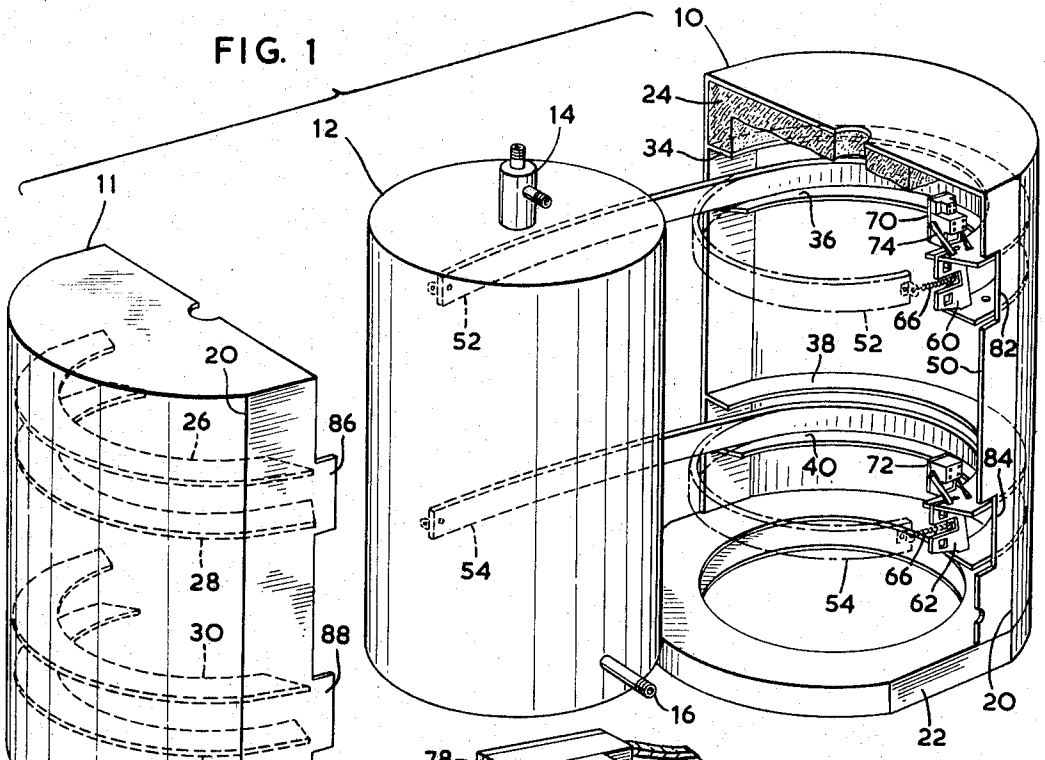
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ELECTRIC WATER HEATER

