Fig. 6 is a vertical cross-sectional view of still another embodiment of my invention; and Fig. 7 is an enlarged vertical cross section through the injector that may be used with the apparatus disclosed herein.

My invention is particularly concerned with using gas in various forms to heat water. However, I broadly contemplate using other heating means than gas, and I contemplate heating other fluids than water, and the following description and claims should be read with this in mind.

Referring to Fig. 1 of the drawings, the numeral 10 indicates an outer housing usually provided with a suitable skirt or legs 12 adapted to support the housing on the floor and having a hood or top cover 14 formed with an appropriate opening 16 adapted to be connected to a flue, chimney or the like. Usually, I form the housing 10 of a cylindrical shape, although it will be understood that the housing may be square or polygonal, as desired. Preferably, a lining 18 is supported inside of the housing 10, as by channels 20, so as to provide an air space between the lining 18 and the housing 10. Holes 22 may be formed in the upper ends of the housing 10 to permit circulation of air between the housing 10 and the lining 18. This acts as a back air vent. The housing 10 and lining 18 are generally formed of sheet metal or plate, but obviously can be made from cast metal or other materials if this is found to be preferable.

Positioned to the bottom of and centrally of the housing 10 is a heating chamber or fire box 24 which is preferably of a truncated conical form and which is covered at its upper end with a cap 28 having a central aperture 30 therein. The bottom of the heating chamber 26 is open and is positioned directly above heating means 32 which ordinarily take the form of a gas burner of any suitable construction. The heating means 32 may be secured in position in any suitable manner as, for example, by the use of angles 34 which are fastened to the legs 12. The bottom of the heating chamber 26 is formed with a sweat pan 36 at its outer periphery and this may be readily accomplished when the heating chamber 26 is made of sheet or plate metal by merely turning up the metal to form a gutter or pan in the manner illustrated in the drawings. The heating chamber 26 is secured to the bottom of the lining 18 adjacent the angles 34.

I preferably provide a boiler 40 inside the housing 10 and usually the boiler 40 takes a square or cylindrical form of approximately the area of the top of the heating chamber 26 and of a height substantially equal to its width. The boiler 40 is mounted inside of the housing in a position directly above the top of the heating chamber 26 so that hot gases escaping out of the opening 30 in the cap 28 flow over the bot-

tom and sides of the boiler as will be understood.

Heat exchange means usually in the form of a substantial helical or truncated conical coil 42 are provided on the outer surface of the heating chamber 26. The lower end of the coil 42 is adapted to be connected by a conduit 44 with a source of cold fluid or cold water supply. The coil 42 may be flattened slightly or may even be embedded in grooves formed on the outer surface of the heating chamber so as to insure the most intimate type of contact between the coil and the heating chamber to thereby effect the best possible type of heat transfer between the heating chamber and the fluid in the coil 42. Usually, I wind the conduit forming coil 42 onto the heating chamber 26 under tension so that the conduit is not only flattened but remains under tension whereby changes in temperature do not loosen the conduit or destroy the intimate heat exchange relation between the coil and heating chamber.

The upper end of the coil 42 is connected by a conduit 46 with the boiler 40 and is also connected to heat exchange means positioned around the boiler. Preferably, the heat exchange means around the boiler 40 take the form of a plurality of spirally wound flat coils 48 which are connected to each other and positioned one above the other in the manner shown in Fig. 1. The coils 48 are, of course, subjected to any hot gases flowing out of the opening 30 in the top of the heating chamber 26 and the coils may be formed in any known manner to facilitate the greatest heat exchange between the hot gases and the fluid passing through the coils. For example, I have illustrated the coils 48 in the drawings as including a substantially vertically extending fin 50 on each of the individual convolutions forming the coil, and it will be understood that additional fins extending either circumferentially, longitudinally or helically can be used if desired.

