

(No Model.)

W. G. MacLAUGHLIN.

METHOD OF GENERATING STEAM AND HEATING AIR.

No. 387,087.

Patented July 31, 1888.

Fig. 1.

Fig. 2.

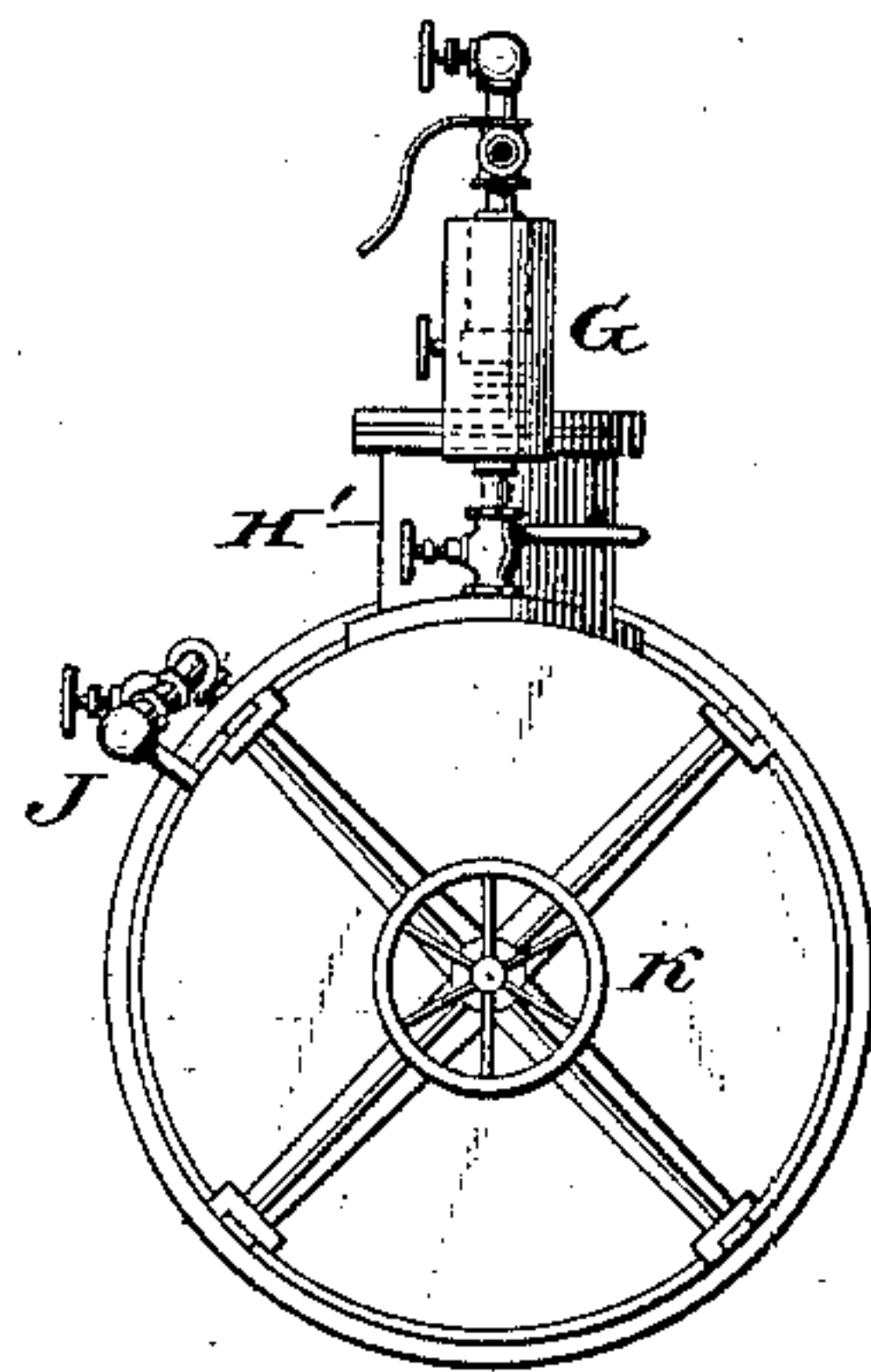
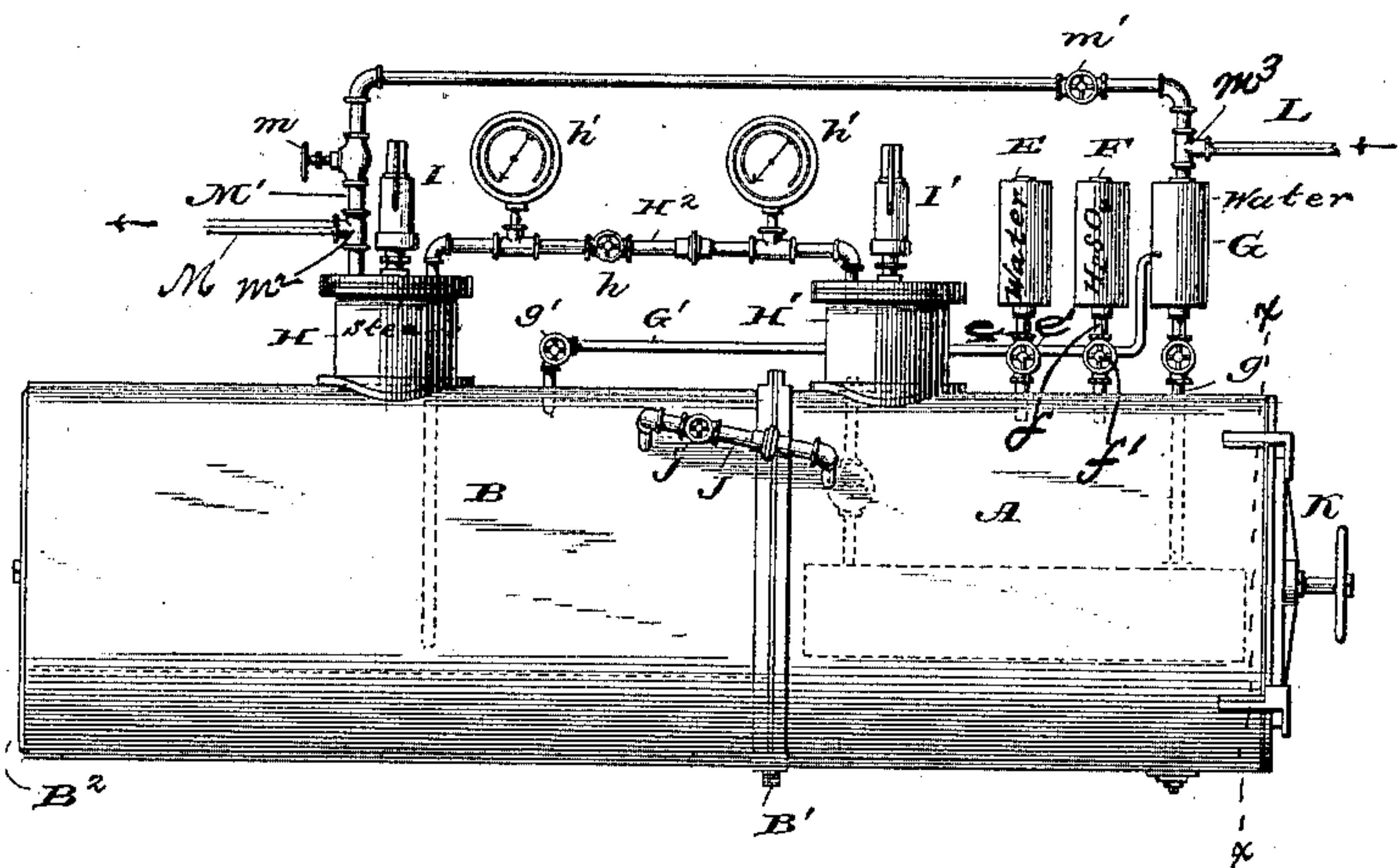
