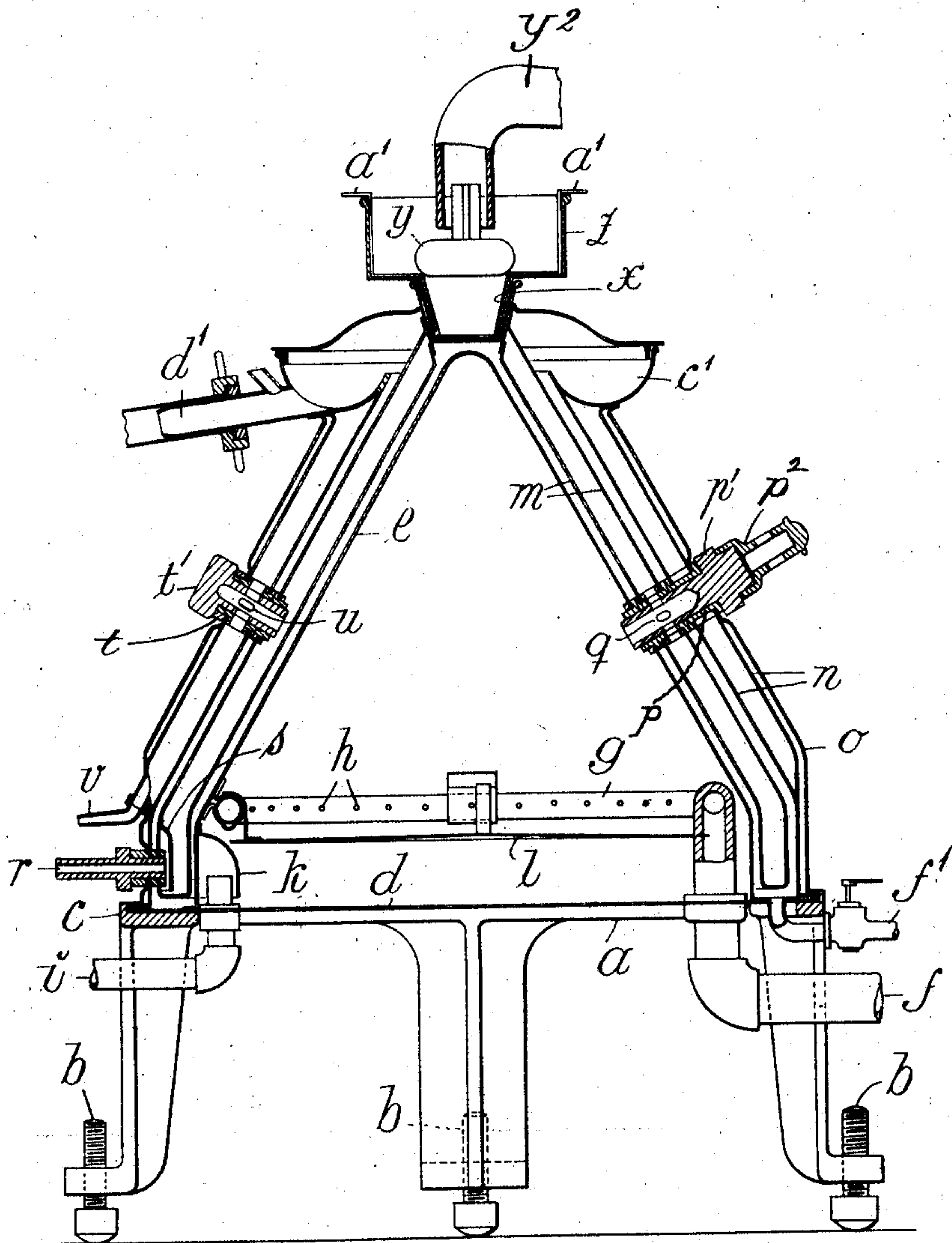


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A. T. PFEIFF.
LIQUID HEATING APPARATUS.
APPLICATION FILED MAY 3, 1907.



Witnesses

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LIQUID-HEATING APPARATUS.

No. 883,339.

Specification of Letters Patent.

Patented March 31, 1908.

Application filed May 3, 1907. Serial No. 371,660.

To all whom it may concern:

Be it known that I, ALEXANDER THEODOR PFEIFF, a citizen of the Kingdom of Sweden, residing at Stockholm, Sweden, have invented new and useful Improvements in Liquid-Heating Apparatus, of which the following is a specification.

This invention relates to a liquid heating apparatus of the kind in which a number of heating elements arranged one around the other form between them a channel of V-shaped cross-section for the liquid to be heated. In apparatus of the said kind heretofore known the heating elements are cylindrical which causes several disadvantages. It is, for instance very difficult to have the liquid pass uniformly through the apparatus. If the outlet is provided at one or more points of the circumference of the apparatus, the several particles of the liquid will have to pass ways of very different length in order to reach the outlet and the result is a uniform heating of the liquid. If the outlet is arranged as an overfall it is necessary on account of the great extension of the apparatus in horizontal direction to adjust the apparatus very accurately in order to obtain a uniform flow of the liquid through the apparatus. A further disadvantage is that the expansion of the liquid in the inlet branch of the said V-shaped channel cannot be prevented by the inflowing liquid, inasmuch as the latter, which in order to be uniformly supplied to the apparatus must be spread over a comparatively large surface, comes into the inlet branch of the V-shaped channel in the form of a thin layer which does not fill the cross section of the channel.

