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DEVICE FOR RETURNING WATER OF CONDENSATION TO BOILERS

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Fig.1

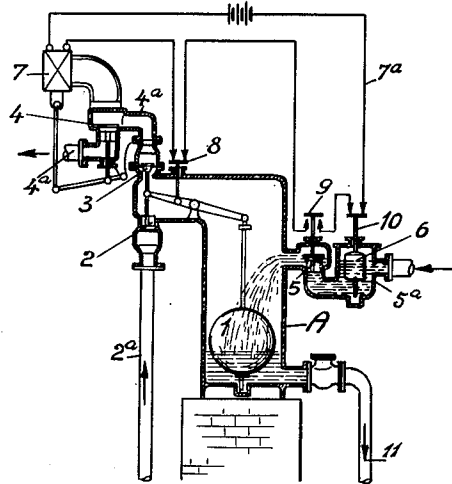
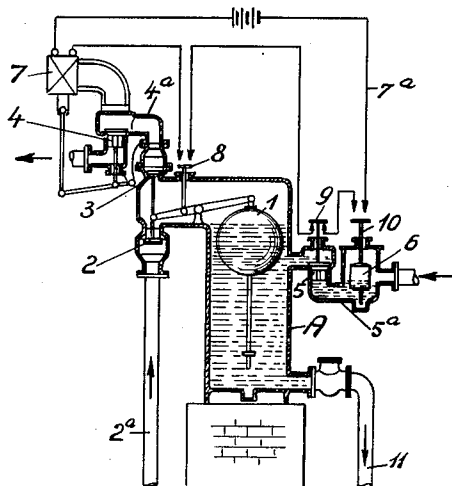


Fig.2



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DEVICE FOR RETURNING WATER OF CONDENSATION TO BOILERS.

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In apparatus for returning water of condensation to a boiler or the like steam generator, it is known to provide the steam space of the receiver with a device by means of which, for the purpose of saving steam, the communication of the said space with the atmosphere is shut off as soon as the pressure in the steam space of the receiver has decreased by a definite measure with relation to the pressure in the pipe supplying the water of condensation to the receiver. To this end, there has been arranged in the steam exhaust pipe of the receiver behind a float-controlled steam outlet valve a secondary valve which is loaded by a piston the other side of which is in communication with the supply pipe for the water of condensation. This known device has the disadvantage that the difference between the pressures in the supply pipe and the steam space of the receiver at the moment the secondary valve is closed, is not steady but varies in accordance with the pressure in the supply pipe. It is now assumed that, in consideration of the resistance of the non-return valve commonly arranged in the supply pipe, of the resistance of the pipe itself and of a sufficiently quick supply of the water of condensation, the secondary steam outlet valve should close no sooner than the pressure in the receiver has become $\frac{1}{2}$ at. smaller than the pressure in the supply pipe. It is further assumed that the sectional area of the secondary outlet valve is 10 cm^2 and the pressure in the supply pipe 10 at. The pressure in the receiver at the moment of the closing of the secondary outlet valve is then $10 - \frac{1}{2} = 9\frac{1}{2}$ at. The secondary outlet valve must therefore be loaded with $10 \cdot 9\frac{1}{2} = 95 \text{ kg}$. At a pressure of 10 at. in the supply pipe this load corresponds to a piston area of $9,5 \text{ cm}^2$. If the pressure in the supply pipe changes, say down to 1 at. the load on the piston becomes $9,5 \cdot 1 = 9,5 \text{ kg}$. In this case, the secondary outlet valve will therefore be closed when the pressure in the steam space of the receiver is $\frac{9,5}{10} = 0,95$ at.

The difference between the pressures in the supply pipe and the receiver is therefore

only 0,05 at. instead of 0.5 at. as described. It is then no longer possible for the water of condensation to flow into the receiver so that the device becomes inoperative. If, on the other hand, the piston area would be dimensioned so that, with a pressure of 1 at. in the supply pipe, the secondary outlet valve would close upon the pressure in the receiver becoming $\frac{1}{2}$ at. smaller, the secondary outlet valve would have to be loaded with $10 \cdot 0,5 = 5 \text{ kg}$. The piston area would then be $\frac{5}{1} = 5 \text{ cm}^2$. At a pressure of 10 at. in the supply pipe the secondary outlet valve would then be loaded with $10 \cdot 5 = 50 \text{ kg}$. It would therefore close upon the pressure in the receiver becoming $\frac{50}{10} = 5$ at. This means that the difference between the pressures in the supply pipe and receiver would be 5 at., so that the saving of heat striven for would be prevented.

The disadvantage set out becomes even greater if the said piston is placed into communication with the steam space of the boiler instead of with the supply pipe of the receiver, or if the piston is replaced by a weight.

Now, the invention has for its object to provide a device of the kind stated in which the operation of the secondary steam outlet valve of the receiver is not dependent upon the pressure in supply pipe for the water of condensation but only upon whether or not there is taking place a flow of water of condensation from the supply pipe to the receiver. If there is such a flow, the secondary outlet valve is closed. This may be obtained by controlling the secondary steam outlet valve through the non-return valve in the water supply pipe in such a manner that the secondary steam outlet valve is closed when the non-return valve is open.

