F. HODGKINSON.

REGENERATOR.

APPLICATION FILED NOV. 11, 1909.

1,037,765. Patented Sept. 3, 1912.

Fig. 1.

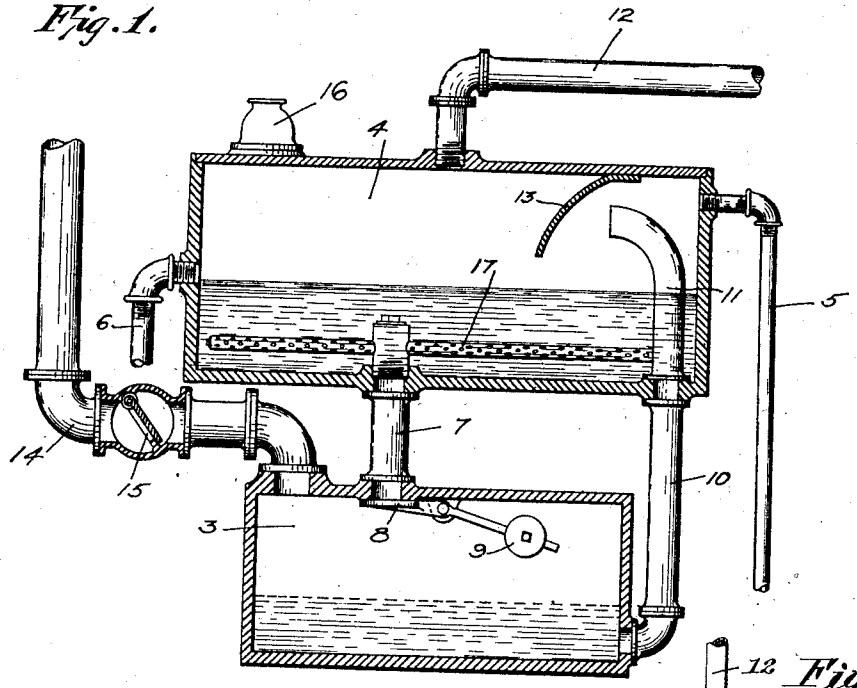


Fig. 2.

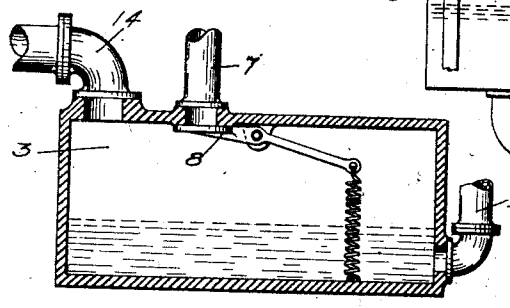
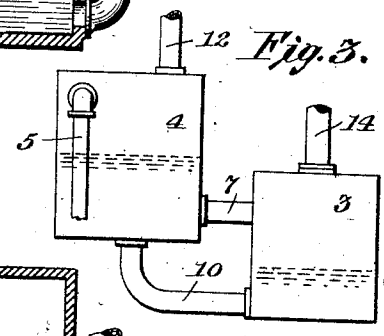


Fig. 3.



Witnesses;

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UNITED STATES PATENT OFFICE.

FRANCIS HODGKINSON, OF EDGEWOOD PARK, PENNSYLVANIA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE COLONIAL TRUST COMPANY, TRUSTEE, OF PITTSBURGH, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

REGENERATOR.

1,037,765. Specification of Letters Patent. Patented Sept. 3 1912.

Application filed November 11, 1909. Serial No. 527,502.

To all whom it may concern:

Be it known that I, FRANCIS HODGKINSON, a subject of the King of Great Britain and Ireland, and a resident of Edgewood Park, in the county of Allegheny and State of Pennsylvania, have made a new and useful Invention in Regenerators, of which the following is a specification.

This invention relates to steam regenerators and more particularly to that type of regenerator in which the steam and the heat storing liquid are mingled in the regenerator chambers so that the steam is condensed and heat is imparted to the liquid when the pressure builds up in the regenerator and the liquid is evaporated to supply the demand for steam when the pressure falls in the regenerator.

An object of this invention, is to produce a regenerator in which simple means are employed for intermingling or intimately mixing the steam and the liquid employed as a heat storing agent. This and other objects I attain in a regenerator embodying the features herein described and illustrated.

In the drawings accompanying this application and forming a part thereof, Figure 1 is a sectional elevation of a regenerator embodying my invention; Fig. 2 is a partial sectional view of a portion of the apparatus shown in Fig. 1 and shows an alternative arrangement for one of the details of the apparatus, and Fig. 3 is an elevational view of a slightly modified form of my invention.

The apparatus disclosed as embodying my invention is adapted to periodically receive steam or to receive varying amounts of steam in a continuous stream. The steam in entering the apparatus is brought into intimate contact with the heat storing liquid (preferably water) and is caused to carry the water with it as it traverses the passages of the apparatus. In addition to this the circulation of water throughout the apparatus is accomplished by means of variations in steam pressure in the different parts of the apparatus.