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FIG. 1



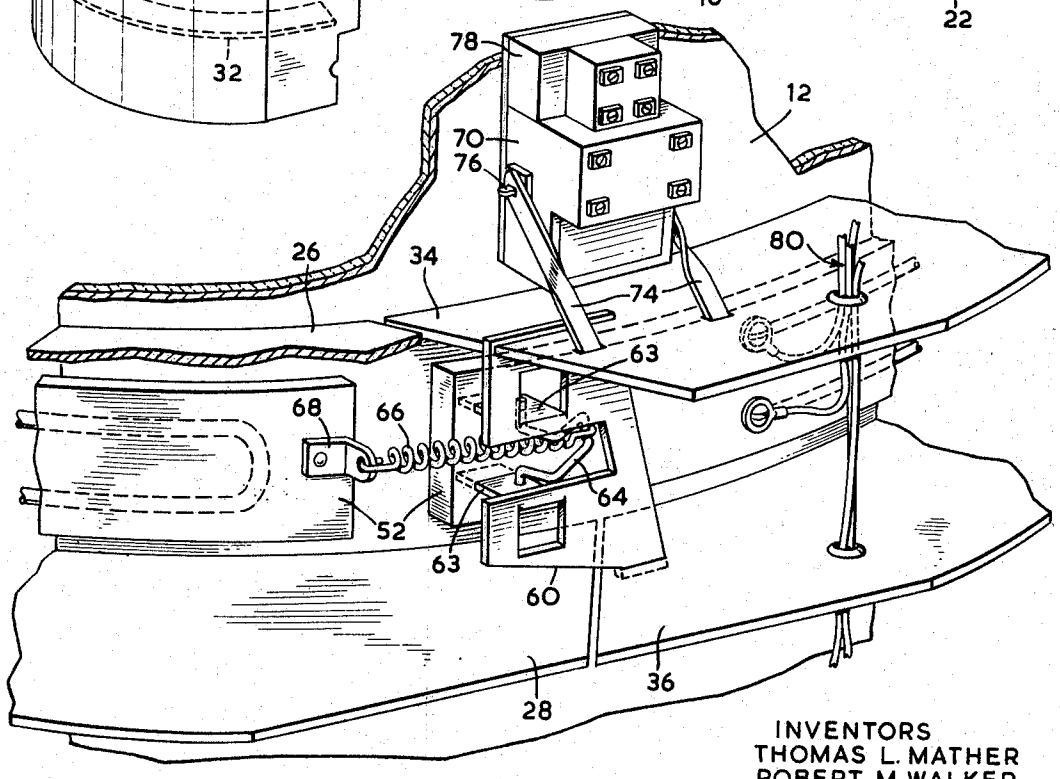


FIG. 2

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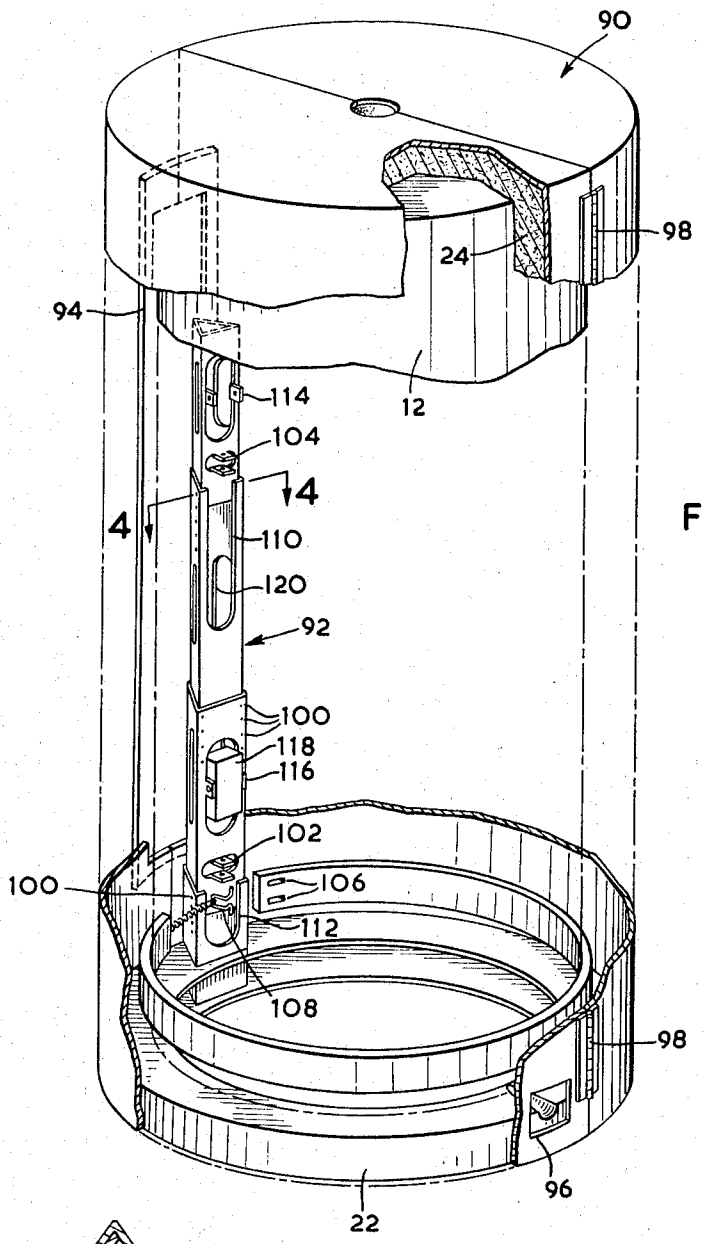
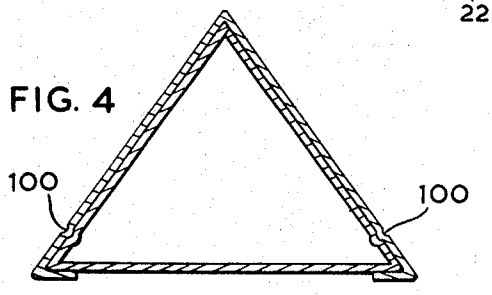


FIG. 3

FIG. 4



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ELECTRIC WATER HEATER

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6 Claims. (Cl. 219—311)

This invention relates to the manufacture of water heaters and is particularly concerned with a manufacture of heaters generally known as "domestic" water heaters.

