H. McNULTA.

STEAM REGENERATOR.

APPLICATION FILED MAY 1, 1911.

1,097,983.

Patented May 26, 1914.

2 SHEETS—SHEET 1.

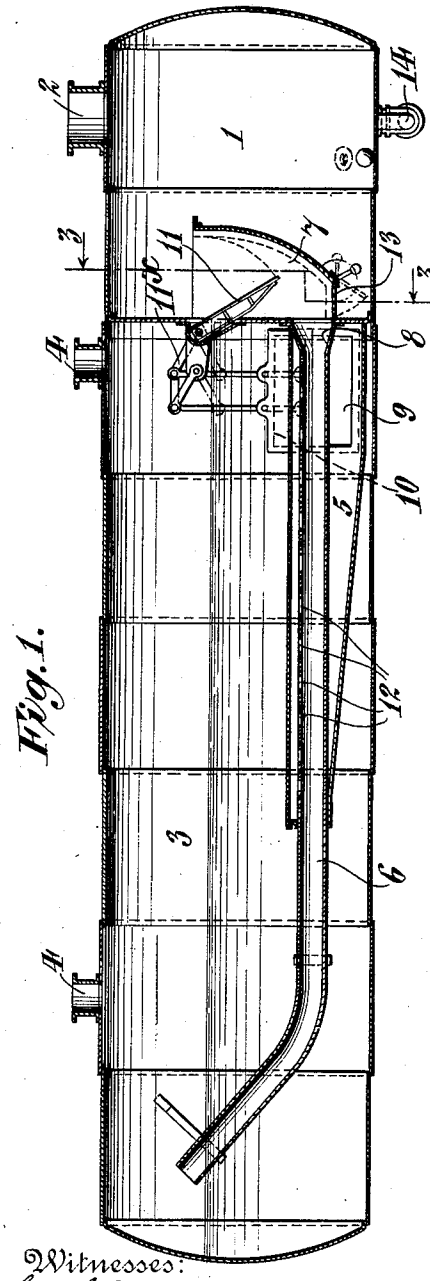


Fig. 1.

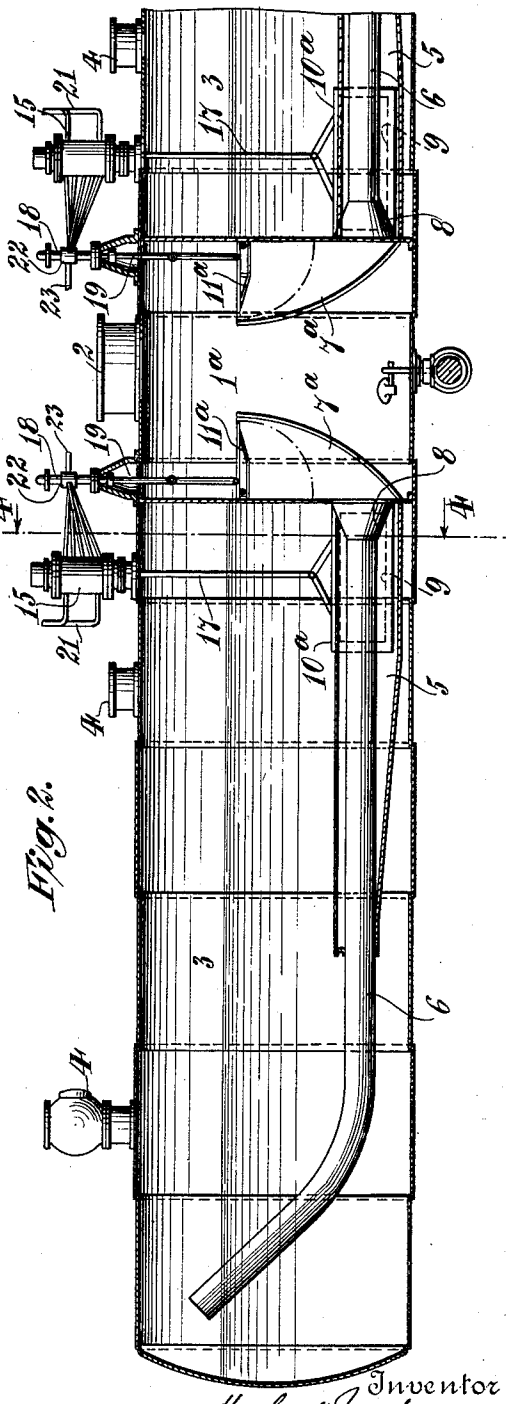


Fig. 2.

