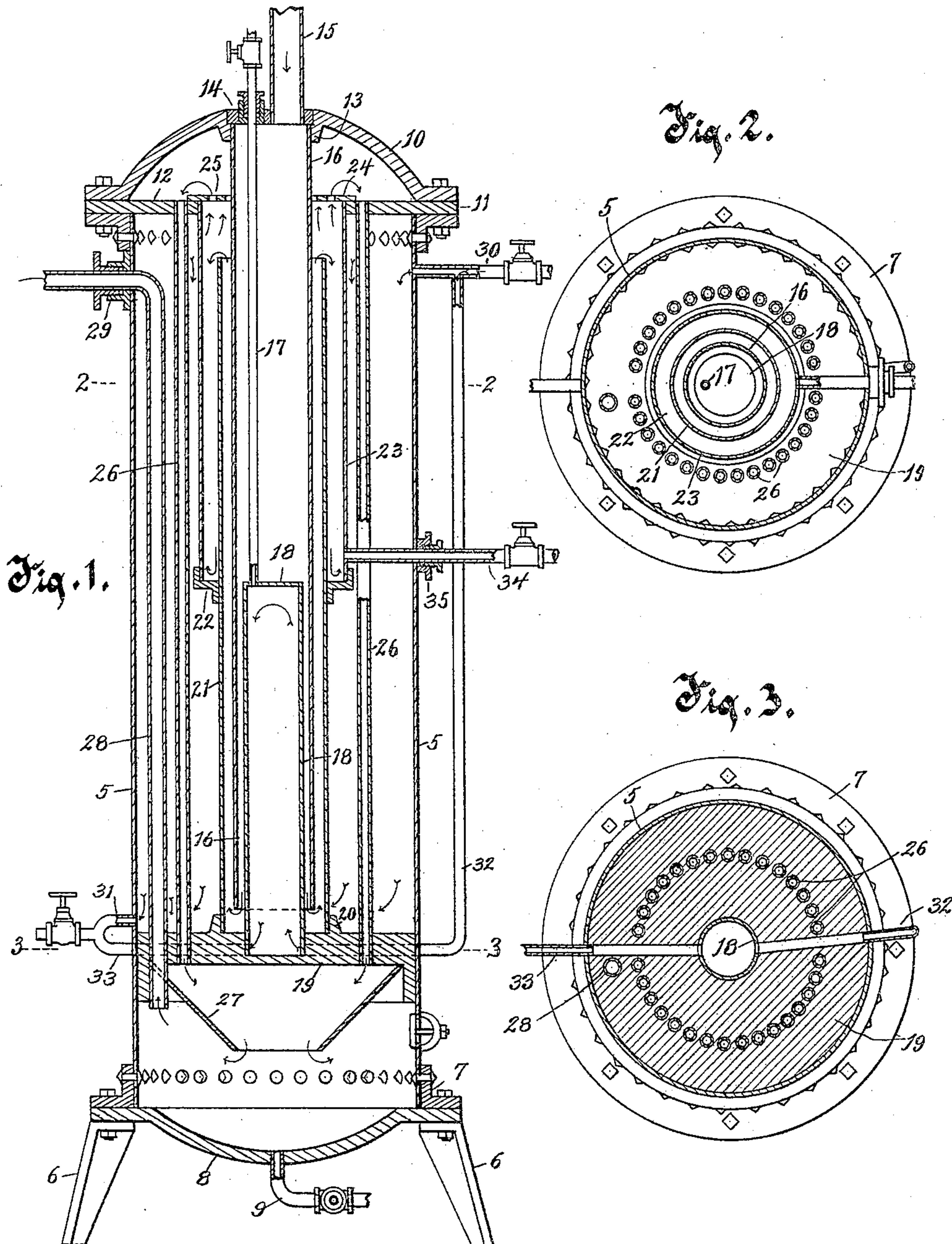


No. 808,385.

PATENTED DEC. 26, 1905.

