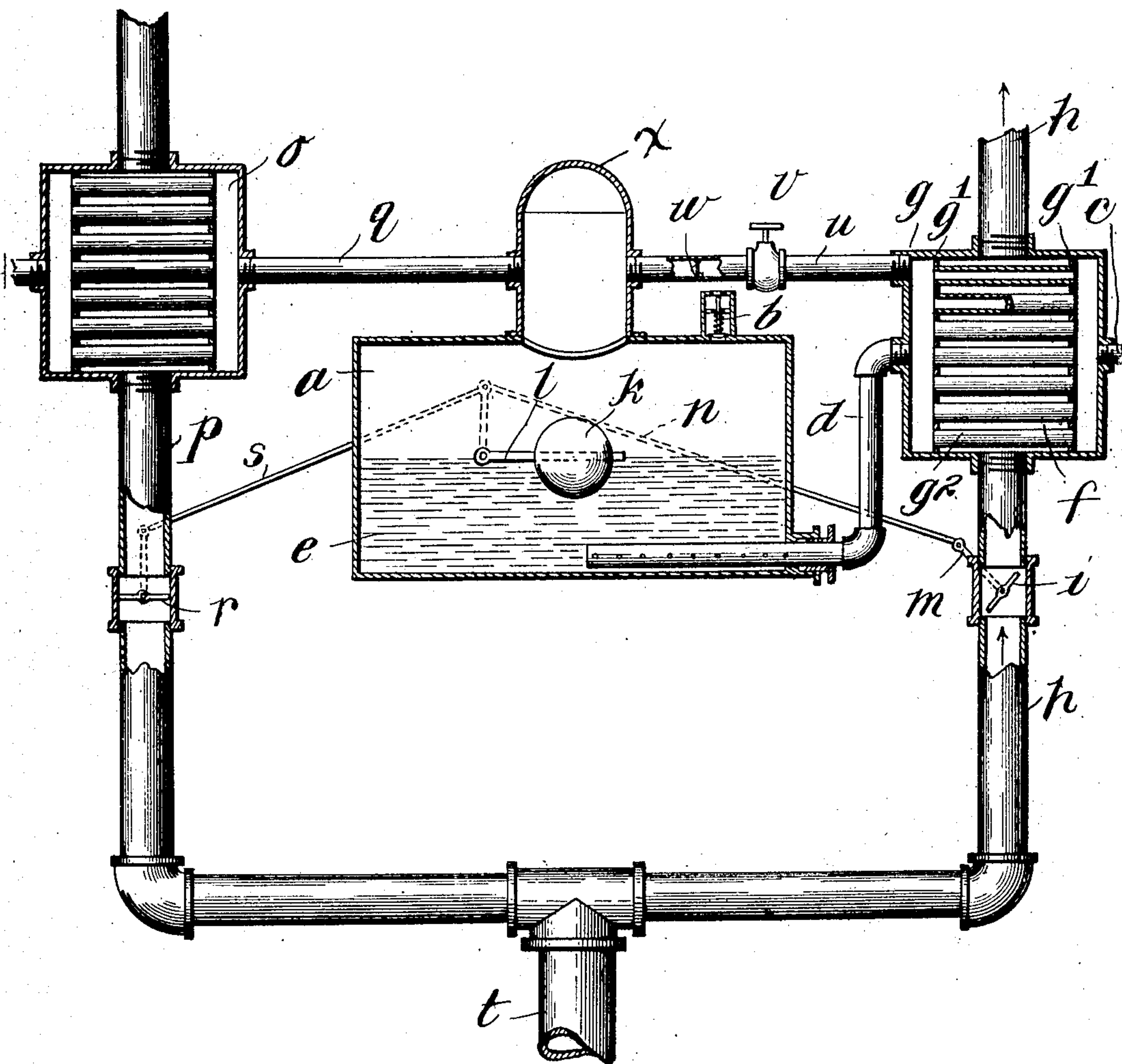


L. P. L. BATTU.
 STEAM REGENERATIVE APPARATUS
 APPLICATION FILED DEC. 3, 1906.

925,797.

Patented June 22, 1909.



