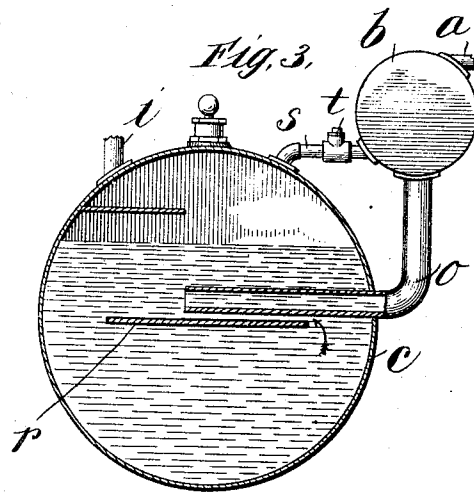
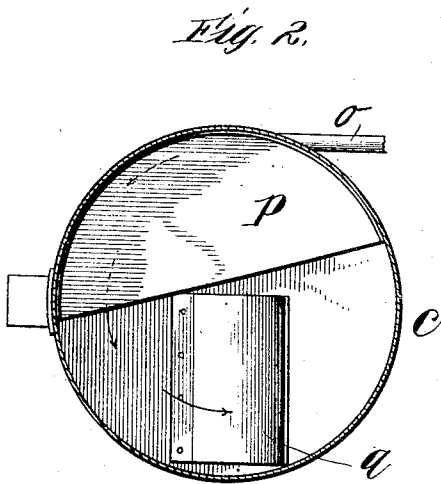
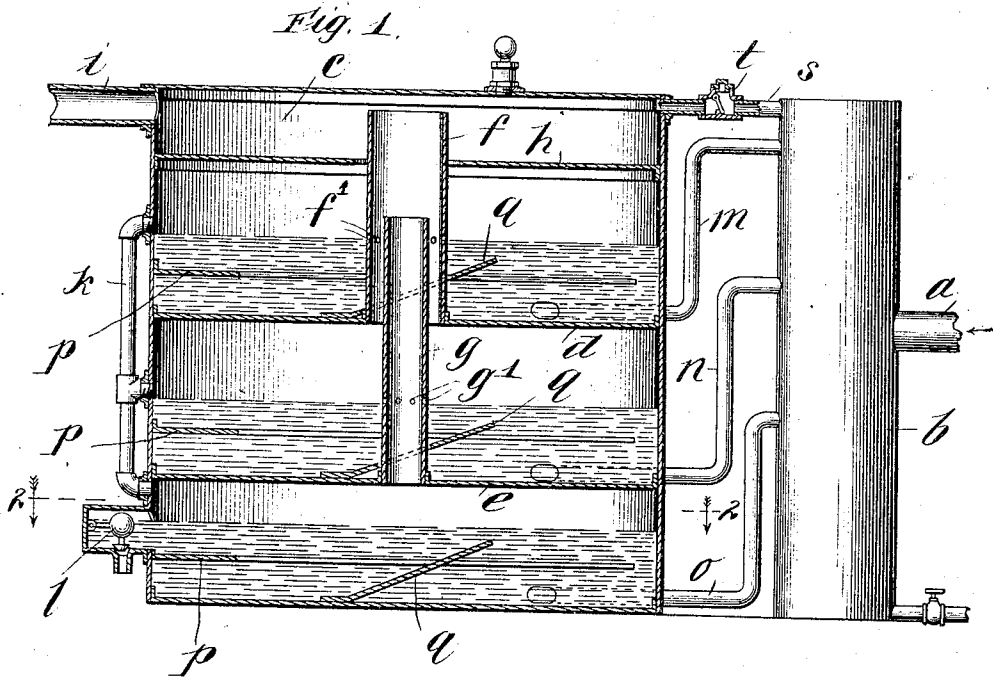


A. C. E. RATEAU.
STEAM REGENERATIVE ACCUMULATOR.
APPLICATION FILED OCT. 1, 1906.

968,194.

Patented Aug. 23, 1910.



Witnesses:

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UNITED STATES PATENT OFFICE.

AUGUSTE CAMILLE EDMOND RATEAU, OF PARIS, FRANCE.

STEAM-REGENERATIVE ACCUMULATOR.

968,194.

Specification of Letters Patent. Patented Aug. 23, 1910.

Application filed October 1, 1906. Serial No. 337,004.