The bottom of coil 48 is connected by a conduit 52 to a spirally wound coil 54 positioned in the top of the heating chamber 26. The coil 54 is formed with heating fins 56 in the manner illustrated. The end of the coil 54 not connected to the conduit 52 extends to a conduit 58 coiled substantially helically or in a truncated conical manner in the inside of the heating chamber 26. The bottom end of the conduit 58 is connected to a conduit 60 which is adapted to be connected to a faucet piping system, as, for example, to supply hot water for home use. A thermostat, indicated as a whole by the numeral 62, is connected in the conduit 58 and is provided with an operating shaft 64 which extends to the outer surface of the housing 10 so that the exact operating temperature of the thermostat can be set from the outside of the housing.

The top of the boiler 40 is provided with a manifold 68, only the branch pipes of which are shown but which is adapted to be connected, as by a conduit 70, to a heat radiating system, as, for example, the usual radiators in a house-heating system. The return conduit from the heat radiating system is indicated by the numeral 72 and is connected to the conduit 60 preferably with a suitable injector mechanism, indicated by the numeral 74 and illustrated in detail in my prior Patent No. 2,033,260. The injector is also shown in Fig. 7 of the accompanying drawings. When water is not being withdrawn from the system through the house

faucets the water in the house heating system returns through pipe 72 (Fig. 1) and passes through the curved pipe 77 in the injector and into conduit 60 where the water is reheated. When a faucet (not shown) connected to pipe 79 is opened the water in conduit 60 will reverse its direction of flow and pass out of the lower end of the conduit through perforated disc 78 rigidly mounted in any suitable manner in the end of the conduit. The force of this water flowing against the open lower end of curved tube 77 and around the lower portion of that tube to pipe 79 stops water in return line 72 from issuing from the curved tube while the faucet is open, whereby the water in the house heating system is not mixed with the water being drawn from the faucets. Usually, the use of an injector of some type is advisable so as to prevent the mixing of the radiator water with the faucet water, but I have found that injector mechanism is not always necessary. I may include an agitator or circulating means 76 in the conduit 72 so as to render positive the circulation of fluid or water through the heat radiating system.

In the operation of the embodiment of my invention just described assume that the thermostat 62 is set for a temperature of 140° F. and the water or other fluid present in the system is relatively cool and below 140° F., having just been fed into the system through the inlet conduit 44. Then, the heating means or burner 32 will be turned on automatically and hot gases flowing up inside of the heating chamber 26 will heat the fluid in the coils 42, 48 and 54 and the fluid in the boiler 40 and in the conduits 58. The heating of the fluid by the heating means 32 will continue until the return fluid coming back from the radiating system through the conduit 72 and into the conduit 58 will be above a temperature of 140° F., then the thermostat will function to turn off the heating means. The flow of fluid in this system will be, of course, through conduits 72, 60, 58, through heating coil 54, heating coils 48, the boiler 40, and the conduit or conduits 70. This heating system can continue to furnish the heat desired in accordance with the thermostat control which will go on and off in the manner explained so as to give a temperature in the rooms heated by the radiating system which is as desired. The control shaft 64 for the thermostat may be extended or coupled to any suitable control mechanism whereby the exact heating characteristics of the apparatus can be controlled from a distance.

It will be understood that the hot fluid or water flowing to the heat radiating system from conduit 70 will be at a temperature considerably above 140° F. and usually is in the neighborhood of 180° to 190° F. This is because the thermostat which controls the operation of the heating means is in turn controlled by the temperature of the fluid or water returning from the heat radiating system and after the fluid has transferred its heat to the radiating system. The hot gases from the heating means 32 flowing up through the heating chamber 26 at the opening 30 and up and around the boiler 40 and coils 48 and thence out the stack 16 will, of course, result in considerably higher temperature in the fluid in the boiler than the fluid in the return conduit 72. In this connection, it will be noted that I have provided heat exchange means of such a construction and arrangement that substantially every bit of heat in the hot gases is transferred to the fluid or water carried in the

coils and conduits. In this manner I obtain a relatively high efficiency, and in fact by controlling the number of coils and the flow of gases over the coils I am able to obtain heat transfer efficiencies of 90 per cent or more of the actual heat present in the gas or other form of energy supplied to the heating means. In the past high efficiencies have not been reached for the reason that the proper stack draft could not be maintained with too high an efficiency. I have found that I can maintain an adequate stack draft even with high efficiencies, and while avoiding any undesirable sweating for the reason that any sweating which does occur in my apparatus results in a trapping of the fluid in the sweat pan 36 at the bottom of the heating chamber where the sweat is evaporated during the inoperative periods of the heating means.