Witnesses:

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UNITED STATES PATENT OFFICE.

LÉONCE P. L. BATTU, OF CHICAGO, ILLINOIS.

STEAM-REGENERATIVE APPARATUS.

No. 925,797.

Specification of Letters Patent.

Patented June 22, 1909.

Application filed December 3, 1906. Serial No. 346,030.

To all whom it may concern:

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

My invention relates to steam regenerative apparatus and has for its object the provision of means adapted to regulate the pressure of a flux of steam.

15 My invention is especially well adapted to regulate the fluctuations in pressure in the exhaust of steam engines.

My invention also provides means whereby the steam undergoing treatment is heated.

20 I will explain my invention more fully by reference to the accompanying drawing, showing the preferred embodiment thereof, the drawing showing as much of the apparatus as is necessary to understand one embodiment of my invention.

I have indicated a vessel *a*, which, if desired, may be closed, except for the steam openings and the safety valve *b*, exhaust, or other steam, undergoing treatment passing
30 from the pipe *c* into the piping *d*, this piping *d* terminating in a perforated portion that projects into the liquid *e*, preferably water. Some suitable agency is employed for superheating the steam that is to be re-
35 generated, this super-heating agency being indicated at *f* and comprising, in the embodiment of the invention shown, a drum *g* containing plates *g*¹, *g*¹, through which
40 tubes *g*² extend, so that the spaces between the end walls of the drum *g* and the plates *g*¹ are adapted to receive only the steam that is to undergo treatment. The spaces between the tubes *g*² communicate and all of
45 the spaces between the tubes are in communication with piping *h*, that may lead hot air or other heating fluid through the spaces between the tubes *g*², so that the steam that is passing through said tubes may be subject to a heating action. The volume of heating
50 fluid passing through the piping *h* is regulated by means of valve mechanism, so that the heating action upon the flowing steam may be regulated.

The valve mechanism *i* is desirably automatically operated, to which end I employ
55 a float *k*, carried upon a bell crank *l*, which is pivoted at its elbow and which has one of its arms connected with the stem *m* of the valve *i* by a link *n*, the whole construction being such that when the level of the liquid
60 *e* occupies a predetermined lowermost position, the valve *i* is closed, so that the incoming steam is subject to no heating action, and whereby as the level of the liquid *e* rises, the valve is opened until a point is
65 reached where the super-heating action upon the incoming steam is of such a degree that the vaporizing influence of the steam admitted to the vessel *a* is sufficiently increased to prevent the liquid from rising higher. 70
I also preferably employ a super-heating agency for the steam after it has issued from the vessel *a*, this super-heating agency being indicated at *o*.

As the structural characteristics of the
75 super-heater at *o* are similar to the structural characteristics of the super-heater indicated at *g*, I will not give a further description of the super-heater at *o*, as it will suffice to say that piping *p* is employed for convey-
80 ing hot air or other hot fluid through the spaces that intervene between the tubes of the corresponding super-heater, the discharged steam finding passage through the piping *q* through the tubing of the heater *o*,
85 to thereby be subject to superheating action. Valve mechanism *r* is employed for regulating the action at the super-heater *o*, this valve being located in the piping *p* and also being desirably automatically operated, to
90 which end, if desired, the float mechanism *k*, *l* may be employed, the stem of the valve *r* being united with the upper arm of the bell crank *l* by means of a link *s*, so that as the level of the liquid *e* lowers, the valve *r*
95 opens to permit an increase of the heating action at *o*, and as the level rises, to decrease the heating action at *o*, the heating action being preferably totally eliminated when the liquid *e* reaches an upper predetermined
100 level and being preferably increased most when the liquid *e* reaches a lower predetermined level.

It will be seen that the super-heater controlling devices *i* and *r* are subject to the
105 same regulating influence exerted by the

liquid *e* to operate as specified and to produce the results desired.

While I prefer the regulating devices indicated at *i* and *r* and the governing mechanism indicated at *k* and *l*, I do not wish to be limited to these characteristics.

If desired, the heating fluid may be received from a common source with which communication is afforded by means of a common pipe *t* communicating with the piping *h* and *p*.