The object of the present invention is to remove the said disadvantages, and my invention consists, principally, in that the heating elements and thus also the V-shaped channel taper upwards so that the inlet as well as the outlet are given the smallest extension possible in horizontal direction. The result therefrom will be firstly that a uniform admission of the liquid to the apparatus is obtained without any special arrangements, secondly that the inflowing liquid on account of the small cross sectional area of the V-shaped channel at the inlet end thereof, fills the whole channel at said end and thereby prevents the liquid from expanding out from the inlet branch of the channel, and thirdly that the apparatus need not be adjusted in the horizontal plane with the same

accuracy as apparatus heretofore known in order that the liquid may flow uniformly through the apparatus.

A further advantage of the present invention is that the liquid on account of the circumstance that the cross sectional area of the V-shaped channel is continually increasing and decreasing will make rotary or whirling motions while flowing through the apparatus, said motions accelerating the uniform heating of the liquid.

In the accompanying drawing I have shown an embodiment of my invention in vertical section.

Referring to the drawing, the apparatus is supported by a base *a*, which in the usual manner is provided with set-screws *b* for adjusting the apparatus horizontally. On the frame *c* of the base *a* is provided a base *d* to which is secured a conical mantle *e* closed at the top and constituting together with the base *d* the innermost heating element. Through the base *d* is inserted a steam pipe *f*, communicating with a steam distributing pipe *g* which extends along the inner side of the mantle *e* and has outlet openings *h* for the steam. For leading off the condensed water an outlet pipe *i* is provided, the inner end of which is placed at a distance above the base *d*, so that on the latter will rest a layer of water of corresponding depth. In order to prevent the steam from issuing through the outlet pipe *i* a screen *k* secured to the mantle *e* is arranged above the inner end of the said pipe *i* and extends down into the water on the base *d* so as to form a water-seal constituting a reliable hindrance against the out-flow of the steam. In order to prevent the steam flowing in through the openings *h* from coming into contact with the water on the base *d* a conical screen or the like, *l* may be provided below the steam distributing pipe *g*.

Around the mantle *e* is provided another mantle *m* having double walls and constituting a second heating element. The mantles *e* and *m* form between them a passage for the liquid to be heated, and the lower end of the mantle *m* is at a distance from the base *d*, as is shown in the drawing. Around the mantle *m* is provided a third mantle *n* which likewise has double walls and constitutes a third heating element resting on the frame *c*. The conical mantles *m* and *n* form between them a space which at the bottom communicates with the space or passage between the man-

bles *m* and *e*. Finally a mantle *o* is provided around the mantle *n*, the said mantle *o* inclosing an insulating layer of air and being secured to the frame *c* in any convenient manner. Connected to the bottom of the mantle *o* is a valved pipe *f'* through which sediment may be drawn off when occasion demands.

Through the walls of all the mantles is inserted a valve casing *p* the valve *p*¹ of which is provided with a handle *p*², and has an opening *q* through which the steam can flow from the interior of the mantle *e* into the space between the walls of the mantle *m*. The condensed water obtained in said space flows off through the pipe *r*, the inner mouth of which is at a distance above the bottom of the said space so that in the latter also will rest a layer of condensed water which flows off according as it rises to the mouth of the pipe *r*. In front of the inner end of the latter is provided a screen *s* extending into the water so that here also is formed a water-seal preventing the steam from flowing off through the pipe *r*.

Through the walls of the mantles *o* and *n* and the outer walls of the mantle *m* is inserted another valve-casing *t*, which preferably is arranged opposite the first mentioned valve casing *p*. The valve *t*¹ has an opening *u* through which the steam can pass from the space between the walls of the mantle *m* into the space between the walls of the mantle *n*. From the last mentioned space the excess of steam together with condensed water flows off through an outlet pipe *v*. An excess of steam should always pass out through said pipe *v* in order to indicate to the operator that the steam uniformly and continually passes through the apparatus.

The liquid is admitted through a hopper *x*, connected to a receiver *z*, and in the receiver may be provided a float *y* for regulating the admission of the liquid to the receiver. The operation of the float *y* is well known from centrifugal separators where similar floats are used. The stem of said float enters the outlet end of a supply pipe *y*². As the liquid rises in the receiver *z* the float *y* is raised and throttles the mouth of the supply pipe to a greater or less extent, thereby regulating the admission of the liquid to the said receiver.

The base of the hopper *x* consists of two perforated plates the upper one of which is movable. The perforations of the said plates correspond to each other so that by moving the upper plate, which may be accomplished by means of two arms *a*¹ connected to said plate, the perforations of the lower plate may be more or less covered or uncovered where- by a smaller or larger quantity of liquid will be admitted to the apparatus. The heated liquid flows up into an annular holder *c*¹ from which it flows off through a pipe or spout *d*¹.

The mantles of the apparatus may easily be removed one after the other if the apparatus is to be cleansed or repaired, and the valve-casings holding the mantles together are so constructed that they can be easily taken to pieces according as the mantles are to be removed.

Having now described my invention, what I claim and desire to secure by Letters Patent is:—

1. In a liquid heating apparatus the combination, of a number of heating elements placed one around the other and forming between them a liquid passage of V-shaped vertical cross-section, the said heating elements being tapering upwards so as to give the inlet- and outlet-ends of the said liquid passage a small extension in horizontal direction, and connections between said heating elements, substantially as and for the purpose set forth.

2. In a liquid heating apparatus the combination, of a number of heating elements placed one around the other and forming between them a liquid passage of V-shaped vertical cross-section, the said heating elements being tapering upwards so as to give the inlet- and outlet-ends of the said liquid passage a small extension in horizontal direction, connections between said heating elements, outlets on the latter for the condensed water, and water-seals closing the said outlets, substantially as and for the purpose set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ALEXANDER THEODOR PFEIFF.

Witnesses:

EVARD DELMAR,
JOHN DELMAR.