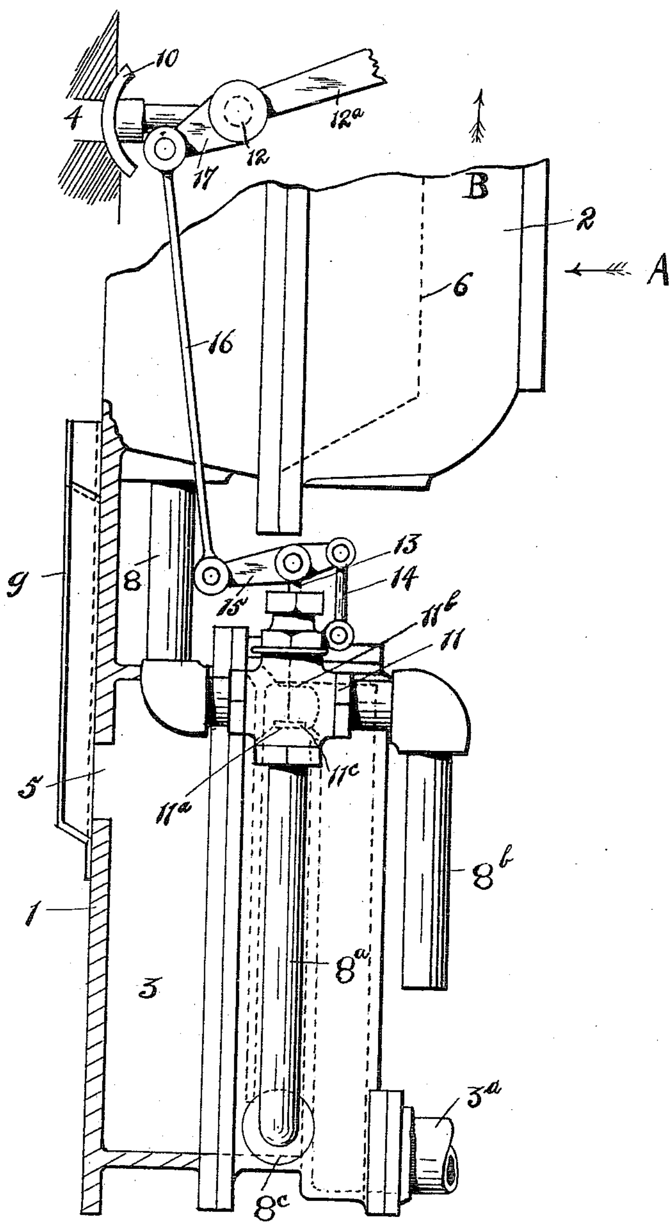
J. W. GAMBLE.

FEED WATER HEATER AND SEPARATOR.

APPLICATION FILED JAN. 18, 1910.

979,462. Patented Dec. 27, 1910.



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UNITED STATES PATENT OFFICE.

JOSEPH WILLARD GAMBLE, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO JOSEPH S. LOVERING WHARTON, WILLIAM S. HALLOWELL, AND JOHN C. JONES, DOING BUSINESS UNDER THE FIRM-NAME OF HARRISON SAFETY BOILER WORKS, OF PHILADELPHIA, PENNSYLVANIA.

FEED-WATER HEATER AND SEPARATOR.

979,462. Specification of Letters Patent. **Patented Dec. 27, 1910.**

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To all whom it may concern:

Be it known that I, JOSEPH WILLARD GAMBLE, a citizen of the United States, and resident of the city and county of Philadelphia, State of Pennsylvania, have invented certain new and useful Improvements in Feed-Water Heaters and Separators, of which the following, taken in connection with the accompanying drawings, is a concise and complete description thereof.

The invention particularly relates to certain improvements in a feed water heater construction, described and claimed in Patent No. 926,108, granted to me June 28th, 1909.

Among the objects of my invention, is to provide a complete and simple device, efficient and economical in operation, and especially to provide therein improved means for cutting the separator out of communication with the heater and overflow chamber, in order to afford the opportunity of cleaning the heater with perfect safety, free from any liability of the water or steam within the water sealed overflow chamber being forced back into the heater, which is the case when the separator chamber is in open communication with the overflow chamber by a drip connection, through which, (in the event that the inlet to the heater is closed) the pressure of steam within the separator is communicated to and exerted upon the water or steam in the overflow chamber, thus forcing the same back into the heater. For the accomplishment of this object, as well as others, I have provided, as illustrated in the accompanying drawings, and described in the following specification, a structure that I may employ in carrying out my invention. I would have it understood, however, that I am not limited to the particular device which I have illustrated as the one by which I accomplish my objects, since other equivalent means may be employed, without departing from the scope and tenor of my claims.