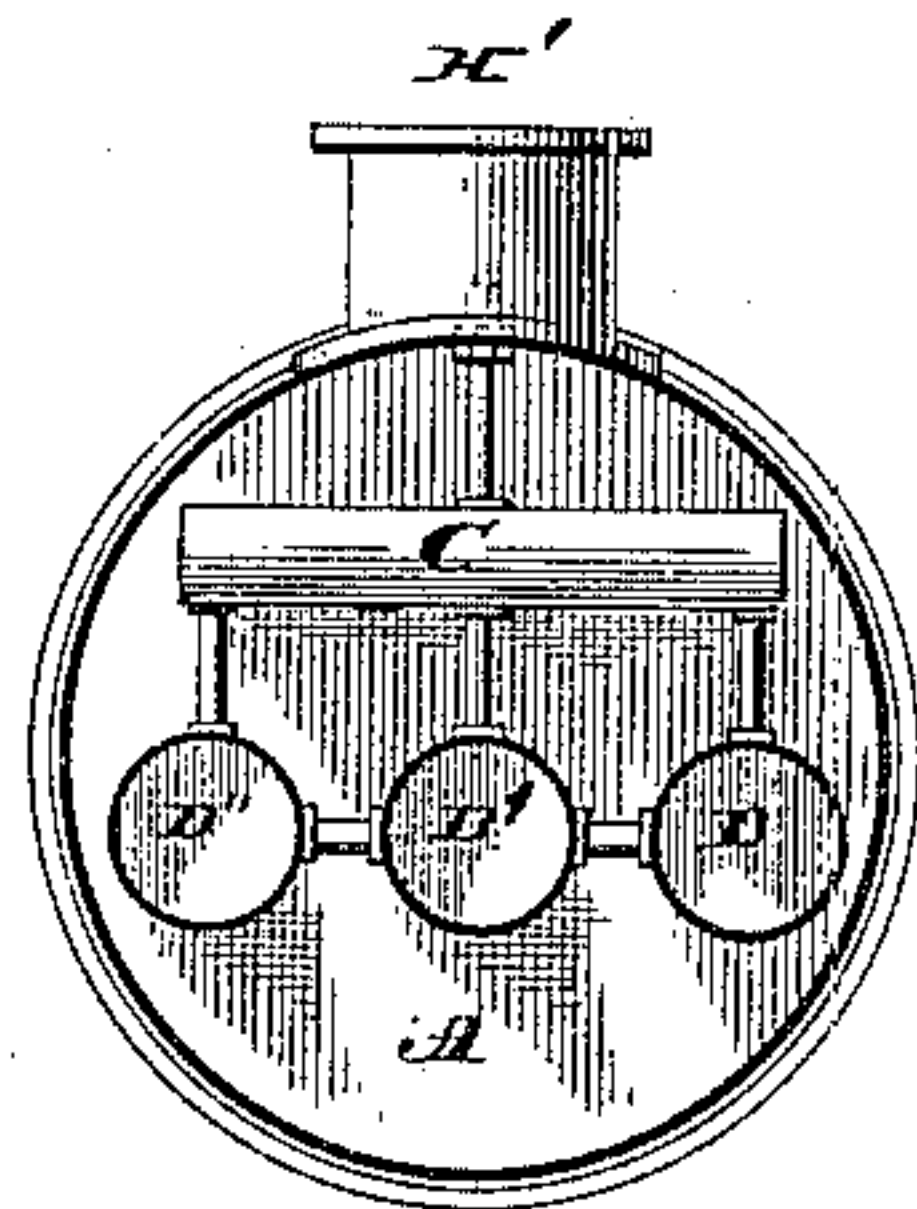
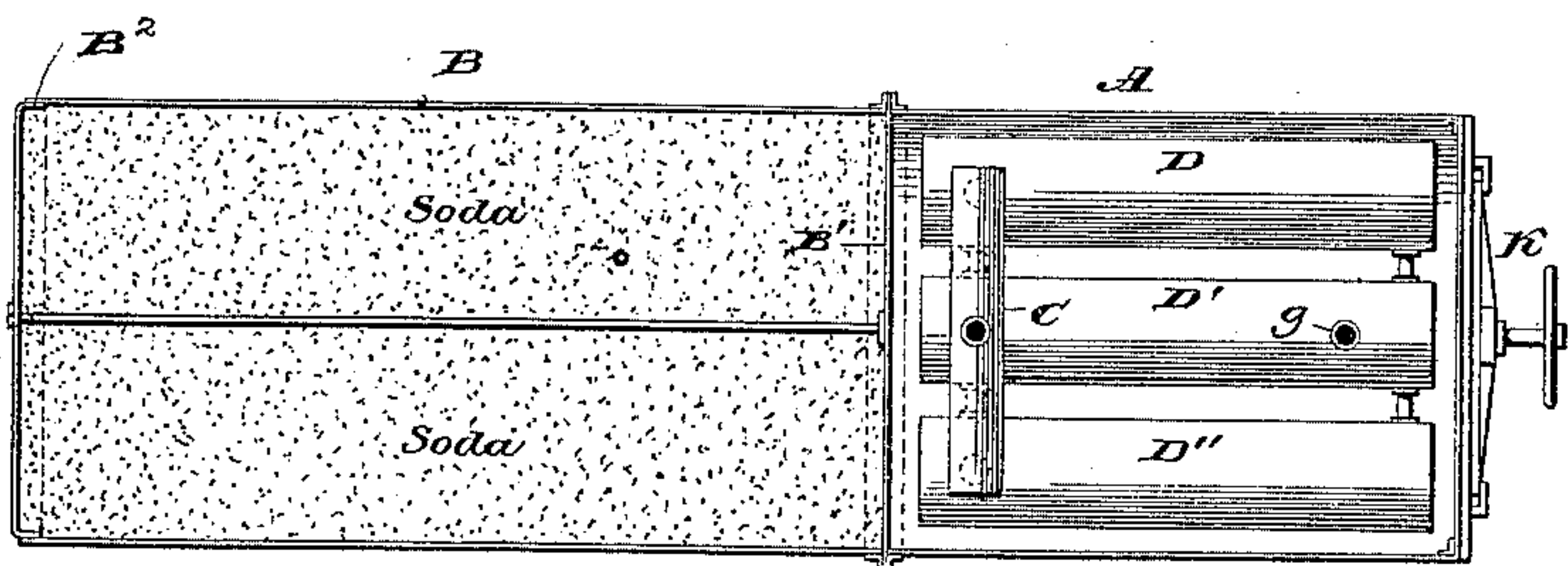