To all whom it may concern:

Be it known that I, AUGUSTE CAMILLE EDMOND RATEAU, citizen of France, residing at Paris, France, 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 drawings, forming a part of this specification.

My invention relates to steam regenerative accumulators, and has for its object the provision of an improved construction thereof whereby very effectual intermingling of steam and liquid is effected within the vessel of the accumulator, which feature of my invention will be fully pointed out in connection with the preferred embodiment thereof shown in the drawing and which feature will be set forth in the claims.

My invention will appear by reference to the accompanying drawing, in which—

Figures 1 and 2 show the preferred embodiment of one type of steam regenerator. Fig. 1 is in sectional elevation and Fig. 2 is in sectional plan on line 2 2 of Fig. 1. Fig. 3 is a view illustrating another type of steam regenerator.

Like parts are indicated by similar characters of reference throughout the different figures.

Steam is admitted from any suitable source, such as the exhaust of a reciprocating engine, which steam finds its passage from the engine through the pipe *a*, which preferably communicates with a header *b* so that the steam is admitted to this header before it is received into the chamber *c* of the accumulator. In the form shown in Fig. 1, the chamber *c* is provided with a plurality of diaphragms *d* and *e* extending across the same, these diaphragms being centrally apertured, diaphragm *d* having a pipe *f* projecting upwardly therefrom and diaphragm *e* having a pipe *g* projecting upwardly therefrom. Another diaphragm *h* is included at the top of the vessel *c* so as properly to define the water and prevent its discharge through the outlet *i* for regenerated steam. The diaphragms *d* and *e* with their pipes *f* and *g* and the wall of the chamber *c* constitute vessels, one superposed on the other. A third vessel is located below the two vessels just described, and is also contained within the chamber *c*, the pipe *g* affording a passage for steam escaping from

the third or bottom vessel while the pipe *f* affords passage for the steam escaping from the intermediate vessel, while a central opening in the diaphragm *h* through which the pipe *f* passes, permits the passage of the steam from the top vessel, all of the steam from these three vessels passing into the escape pipe *i* to perform the duty for which it is adapted.

In order that the levels in the different vessels may be maintained uniform, openings *f'* may be provided in the pipe *f* and openings *g'* in the pipe *g*, located at the level to be maintained, the water flowing through these openings when it is about to exceed this level. By reason of this construction there is a constant to and fro movement of the water from chamber to chamber, the water being finely divided as it falls from one chamber to a lower one by gravity through the steam in the main steam passage and being carried upward by the steam from a lower to a higher chamber. Moreover, the greater the amount of steam the greater will be the mean levels of the water in the various chambers so that an amount of water proportional substantially to the amount of steam will flow from an upper to a lower chamber through the up flowing steam. Under these conditions there is a most intimate intermingling of steam and water—the most important feature in a steam regenerator. The spraying of the water by means of perforations also has the advantage of preventing any pockets of water temporarily closing the steam passage and causing back pressure upon the flowing steam, which would be liable to occur if water from one chamber was allowed to pass through the steam passage to another chamber without being sprayed. Where, as in Fig. 1, there are more than two chambers, the telescopic arrangement of pipes *f* and *g* still further assists the thorough intermingling of the steam and water in the to and fro movement of the latter, because it compels the water falling from the upper chamber to pass to the next chamber along the inside of one pipe and the outside of the other, and in like manner to pass from each chamber to the next in the whole series. As a supplemental means for maintaining the level in the two upper vessels, piping *k* may be employed having connections as indicated with these two upper vessels for the purpose stated. The lowermost vessel has a float

valve structure *l* or any suitable means for permitting the overflow of the water when it has accumulated in sufficient quantity from the lowermost vessel.

5 When there is a plurality of vessels employed in a regenerating chamber *c*, as indicated in Fig. 1, several pipes or ducts *m*, *n*, *o* are employed, which convey the steam from the header *b* or any other suitable
10 source into the vessels, to effect agitation of the liquid contained in said vessels and to occasion the intermingling of the steam conveyed through the pipes or ducts *m*, *n*, *o* with the liquid contained in the vessels. Baffle-
15 plates *p*, *p*, *p* are provided—one for each vessel—below which the pipes *m*, *n*, *o* have communication with the corresponding vessels, the liquid lying above the diaphragms *p*. In order that the liquid above the diaphragms *p* may also be brought effectively
20 into agitation, I provide deflecting plates *q* in the different vessels, that cause the liquid to be displaced obliquely. It will be seen that the discharge openings of the pipes *m*,
25 *n*, *o* are so far below the other ends of these pipes that the liquid in the vessels cannot find back passage into the header *b*. The pipes *m*, *n*, *o* are desirably led into the vessel *c* in a tangential direction, so that the fluid
30 is caused to circulate tangentially, whereby the liquid in the different vessels is gyrated, and by reason of the gyrating motion or circulation thereof, most thorough intermixture of the steam and the liquid, which is
35 preferably water, is permitted.