When the apparatus described is used to supply hot water or hot fluid to a faucet system the faucet system is opened which allows fluid or water to flow out of the conduit 60. This loss of water in the system is compensated for by the inflow of cold water through the inlet conduit 44. So long as the water flowing past the thermostat 62 and out of the outlet conduit 60 is above a temperature of 140° F. the heating means 32 is turned off. However, when the temperature of the fluid drops below 140° F. the heating means 32 is turned on. This results in a heating of the fluid or water in the coil 42, the coils 48, the coil 54, and the conduit 58. Once the temperature of the water is brought up above a point of 140° F. the burner is again shut off. I have found that my apparatus can be used as an instantaneous heater, namely, that water can be drawn continuously from the conduit 60 for long periods without the temperature of the water falling below approximately 140° F. In this operation of my apparatus the water or fluid in the heat radiating system will not be affected or drawn into the faucet system, due to the action of injector 74. Also, any interruption in the normal functioning of the heat radiating system is in ordinary use of such a temporary character that it can be forgotten.

The exact temperature of the water supplied for the heat radiating system and the water or fluid supplied for the faucet system may be controlled not only by changing the operating characteristics of the thermostat 62 but by changing the position of the thermostat in the conduit 58. More particularly, in a combination heater of the type above and hereinafter described, the temperature of the heat radiating water and the temperature of the faucet water is directly dependent upon the length of the conduit 58, the position and size of the coils 48 and 54, the heat transfer characteristics thereof and the position of the thermostat 62 in the conduit 58 and the relation of the thermostat to the faucet conduit 60 and to the heat radiating conduit 70. The closer the thermostat is to the faucet conduit 60 the greater the temperature difference between the faucet and heating radiating waters. The closer the thermostat is to the heat radiating conduit 70 the less temperature difference between faucet and heat radiating waters. It will be understood that by properly coordinating the position of the thermostat, the lengths, positions and heat exchange characteristics of the conduits and coils mentioned the exact temperatures for faucet and heat radiating waters can be obtained.

The structure and operation of the embodiment of my invention illustrated in Fig. 2 is generally similar to that described in detail above in conjunction with Fig. 1. Briefly, the apparatus of Fig. 2 includes an outer housing 80, an inner housing 82, a heating chamber 84, a burner 86, and a boiler 83. A substantially helical coil 90 wrapped tightly around the heating chamber 84 and connected at its lower end to a cold water supply 92 has its upper end connected by a conduit 94 to the bottom of the boiler 83, and likewise to the inside of a substantially spiral coil 96 which in turn is connected through a conduit 98 and a thermostat 100 to a conduit 102 extending to a faucet system and to the return 104 from a heat radiating system. An injector mechanism may be employed at 106 to insure the return of the water from the heat radiating system all in the manner heretofore described.

The coil 96 is formed with a plurality of heat transfer fins 106 which as heretofore stated may take the form of circumferential, longitudinal or helical fins or which may comprise a plurality of relatively small wire-like fingers cut from the individual conduits of the coil and extending out from the surface thereof substantially in the form of wire brush fingers. A baffle 108 secured to the bottom of the coil 96 causes the hot gases from the heating means 86 to flow over substantially the entire surface of the coil 96. The top of the boiler 83 is formed with a manifold 110 which is adapted to be connected to a heat radiating system.

This form of my invention operates in a manner very similar to that already described in conjunction with Fig. 1 of my invention, and is particularly characterized as being able to be readily drained, which is sometimes desirable. The bottom of the firing chamber 84 may be formed with a suitable sweat box 112, as will be understood.

