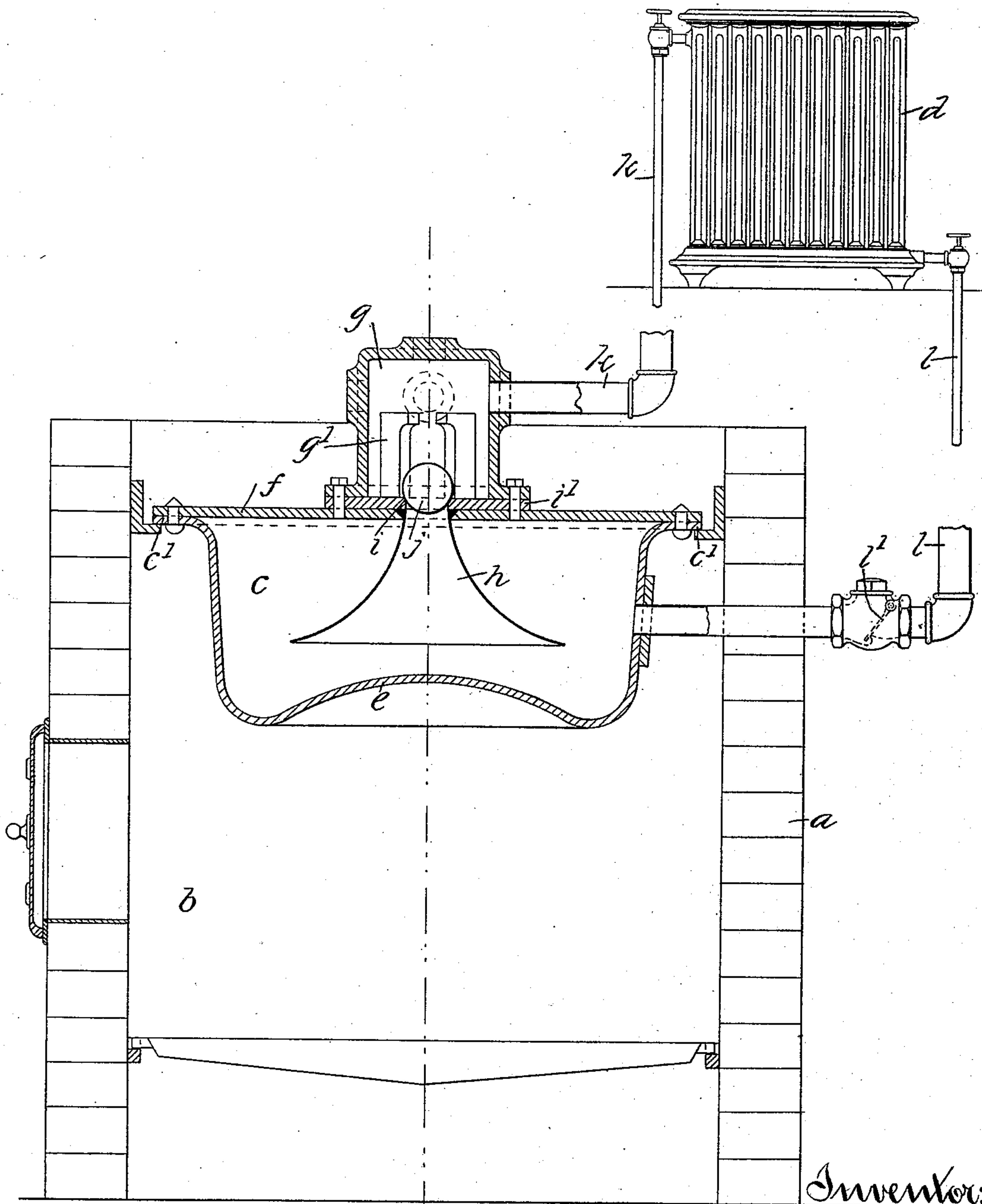


(No Model.)

F. K. CASWELL.  
HOT WATER HEATER.

No. 494,323.

Patented Mar. 28, 1893.



Inventor:

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# UNITED STATES PATENT OFFICE.

FREDERICK K. CASWELL, OF HARTFORD, CONNECTICUT.

## HOT-WATER HEATER.

SPECIFICATION forming part of Letters Patent No. 494,323, dated March 28, 1893.

Application filed November 19, 1892. Serial No. 452,488. (No model.)

*To all whom it may concern:*

Be it known that I, FREDERICK K. CASWELL, of Hartford, in the county of Hartford and State of Connecticut, have invented certain  
5 new and useful Improvements in Hot-Water Heaters, of which the following is a full, clear, and exact description, whereby any one skilled in the art can make and use the same.

My invention relates to that class of apparatus by means of which hot water is circulated throughout a system of pipes and heaters for the purpose of warming buildings and the object of my invention is to provide an apparatus of this class in which a positive circulation of heated water is insured.

To this end my invention consists in the details of the several parts making up the apparatus as a whole and particularly in the circulating devices and in the combination of  
20 the several parts as more particularly herein-after described and pointed out in the claims.

