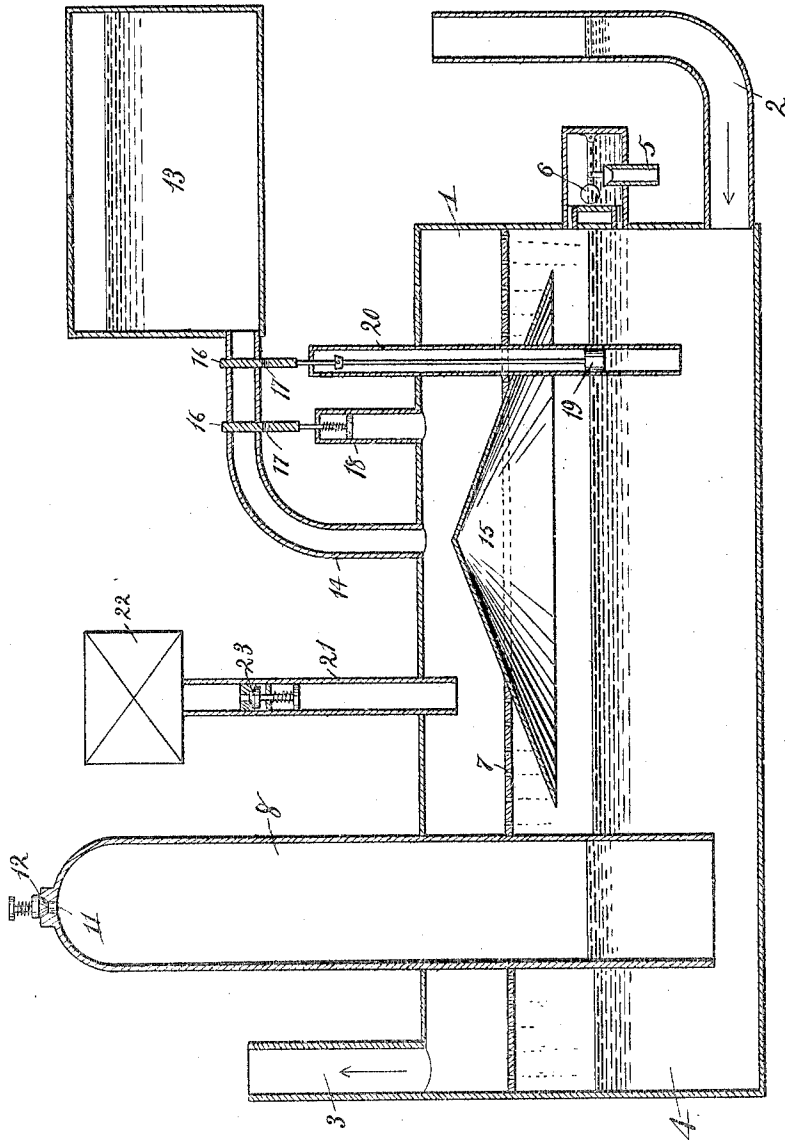


L. P. L. BATTU.  
STEAM REGENERATIVE ACCUMULATOR.  
APPLICATION FILED APR. 17, 1905.



Witnesses

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# UNITED STATES PATENT OFFICE.

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## STEAM-REGENERATIVE ACCUMULATOR.

No. 802,491.

Specification of Letters Patent.

Patented Oct. 24, 1905.

Application filed April 17, 1905. Serial No. 255,988.

*To all whom it may concern:*

Be it known that I, LÉONCE P. L. BATTU, a citizen of France, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Steam-Regenerative Accumulators, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawing, forming a part of this specification.

My invention relates to steam-regenerative accumulators, and has for one of its objects the provision of improved means and method for regulating the pressure of steam within the accumulator.

In practicing my invention I employ a tank which preferably contains as the pressure-equalizing fluid a body of water which in performing its function acts as a heat-retaining body or carrier, the steam to be regenerated being admitted to this tank and discharged therefrom in its regenerated condition to perform any service to which it is adapted, which service is most desirably the operation of steam-motors, such as steam-turbines. The steam to be regenerated is most generally supplied from steam-engines of the reciprocating type, and, as is well known, the exhaust-steam furnished by the said engines varies in some of said engines within very wide limits. This is particularly the case in connection with engines used in rolling-mills, hoisting machinery, and similar work where the load imposed upon the engine fluctuates greatly. I provide improved means for reducing this fluctuation in the pressure of the steam within the accumulator, which operates by furnishing agitation of the fluid within the vessel or tank. Fluid is preferably supplied from an external source, which fluid is preferably cool, so as have decided condensing action upon the steam within the tank or vessel whenever such steam is beyond a predetermined pressure, such fluid from the external source being desirably only admitted when excessive steam-pressure within the tank is reached.