The embodiment of my invention shown in Fig. 3 includes an outer housing 120, an inner housing 122 forming a heating chamber and having heating means 124 positioned at the bottom thereof. A coil 126 wrapped tightly around the inner housing 122 and connected to a cold water inlet 128 at its bottom end extends in substantially helical form up between the inner and outer housings and is connected to the top of a helical coil 129 positioned at the inside and upper end of the inner housing 122. The bottom end of the coil 129 extends through a thermostat 130 to an outlet conduit 132 adapted to be connected to a faucet system. A baffle 134 of square or cylindrical shape is positioned inside of the coil 129, which coil is usually formed with suitable fins to insure the best type of heat transfer. The upper end of the coil 129 is connected by a conduit 136 with a heat radiating system, and a conduit 138 adapted to be connected to the return conduit from the heating system is connected to the outlet conduit 132 in the manner illustrated in the drawings.

The operation of this embodiment of my invention is believed to be fully understandable from that already set forth above in conjunction with Fig. 1 of my invention.

In Fig. 4 I have illustrated a simple water heater which does not provide water or other fluid heated to two different temperatures. In this form of my invention the numeral 142 indicates an outer housing which surrounds in spaced relation an inner housing and heating chamber 144 in the bottom of which is positioned a heat-

ing means 146. A conduit substantially in the form of a helical coil 148 and having its lower end connected to a return pipe 150 extends vertically through the heater between the outer housing 142 and the inner housing 144 and is secured in intimate relation with the inner housing. The upper end of the coil 148 is connected by a conduit 152 to the upper end of a helically wound coil 154 which is provided with suitable heat transfer fins 156. The bottom end of the coil 156 is connected, as at 157, to a storage tank 158 which is positioned inside of the coil 154.

A stand pipe 150, extending from the boiler 153, is connected to the inside of a substantially spiral coil 162 formed with suitable heat exchange fins 164 and having its outer end connected through a thermostat 166 to an outlet conduit 168. The thermostat 166 may be positioned in the boiler 153 if desired. A by-pass conduit 170 connected to the boiler 153 and the outlet conduit 168 insures circulation of water through the boiler when the water in the boiler is being brought up, without withdrawal from the system, to the necessary temperature to operate the thermostat and shut off the heating means 146. Baffles 172, 174 and 176 control the flow of hot gases over the coil 162 and around the bottom of the boiler 153. A helical baffle 178 positioned between the boiler 153 and the inner housing 144 causes a helical flow of hot gases over the coil 154 and over the outer surface of the boiler 153.

This particular embodiment of my apparatus is adapted to heat either a radiator or other heat radiating system or it may be used to heat hot water for a faucet system, in which case the conduit 150 is merely connected to the cold water inlet and the conduit 168 is connected to the hot water faucet system.

The embodiment of my invention shown in inner housing 192 of substantially cylindrical or Fig. 5 comprises an outer housing 190 and an slightly conical shape with the inner housing serving as a heating chamber which has a burner 194 or other heating means positioned at the bottom of the heating chamber. A cap 196 closes the top of the outer housing 190 and is provided with an aperture 198 adapted to be connected to a chimney or stack. Heat exchange means, usually in the form of a coil 200 of substantially helical shape, is positioned between the outer housing 190 and the inner housing 192 in intimate heat transfer relation with the inner housing. The bottom of the coil 200 is connected to a cold water inlet conduit 202. The top of the coil 200 is connected to heat exchange means positioned in the inside of the inner housing 192 near the top thereof. Preferably these heat exchange means take the form of a helical coil 204 provided with suitable fins 206 which facilitate the heat exchange between the water carried by the coil and the hot gases which flow over the coil.

A baffle or boiler 208 is positioned centrally of the top of the inner casing 204 so that the hot gases flowing up from the heating chamber are directed to flow over the convolutions of the coil 204. I contemplate employing a wet boiler in this position which may be connected to the coils in the manner already described in conjunction with the previous embodiments of my invention. However, I have illustrated a dry boiler which is not connected into the coils or conduits in any way with the boiler serving

merely as a baffle. The bottom of the coil 204 is connected to a thermostat 210, which in turn is connected to a conduit 212 and which is adapted to be connected to the hot water or faucet system in any given installation. Of course, I may employ the heater illustrated in Fig. 5 as a house heater or a heater for heating water used in a heat radiating system, and in this case the conduit 212 leads to such a heat radiating system and the conduit 202 is connected to the return conduit from the system with any suitable means being used to bleed additional water into the system as infrequently required.