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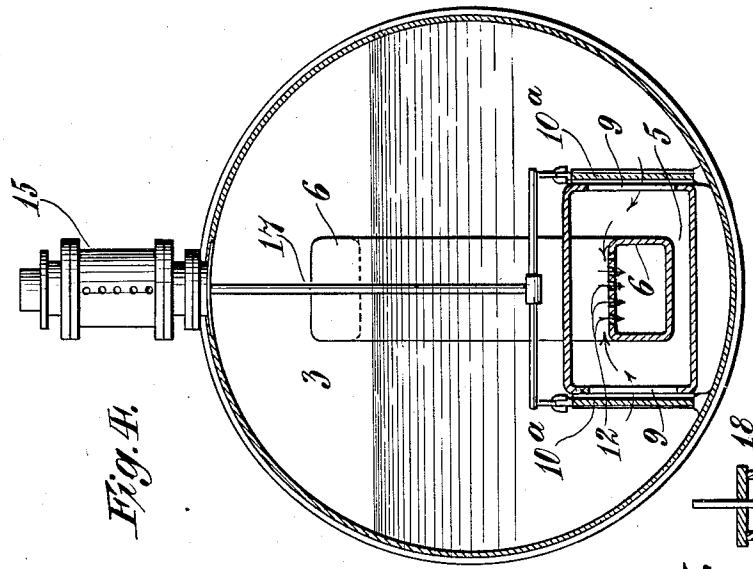


Fig. 4.

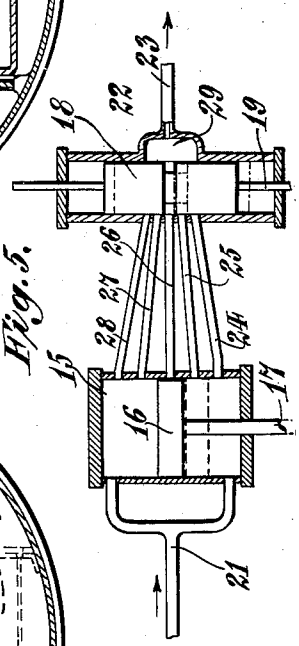


Fig. 5.

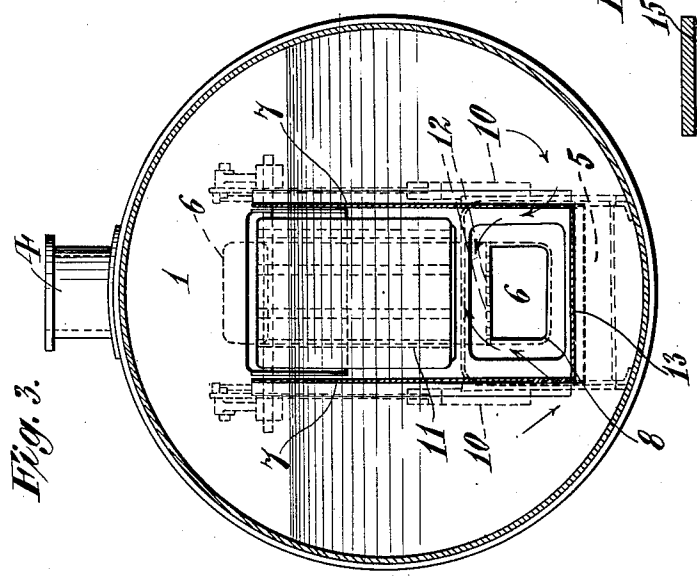


Fig. 3.

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STEAM-REGENERATOR.

1,097,983. Specification of Letters Patent. **Patented May 26, 1914.**

Application filed May 1, 1911. Serial No. 624,364.

To all whom it may concern:

Be it known that I, HERBERT McNULTA, a citizen of the United States, and a resident of the city of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Steam-Regenerators, of which the following is a specification.

The invention relates to apparatus for use in the regeneration of steam which is supplied thereto intermittently and often in variable quantities and which apparatus is designed to deliver steam therefrom at any time regardless as to whether or not steam is being supplied to the apparatus at the particular instant of withdrawal.

The invention furthermore particularly relates to a regenerator in which water in finely divided form is delivered into the path of flowing steam and carried to a place where it can be collected into a large body of regenerating liquid so that a comparatively large quantity of steam can be given off from the liquid when the supply coming into the regenerating apparatus is less than the amount of steam which is being withdrawn from the regenerating apparatus.