In accordance with another feature of my invention I provide means for supplying heat to the fluid within the accumulator in case the pressure of the steam to be regenerated has fallen too far below a predetermined value, to which end hot steam, preferably steam supplied at higher pressure, is admitted to the tank. The admission of this steam and the admission of the cold fluid is governed by valves that are regulated in their action by

the steam-pressure within the tank. When the steam-pressure within the tank is too low, the valve controlling the admission of the extra steam is opened, the valve mechanism controlling the admission of the cold fluid being at this time closed. When the pressure within the tank is above a predetermined limit, the aforesaid steam-valve is closed and the valve mechanism controlling the supply of cold fluid is opened, so that the said cold fluid is admitted to the tank to condense the steam sufficiently to reduce the steam-pressure, and in case the admitted cold fluid should have too great a condensing action the hot steam will again be admitted to have the effect stated. An overflow pipe or passage is provided for maintaining the fluid within the tank below a given level.

I will explain my invention more fully by reference to the accompanying drawing, showing one of many embodiments thereof, the drawing illustrating in sectional elevation apparatus constructed in accordance with the invention.

The tank 1 is constructed in any suitable shape and has a steam-inlet 2 communicating with any suitable part thereof, such as that illustrated, through which inlet the steam that is to be regenerated is passed into the tank. The regenerated steam passes through the outlet 3 to perform the work to which it is adapted, this outlet being above the level of the fluid 4, so that the regenerated steam unmixed with the fluid, which is preferably water, will be discharged from the accumulating-tank. The body of fluid 4 constitutes a heat-retaining body that serves to retain the heat imparted to it by the steam that is being regenerated, and which acts to give up heat in the regenerating process. A discharge-duct or opening 5 is provided for substantially preventing the liquor from exceeding a given level by permitting the excess of the liquor to flow away from the vessel 1. Any means may be employed for securing this result, as the float-valve 6. The incoming fluid is preferably directed by a guide 15 upon the perforated deck 7, through which deck the liquid falls like rain to have intimate contact with the steam to have condensing action thereupon to reduce the steam-pressure. The stand-pipe 8 projects within the fluid 4 and desirably has an opening 11 therein of small diameter calculated to the service required, this opening being preferably normally closed by means of a valve 12, which is operated when the air

or gas above the liquid is sufficiently compressed by the liquid rising in the pipe. Thus the gas normally confined between the valve 12 and the liquid acts as a cushion or spring against the force of which the liquid is raised by the pressure of the steam surrounding the pipe. There is thus provided a balancing-column of fluid within the pipe 8, that causes the steam-space within the vessel 1 to increase on increase of steam-pressure and to decrease upon decrease of steam-pressure. Said stand-pipe coöperates with the tank 1 to form with the said tank a receptacle of variable capacity for the regenerated steam. As the pressure within the tank increases the fluid is forced up within the pipe 8, and as the pressure decreases the fluid within the pipe 8 descends, whereby a further compensation for variation of pressures within the tank is afforded. In case the steam within the tank or chamber 1 should be of excessive pressure I admit cooling fluid from the chamber 13 through the duct 14 into the chamber 1, the fluid preferably falling upon a diffuser or spreader 15, preferably conical in shape, being located beneath the mouth of the duct 14, so that the cooling fluid, preferably water, passing through said duct, spreads over a large surface to have full condensing effect upon the steam within the chamber 1 to reduce the pressure. The admission of this cooling fluid may be governed by any suitable means. In the embodiment of the invention illustrated I have provided two valves 16 in the form of slides, having perforations 17, which are normally out of line with the bore of the duct 14, but which are brought into communication with said bore by the operation of the fluid-pistons 18 19 taking place when the pressure of the steam within the chamber 1 is excessive. The steam-pressure acts directly upon the valve-piston 18 when sufficiently great to move its slide-valve 16 to bring the opening 17 into communication with the bore of the duct 14. This steam-pressure acts indirectly upon the valve-piston 19 through the body of fluid 4, the steam depressing the level of said fluid 4 to cause the said fluid to rise in the pipe 20, containing the piston 19, whereby the corresponding slide 16 is elevated to bring its opening 17 in line with the bore of the duct 14. Both of the pistons 18 19 and their associate apparatus are thus operated by the steam-pressure. If desired, one or the other of the elements 18 19, with its associate apparatus, may be removed. In case the cooling fluid admitted reduces the temperature of the body of liquid 4 to such an extent as to cause the pressure in the vessel 1 to be below a predetermined value I provide automatically-controlled means for increasing the heat of the body of liquid 4, which in the embodiment of the invention shown includes a pipe 21, conducting fluid hotter than the fluid 4 from a suitable source of supply 22, this hot fluid

being desirably steam. A valve 23 controls the communication between the vessels 1-22, this valve being closed when the pressure within the vessel 1 is above a given limit and opening automatically when the pressure is below said limit.