The term "domestic" water heaters generally is used to describe heaters of relatively small capacity as distinct from large boiler type heaters. The term is used in this specification in the same respect and is not to be understood as limiting use of the water heaters in accord with this invention to the household as it may be used in any application requiring the production of a constant supply of hot water.

The various domestic water heaters now available all suffer two major disadvantages. The first disadvantage is that the know heaters are so constructed that the failure of the inner pressure tank eventually results in the loss of the complete heater. As is well known all aqueous heating equipment is subject to corrosion of the tank in which the hot water stored under pressure. This is due to the corrosive qualities of hot water, the nature and concentration of dissolved salts, and, where water softeners are in use, corrosion from increased electrical conductivity due to ionic exchange.

Leaks due to corrosion sooner or later occur in the pressure tank and although they can be plugged temporarily, they inevitably arise elsewhere. The resultant spraying of hot water under pressure into the thermal insulating material and other parts eventually necessitates replacement of the complete assembly. The second major disadvantage is scaling. In hard water areas scaling usually occurs before the tank corrodes. Commercially a tank is descaled by removing the entire water heater, replacing it with a fresh one, and subjecting the tank in the replaced water heater to hydraulic or chemical flushing or scouring at the utility's plant. In other words the present integrated method of constructing the pressure tank and heater proper makes it necessary to replace not only the defective tank but also the whole heater with its associated hardware which may well be in good condition. In addition to the material costs there are labour costs in removing the old tank and installing a new one.

Due to local variations in the corrosiveness of water the known water heaters are made available in several price ranges depending upon their ability to resist corrosion. These tanks are generally divided into metal tanks (mostly ceramic-lined, for average water conditions) and so-called "stone-lined" tanks for hard water areas. The latter are really concrete tanks which provide more corrosion protection than ceramic-lined tanks but are also more expensive due to their greater weight, bulkiness, and smaller share of the market. However, purchasers of water heaters are not always familiar with or are not always advised as to the corrosive quality of the local water supply and will very often purchase heaters with more or less than adequate corrosion protection. In either case the purchaser is involved in unnecessary expense.

Another disadvantage of the known heater constructions is that their capacities are fixed due to their integral construction. In the result a user will often find that when his present heater will not provide him with a sufficient volume of hot water for its needs he must purchase a complete heater of larger capacity. Similarly the user may find that his requirement of hot water decreases and

he may find himself in the position in which he is operating a larger heater than he really needs and is involved in unnecessary expense in paying for the extra energy consumption required to operate the larger heater.

In view of the above described disadvantages of the known water heater constructions, it is a primary object of this invention to provide a water heater construction which will avoid the need to purchase a complete water heater due to failure of the inner pressure tank or to occasion the removal and replacement of the complete heater for descaling operations.

It is a further object of the invention to provide a water heater construction which will permit adaptation to pressure tanks of varying corrosive resistance to meet discovered local water conditions without having to purchase complete heater units.

It is a still further and important object of the invention to provide a water heater construction which will permit ready alteration of the capacity of the heater.

It is a further object of the invention to provide a water heater construction which will be universal in its applicability to both hard and soft water areas, providing savings to the consumer by reason of (a) its lower cost than "stone-lined" heaters now used in hard water areas and (b) the protection it affords to the consumer who can purchase a heater without any knowledge of the hardness of his local water supply and (c) the manufacturing economies inherent in producing a standard heater for both hard and soft water areas.

These and other objects of the invention are accomplished by providing a water heater construction which includes an inexpensive replaceable inner pressure tank which is made available in various sizes but adapted to fit in a fixed capacity outer shell with the inner tank being readily separable from the heat transfer mechanisms, plumbing connections, insulation, etc., without employing skilled labour whereby the inner tank can be removed and replaced without loss of the outer shell and its associated hardware.

Essentially, therefore, the water heater construction in accordance with this invention consists of two main components, namely, a permanent outer shell and an inner replaceable pressure tank with the outer shell being so constructed as to provide ready access to the inner tank. The heating devices are associated with the base of the assembly through their attachment to either the shell or a separate standard both of which project upwardly from the base.

The invention will be more thoroughly understood from the following description of two preferred embodiments thereof as read in conjunction with the accompanying drawings.