Referring to the accompanying sheet of drawing, —1— indicates a portion of the wall or shell of a heater.

—2— indicates the separator.

—3— indicates the overflow chamber from the heater, and —3ª— outlet from overflow chamber to waste.

The heater is provided with an exhaust inlet opening —4— from the separator —2— and an overflow outlet —5— leading to the overflow chamber —3—. Within the separator —2— is provided a ribbed baffle —6—, indicated by dotted lines. The separator also is provided with an auxiliary outlet leading to a heating system or other point of use (not shown).

—8— indicates the separator drain or drip connection provided with two outlet connections —8ª— and —8ᵇ—, connection —8ª— discharging into the water sealed leg of the overflow chamber —3— at —8ᶜ—, and the connection —8ᵇ— discharging directly to waste exterior of said overflow chamber.

—9— indicates a skimmer within the heater, down through which the overflow water is passed to waste, this being of usual and well known construction.

The exhaust inlet —4— and the separator drip outlet —8— are controlled by valves —10— and —11ᶜ—, which are connected through intermediate mechanism, and operate simultaneously, the valve —10— to control the admission of the exhaust steam to the heater —1— from the separator —2— and the valve —11ᶜ— to control and divert through one or the other outlets —8ª— and —8ᵇ—, as the case may be, the entrained impurities of such exhaust steam as may be separated therefrom in passing through the separator —2—. The manner in which these valves are constructed, mounted, and operated, is substantially in accordance with the following detailed description:

Rotatably mounted outside of the heater proper is a shaft —12— upon which is keyed, or otherwise suitably mounted, a valve —10—.

—12ª— indicates a lever or handle fast upon shaft —12—, for the purpose of operating the valves. The valve casing —11— containing the valve —11ᶜ— as explained, is arranged intermediate the drip connection —8— and its branched outlets —8ª— and —8ᵇ—. The valve —11ᶜ— is connected to the valve —10— and operates simultaneously therewith through the operation of the lever —12ª—. The valve casing —11— is constructed with two interior openings —11ª— and —11ᵇ—, governed by disk valve —11ᶜ—, all of which is suitably indicated by dotted lines. The opening, —11ª— commu-

nicates with pipe —8ª— leading into the lower portion of the overflow chamber, and opening —11ᵇ— communicates with the pipe —8ᵇ— leading directly to waste. It is apparent, however, that the pipe —8ᵇ— may be reversed upon itself, so as to form a water seal, and then discharge into an opening in the overflow chamber —3— provided therefor.

The mechanism for operating the valve —11ᶜ— may be described as follows: A valve rod —13— at the end of which is fastened the valve —11ᶜ— is slidably arranged within the valve casing —11—, the same being provided with a suitable packing, to prevent leakage, etc. A supporting link —14— fastened to the valve casing has pivoted thereto a draw lever —15— which, in turn, has connected therewith rod —13— carrying the valve —11ᶜ— as shown. Pivoted at one end of extremity of the lever —15— is a connecting rod —16— which is connected to an arm —17— mounted or keyed upon the shaft —12—. From this description, it will be apparent that when the operating arm —12ª— is actuated to open the exhaust valve —10— to admit the exhaust steam from the separator to the heater, the valve —11ᶜ— in the drip connection will be raised through the operation of the connecting linkage, so as to close opening —11ᵇ— and uncover the opening —11ª— of the valve casing —11—, thus directing and discharging the separated matter received from the separator into the water seal of overflow chamber —3—. Now, on the other hand, when the exhaust inlet valve —10— is closed, (as in the position shown) the valve —11ᶜ— will be in its lower position, closing opening —11ª— and diverting the separated matter through opening —11ᵇ— and discharging it directly to waste through pipe —8ᵇ—. In the latter position, there exists no communication between the separator and the heater, thus eliminating any liability of the water in the overflow chamber —3— being forced back into the heater through outlet opening —5— by the steam pressure created within the separator —2— communicating through the drip connection —8—, and also the steam itself, both of which would prevent cleaning the heater with safety. It will also be apparent from my arrangement as described, that at all times the overflow from the heater will be free and unobstructed, whether the exhaust inlet valve be in open or closed position.