According to the invention, the device is further provided with means for keeping the secondary steam outlet valve closed when there is no water but steam in the water supply pipe before its entrance into the receiver. This is done for the purpose of saving steam, because steam would flow through

the receiver into the atmosphere if the secondary steam outlet valve would be left open during the period the receiver is being filled. To this end, there may for instance be arranged in the supply pipe before its entrance into the receiver a float adapted to control the secondary steam outlet valve in such a manner as to close it if no water is contained in the supply pipe before its entrance into the receiver.

In a device constructed in accordance with the invention the secondary steam outlet valve will therefore only be open during the filling period if the supply pipe contains before its entrance into the receiver water which has not yet begun to flow into the receiver. During the delivery period of the device it is without any importance whether the secondary outlet valve is open or closed, since the primary outlet valve controlled by a float in the receiver is at that time closed.

The device according to the invention possesses an absolute safety of working and allows of the greatest possible saving of steam.

An embodiment of the subject-matter of the invention is illustrated, by way of example, in the accompanying drawing in which:

Fig. 1 is a vertical section, partly in elevation, of the improved device for returning water of condensation to boiler, the several parts being shown in the position they assume during the filling period.

Fig. 2 is a view similar to Fig. 1 with the parts in the position they assume during the delivery period.

Referring to the drawings in detail, A designates the receiver for the water of condensation. 1 is the closed float in the receiver A. 2 is the steam inlet valve and 3 the primary steam outlet valve, both valves being controlled by the float 1, as will be understood from the drawing. 2^a is the steam supply pipe and 4^a the steam outlet conduit. 4 is the secondary steam outlet valve which is arranged behind the valve 3 in the conduit 4^a. 5 is the non-return valve and 6 a closed float arranged in the pipe 5^a supplying the water of condensation to the receiver A. 7 designates a lifting magnet designed to actuate the secondary steam outlet valve 4. 8, 9 and 10 are breakers in the electric circuit 7^a of the lifting magnet 7. This circuit is closed at 8 when the outlet valve 3 is open, that is to say during the filling period (Fig. 1). It is closed at 9 when the non-return valve 5 rests on its seat (Fig. 2), and it is closed at 10 when the float 6 in the supply pipe 5^a is in its uppermost position (Fig. 1). If the circuit is broken, the secondary steam outlet valve 4 is closed. 11 is the delivery pipe for the water of condensation.

The operation of the device is as follows:

During the delivery period, that is during the time the water of condensation is being forced out of the receiver A through the pipe 11, the steam inlet valve 2 is open and the primary steam outlet valve 3 closed. The electric circuit 7^a of the lifting magnet 7 is closed at 9, and it is also closed at 10 if the supply pipe 5^a contains water before the entrance into the receiver A, as shown in Fig. 1. However, the circuit is broken at 8 so that the secondary steam outlet valve 4 remains closed. This arrangement is made for preventing the lifting magnet 7 from being unnecessarily energized during the delivery period. As regards the consumption of steam of the device it is inconsiderable whether the secondary outlet valve is open or closed during the delivery period, since the primary outlet valve 3, which is closed at that time by the float 1, prevents per se the escape of the steam.

At the end of the delivery period, the float 1 coming into its lowermost position closes the steam inlet valve 2 and opens the primary steam outlet valve 3. At the same time it closes the circuit-breaker 8. The circuit-breaker 9 is likewise closed because the non-return valve 5 is still in its position of rest. Now, if no water is contained in the supply pipe before the entrance into the receiver A, the circuit-breaker 10 is held open by the float 6 so that the secondary steam outlet valve 4 remains closed. No steam can therefore escape from the receiver. If, however, the supply pipe 5^a contains water before the receiver A, the breaker 10 and therefore the whole circuit 7^a of the lifting magnet 7 are closed. The lifting magnet lifts the secondary steam outlet valve 4 from its seat and the steam may escape from the receiver A until the non-return valve 5 opens, thereby interrupting the circuit 7^a at 9 so that the secondary steam outlet valve 4 is again closed (Fig. 1). If the flow of water into the receiver A ceases before same is filled, the non-return valve 5 returns into its position of rest. The breaker 9 is closed so that the secondary steam outlet valve 4 is opened again when or as soon as the supply pipe 5^a contains before the receiver a sufficient quantity of water for closing also the breaker 10 through the float 6.

When the receiver is filled, the float 1 coming into its uppermost position closes the primary steam outlet valve 3 and opens the steam inlet valve 2. At the same time the breaker 8 is opened so the secondary steam outlet valve 4 closes.

Having thus described my invention, what I claim as new and desire to secure by Letters-Patent, is:—

1. A device for returning water of condensation to boiler, comprising a receiver, a conduit for supplying water of condensation to the receiver, a steam inlet valve, a steam

exhaust conduit, a primary steam outlet valve in this exhaust conduit, a float in the receiver for controlling both the steam inlet valve and the primary steam outlet valve, a
 5 secondary steam outlet valve in the steam exhaust conduit behind the primary steam outlet valve, and means for closing this secondary steam outlet valve as soon as the
 10 flow of the water of condensation from the supply pipe into the receiver has begun.