In the drawings:

FIGURE 1 is an exploded perspective view of a water heater constructed in accord with a first preferred embodiment of the invention,

FIGURE 2 is an enlarged perspective view of a portion of the heater shown in FIGURE 1 and particularly illustrating the manner in which certain components of the heater are arranged when the heater is assembled for operation.

FIGURE 3 is a perspective view, partly broken away of a second preferred embodiment of the invention, and

FIGURE 4 is a cross-sectional view taken along the line 4—4 of FIGURE 3.

Referring to FIGURE 1, the first illustrated embodiment of the invention essentially consists of an outer shell formed of two components **10** and **11** and an inner replaceable pressure tank **12**. Both the outer shell and the inner tank **12** can be manufactured of a number of different materials as are well known to manufacturers of this

type of equipment. Thus the inner tank **12** might be made of the usualy heavy gauge galvanized steel material commonly used for pressure tanks while the outer shell might be made of light to medium gauge steel or a modern plastic.

The inner tank **12** is provided with an appropriate inlet-outlet fitting **14** and a drain fitting **16**. As is usual the inlet-outlet **14** is adapted for connection with appropriate plumbing whereby to provide means for feeding cold water to the heater and for carrying off the hot water.

It is an important feature of this water heater construction that the inner pressure tank **12** is to be made in different sizes and incorporated in the same outer shell. This feature is discussed in detail hereinafter.

As mentioned above the outer shell is composed of the two components **10** and **11**. These are illustrated as consisting of semi-cylindrical elements which are preferably deformed along several vertical lines as at **20** whereby to provide them with longitudinal rigidity. Component **10** is permanently fixed to a base member **22** which is adapted to rest on the floor. The inside surfaces of both components **10** and **11** are covered by mechanical fastening, chemical bonding, or glue with appropriate insulation **24**, only a portion of which is shown in the drawings. The type of insulation is not essential to this invention although it is preferable to use insulation having resistance to penetration and corrosion by water.

Fixed to the inside surfaces of each shell component are a number of spacing rings **26** to **40** inclusive. As is explained hereinafter, these rings are so shaped as to provide for a gripping action on inner tank **12** whereby the total assembly may be releaseably locked together. The rings **34** to **40** inclusive are provided with a number of slots and apertures for receiving brackets holding the several components making up the particular heating means illustrated.

From the above introductory description of the illustrated embodiment of the invention, it will be appreciated that the heater may be readily dismantled whereby to replace the inner tank **12**. The main objects of the invention are achieved by this feature. As mentioned above there are several conditions under which it might be necessary to replace the inner tank, and the chief advantage of the invention is that this can be done without having to throw away the other components of the heater, namely, the other shell, the base, the insulation and the heating and control devices. One of these conditions is that it might be desirable to change the capacity of the heater. Thus, by way of example, a new family might find its original hot water requirements are low and could purchase a heater having a relatively small inner tank. As the family grows it might be necessary to provide for a greater supply of hot water and this can be readily accomplished by replacing the original small inner tank by a larger one. With the heaters now available on the market, it is necessary to purchase a complete new heater in order to obtain the required greater capacity. In other words, the family is required to purchase a new outer casing, base, insulation, and heating mechanism, whereas these elements of the original heater might be in perfectly good condition.

In accord with the first embodiment of the invention, the inner tanks **12** vary from each other in diameter. As is explained hereinafter the provision of inner tanks of varying diameter requires certain adjustments to the spacer rings **26** to **40** when substituting one tank for another. As can be seen in the drawings, the ends of the spacer rings are shaped as to mate with their opposite number in the other shell component. This feature can best be seen in FIGURE 2 where ring **26** is shown as mating with ring **34** while ring **28** mates with ring **36**. It will be noted that a certain portion of one end of each ring extends beyond the parting line separating the two shell components. Thus, by way of example, a certain portion of one end of ring **34** extends beyond the edge **50** of component **10**. It is by this arrangement that the rings are

adapted to clamp on the inner tank **12** as to releasably lock the assembly together.