C. KIEREN.  
FEED WATER HEATER.  
APPLICATION FILED MAY 16, 1904.



Witnesses:  
C. H. Kenney,  
R. S. Caldwell.

Inventor:  
Conrad Kieren  
By Benedict and Morrell  
Attorneys.



# UNITED STATES PATENT OFFICE.

CONRAD KIEREN, OF APPLETON, WISCONSIN, ASSIGNOR OF TWO-THIRDS  
TO WILLIAM TIMM AND THEODORE J. SCHOTT, OF APPLETON, WIS-  
CONSIN.

## FEED-WATER HEATER.

No. 808,385.

Specification of Letters Patent.

Patented Dec. 26, 1905.

Application filed May 16, 1904. Serial No. 208,078.

*To all whom it may concern:*

Be it known that I, CONRAD KIEREN, resid-  
ing in Appleton, in the county of Outagamie  
and State of Wisconsin, have invented new and  
5 useful Improvements in Feed-Water Heaters  
and Purifiers, of which the following is a de-  
scription, reference being had to the accom-  
panying drawings, which are a part of this  
specification.

10 This invention relates to feed-water heaters  
and purifiers, and has for its object to remove  
impurities from water fed to boilers or for  
other uses and at the same time to raise the  
temperature of such water.

15 Another object of this invention is to ac-  
complish the above results by causing the wa-  
ter to follow a sinuous course in close relation  
to a heating medium, such as steam, with suit-  
able means provided for drawing off the sedi-  
20 ment of impurities deposited by the heating  
of the water.

With the above objects in view the inven-  
tion consists in the devices and parts and their  
equivalents, as hereinafter set forth.

25 Referring to the accompanying drawings,  
in which like characters of reference indicate  
the same parts in the several views, Figure 1  
is a vertical sectional view of a feed-water  
heater and purifier embodying the principles  
30 of this invention. Fig. 2 is a transverse sec-  
tion thereof on the line 2 2 of Fig. 1, and Fig.  
3 is a similar view taken on the line 3 3 of  
Fig. 1.

35 In the views, 5 represents a cylindrical cas-  
ing which is preferably mounted in a vertical  
position, as shown, by suitable supporting  
means, such as legs 6, bolted to a flanged ring  
7, which is securely riveted to the lower end  
40 of the casing 5, and to which is also bolted  
the concave head 8, which is provided with  
a valved mud-draw-off pipe 9 for the purpose  
of discharging the mud or other impurities  
which may be deposited thereon by means  
which will be later more fully described.

45 At the upper end of the cylindrical casing  
5 a dome-head 10 is secured by being bolted  
to the flanged ring 11, which is riveted to the  
upper end of the cylindrical casing 5, and be-  
tween the said flanged ring 11 and the dome-  
50 head 10 is secured the partition 12.

In the center of the dome-head 10 is pro-  
vided a shouldered seat 13, into which fits a  
plate 14, carrying a water-inlet pipe 15, to  
communicate with the central tube 16, which

fits the shouldered seat 13 and extends down 55  
within the cylindrical casing 5 to near the bot-  
tom thereof. A valved vent-pipe 17 also ex-  
tends through the plate 14, preferably through  
a bushing connection thereon, and extending  
down within the central tube 16 connects with 60  
the closed upper end of a cylindrical heating-  
chamber 18, which is supported at its lower  
end by a partition 19, extending across the  
cylindrical casing 5 at a short distance above  
its lower end and slightly lower than the 65  
lower end of the central tube 16.

Fitting within an annular upwardly-pro-  
jecting flange 20 on the top surface of the  
partition 19 is an upwardly-extending tube 21,  
surrounding the central tube 16 and slightly 70  
larger than said central tube, so as to provide  
a passage therebetween in continuation of the  
passage-way between said central tube and  
the chamber 18. The tube 21 does not ex-  
tend as high as the partition 12; but at its 75  
intermediate portion it is provided on its ex-  
terior with a shouldered flange 22, with which  
fits a tube 23, which does extend to the par-  
tition 12 and fits within the central circular  
opening therein, which opening is covered by 80  
a disk 24, having a central opening larger  
than the tube 16 and also provided with per-  
forations 25, so that water may pass from the  
space between the central tube 16 and the  
tube 23 to the space within the dome-head 85  
outside of the central tube 16.