Referring to the drawings, the regenerator consists of a receiving chamber 3, to which steam is delivered, a delivery chamber 4 from which steam is discharged and a water and steam circulatory system which connects the two chambers. For the sake of clearness I have shown the chamber 3 located below the chamber 4. It is obvious, however, that the chamber 3 may be located to one side of the chamber 4, in which event the water level in the chamber 3 would be normally below the water level in the chamber 4.

The heat storing liquid, is delivered to the chamber 4 through a pipe 5 and is prevented from exceeding a predetermined level in this chamber by an overflow pipe 6. The delivery of water through the pipe 5 is usually controlled by a float valve (not shown) which maintains the water at a determined level in the chamber. A water delivery pipe 7 communicates with the bottom of the chamber 4 and with the top of the chamber 3 and is adapted to be closed at its lower end by a valve 8 located in the chamber 3 and provided with a closing weight 9. The valve 8 operates in response to variations of pressure in the chamber 3 relative to the pressure in the chamber 4.

A pipe 10 communicates with the chamber 3 near the bottom of the chamber and with the chamber 4. A pipe 11 is located within the chamber 4 and is so situated that the pipe 10 communicates through it with the upper portion of the chamber 4. A steam delivery pipe 12 communicates with the upper portion of the chamber 4 and is separated from the pipe 11 by means of a baffle plate or other baffling means 13. Steam is delivered to the chamber 3 through piping 14 which enters the upper portion of the chamber and is preferably located on the opposite side of the chamber from the inlet to the piping 10. A check valve 15 is provided in the piping 14 and opens against the pressure in the chamber 3. A safety or blow off valve 16 is mounted on the chamber 4 and communicates with the upper portion of the chamber.

The operation of the apparatus is as follows: When steam is admitted to the receiving chamber 3 the pressure in that chamber builds up until it is sufficient to lift the water contained in the chamber to the delivery chamber 4 through the piping 10 and 11. The pressure in the chamber 3 will be maintained at a pressure corresponding to the weight of the column of water in the piping 10 and 11 plus the pressure in the chamber

4 as long as the continuity of the column of water in the piping 10 and 11 is maintained. When the water level in the chamber 3 is decreased to such an extent that the continuity of the column of water in the piping 10 and 11 is broken, the pressure in the chamber 3 will drop, because the steam has a more or less unrestricted passage through the piping 10 and 11 into the chamber 4. The steam in traversing the piping 10 and 11, carries water from the chamber 3 with it and delivers it to the chamber 4. The pressure in the chamber 3 drops as the water level in that chamber falls, because the steam has a freer passage through the piping to the chamber 4. At some determined pressure in the chamber 3, relative to the pressure in the chamber 4, the valve 8 is opened by the weight of the column of water above it and the pressure in the chamber 4 and a stream of water is delivered from the chamber 4 to the chamber 3. The amount of the valve opening is dependent on the difference in pressure between the chambers 3 and 4 and will vary with the variations of pressure. As the pressure drops in the chamber 3, the valve will increase the flow of water to that chamber, and as the pressure rises in the chamber 3 relative to the pressure in the chamber 4 the valve will operate to decrease the flow of water. The result is that the amount of water carried by the steam traversing the passages 10 and 11, is proportioned to the flow of steam through the chamber 3.

The baffle 13 is provided over the delivery end of the pipe 11 so that the steam discharged from the piping 12 is comparatively dry and is not mixed with the water and wet steam delivered by the piping 11. This baffle is so arranged that it deflects the flow of steam and water downwardly into the body of water contained in the chamber 4.

A perforated branch pipe 17 communicates with the pipe 7 and is so arranged that water delivered from the chamber 4 to the chamber 3 is taken from all parts of the body of water contained in the chamber 4.

In Fig. 2 I have shown the valve 8 provided with an operating spring adapted to perform the function of the weight 9 shown in Fig. 1.

Having now described my invention, what I claim is:

1. In a regenerator, a receiving chamber, a delivery chamber, a steam delivery port communicating with the receiving and delivery chambers, a steam discharge port communicating with said delivery chamber, a water circulatory system between said chambers and a pressure responsive valve for controlling the flow of water from one chamber to another.

2. In a regenerator, a receiving chamber and a delivery chamber, a steam delivery pipe communicating with said receiving chamber, water supply pipe and a steam discharge pipe communicating with said delivery chamber, a passage communicating with the lower part of said receiving chamber and the upper part of said delivery chamber for discharging steam and water from said receiving to said delivery chamber and a pressure actuated valve for controlling the delivery of water to said receiving chamber.

3. In a regenerator, a receiving chamber, a delivery chamber, a connection between them, a delivery pipe communicating with said receiving chamber, and a discharge pipe communicating with said delivery chamber and a pressure actuated valve responsive to pressure within said receiving chamber for controlling the flow of water from said delivery to said receiving chamber.

4. In a regenerator, a receiving and a delivering chamber connected together, a fluid delivery pipe communicating with said receiving chamber and a fluid discharge pipe communicating with said delivery chamber, a water circulatory system between said chambers and a pressure actuated valve responsive to pressure within said receiving chamber for controlling the flow of water to said system.

In testimony whereof, I have hereunto subscribed my name this 8th day of November, 1909.

FRANCIS HODGKINSON.

Witnesses:
C. W. McGHEE,
C. W. BALLAY.