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AIR SEPARATOR FITTING FOR CLOSED HOT WATER HEATING SYSTEMS

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Fig. 1.

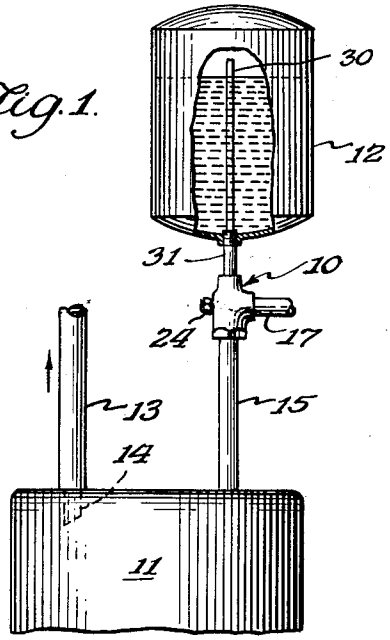


Fig. 2.

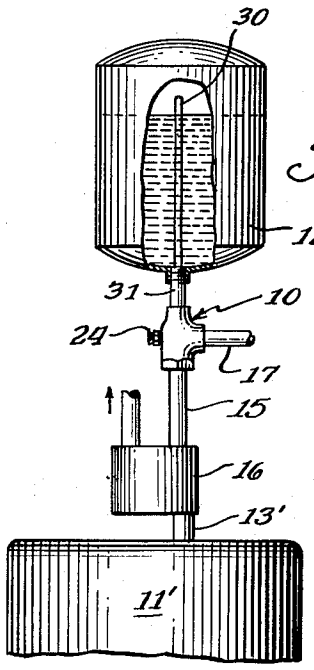


Fig. 3.

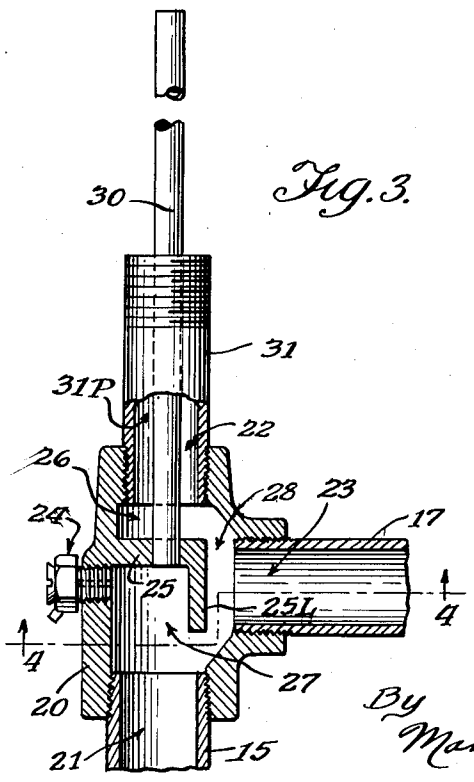
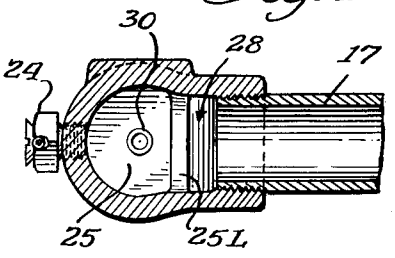


Fig. 4



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AIR SEPARATOR FITTING FOR CLOSED HOT WATER HEATING SYSTEMS

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1 Claim. (Cl. 55—201)

This invention relates to closed hot water heating systems of the type equipped with a boiler or heat exchanger and a compression tank and more particularly is concerned with a novel air eliminator fitting of the type that is used for connection between the boiler and compression tank to separate air bubbles from the water in the system and direct these separated air bubbles into the compression tank and to permit an equivalent volume of water to flow from the tank back to the boiler or heat exchanger.

In a closed hot water heating system, under ordinary circumstances, entrained air bubbles flow to the radiation, causing air binding in the radiation units which, in severe instances, may entirely prevent heating. Modern heating systems are provided with facilities for trapping air bubbles at the top of the boiler or are provided with an external tank for providing sufficient velocity reduction of the water flow stream to allow air bubbles to rise to the top of the tank and through a connection line to the compression tank.