A circular series of vertical pipes 26 sur-  
rounds the tube 23 and connects the space  
above the partition 12 with the space beneath  
partition 19, and a deflecting funnel-shaped 90  
baffle-plate 27 directs the water issuing from  
the series of pipes 26 to the center of the  
mud-drum formed between the concave head  
8 and the partition 19. Water may pass from  
the upper part of said mud-drum, by way of 95  
pipe 28, through a bushing 29 in the upper  
end of the cylindrical casing 5 to connect with  
the boiler or other device to be supplied with  
the heated purified water.

A suitable means is provided for heating 100  
the water in its several passages, such as by  
admitting live or exhaust steam through a  
valved-pipe 30 to the upper end of the cylin-  
drical casing 5, beneath the partition 13, and  
allowing for its being withdrawn through 105  
a valved outlet-pipe 31 at the lower end of the  
cylindrical casing 5, above the partition 19.  
It is obvious that the steam or other heating



medium in its passage from pipe 30 to pipe 31 will surround the tube 23 and the lower end of tube 21 and also surround the series of pipes 26 and the water-outlet pipe 28.

5 A branch pipe 32 leads from pipe 30, through the cylindrical casing 5 and the partition 19, to the lower end of the chamber 18, at one side thereof, so that steam is admitted by way of said pipe 32 to the lower end of the chamber 18, where it will circulate throughout the chamber 18 and finally pass out at the lower end of the said chamber on the side opposite its admission by way of pipe 33, which passes through the partition 19 and the cylindrical casing 5 and joins with pipe 31.

From the foregoing it will be seen that water admitted to the device through the supply-pipe 15 passes in a thin film around the chamber 18, where it is subjected to the heat of the steam circulating within said chamber, and then, passing with considerable speed, which will prevent the impurities settling here as a result of the heating, it passes upward still in a thin film around the central tube 16, where it is further subjected to the heat of the steam surrounding the tube 21.

When it reaches the upper end of the tube 21, it has a comparatively large settling-space within the tube 23, where the impurities freed by the heating of the water are permitted to settle to the bottom of the tube 23 and may be drawn off through a valved draw-off pipe 34, which passes from the lower end of the tube 23 through a bushing 35 in the side of the cylindrical casing 5. The partially-purified water passes from the tube 23 at its upper end, through the openings in disk 24, to the space within the dome-head 10, where it is discharged through the circular series of pipes 26, again passing through the steam-heating space within the casing 5, where it is subjected to intense heat, and on issuing from said pipes in the mud-drum it is deflected centrally by the baffle-plate 27, and by reason of the large capacity of the mud-drum it is given the opportunity to deposit the remainder of the impurities contained therein before departing by way of pipe 27, so that it is quite free of its impurities and at a high temperature suitable for boiler-feeding purposes when it leaves the device.

The valved vent-pipe 17 permits of the removal of the air contained within the chamber 18 when necessary to enable the steam to quickly and completely fill the chamber 18; but this may be dispensed with when desired. Furthermore, it is obvious that if it should be found desirable another draw-off pipe could be provided for the lower end of tube 21 similar to the pipe 34; but it is intended that the speed of the water flowing at this point will be sufficient to carry the impurities separated by the preliminary heating to the upper end of the tube 21, so that they may settle in the tube 23 and be drawn off by pipe 34.

What I claim as my invention is—

1. In a water-heater, a casing, a pair of telescoping tubes forming a sinuous passage for the water, and a heating-chamber projecting part way within the inner tube and reducing the area of the passage therethrough at such part thereof, whereby a comparatively slight preliminary heating of the water will be produced during the comparatively slow travel of the water through the unreduced portion of the inner tube and subsequently a greater heating of the water will be produced during the faster travel thereof through the reduced portion of the inner tube around the heating-chamber.