It is obvious that many changes may be made in the apparatus of my invention without departing from the spirit thereof, and I do not, therefore, wish to be limited to the precise construction shown; but

Having thus described my invention, I claim as new, and desire to secure by Letters Patent, the following:

1. Apparatus for regenerating steam, including a vessel having ducts leading the steam to be regenerated thereto and for conveying the regenerated steam therefrom, a heat-retaining body within said vessel and subject to the action of the steam to be regenerated, and means governed by the steam for condensing a portion of the steam within the vessel to prevent it from reaching excessive pressure.

2. Apparatus for regenerating steam, including a vessel having ducts leading the steam to be regenerated thereto and for conveying regenerated steam therefrom, a heat-retaining body within said vessel and subject to the action of the steam to be regenerated, a supply of cooling fluid for condensing steam in said vessel to prevent said steam from reaching excessive pressure, and means controlling the admission of said cooling fluid to said vessel.

3. Apparatus for regenerating steam, including a vessel having ducts leading the steam to be regenerated thereto and for conveying regenerated steam therefrom, a heat-retaining body within said vessel and subject to the action of the steam to be regenerated, a supply of cooling fluid for condensing steam in said vessel to prevent said steam from reaching excessive pressure, and automatically-operated means controlling the admission of said cooling fluid to said vessel.

4. Apparatus for regenerating steam, including a vessel having ducts leading the steam to be regenerated thereto and for conveying regenerated steam therefrom, a heat-retaining body within said vessel and subject to the action of the steam to be regenerated, a supply of cooling fluid for condensing steam in said vessel to prevent said steam from reaching excessive pressure, and mechanism controlling the admission of said cooling fluid to the vessel automatically operated by steam within the vessel.

5. Apparatus for regenerating steam, including a vessel having ducts leading the steam to be regenerated thereto and for conveying regenerated steam therefrom, a heat-retaining body within said vessel and subject to the action of the steam to be regenerated, a supply of cooling fluid for condensing steam in said vessel to prevent said steam from reaching excessive pressure, and valve mechanism con-

trolling the admission of said cooling fluid to the vessel automatically operated by the steam within the vessel.

5 6. Apparatus for regenerating steam, including a vessel having ducts leading the steam to be regenerated thereto and for conveying the regenerated steam therefrom, a heat-retaining body within said vessel and subject to the action of the steam to be regenerated, 10 means governed by the steam for condensing a portion of the steam within the vessel to prevent it from reaching excessive pressure, and mechanism for admitting hot fluid to the vessel to effect increase of the pressure of the steam therein.

15 7. Apparatus for regenerating steam, including a vessel having ducts leading the steam to be regenerated thereto and for conveying regenerated steam therefrom, a heat-retaining body within said vessel and subject to the action of the steam to be regenerated, a supply of cooling fluid for condensing steam in said vessel to prevent said steam from reaching excessive pressure, means controlling the admission of said cooling fluid to said vessel, and 25 mechanism for admitting hot fluid to the vessel to effect increase of the pressure of the steam therein.

30 8. Apparatus for regenerating steam, including a vessel having ducts leading the steam to be regenerated thereto and for conveying regenerated steam therefrom, a heat-retaining body within said vessel and subject to the action of the steam to be regenerated, a supply of cooling fluid for condensing steam in said vessel to prevent said steam from reaching excessive pressure, automatically-operated means controlling the admission of said cooling fluid to said vessel, and mechanism for admitting hot fluid to the vessel to effect increase of the pressure of the steam therein.

40 9. Apparatus for regenerating steam, including a vessel having ducts leading the steam to be regenerated thereto and for conveying regenerated steam therefrom, a heat-retaining body within said vessel and subject to the action of the steam to be regenerated, a supply of cooling fluid for condensing steam in said vessel to prevent said steam from reaching excessive pressure, mechanism controlling the admission of said cooling fluid to the vessel automatically operated by steam within the vessel, and mechanism for admitting hot fluid to the vessel to effect increase of the pressure of the steam thereto.

55 10. Apparatus for regenerating steam, including a vessel having ducts leading the steam to be regenerated thereto and for conveying regenerated steam therefrom, a heat-retaining body within said vessel and subject to the action of the steam to be regenerated, a supply of cooling fluid for condensing steam in said vessel to prevent said steam from reaching excessive pressure, valve mechanism controlling the admission of said cooling

fluid to the vessel automatically operated by the steam within the vessel, and mechanism for admitting hot fluid to the vessel to effect increase of the pressure of the steam therein.