When installing inner tank **12** in the heater, it is first pushed into component **10** of the outer shell by deforming the outer ends of the rings carried by component **10**. In actual fact, it is the wall of the outer shell, circumferentially strengthened by the spacer rings, which together give to permit the tank to move past these outer ends of the spacer rings so that the tank is clamped by the rings and held securely in position on base **20** and within shell component **10**. Following connection of the heating elements, as described below, the other shell component **11** is pressed against the tank as to deform the rings **26** to **32** or, more accurately stated, to deform the wall and rings of component **11** as to cause the latter to clamp onto the tank. Removal of the tank merely involves the reverse of these procedures. As mentioned above, replacement of one tank by another of larger or small diameter will require adaptation of the spacer rings to fit the new tank. In changing to a larger tank, this can be done by cutting down the spacer rings to narrow stubs and fixing adapter type spacer rings to the stubs. In changing to a small tank, adapter spacer rings can be fixed to the originally installed rings. It is here emphasized that the use of the illustrated spacer rings for achieving connection between the tank and the two shell components is a preferred expedient which is attractive by its simplicity and low cost. However, other means could be employed for this purpose.

The heating assembly illustrated is electrical, but another type of heating arrangement could be employed, such as a gas heater. The illustrated electrical arrangement is largely formed of available components which are attached to the spacer rings **34** to **40** by appropriate brackets. The heater elements **52** and **54** are flexible resistance heaters of known construction. The fixed ends of these elements are held in position by the brackets **60** and **62**. These are held between spacer ring **34** and **36** and between rings **38** and **40** respectively by being received in slots therein. Projecting inwardly from each of the brackets **60** and **62** are a pair of tabs **63** which are received in slots in the heater elements. The tabs are punched to receive spring anchoring devices **64** to which are fixed a pair of springs **66** with the opposite ends of the springs being releasably connected to small L-shaped brackets **68** fixed to the other ends of the heater elements. The springs **66** insure that the heater elements will be clamped tightly about the inner tank **12** as to insure proper heat transfer between the elements and the tank.

As can be readily appreciated from the foregoing description of the heater assembly, it is a simple step to release the heater elements from engagement about the tank prior to changing the tank by disengaging the springs **66** from the brackets **68**. In the event that a large inner tank is replaced by a smaller one it may be necessary to substitute the originally installed heater elements by new ones of shorter lengths. This can be simply achieved by sliding the fixed end of the heater elements from the tabs **63** projecting inwardly from the brackets **60** and **62** and substituting the shorter elements.

Provision is also made for a pair of thermostats **70** and **72** which may also be standard units. They are carried on the spacer rings **34** and **38** by means of a number of brackets **74**. These brackets are slotted at their upper ends to receive tabs **76** projecting outwardly from each side of the thermostats and are received in slots in the upper surfaces of rings **34** and **38** which slots are slanted relative to the planes of the spacer rings. Due to the slanting of these slots and the shape of the brackets **74**, the thermostats are biased towards and are therefore tightly held against the inner tank **12**. The upper thermostats **70** carry a high temperature cut-off device **78** which acts in the normal manner to interrupt current flow to the heater elements should the water become over-heated. The thermostats also act in the known manner to control the current flow to the individual heater elements where-

by to maintain the water in the tank at the desired temperature. The spacer rings **34** and **38** are apertured to provide passage-way for the various wires **80** required to connect the heater elements and the thermostats to a junction box which is fixed to the outside of the shell component **10**.

It will be noted that certain portions of the shell component **10** are cut away as at **82** and **84** as to provide ready access to the thermostats and their retaining brackets whereby these items may be serviced as required. Appropriately shaped tabs **86** and **88** are carried on the other shell component **11** for closing these open spaces when the heater is assembled.

As can be appreciated from the foregoing description of the first illustrated embodiment of the invention, this heater can be readily dismantled as to replace the inner tank **12** without having to purchase a complete heater assembly and throwing away an outer shell, insulation and heater elements which might be in perfectly good condition.

Referring now to the second embodiment of the invention shown in FIGS. 3 and 4, it is to be understood that it is the primary object of this embodiment to employ inner tanks of constant diameter but variable height as distinct from the first embodiment which is primarily intended to employ tanks of constant height but varying diameter.

The assembly shown in FIG. 3 essentially consists of a base **20**, an outer readily removable shell **90**, an inner tank which is not shown in FIG. 3 but which is comparable to the inner tank shown in FIG. 1, and an adjustable standard **92** projecting upwardly from the base.

The outer shell **90** is preferably a split shell of the type shown in FIG. 1 so that it might be removed from the assembly without lifting it from the top. The shell is lined with insulation **24** and is provided with an opening adjacent standard **92**, which opening is normally closed by a name plate or the like **94** which is readily removable as to provide access to the standard and the electrical devices carried thereby. The shell is dimensioned to rest on the top of the surface of base **20** and is provided with a second small opening **96** to permit the drain fitting **16** to project therethrough. The shell might also be provided with a piano hinge **98** at one of its mating edges so that removal of the shell will be accomplished by pivoting the two halves thereof on the piano hinge as to spread them apart a sufficient distance to slide easily from the assembly.