2. In a water-heater, a casing, a tube therein closed at one end, a second tube closed at one end and telescoping with its other end the open end of the first-named tube, and a heating-chamber projecting part way within the open end of the first-named tube and reducing the area of the passage therethrough, whereby a comparatively slight preliminary heating of the water will be produced during the comparatively slow travel of the water through the unreduced portion of the inner tube and subsequently a greater heating of the water will be produced during the faster travel thereof through the reduced portion of the inner tube around the heating-chamber.

3. In a device of the character described, a casing, a tube therein closed at one end, a second tube closed at one end and telescoping with its other end the open end of the first-named tube, a heating-chamber projecting part way within the open end of the first-named tube and changing the area of the passage therethrough, and a vent-pipe for the heating-chamber.

4. In a device of the character described, a casing, a standing tube therein, and a second tube surrounding the upper end of the first-named tube and having its lower end closed to constitute a settling-chamber.

5. In a device of the character described, a casing, a standing tube therein, a second tube surrounding the upper end of the first-named tube and having its lower end closed to constitute a settling-chamber, and a valved draw-off pipe through which the sediment in the settling-chamber may be removed.

6. In a device of the character described, a casing, a standing tube therein, a second tube surrounding the upper end of the first-named tube, and a shouldered flange on the first-named tube fitting and closing the lower end of the second tube to form a settling-chamber thereof.

7. In a device of the character described, a casing, a tube therein closed at one end, a second tube closed at one end and telescoping with its other end the open end of the first-named tube, a shouldered flange at the intermediate portion of the second tube, and a third tube fitting with and closed by said



shouldered flange and extending above the upper end of the second tube to constitute a settling-chamber.

8. In a device of the character described, a casing, a tube therein, a second tube closed at one end and telescoping with its other end the open end of the first-named tube, a heating-chamber within the first-named tube, a heating-pipe leading to and from the casing, and a branch pipe connecting the heating-chamber with said heating-pipe.

9. In a device of the character described, a casing, heads closing the ends of the casing, a pair of partitions within said casing, a tube fitting within the upper head and passing through an opening in the upper partition and extending to near the lower partition, a heating-chamber projecting from the lower partition into the said tube, a second tube mounted on the lower partition and surrounding the first-named tube, said second tube terminating below the upper partition, a shouldered flange around the intermediate portion of the second tube, a third tube fitting upon and closed by the shouldered flange and also fitting within the opening of the upper partition, a perforated plate surrounding the first-named tube and resting upon the upper partition, a series of pipes connecting the space above the upper partition with the space below the lower partition, an outlet-pipe leading from the space below the lower partition and means for conveying heat to the interior of the casing and the heating-chamber, substantially as described.

10. In a device of the character described, a casing, heads closing the ends of the casing,

a pair of partitions within said casing, a tube fitting within the upper head and passing through an opening in the upper partition and extending to near the lower partition, a heating-chamber projecting from the lower partition into the said tube, a second tube mounted on the lower partition surrounding the first-named tube, said second tube terminating below the upper partition, a shouldered flange around the intermediate portion of the second tube, a third tube fitting upon and closed by the shouldered flange and also fitting within the opening of the upper partition, a perforated plate surrounding the first-named tube and resting upon the upper partition, a series of pipes connecting the space above the upper partition with the space below the lower partition, a funnel-shaped deflecting-plate secured beneath the lower partition and deflecting the water issuing from the said pipes to the center of the space beneath the lower partition, an outlet-pipe extending from said space below the lower partition through said partition and through the heating-space between the two partitions, draw-off pipes for the third tube and the space beneath the lower partition, means for admitting heat to the interior of the casing and the heating-chamber, and a vent-pipe for the heating-chamber.

In testimony whereof I affix my signature in presence of two witnesses.

CONRAD KIEREN.

Witnesses:

T. J. SCHOTT,  
P. A. KORNELY.