The operation of this embodiment of my invention is quite similar to the operation of the forms of my invention already described. Suffice it to say that the heating means 194 are only turned on when the water passing out of the coil 204 over the thermostat 210, and out of the conduit 212, falls below the temperature at which the thermostat is set to operate. When the water becomes hotter than this temperature the heating means is turned off. The outer housing of this form of my invention is kept quite cool in operation and the desired per cent of heat from the gas or other operating means can be absorbed by the heat exchange means provided so that fluid, and particularly water, of the desired temperature can be obtained. This heater, like substantially all of those previously described, may be used as an instantaneous heater to raise water to any temperature desired.

The form of my invention illustrated in Fig. 6 includes a housing 250 having a cap 252 closing the top and formed with a central aperture 254 adapted to be connected to a stack or flue (not shown). A heating means, usually in the form of a gas burner 256, is positioned centrally of and at the bottom of the housing. An appropriately finned substantially helical coil 258 closely surrounds the inside of the casing and is connected at its bottom end to a conduit 260 adapted to be connected to a cold water inlet. Appropriate finning on the coil 258 preferably takes the form of a large plurality of integral wire-like fingers cut from the coil conduit and extended radially thereof. However, other finning means of satisfactory character may be used for fins, as will be obvious.

The top end of the coil 258 is connected to a boiler 262 positioned centrally of the top of the housing and the boiler has one or more manifold connections 264 adapted to be connected to a heat radiating system. A cylindrical baffle plate 266 may be secured to the bottom of the boiler to assist in guiding the hot gases from the burner 256 over the coil 258.

A thermostat 270, adjustable from outside the housing 250, is secured in the coil 258 approximately half way up its length and the thermostat, in accordance with known operating characteristics, is adapted to turn the burner 256 on when the temperature of the water flowing over the thermostat falls below a desired temperature and also acts to shut the burner 256 off when the temperature of the water flowing over the thermostat goes above a desired temperature.

The heater comprising this embodiment of my invention is also adapted to supply hot water to a faucet system at a temperature below that at which it supplies the hot water for the heat radiating system. To this end, a conduit 272 is connected to the coil 258 in the manner and po-

sition illustrated and this conduit is adapted to be connected to a faucet system.

The present form of combination heater differs from that illustrated in Figs. 1, 2 and 3 and above described in that here the return from the heat radiating system instead of being connected to the conduit 272, as might be done, is connected with or without an injector, and by a conduit 274, to the cold water inlet conduit 260.

The operation of this embodiment of my invention is substantially the same as the operation of the apparatus shown in Figs. 1, 2 and 3 and will be readily understood from the description of the operation given above.

Of course, it should be understood that the various forms of my invention are adapted to be easily converted to radiating water heaters alone, faucet water heaters alone, or combination heaters. However, the embodiment of my invention shown in Fig. 6 is particularly adapted to these three uses.

From the foregoing it will be recognized that the various objects of my invention have been achieved by the provision of relatively simple and inexpensive apparatus which is easily installed, operated and maintained, and which functions over long periods of time substantially without attention or repair to provide water or other fluid at a desired temperature or temperatures. The size and cost of the heat exchange means is kept at a minimum and the heat exchange means are removed from direct contact with the heating means so that their lives and heat exchange characteristics are prolonged. Waste heat is largely eliminated and my improved heaters can be operated at efficiencies much higher than normally used or expected. I have provided adequate means to prevent sweating and have avoided the usual wastes of a heater of the instantaneous type. In accordance with my invention the same heating means, heating chamber, and heat exchange means are employed to heat both the fluid for water used in a heat radiating system, and the water used in a faucet system, thereby noticeably reducing the cost of such equipment.

I am able with the apparatus herein disclosed, and when made in a size adapted to residential homes, to heat as much as three gallons of water per minute in an amount to cause a temperature rise of about 60° F. or to meet other standard requirements of heating or building codes or associations. Of course, smaller units can be made to operate upon a smaller quantity of water, and larger units can be constructed to raise a greater number of gallons of water per minute through the desired temperature rise.