11. Apparatus for regenerating steam, including a vessel having ducts leading the steam to be regenerated thereto and for conveying the regenerated steam therefrom, a heat-retaining body within said vessel and subject to the action of the steam to be regenerated, means for condensing a portion of the steam within the vessel to prevent it from reaching excessive pressure, a source of hot-fluid supply, and valve mechanism governing the admission of said hot fluid to the vessel and governed in turn by the pressure of the steam within the vessel.

12. Apparatus for regenerating steam, including a vessel having ducts leading the steam to be regenerated thereto and for conveying the regenerated steam therefrom, a heat-retaining body within said vessel and subject to the action of the steam to be regenerated, means governed by the steam for condensing a portion of the steam within the vessel to prevent it from reaching excessive pressure, a source of hot-fluid supply, and valve mechanism governing the admission of said hot fluid to the vessel and governed in turn by the pressure of the steam within the vessel.

13. Apparatus for regenerating steam, including a vessel having ducts leading the steam to be regenerated thereto and for conveying regenerated steam therefrom, a heat-retaining body within said vessel and subject to the action of the steam to be regenerated, a supply of cooling fluid for condensing steam in said vessel to prevent said steam from reaching excessive pressure, means controlling the admission of said cooling fluid to said vessel, a source of hot-fluid supply, and valve mechanism governing the admission of said hot fluid to the vessel and governed in turn by the pressure of the steam within the vessel.

14. Apparatus for regenerating steam, including a vessel having ducts leading the steam to be regenerated thereto and for conveying regenerated steam therefrom, a heat-retaining body within said vessel and subject to the action of the steam to be regenerated, a supply of cooling fluid for condensing steam in said vessel to prevent said steam from reaching excessive pressure, automatically-operated means controlling the admission of said cooling fluid to said vessel, a source of hot-fluid supply, and valve mechanism governing the admission of said hot fluid to the vessel and governed in turn by the pressure of the steam within the vessel.

15. Apparatus for regenerating steam, including a vessel having ducts leading the steam to be regenerated thereto and for conveying regenerated steam therefrom, a heat-

retaining body within said vessel and subject to the action of the steam to be regenerated, a supply of cooling fluid for condensing steam in said vessel to prevent said steam from reaching excessive pressure, mechanism controlling the admission of said cooling fluid to the vessel automatically operated by steam within the vessel, a source of hot-fluid supply, and valve mechanism governing the admission of said hot fluid to the vessel and governed in turn by the pressure of the steam within the vessel.

16. Apparatus for regenerating steam, including a vessel having ducts leading the steam to be regenerated thereto and for conveying regenerated steam therefrom, a heat-retaining body within said vessel and subject to the action of the steam to be regenerated, a supply of cooling fluid for condensing steam in said vessel to prevent said steam from reaching excessive pressure, valve mechanism controlling the admission of said cooling fluid to the vessel automatically operated by the steam within the vessel, a source of hot-fluid supply, and valve mechanism governing the admission of said hot fluid to the vessel and governed in turn by the pressure of the steam within the vessel.

17. Apparatus for regenerating steam including a vessel having ducts leading the steam to be regenerated thereto and for conveying regenerated steam therefrom, a heat-retaining fluid within said vessel and subject to the action of the steam to be regenerated,

and a stand-pipe or supplemental vessel into which said fluid is forced from the main vessel by the steam when sufficiently increased in pressure, said vessel having a valved opening permitting the displacement of the gas therein as the fluid rises in the pipe.

18. An apparatus for regenerating steam, including a vessel containing a heat-retainer and having an inlet for the steam to be regenerated, a supply of hot fluid for raising the pressure of the steam within the vessel, and means regulated by the steam for admitting hot fluid from said supply to said vessel.

19. An apparatus for regenerating steam, including a vessel having an inlet for the steam to be regenerated, a supply of hot fluid for raising the pressure of the steam within the vessel, and means regulated by the steam for admitting hot fluid from said supply to said vessel.

20. An apparatus for regulating steam, including a vessel having an inlet for the steam to be regenerated, supplies of hot and cold fluids for regulating the steam-pressure, and mechanism regulated by the pressure of steam effecting admission of said fluids to the vessel.

In witness whereof I hereunto subscribe my name this 13th day of April, A. D. 1905.

LÉONCE P. L. BATTU.

Witnesses:

G. L. CRAGG,  
CHAS. F. BASSETT.