As showing specific embodiments of my invention reference is made to the drawings, in which—

Figure 1 shows in section one form of the regenerating apparatus. Fig. 2 shows another form. Fig. 3 is a vertical sectional view taken on the line 3—3 of Fig. 1 looking in the direction of the arrows. Fig. 4 is a vertical sectional view taken on the line 4—4 of Fig. 2 looking in the direction of the arrows, and Fig. 5 shows the manner in which the piston for regulating the flow of water in the regenerating chamber can be controlled by a piston valve that is operatively connected to a movable vane or valve member located in the path of the incoming steam.

Throughout the specification and in the drawings the same reference character refers to the same part.

In Fig. 1 there is illustrated a regenerating apparatus comprising a steam receiving chamber 1 provided at the upper portion with a steam inlet 2, a liquid holding or regenerating chamber 3, provided at the upper portion with steam outlets 4, a spray box 5, and an eduction pipe 6 passing through the spray box and connecting the steam receiving chamber with the upper interior portion of the liquid holding chamber. There is located in the steam receiving chamber 1 a funnel shaped member 7 leading to the funnel shaped end 8 of the eduction pipe 6 and these two funnel shaped portions serve as an enlarged end for the eduction pipe and through these the incoming steam must pass before traveling along said pipe. The spray box 5 is provided with an opening 9 communicating with the interior of the regenerating or liquid holding chamber and this opening is controlled by a valve 10. Located within the funnel shaped member 7 is a movable vane or valve member 11 so mounted that its position is dependent upon the amount of incoming steam passing through the funnel member 7 on its way through the eduction pipe. It will be observed that there is an arm and link connection 11^x between the movable member 11 and the valve 10 whereby as the former is caused to move by the steam flowing through the funnel shaped portion the valve 10 will be positioned so that the amount of liquid flowing into the interior of the spray box and from thence into the eduction pipe by means of the numerous openings 12 in the walls thereof will be dependent upon the amount of steam passing through the eduction pipe at that time. It will also be observed that the openings 12 are comparatively small and they therefore deliver liquid in a finely divided form into the steam flowing along said pipe and the consequence of this is that the steam and water are intimately mixed whereby the water will absorb heat from the steam and will be carried by the steam up through the pipe where it can again mingle with the water in the regenerating or liquid holding chamber so as to give off steam when the pressure in said chamber is decreased by the withdrawal of steam therefrom in excess of that being supplied. In the form shown in Fig. 1 there is also provided at the lower end of the funnel shaped portion 7 a movable bottom or drip member 13 which permits any liquid that may collect in the bottom thereof to be drained into the lower part of the steam receiving chamber from which it can be removed by an overflow or drain 14.

In the form illustrated in Figs. 2 and 4

there is disclosed liquid holding or regenerating chambers 3, 3; spray box 5, 5; eduction pipes 6, 6 and the funnel shaped portions 7^a, 7^a leading thereto. These parts are all shown in duplicate and are all operatively connected in substantially the manner above described in relation to Figs. 1 and 3 to a common receiving chamber 1^a. In this form however the movable bottom at the lower portion of the funnel shaped member 7^a has been omitted and instead of utilizing the arm and link connection between the valve 10^a between the regenerating or liquid holding chamber and the spray box, and the movable member or valve 11^a, there is utilized a cylinder 15 having therein a piston 16 connected by means of a rod 17 to the valve 10^a and the position of the piston 16 in the cylinder is dependent upon the position of a piston valve 18 which is operatively connected to the movable vane 11^a by rod 19. From an inspection of Figs. 2 and 5 it will be seen that the steam cylinder 15 is connected at its opposite ends to a live steam supply 21 and that the piston valve 18 is located in a casing 22 open to the atmosphere by pipe 23 and connected to the cylinder 15 by a series of pipes 24, 25, 26, 27 and 28, leading from different longitudinal sections in the cylinder to different longitudinal sections along the casing. Now as the cylinder 15 is supplied at its opposite ends with live steam through the pipes 21 it will be apparent that when the piston valve 18 is caused to move from the dotted to the full line position shown in Fig. 5 by the movable vane 11^a a differential pressure on opposite sides of the piston 16 shown in dotted lines will be effected since the pipes 26 and 23 and the cut-out portion 29 of the valve 18 form a direct exhaust and this differential pressure will cause the piston 16 to move to the position shown in full where it can close the opening leading to the pipe 26 and when this opening is closed it will be apparent that the pressure on opposite sides of the piston 16 will be equalized and the piston will stop in this position. By the construction just described the position of the valve controlling the opening between the regenerating chamber and the spray box can be made dependent upon the position of the movable member 11^a controlled by the flow of steam passing thereby.

It will also be apparent that the funnel shaped portions 7 and 7^a, the eduction pipe and the spray box are all located within the cylindrical wall which defines the steam receiving chamber and the liquid holding chamber and one phase of the invention relates to this structure which is exceedingly simple and compact but all phases of the invention are not necessarily limited to this form.