While in accordance with the patent statutes I have particularly illustrated and described my invention, it will be appreciated that I am not to be limited thereto or thereby but that the scope of my invention is defined in the appended claims.

I claim:

1. A combined faucet water heater and radiating system water heater comprising a heating chamber, heating means in the chamber, heat exchange means associated with the heating chamber, a conduit connected to one portion of the heat exchange means and adapted to extend to a faucet hot water system, a second conduit connected to another portion of the heat exchange means and adapted to extend to a heat radiating system, a third conduit connected to the first conduit by means of an injector and adapted to

extend to the return from a heat radiating system, and a thermostat associated with the heat exchange means adjacent the injector for turning on the heating means when the return water from a radiating system is too cold or when the outlet water to a faucet system is too cold.

2. A combined faucet water heater and radiating system water heater comprising a heating chamber, heating means in the chamber, heat exchange means associated with the heating chamber, a conduit connected to the heat exchange means and adapted to extend to a faucet hot water system, a second conduit connected to the heat exchange means and adapted to extend to a heat radiating system, a third conduit connected by means of an injector to the heat exchange means substantially adjacent the connection of the first conduit thereto and adapted to extend to the return from a heat radiating system, and means for turning on the heating means when the return water from a radiating system is too cool or when the outlet water to a faucet system is too cool.

3. A combined faucet water heater and radiating system water heater comprising a heating chamber, gas heating means in the chamber, heat exchange means associated with both the outside and inside of the heating chamber, a conduit connected to one portion of the heat exchange means and adapted to extend to a faucet hot water system, a second conduit connected to another portion of the heat exchange means and adapted to extend to a heat radiating system, a third conduit connected to the heat exchange means substantially adjacent the connection of the first-named conduit thereto and adapted to extend to the return from a heat radiating system, a thermostat associated with the heat exchange means for turning on the heating means when the return water from a radiating system falls below a desired temperature or when the outlet water to a faucet system falls below a desired temperature, the position of the thermostat and the size, location and heat exchange characteristics of the heat exchange means being such that the waters supplied to the faucet and heat radiating systems are at the desired temperatures, and means for supplying additional water to the heat exchange means when water is withdrawn by the faucet hot water system.

4. A fluid heater comprising a heating chamber, heating means associated with the heating chamber, a boiler associated with the heating chamber, a conduit adapted to be connected to the cold fluid supply and extending substantially in a helical coil around the heating chamber and connected to the boiler, a heat exchange conduit coil associated with the heating chamber and connected at one end to the boiler and adapted to have its other end connected to a faucet hot water system, conduits connected to the boiler and adapted to extend to a heat radiating system, a conduit adapted to be connected to the return from a heat radiating system and connected to the heat exchange conduit coil adjacent the outlet adapted to extend to a faucet hot water system, and a thermostat in the heat exchange conduit coil adjacent the radiating system return conduit and the outlet to the faucet hot water system so that the heating means are turned on whenever the fluid flowing to the faucet hot water system or returning from the heat radiating system drops below a certain temperature.

5. A fluid heater comprising a thin-walled heating chamber, gas heating means associated with the heating chamber, a boiler associated with the heating chamber, a conduit adapted to be connected to the cold fluid supply and extending substantially in a helical coil around the outside of the heating chamber in intimate heat-transferring relation therewith and connected to the boiler, a finned heat exchange conduit coil in the heating chamber and connected at one end to the boiler and adapted to have its other end connected to a faucet hot water system, conduits connected to the boiler and adapted to extend to a heat radiating system, and a conduit adapted to be connected to the return from a heat radiating system and connected to the heat exchange conduit coil adjacent the outlet adapted to extend to a faucet hot water system.

6. A fluid heater comprising a heating chamber, heating means associated with the heating chamber, a boiler associated with the heating chamber, a conduit adapted to be connected to the cold fluid supply and extending substantially in a helical coil around the heating chamber and connected to the boiler, a finned heat exchange conduit coil associated with the heating chamber and connected at one end to the boiler and adapted to have its other end connected to a faucet hot water system, conduits connected to the boiler and adapted to extend to a heat radiating system, and a conduit adapted to be connected to the return from a heat radiating system and connected to the heat exchange conduit coil adjacent the outlet adapted to extend to a faucet hot water system.

