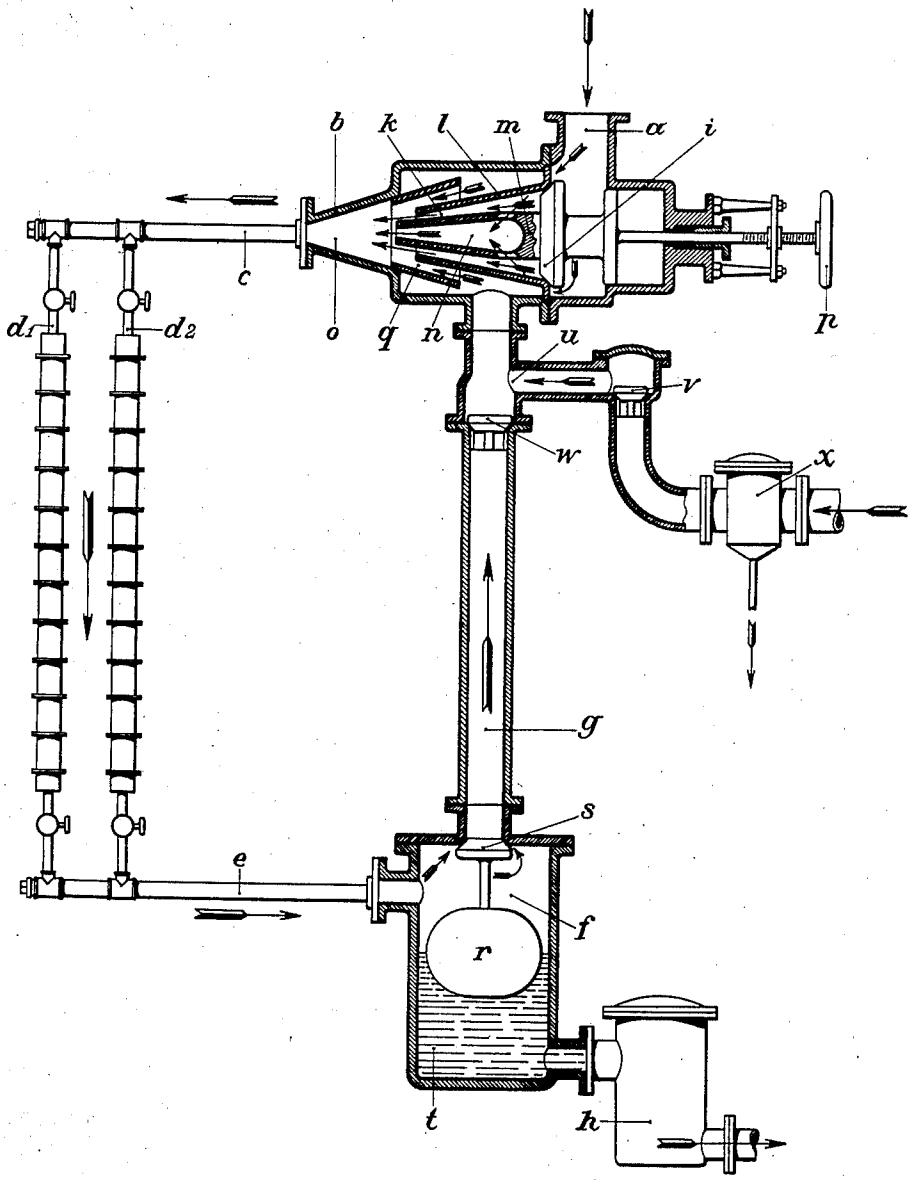
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STEAM HEATING PLANT

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STEAM HEATING PLANT

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My invention relates to a steam heating plant combined with a steam draining device provided with an automatic suction pipe closure, the whole being intended for steam-heating plants in which the steam circulates continuously and into which low pressure steam, for instance, exhaust-steam, is sucked from a pipe specially provided for this purpose.