It is known to provide an air eliminator fitting in this connection line to the compression tank, with the piping leading up to the fitting being large enough to accommodate a two-way flow therein so that heated water from the boiler rises in an annular portion of the pipe while cooler water descends, thus establishing circulation and transferring heated water to the proximity of the air eliminating device.

The principal object of the present invention is the provision of an improved air separator fitting of this type for connection in a system of the above type to allow transfer into the compression tank of air bubbles separated from the water of the system.

Another object of the invention is the provision of a fitting of this type equipped with a manual vent valve arranged to expel air during initial installation of the system and arranged to predetermine the initial water level in the system so as to provide an entrapped air cushion that initially fills the entire compression tank.

Still another object of the invention is the provision of an air eliminator fitting of the above type and equipped with an air diverting internal baffle and with connection facilities for a cold water supply line for initially separating entrained air entering in the supply of cold water.

Other objects and advantages will become apparent during the course of the following description.

In the accompanying drawings forming a part of this specification and in which like numerals are employed to designate like parts throughout the same:

FIG. 1 is a diagrammatic elevational view of the pertinent parts of a closed hot water heating system and illustrating the connection and arrangement of the present fitting therein;

FIG. 2 is a view corresponding to FIG. 1 but illustrating a system equipped with an external tank for air bubble separation and illustrating the connection of the present fitting therein;

FIG. 3 is a vertical sectional view through the fitting of the present invention; and

FIG. 4 is a developed cross-sectional view taken on the line 4—4 of FIG. 3.

Referring now to the drawings, in FIG. 1 the fitting of this invention is designated generally at **10** and is shown installed in a hot water heating system equipped with a boiler **11**, a compression tank **12**, and a hot water supply line **13** rising from the top of the boiler and provided with a dip tube **14** that projects into the boiler water to supply air free hot water through the supply piping **13** to the radiation (not shown). A riser pipe **15** is shown extending from the top of the boiler and at its upper end is connected into the bottom of the fitting **10**, which in turn is connected to the compression tank **12** for directing air into the tank.

An equivalent heating system arrangement is shown in FIG. 2 wherein the hot water supply pipe **13'** extending up from the boiler **11'** is equipped with an external air separation tank **16** wherein the hot water undergoes a velocity reduction to permit release of air bubbles. A riser pipe **15** is shown connected to an outlet opening at the top of the air separator tank **16** and again is equipped with a fitting **10** for routing air to the compression tank **12**.

For purposes of disclosure, a preferred constructional embodiment of the air separator fitting **10** of this invention is illustrated in FIGS. 3 and 4. The fitting comprises a chambered housing **20**, having an opening **21** at its lower end for receiving the riser pipe **15**, an opening **22** at its upper end for connection to the compression tank **12**, an opening **23** in one side wall for receiving the cold water supply pipe **17**, a manual vent valve **24** in its opposite side wall and having a valved discharge passage communicating with the interior of the housing **20**, and a generally horizontally extending integrally formed interior baffle **25** dividing the interior of the fitting into upper and lower chambers **26** and **27**, respectively, which are connected by a passageway indicated generally at **28** that is sized to substantially prevent two-way circulation therethrough.

The free edge of the baffle **25** is provided with a vertically extending lip **25L** disposed in the flow path of water entering from the cold water supply pipe **17**. During the filling operation, this lip **25L** acts to deflect air bubbles entrained in the entering cold water stream and immediately directs many such bubbles into the compression tank. This is desirable for minimizing the possibility of air bubbles entering the main flow circuit of the heating system.

The internal baffle of the fitting is drilled vertically to receive the lower end of a tube **30** that projects through the top opening **22** of the fitting and into the upper region of the compression tank **12**, this tube is rolled, pressed, or otherwise permanently fixed in the drill hole of the baffle and establishes communication between the lower chamber **27** of the fitting and the air space in the compression tank **12**. Finally, a connection nipple, or stub pipe **31**, is secured in the top opening **22** of the fitting. The pipe **31** is larger than and encircles the tube to provide an annular flow passage **31P** surrounding the lower end of the tube **30**. At is upper end, the pipe **31** opens into the water space of the compression tank **12** to provide a return flow path for water displaced by air entering the compression tank through the tube.