7. A fluid heater comprising a thin-walled heating chamber, heating means associated with the heating chamber, a boiler associated with the heating chamber, a conduit adapted to be connected to the cold fluid supply and extending substantially in a helical coil around the outside of the heating chamber in intimate heat transferring relation therewith and connected to the boiler, a heat exchange conduit coil in the inside of the heating chamber and connected at one end to the boiler and adapted to have its other end connected to a faucet hot water system, conduits connected to the boiler and adapted to extend to a heat radiating system, a conduit adapted to be connected to the return from a heat radiating system and connected to the heat exchange conduit coil adjacent the outlet adapted to extend to a faucet hot water system, and a thermostat in the heat exchange conduit coil adjacent the radiating system return conduit and the outlet to the faucet hot water system so that the heating means are turned on whenever the fluid flowing to the faucet hot water system or returning from the heat radiating system drops below a certain temperature.

8. A fluid heater comprising a thin-walled heating chamber, heating means associated with the heating chamber, a boiler associated with the heating chamber, a conduit adapted to be connected to the cold fluid supply and extending substantially in a helical coil around the outside of the heating chamber in intimate heat transferring relation therewith and connected to the boiler, a heat exchange conduit coil in the inside of the heating chamber and connected at one end to the boiler and adapted to have its other end connected to a faucet hot water system, conduits connected to the boiler and adapted to extend to a heat radiating system, a conduit adapted to be connected to the return from a heat radiat-

ing system and connected to the heat exchange conduit coil adjacent the outlet adapted to extend to a faucet hot water system, a thermostat in the heat exchange conduit coil adjacent the radiating system return conduit and the outlet to the faucet hot water system so that the heating means are turned on whenever the fluid flowing to the faucet hot water system or returning from the heat radiating system drops below a certain temperature, and means for positively circulating water through the conduit adapted to be connected to the return from a heat radiating system.

9. A fluid heater comprising a heating chamber, heating means associated with the heating chamber, a boiler associated with the heating chamber, a conduit adapted to be connected to the cold fluid supply and extending substantially in a helical coil around the heating chamber and connected to the boiler, a heat exchange conduit coil associated with the heating chamber and connected at one end to the boiler, a connection from the boiler adapted to extend to a heat radiating system, a conduit adapted to be connected to the return from a heat radiating system and connected to the heat exchange conduit coil adjacent its end remote from the boiler, and a thermostat in the heat exchange conduit coil adjacent the radiating system return conduit so that the heating means are turned on whenever the fluid returning from the heat radiating system drops below a certain temperature.

10. A fluid heater comprising a heating chamber, heating means positioned adjacent the bot-

tom of the heating chamber, a conduit of substantially helical shape surrounding the heating chamber and adapted to be connected at its bottom end to a cold fluid supply, a housing around the helical conduit and together with the heating chamber providing a back air vent, heat exchange means inside the heating chamber, a connection between the heat exchange means and the upper end of the conduit, an outlet conduit connected to the heat exchange means and adapted to be connected to a piping system, and a thermostat associated with the outlet conduit and adapted to turn on the heating means when the fluid passing out the outlet conduit falls below a desired temperature.

11. A fluid heater comprising a heating chamber, heating means positioned adjacent the bottom of the heating chamber, a conduit of substantially helical shape surrounding the heating chamber and adapted to be connected at its bottom end to a fluid supply, a finned helically-coiled heat exchange means inside the heating chamber, a dry baffle-boiler inside of the heat exchange means and serving to direct the flow of heat over the heat exchange means, a connection between the heat exchange means and the upper end of the conduit, an outlet conduit connected to the heat exchange means and adapted to be connected to a piping system, and a thermostat associated with the outlet conduit and adapted to turn on the heating means when the fluid passing out the outlet conduit falls below a desired temperature.

HARRISON D. STERICK.