While I have herein shown the preferred method of regulating the super-heating action upon the incoming steam as well as upon the outgoing steam, I do not wish to be limited to the precise mechanism illustrated.

I prefer to employ two superheating devices, one operating upon the steam after it is discharged and the other operating upon the steam before it is admitted into the interior of the steam regenerating vessel, but I do not wish to be limited in all embodiments of the invention to the use of both superheating devices.

It frequently happens that a portion or even the totality of the steam flowing toward vessel *a* need not be forced through the liquid heat retainer contained in the regenerating vessel. Pipe *u* connected to dome or duct *x* by-passes the steam through pipe *q* above the liquid level, dome or duct *x*, allowing the steam flowing through pipe *u* to flow toward the heat retainer contained in regenerating vessel *a*, if the temperature in the vessel *a* is lower than the temperature corresponding to the steam pressure of the steam flowing through pipe *u*. Dome or duct *x* will also allow the steam to flow from pipe *u* to pipe *q* if the temperature in the vessel *a* is higher than the corresponding temperature of the steam flowing through pipe *u*. It will be seen that the above described equipment provides for means allowing the flux of steam to be treated to flow through the steam pipe *u*, *q*, and that the regenerative action of the heat retainer *e* will take effect only when needed; i. e., that the flux of steam will flow to or from the regenerative vessel under the action of difference in temperatures, a passage or communication being provided by dome or duct *x* between the steam piping and the regenerative vessel. The steam regenerating vessel described has the characteristic feature of reversing the direction of the flow of steam in duct *x*. In order that the by-pass *u* may be thrown totally out of service, or may be adjusted as to its capacity, I employ a hand valve *v* therein.

In order that there may be an automatic control of the steam flowing through the by-pass when said by-pass is brought into

subject to the pressure of the outgoing regenerated steam and also the pressure of the incoming exhaust steam, this valve being loaded as desired, so that when the exhaust steam exceeds a predetermined pressure, said valve is automatically opened to permit the exhaust steam to flow directly through the by-pass *u* into the piping *q*. By means of these valves I can prevent the flux of steam, or part of the flux of steam, flowing toward vessel *a*, from going through submerged pipe *d*.

I have herein shown and particularly described the preferred embodiment of my invention, but I do not wish to be limited to the precise details of construction and arrangement of apparatus shown, but,

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

1. A steam regenerative apparatus including a vessel having a heat retaining body of liquid therein, said vessel serving to receive the steam that is to be regenerated, and means governed by the liquid for heating the steam to be treated, said heating means acting upon the steam before it interacts with the liquid within the vessel.

2. A steam regenerative apparatus including a vessel having a heat retaining body of liquid therein, said vessel serving to receive the steam that is to be regenerated, and means governed by the liquid for heating the steam to be treated.

3. A steam regenerative apparatus including a vessel having a heat retaining body of liquid therein, said vessel serving to receive the steam that is to be regenerated, and means governed by the liquid for heating the steam discharged from the vessel.

4. A steam regenerative apparatus including a vessel having a heat retainer therein, said vessel serving to receive the steam that is to be regenerated, means for heating the steam discharged from the vessel, and means for regulating the heating means.

5. A steam regenerative apparatus having a vessel including a heat retaining body of liquid, means for heating the steam before its admission to the vessel and after its discharge from the vessel, and means governing the operation of both heating means and governed by the liquid.

6. In a steam regenerative apparatus, a vessel containing a heat retainer, a duct for conveying steam from its source to the point of use and a passage between said vessel and duct through which the steam conveyed in the duct is adapted to flow alternately from the duct to the vessel and from the vessel to the duct, the direction of the flow being governed by the respective temperatures of the flux of steam and of the heat retainer.

vessel containing a liquid heat retainer,
piping directing the steam to be treated un-
der and above the liquid heat retainer and
adjustable means responsive to changes in
5 the steam pressure allowing the steam to
flow toward the vessel under or above the
liquid level.

In witness whereof, I hereunto subscribe
my name this 30th day of November A. D.,
1906.

LÉONCE P. L. BATTU.

Witnesses:

G. L. CRAGG,
LEON G. STROH.