The functioning and advantages of the fitting **10** of this invention will best be understood from the following general description of the installation and operation of a closed hot water heating system equipped with such a fitting.

When the system is initially being filled with water, many of the air bubbles entrained in the entering stream of cold water are immediately diverted to the compression tank by the lip **25L** on the free edge of the baffle. This minimizes future problems of air binding in the

radiation. The air that is originally in the system and that is displaced by the incoming water is vented out the fitting **10** by the manual vent valve **24** until the water level in the riser pipe **15** rises to the elevation of the vent valve. At this time, the upper chamber **26** of the fitting, the connections **30** and **31** to the compression tank **12**, and the compression tank itself, are all filled with air.

The unique mounting of the manual vent valve **24** in the housing **20** of the fitting **10** predetermines the amount of air initially entrapped and permits of trapping an amount slightly in excess of the capacity of the compression tank. A compression tank precision sized based on the volume of system water may be utilized as the illustrated arrangement regulates the initial water level in the system and hence insures that the tank is initially completely filled with air This provides more efficient utilization of the capacity of the compression tank and results in a substantial reduction in the size and hence the cost of the compression tank.

When the system is turned on and system pressure builds up, the entrapped cushion of air is compressed until it occupies only the upper portion of the compression tank **12** and correspondingly the water rises through the fitting **10** and into the compression tank and the typical level of water in the tank is indicated in FIGS. 1 and 2.

The riser pipe **15** which has a ¾" or larger I.D. allows a continuous internal circulation to occur therein with hot water from the boiler rising in one portion of the pipe's cross-section while relatively cool water descends in a remaining portion of the pipe's cross-section. This internal circulation provides a flow of heated water to the proximity of the fitting **10**. In order to prevent the hot water from the boiler from heating the air cushion in the compression tank **12** and consequently creating an unduly high system pressure, circulation of the heated water to the compression tank is blocked by the restricted passage **28** which is sized to substantially prevent simultaneous two-way flow.

During system operation, air bubbles are enabled to rise freely in the ¾" I.D. riser pipe **15** and due to the presence of the internal baffle **25**, these air bubbles are collected in the lower chamber of the fitting to form a large bubble substantially filling the ceiling beneath the baffle from which bubbles of varied sizes rise through the inner tube **30** which leads to the air space at the top of the compression tank. As air enters the compression tank and expands the air cushion therein, a similar volume of water falls from the lower portion of the tank **12** through the connecting nipple **31** to the upper chamber

26 of the fitting **10**, and then through the restricted passage **28** leading around the free edge of the baffle **25** and into the riser pipe **15** of the system.

It should be understood that the description of the preferred form of the invention is for the purpose of complying with Section 112. Title 35, of the U.S. Code and that the claim should be construed as broadly as prior art will permit.

What is claimed is:

A fitting for facilitating separation of air from water in a closed boiler and compression tank equipped hot water heating system and comprising a housing having a bottom opening for connection to said system, a top opening for connection to said tank, a side opening for connection to a cold water supply line and a horizontal interior baffle dividing the interior of said housing into upper and lower chambers communicating through a liquid flow passageway extending around a free edge of said baffle, said passageway being impermeable to simultaneous two-way circulation therethrough, one of the chambers being connected to said system for trapping air bubbles released therefrom, a vertical air flow tube having a lower end opening directly into said one chamber and having an upper end opening directly into air space in the top of said tank, and the other chamber having a liquid flow conduit communicating therewith and projecting thereabove to communicate with water space at the bottom of said tank whereby water in the tank is displaced into said other chamber to flow through said passageway and back to the system when air bubbles move through said tube and into the air space of the tank, said baffle being disposed in said housing at an elevation corresponding to that of the side opening and terminating in a vertically extending lip adjacent to said side opening and spaced therefrom to provide said passageway between said chambers, with said lip being disposed cross-wise in the flow path of water entering from said side opening to initially separate and divert air bubbles entrained therein, and a manual vent valve mounted in said housing at a point opposite said side opening and communicating directly with said lower chamber.

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