It is known that the consumption of steam in a heating plant is different at different times according to the number of the radiators or the size of the radiating surfaces supplied with the steam, and in consequence thereof also the amount of steam passing through the regulating device varies accordingly. It is, therefore, in order to attain a continually, as well as a most effective uniform sucking action, necessary to alter or adjust correspondingly the free sectional area of the nozzles.

With jet devices in which the free sectional area of the nozzles can be altered or adjusted by means of a movable nozzle core this core impairs the sucking action because it presents to the steam flowing through the nozzle a certain resistance by which the velocity of the steam is reduced. The object of the present invention is to obviate that drawback, and I attain this object by providing the nozzle core with a bore constituting another nozzle, an inner nozzle having no nozzle core. Hereby it is rendered possible that when heating surfaces are disconnected from the steam, and the amount of steam passing through the nozzle is, therefore, reduced, the steam can flow freely and unimpededly through said bore or inner nozzle. The greatest possible sucking action is now maintained which is indispensably requisite with heating plants with circulating steam in which the returning steam is re-introduced into the circuit by the sucking action of the jet-nozzle.

When a large heating surface is to be connected up to the steam supply it is, by the present invention, rendered possible to cause a larger amount of steam to flow through the double-nozzle formed by the bore mentioned in the preceding paragraph than can flow through a nozzle provided with a solid nozzle core.

In order to attain with heating plants with circulating steam the most favorable heating effect and to maintain the good efficiency of the jet-nozzle it is indispensably requisite that the returning steam is free from condensed steam when re-entering the heating pipes. For this purpose the improved device forming the subject matter of this invention is provided with a steam draining device located in the suction channel and combined with an automatic device closing this channel when a comparatively large amount of condensed steam collects in said steam-draining device, so that no wet steam or condensed steam can find access to the heating pipes through the jet apparatus. Steam can then be sucked into these pipes only after the condensed steam has been discharged and the steam present in the draining device is again dry.

It is, from economical reasons, advantageous to discharge into the heating plant pipes, and to utilize therein, the entire amount of the exhaust-steam of steam engines, steam hammers, steam compressors and the like. There is, however, the difficulty to overcome to introduce this exhaust-steam into the heating plant pipes (which are fed with live steam) in such a manner that no back-surge occurs which would diminish the efficiency of the steam-engine or the like. From this reason the arriving exhaust steam is introduced into the suction channel, and the jet nozzle sucks in said steam also, whereby not only back-surge is obviated, but, besides, a reduced pressure in the exhaust-steam pipe is obtained which produces a saving of steam in the steam-engine or the like.

The invention is illustrated diagrammatically and by way of example on the accompanying drawing on which is shown a vertical, as well as axial section through an arrangement and combination of parts designed according to this invention.

On the drawing, *a* denotes the branch where the live steam enters into the heating plant; this steam flows through the jet and

regulating device b in the direction of the arrows and passes then through the pipe c into the pipes d^1 and d^2 by which the steam is distributed onto the radiators. The steam then passes through the pipe e into the draining device f from which the drained steam is conducted back into the circuit through the pipe g, the valve w and the passage q, whereas the water of condensation is removed with the aid of, and through, the water separator h.

The steam-jet and regulating device is provided with a valve i which can be opened and closed or adjusted by a hand wheel p. When the valve is open the steam flows through the annular conical passage l formed by the outer nozzle k and the hollow nozzle core m, as well as through this core which is provided with lateral apertures through which a part of the steam can enter into the core chamber. The currents of steam from the passage l and the chamber n meet in the space o where they exert a sucking action upon the steam flowing through the pipe g, this steam becoming now mixed with said currents and this mixture passing then to the radiators.

The free sectional areas of the nozzles are so chosen that the amounts of steam passing through them is sufficiently large to attain a good heating effect, and that their sucking action is sufficiently great to carry the steam from the pipe g along with them.