While I prefer to direct the pipe *o* into the vessel *c* as indicated in Fig. 2, I do not wish to be limited to this arrangement, for the construction shown in Fig. 3 may be em-
40 ployed particularly where the chamber *c* is horizontally disposed instead of being vertically disposed, as it is in the construction shown in Figs. 1 and 2. In the construction shown in Fig. 3, the horizontally disposed
45 chamber *c* has a diaphragm *r* extending preferably throughout the length of the vessel *c* and being desirably diametrically placed with reference to the vessel *c*. The diaphragm, however, is disconnected from
50 the longitudinal sides of the vessel *c* so that the liquid in the vessel may circulate.

The inlet pipe, lettered *o* in Fig. 3, may be projected into the liquid as there shown and may cause a circulation of the liquid with
55 the aid of the baffle-plates *r* to cause the same gyrating action of the fluid in the vessel for the same purpose. While I have shown but one pipe *o* in Fig. 3 projected into a vessel *c*, I do not wish to be limited to the num-
60 ber of pipes.

In order that there may be a definite ratio of pressures in the chamber *c* and the header *b*, a branch pipe *s* is connected between these
65 a relief valve *t* opening whenever the pres-

sure in the element *c* has exceeded a predetermined value.

By the apparatus illustrated an extremely high velocity within the generator is secured, so that a most thorough interaction of the
70 steam and liquid is secured for regenerating purposes.

The header *b* may possess as an additional function the capacity to spread oil and water, to which end the said header will be
75 constructed in a manner well known to those skilled in the art.

It is obvious that changes may readily be made in the embodiments of the invention herein shown, without departing from the
80 spirit of my invention, and I do not, therefore, wish to be limited to the precise constructions shown, but,

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

1. A steam regenerator including a chamber containing a liquid heat retainer, a diaphragm located in the liquid dividing the
85 liquid in shafts or layers, a header located above the liquid level and piping leading steam from the header into the liquid on one side of the diaphragm.

2. A steam regenerator including a chamber containing liquid, a duct tangentially
95 disposed with respect to the chamber to so direct steam into the chamber as to effect gyration of the liquid, a baffle plate located above the discharge opening of the duct, and a deflecting plate for obliquely directing the
100 liquid.

3. A steam regenerator including a chamber for containing liquid, said chamber having an obliquely disposed baffle plate therein, a duct for directing steam into the cham-
105 ber so as to cause liquid within the chamber to be deflected by said baffle plate and a baffle plate located above the duct.

4. A steam regenerator comprising several chambers located one above the other, piping
110 leading steam from lower chamber to upper chamber above the level of liquid contained therein and provided with a number of perforations or openings located to allow liquid to fall in streams from upper chamber to
115 lower chamber through the steam passing from one chamber to the other.

5. A steam regenerator comprising several chambers located one above the other, piping
120 leading steam from lower chamber to upper chamber above the level of liquid contained therein and provided with perforations or openings located to allow liquid to fall in streams from upper chamber to lower chamber through the steam passing from one
125 chamber to the other, and automatic means to remove the liquid from lower chamber.

6. In a steam regenerator, a plurality of chambers, a main steam passage carrying
130 steam from one chamber to above the water

level of another, and means for conveying water in finely divided streams from the latter chamber to the former through the steam in said passage.

- 5 7. In a steam regenerator, two chambers, means for conveying water in finely divided streams from one chamber to the other, and means for carrying the steam through said divided streams to the chamber from which
10 they were conveyed.

8. In a steam regenerator, two chambers, a main steam passage carrying steam from one chamber to above the water in another,

and means for conveying water in finely divided streams, and in amount proportional to the amount of steam, from the latter chamber through the steam in said passage to the former chamber. 15

In witness whereof, I hereunto subscribe my name this sixth day of September A. D., 20 1906.

AUGUSTE CAMILLE EDMOND RATEAU.

Witnesses:

L. H. MUNIER,
E. MERKLIN.