2. A device for returning water of condensation to boiler, comprising a receiver, a conduit for supplying water of condensation to the receiver, a steam inlet valve, a steam
 15 exhaust conduit, a primary steam outlet valve in this exhaust conduit, a float in the receiver for controlling both the steam inlet valve and the primary steam outlet valve, a secondary steam outlet valve in the steam
 20 exhaust conduit behind the primary steam outlet valve, a non-return valve in the water supply conduit, and means between this non-return valve and the secondary steam outlet valve for controlling the last-said
 25 valve so as to close it when the non-return valve is open.

3. A device for returning water of condensation to boiler, comprising a receiver, a conduit for supplying water of condensation to the receiver, a steam inlet valve, a
 30 steam exhaust conduit, a primary steam outlet valve in this exhaust conduit, a float in the receiver for controlling both the steam inlet valve and the primary steam outlet valve, a secondary steam outlet valve in the steam exhaust conduit behind the primary
 35 steam outlet valve, and means for closing the secondary steam outlet valve if no water is contained in the supply pipe before the entrance into the receiver.
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4. A device for returning water of condensation to boiler, comprising a receiver, a conduit for supplying water of condensation to the receiver, a steam inlet valve, a steam exhaust conduit, a primary steam outlet valve
 45 in this exhaust conduit, a float in the receiver for controlling both the steam inlet valve and the primary steam outlet valve, a secondary steam outlet valve in the steam exhaust conduit behind the primary steam outlet valve, means for closing this secondary
 50 steam outlet valve as soon as the flow of the water of condensation from the supply pipe into the receiver has begun, and means for closing the secondary steam outlet valve if no water is contained in the supply pipe before the entrance into the receiver.
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5. A device for returning water of condensation to boiler, comprising a receiver, a conduit for supplying water of condensation to the receiver, a steam inlet valve, a
 60 steam exhaust conduit, a primary steam outlet valve in this exhaust conduit, a float in the receiver for controlling both the steam inlet valve and the primary steam outlet
 65 inlet valve and the primary steam outlet

valve, a secondary steam outlet valve in the steam exhaust conduit behind the primary steam outlet valve, means for closing this secondary steam outlet valve as soon as the
 70 flow of the water of condensation from the supply pipe into the receiver has begun, a float in the water supply pipe, and means between this float and the secondary steam outlet valve for closing this valve when the float is in its lowermost position.
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6. A device for returning water of condensation to boiler, comprising a receiver, a water supply conduit, a steam inlet valve, a steam exhaust conduit, a primary steam outlet valve in this exhaust conduit, a float
 80 in the receiver for controlling the steam inlet valve and the primary steam outlet valve, a secondary steam outlet valve in the exhaust conduit behind the primary outlet valve, a non-return valve in the water supply conduit, means between the secondary steam outlet valve and the non-return valve and operable by the latter for closing the
 85 secondary steam outlet valve when the non-return valve is open, and a float in the water supply pipe adapted to close the secondary steam outlet water when the float is in its lowermost position.
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7. A device for returning water of condensation to boiler, comprising a receiver, a
 95 conduit for supplying water of condensation to the receiver, a steam inlet valve, a steam exhaust conduit containing a primary and a secondary steam outlet valve arranged one behind the other, a float in the receiver for controlling the steam inlet valve and the primary steam outlet valve, a non-return valve in the water supply conduit, a float in the water supply conduit, a lifting magnet operatively connected with the secondary steam outlet valve for opening the
 100 latter when the electric circuit of the magnet is closed and closing it when the circuit is broken, a breaker in the circuit of the lifting magnet adapted to be opened by the said non-return valve when same is open and to be closed by it when same is closed, and another breaker in the said circuit adapted to be opened and closed by the float in the water supply conduit according to
 105 whether same is in its upper or lowermost position.
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8. A device for returning water of condensation to boiler, comprising a receiver, a conduit for supplying water of condensation to the receiver, a steam inlet valve, a steam exhaust conduit containing a primary and a secondary steam outlet valve arranged one behind the other, a float in the receiver for controlling the steam inlet valve
 115 and the primary steam outlet valve, a non-return valve in the water supply conduit, a float in the water supply conduit, a lifting magnet operatively connected with the secondary steam outlet valve for opening the
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 125
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latter when the electric circuit of the magnet is closed and closing it when the circuit is broken, a breaker in the circuit of the lifting magnet adapted to be opened by the
5 said non-return valve when same is open and to be closed by it when same is closed, another breaker in the said circuit adapted to be opened and closed by the float in the water supply conduit according to whether

same is in its upper or lowermost position, 10
and a third breaker in the said circuit and means for opening this third breaker when the primary steam outlet valve is closed and for closing it when the primary steam outlet
15 valve is open.

In testimony whereof I have signed my name to this specification.

DR. HUBERT KRANTZ.