As, however, the heating surface is not always fully utilized, for instance if any of the radiators are disconnected from the steam supply, the amount of the supplied steam must be reduced correspondingly by diminishing the free sectional area of the nozzle in such a measure that also afterwards the most advantageous suction effect is obtained. This is rendered possible by the double nozzle shown. The nozzle member k is firmly connected with the valve i and can, therefore, be moved axially with it. When the valve is fully open and the free sectional area of the annular passage l is the largest, the full amount of the steam can flow therethrough, but when the valve is less open and the free sectional area of said passage, therefore, correspondingly reduced, the smaller amount of steam will pass not only through the said annular passage, but through the chamber n also, whereby the suction effect of the steam with respect to the tube g is maintained. If only an ordinary or single nozzle is provided, as usual, the suction effect is greatly impaired when the amount of steam becomes smaller. Another effect of the double nozzle consists in an increase of speed of the steam which is also very useful for the sucking action, so that the efficiency of the heating plant is considerably improved.

The steam draining vessel f is provided with a float r connected with a valve s in such a manner that the flow of the steam is interrupted when the water of condensation t has reached a certain predetermined level, whereas the valve is reopened automatically when the level of the water of condensation sinks owing to a part of it having escaped through the vessel h. If this water discharging vessel fails or if the steam arrives in the vessel f in a very wet state, the level of the water of condensation t will rise, the float will close the tube g, and no steam from the vessel f will be sucked through the tube g into the nozzles and through it, and this state will continue until such an amount of the water t has been withdrawn that in the meantime the steam has been changed from wet steam to practically dry steam.

The tube u terminating into the pipe g above the valve w is the exhaust-tube of a steam-engine and provided with a non-return valve v preventing the exhaust steam from flowing in the reverse direction when the engine has come to a standstill. x denotes a water-and oil-separator preventing the exhaust-steam from carrying water of condensation into the nozzle and from soiling it and the other parts of the heating steam circuit with oil. The object of the valve w is to prevent the vessels f and h from being affected by eventual irregularities in the amounts of the steam exhausted from the respective engine into and through the tube u.

The inner cone m is so adjusted by means of the hand-wheel p that a state of equilibrium is obtained and maintained in the circuit formed by the radiators, the vessel f, the tube g, the double-nozzle, and the pipes c and d^1 d^2. In the state of equilibrium the valves v and w are opened to the proper extent by the sucking action of the steam flowing through the double-nozzle, the steam that has passed said valves has no tendency to reverse its direction, the steam engine runs with very slight back-pressure, and the exhaust steam is utilized fully in the circuit of the heating plant.

I claim:

1. A steam heating plant comprising, in combination, a live steam conduit; a mixing device communicating with said conduit; a distributing conduit connected to said mixing device; radiators connected to said distributing conduit; and a collecting conduit receiving the waste steam from said radiators and opening into said mixing device; said mixing device including a double nozzle comprising a fixed outer nozzle shell, and a hollow nozzle core within said shell, the interior of the core and the space between the core and shell being in communication, said live steam conduit being arranged to feed steam into said space and into the interior

of said core, and a casing surrounding said shell and communicating with said distributing conduit, said collecting conduit opening into the space between said casing and shell; said nozzle core and shell being movable relatively to each other.

2. The combination as set forth in claim 1, and a controlling and closure member rigidly connected to the movable part of said double nozzle and arranged to vary or shut off the feed of live steam to the space between the nozzle shell and core.

3. The combination as set forth in claim 1, wherein said casing is of tapered form and forms an annular nozzle with the nozzle shell.

4. The combination as set forth in claim 1, and a water separator located in the collecting conduit, and a valve controlled by the height of the water in said separator for controlling the feed of steam from the collecting conduit to said mixing device.

5. The combination as set forth in claim 1, and a conduit connected to said collecting conduit and adapted to feed low pressure steam thereinto.

6. In a steam heating plant, in combination, a steam distributing conduit, a nozzle opening axially into said conduit and having its discharge end spaced from the walls of said conduit, a conduit feeding live steam under high pressure to said nozzle to reduce the pressure in the space about the discharge end of the nozzle, a low pressure steam conduit communicating with said space so that a suction effect is exerted upon the low pressure steam conduit when said live steam passes through the nozzle, and means for varying the effective nozzle outflow area.

7. The combination as set forth in claim 6 and a water separator located in said low pressure steam conduit.

In testimony whereof I affix my signature.

ADOLF MIERSBE.