It is the purpose of standard **92** to carry the heating elements and associated electrical devices, such as thermostat and cut-off devices, as to hold these devices in juxtaposition with the inner tank but without direct connection therewith. The standard can be rigidly fixed as by welding or the like to base **20** or it might be received in an opening in the top flange of the base in the manner illustrated.

The standard is adjustable in height so as to permit re-positioning of the heating devices on the inner tank. Thus, as a smaller inner tank is replaced by a larger one to increase the capacity of the heater, both the top and bottom heating devices may be adjusted in height to properly fit the larger tank.

The illustrated standard **92** consists of four telescoping members which are triangular in cross-sectional shape, although not necessarily so. The three lowermost members are provided with a number of inwardly directed dimples **100** which co-operate with like dimples carried at the lower ends of the three uppermost members. These dimples, of course, serve to improve the frictional contact between the telescoped ends of the members as to ensure their remaining in a particular set position.

Two of the members are provided with means for attaching heating elements thereto, which means consist of tabs **102** and **104** which might be stamped from the members themselves and which receive the heating elements by fitting into the slots **106** in the heating elements. Thus the tabs **102** and **104** are comparable to the members **63** shown in FIG. 2. The tabs **102** and **104** are provided with a pair of opposed holes for receiving wire brackets **108** which are comparable to the members **64** shown in FIG. 2.

The two standard members which receive the standard members actually carrying the heating elements are appropriately slotted as at **110** and **112** to permit the raising and lowering of the members carrying the heating elements. The latter members also are provided with apertured tabs **114** and **116** for receiving thermostats **118** which are comparable to the device **70** and **72** shown in FIG. 1. As a further preferred but not essential feature, each of the members of the standard are provided with additional cut-outs such as a cut-out **120** for reducing the weight of the standard and for providing access to the rear faces of the thermostats.

To replace one inner shell by another, it is a relatively simple matter to remove the outer shell **90**, disconnect the water connections to the installed tank and disconnect the heating elements. The installed tank can then be lifted out and replaced by the new one and the heating elements and water connections attached to the new tank, after which the shell is reinstalled.

It will be appreciated that the main object of the invention, which is to provide a water heater assembly which has a readily replaceable inner tank, is achieved in both embodiments of the invention by the principle of carrying the heating elements and other electrical devices from members projecting upwardly from the base, which members in one case consist of one-half of the split outer shell and, in the other case of an interial standard.

What we claim as our invention is:

1. A water heater comprising, in combination, an inner cylindrical pressure tank having water inlet and outlet means, a generally cylindrical two-piece outer shell fully enclosing said pressure tank and adapted for ready dismantlement as to permit replacement of said pressure tank; a base supporting said tank and said shell, said heater including electric heating means, thermostat means for controlling the operation of said heating means, and insulation, said insulation being attached to the inside surface of said outer shell, and means for holding said heating means and thermostat means within said shell and in removable juxtaposition with the outer surface of the sides of said pressure tank, said holding means consisting of a standard carried by and projecting upwardly from said base within said shell and between said shell and said pressure tank, said standard being adjustable in height as to permit height adjustment of said heating means.

2. A water heater as claimed in claim **1** in which said standard consists of a plurality of telescoping members.

3. A water heater as claimed in claim **2** in which said telescoping members are substantially triangular in cross-section and including dimples positioned on the mating surfaces of the telescoping members for providing frictional connection therebetween.

4. A water heater as claimed in claim **3** in which certain of said telescoping members carry outwardly projecting tabs for connection with said heating means and thermostat means, and in which said members are provided with cut-out portions for reducing the weight of said standards and for providing access to the thermostat means.

5. A water heater as claimed in claim **4** in which said standard has four telescoping members in which the uppermost and third uppermost members carry said tabs for connection with said heating and thermostat means, the lowest and third lowest members being provided with slots positioned as to permit said tabs carried by the other of the members to move in a vertical direction.

6. A water heater as claimed in claim **1** in which the two sections of said outer shell are substantially semi-cylindrical in shape and are connected at one of the

mating edges thereof by a piano hinge and including a removable cover plate at the other of the mating edges thereof, said cover plate being positioned adjacent said standard as to provide access thereto.

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