The operation of the heater is as follows: The exhaust steam enters the separator —2— in the direction of arrow A, and impinges on the baffle —6—, (which is of well known corrugated type) where the solids and impurities are arrested and separated from the steam, the steam then passes around the baffle through suitable openings at its sides. Now supposing that the valves are in the reverse position, to that shown, the ports —4— and —11ª— being uncovered, the purified steam passes through the port —4— into the heater, where it contacts with the raw water, which, upon being admitted to the heater, is disintegrated and broken into small particles in the well known manner. The water, after abstracting the thermal units from the steam, and having its temperature thereby raised, is drawn off through a port, (not shown) for any required service. Normally the service demand for the heated water does not exceed the rate of supply at which the water is admitted to the heater, but it may sometimes happen, through derangement of the working parts, such, for instance, as if the valve controlling the raw water supply becomes inoperative, or in case of obstruction of an interior filter (when one is used) then the water level within the heater will be raised until it reaches the top of the skimmer —9—, in which event the surplus will then pass down through the overflow outlet —5— into overflow chamber —3—, and thence through outlet —3ª—. The entrained and separated matter from the separator flows down through drip connection —8— through passage —11ª— down through leg —8ª— into the water seal compartment of the overflow chamber —3—, and thence through the outlet —3ª—. Now, when it is desired to interrupt the flow of exhaust steam from the separator to the heater, to give the latter part time service, the operating lever —12ª— is given a partial rotary movement upward until the valves —10— and —11ᶜ— are closed through the operation of the intermediate connecting mechanism described. In this position, the exhaust steam passes out through the auxiliary outlet, (not shown,) in the direction of the arrow B, to a heating system or other point of use (not shown). The exhaust steam, whichever way it flows, impinges the baffle —6—, and is purified within the separator, and at all times when the separator is operating, entrained substances accumulate and should be taken care of by being passed off to waste. Therefore, in this latter position, as shown in drawing, the entrained matter leaving the separator —2— through drip connection —8— is caused to flow through opening —11ᵇ— of the valve casing —11—, and passes out through leg —8ᵇ— where it is discharged directly into an exterior waste, or, as mentioned above, may be, by reversing the pipe upon itself to form its own water seal, discharged directly into the overflow chamber —3— through a suitable opening therein provided for the purpose.

Where I have used the term "overflow chamber", I mean any overflow into and through which may be discharged the sepa-

rated waste products of the separator or surplus water from the heater, or both; and as a special type of overflow chamber, I would mention the well known form of steam trap.

Where I have used the words "combined heater and separator", I mean that both the heater and separator form part of the same structural unit.

Where I have used the words "unitary structure" I mean that the component parts, such, for instance, as the heater, separator and overflow, form part of the same structural unit, though they are not necessarily integral.

Having thus described my invention, what I claim and desire to protect by Letters Patent, is:

1. In a combined heater and separator, a drip for said separator; a valve intermediate the heater and separator; a valve in said drip, and connecting means for cooperatively moving said valves.

2. The combination of a heater having an overflow; a separator; a valve intermediate the heater and separator; a drip connection from said separator having one outlet connected to the overflow, and another outlet exterior thereof; another valve connected with said first mentioned valve and situated intermediate and controlling the two outlets; and means for operating both valves coöperatively.

3. The combination of a heater having a water sealed overflow chamber; a separator; a valve intermediate the heater and separator; an auxiliary outlet from said separator; a drip connection from said separator connecting it with the overflow chamber; an auxiliary outlet for said drip connection; and means for alternately cutting out the separator from communication with the overflow chamber, and with the auxiliary drip outlet.

4. The combination of a heater having a water sealed overflow chamber; a separator; an auxiliary outlet from said separator; a valve intermediate the heater and separator; a drip connection from said separator connected to said overflow chamber, and means for interrupting the connection between the separator and the overflow chamber when the valve intermediate the heater and separator is closed.

5. In a combined heater and separator provided with an overflow chamber; a drip connection from said separator provided with two outlets; a valve intermediate the heater and separator and controlling the flow of exhaust steam therethrough; a valve in the separator drip connection for successively controlling the drip discharge through said outlets; and means for coöperatively moving said valves.

6. The combination of a heater provided with a separation chamber and an overflow chamber, and intercommunicating passageways therebetween; a valve intermediate the heater and separating chamber, controlling the passage therethrough; an auxiliary outlet to the passage connecting the separation chamber with the overflow chamber; a valve in said passage for diverting the flow through the auxiliary outlet; and means for operating the valves in unison.

7. The combination of a heater and separator; a drip connection from said separator communicating with said heater; an auxiliary outlet from said drip connection; and means for interrupting communication between the separator and heater, said means comprising two valves, one valve situated intermediate the separator and heater, the other valve situated in the drip connection; and connecting means for coöperatively moving said valves.

8. The combination of a heater provided with a separation chamber and an overflow chamber, intercommunicating passageways therebetween; a valve intermediate the heater and separating chamber controlling the passage therethrough; an auxiliary outlet to the passage connecting the separation chamber with the overflow chamber; a valve in said passage for diverting the flow through the auxiliary outlet.

JOSEPH WILLARD GAMBLE.

In presence of—
ROBERT G. CLIFTON,
W. ATWOOD MEHARG.