Referring to the drawing:—The figure shown is a view in vertical central section of a furnace embodying my invention and illustrating the manner in which the apparatus is used in connection with a heating plant.

In the accompanying drawing the letter *a* denotes the wall of a furnace, *b* the fire pot, *c* the boiler and *d* a radiator. The boiler *c* is  
30 made of any convenient form and material, preferably circular in outline and of iron or steel plate, although it may be made of cast metal if desired. The boiler proper has preferably a re-entrant bottom *e* which serves to  
35 retain the heated products of combustion until their full effect is utilized in heating the water contained within the boiler. In the form shown the boiler has a flange *c'* to which is bolted a cover plate *f*, the latter supporting  
40 a valve chamber *g* and a circulator *h*. The latter is funnel shaped, secured to an opening in the cover plate and projecting downward within the boiler, the flaring mouth of the circulator being located near the bottom  
45 and operating to cause a uniform flow of the heated water into the circulator from all parts of the boiler. A valve plate *i'* contains a valve seat *i* in which a puppet or ball valve *j* is supported, the valve opening outward  
50 from the boiler and being held in place either by gravity or by means of a spring. In the form shown the valve chamber *g* contains a

number of guides *g'* that are posts grouped about the valve and with overarching upper ends that serve to limit the extent of upward  
55 movement of the valve *j*. This valve-chamber *g* is preferably of metal cast to shape with a series of bosses arranged on several sides so that any one or more of them may be drilled and tapped for the purpose of connect-  
60 ing with pipes of the circulator. A riser *k* extends from the valve chamber to one or more radiators *d*, the returns coming into the main return pipe *l* that delivers into the boiler at any suitable place and is provided  
65 usually with a check valve *l'* which permits the water to flow through the returns toward the boiler to prevent it from flowing outward.

The method of operation of my improved apparatus is as follows: The boiler being  
70 filled to a desired extent with water through a suitable opening, heat is applied as by building a fire in the furnace and steam will be generated and will accumulate in the upper part of the boiler. The pressure of this steam  
75 forces the heated water into the circulator *h*, causes it to lift the valve *j* and to flow into the riser *k* until the pressure has been reduced by the outflow of the water when the valve drops to its seat and holds the column  
80 of heated water until another excess of pressure, due to the generation of an additional amount of steam, again lifts the valve and discharges more heated water into the riser. This outflow of heated water under pressure  
85 causes a flow into the boiler through the returns *l* and an intermittent forced circulation of the heated water is established and maintained as long as the heat is applied to the boiler.

The circulator located in this apparatus is so constructed and arranged as to practically divide the interior of the boiler into an upper and a lower part, the former being that  
90 in which steam may accumulate while the water is located in the lower part. The accumulation of steam in the upper part of the boiler forces the water to rise within the circulator and prevents any steam from flowing from the steam space into the valve chamber until  
95 the level of the water within the boiler has been forced below the lower edge of the circulator. In practice this is not liable to occur, for the reason that the end of the return



pipe 1 is uncovered before such a level is reached and the inflow of colder water from the return pipe condenses the steam and creates a partial vacuum which induces a more rapid flow through the return pipes and the coils into the boiler. Another function of the circulator is to provide for a comparatively even distribution of the flow of the water from all parts of the boiler toward and into the valve chamber and to break up cross currents.

It is obvious that the boiler and circulator may be changed in form and details of construction without departing from my invention that consists mainly in the embodiment in the heating apparatus of a circulator so combined with the pressure chamber and a valve as to produce an intermittent flow of the heated water automatically through the alternating pressure of the steam generated in the boiler.

It has been found by experiment with, and practical test of, this apparatus that a partial vacuum formed in the boiler by the return to it of the cooler water from the returns is a factor in maintaining the forced circulation of the water through the pipes and radiators or coils of the heating system. The degree of vacuum will, of course, depend upon the difference in temperature between the heated water and steam and the column of cooler water from the returns but there is in any event an appreciable aid to the circulation due to the vacuum created.

Only so much of a hot water heating apparatus is shown and described in the within case as directly relates to the special feature of my improvement and an understanding of

its operation, provision in a complete apparatus being of course made for the proper expansion of the water and for the means and devices for controlling and directing its flow through the pipes of the system, that is, suitable valves and test-cocks being supplied in the practical embodiment in a complete and operative heating system.

I claim as my invention—

1. In combination in a hot water heater a boiler, an outlet communicating with a riser, a valve arranged in the outlet and normally closed against the return flow of water from the riser into the boiler, a circulator extending from the valve chamber to within the boiler, a return pipe connecting with the boiler, and the pipes and coils of the circulation, all substantially as described.

2. In a hot water heater in combination with a boiler, the outlet communicating with a riser, a valve located in the outlet and normally closed against the return flow of water from the riser into the boiler and the funnel shaped circulator extending from the outlet within the vessel with its smaller end adjacent to the outlet, all substantially as described.

3. In a hot water heater a boiler, a valve automatically controlling the return flow of heated water into the boiler from the riser and a funnel-shaped circulator having the flaring mouth arranged within and near the bottom of the boiler, all substantially as described.

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