It is obvious that the structures shown in Figs. 1 and 2 might be utilized in a regenerator having one or two or more liquid holding chambers and also that various other forms and modifications may be made without departing from the spirit and scope of the invention.

I claim as my invention:—

1. A regenerating apparatus comprising in combination a liquid holding chamber provided with a steam outlet, a steam receiving chamber, an eduction pipe leading from the receiving chamber to the upper portion of the liquid holding chamber, a spray box within the liquid holding chamber and having an opening in its walls through which water can pass from the holding chamber into said spray box and means controlled by the steam passing through the eduction pipe to regulate the flow of liquid through said openings, there being communicating openings leading from the interior of said spray box to the interior of the eduction pipe.

2. In a regenerating apparatus the combination of a steam receiving chamber, a liquid holding chamber, an eduction pipe leading from the interior of the first mentioned chamber and terminating within the interior portion of the holding chamber, a spray box within the walls of the holding chamber which spray box has an opening in the walls thereof through which liquid in the holding chamber can pass to the spray box, valve means for regulating the flow of liquid therethrough, and communicating ducts leading from the interior of the spray box into the eduction pipe whereby liquid can be sprayed into the latter.

3. The combination of a liquid holding chamber having within the shell thereof a spray box, an eduction pipe within said shell having communicating openings with the interior of the spray box and finally terminating in the upper portion of the liquid holding chamber, the liquid holding chamber and the spray box having a valve controlled opening therebetween and the spray box and eduction pipe being arranged so that the liquid passes to the spray box and thence to the pipe.

4. In a regenerating apparatus the combination of a liquid holding chamber having a steam outlet leading from the upper portion, a steam receiving chamber exterior of the liquid holding chamber, an eduction pipe with a funnel shaped inlet, said pipe leading from the interior of the steam receiving chamber, terminating within the liquid holding chamber and projecting above the liquid in the last mentioned chamber and spraying means for delivering liquid from the liquid holding chamber to the interior of the eduction pipe.

5. In a regenerating apparatus the combination of a liquid holding chamber, an eduction pipe running along the lower interior portion thereof and terminating with-

in the chamber, there being communicating openings in the walls of the pipe through which chamber liquid can pass to the interior of the pipe, a movable member for regulating the area of the opening through the inlet end of the eduction pipe and means controlled by the movement of said member for regulating the amount of liquid delivered into the eduction pipe.

6. The combination in a horizontal cylindrical shell of a liquid holding chamber, a steam receiving chamber and a spray box, an eduction pipe leading from the steam receiving chamber and terminating in the upper portion of the liquid holding chamber, a valve controlled passage-way for liquid provided with a valve between the liquid holding chamber and the spray box and openings between the spray box and the interior of the eduction pipe for delivering liquid from the interior of the chamber to the interior of the pipe, a movable member whose movement is dependent upon the amount of incoming steam said movable member being coöperatively related to the valve means for regulating the area through liquid passage-way means whereby the amount of liquid delivered to the spray box is dependent upon the amount of incoming steam.

7. In a regenerating apparatus the combination of a liquid holding chamber having a steam outlet in its upper portion, a pipe in the lower interior portion of the chamber terminating within said chamber, said pipe provided with openings in and along its walls through which openings water in the lower portion of the chamber can pass to the interior of the pipe when steam is flowing through the pipe and an automatically operated means which diminishes the flow of liquid from the holding chamber to the pipe when the flow of steam through the pipe decreases.

8. The combination of a horizontal cylindrical shell having a vertical transverse portion separating a steam receiving chamber and liquid holding chamber, a pipe with a funnel shaped inlet leading from the steam chamber through the lower portion of the liquid holding chamber and terminating in the upper portion of the liquid holding chamber, openings in the wall of the pipe through which water from the lower portion of the chamber can pass into the pipe, a movable member in the enlarged inlet end of the pipe the movement of which is controlled by the amount of incoming steam passing through the pipe and means controlled by the movement of said member to regulate the amount of chamber liquid delivered to the interior of said pipe.

9. A steam regenerating apparatus comprising in combination therein a shell provided with a steam receiving chamber at the central portion thereof, liquid holding chambers at the end portions thereof and an eduction pipe leading from the interior of the receiving chamber to the interior of each of the liquid holding chambers, at least one portion of each of the eduction pipes rising above the level of the liquid in the liquid holding chamber which it enters.

This specification signed and witnessed this 28th day of April A. D., 1911.

HERBERT McNULTA.

Signed in the presence of—

EDWIN A. PACKARD,

G. McGRANN.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."