Fig. 3.

Fig. 4.



Witnesses.

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# UNITED STATES PATENT OFFICE.

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## METHOD OF GENERATING STEAM AND HEATING AIR.

SPECIFICATION forming part of Letters Patent No. 387,087, dated July 31, 1888.

Application filed December 30, 1887. Serial No. 259,411. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM G. MACLAUGHLIN, a citizen of the United States of America, residing at Omaha, in the county of Douglas and State of Nebraska, have invented certain new and useful Improvements in Methods of Generating Steam and Heating Air; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

My invention relates to a method or process of chemically heating water to produce steam or air to produce hot air for use in connection with cars or apartments, or for creating steam for running machinery when aided by certain mechanical devices, the success of the process relying to a great extent upon vibration to cause a deposit of condensed moisture upon a chemical in a regenerating-chamber, and the prevention of crystallization by a continuous exhaust.

My invention consists in certain well-defined steps which become continuous for a period of time.

It is well known in the art that sodas and acetates have heretofore been used for the generation and propulsion of steam; but the processes used in such instances have in whole or in part been unsuccessful, due to the tendency which said chemicals have to crystallize, which would necessarily clog the connecting-pipes and thereby deteriorate from the proper operation of the machine. The failure of the processes heretofore used has also been due in a great measure to a lack of proper exhaust, which, unless it be continuous, will permit crystallization.

The object of my invention is to avoid these difficulties by establishing a continuous exhaust.

The essential features of my invention are, first, to produce heat for heating cars and apartments and for any other purpose that may be desired by means of hot air or steam; second, by inserting water-containing boilers

in the heat-generating chamber to produce steam for heating purposes and running machinery; third, re-creating in a regenerating-chamber the steam formed in the generating-chamber by contacting it with a bed of dry soda; fourth, causing the water of condensation to fall from the sides of said regenerating-chamber and form a propelling medium for the re-created steam; fifth, producing heated air in the generating-chamber and storing it in the regenerating-chamber, and, sixth, feeding water to a bed of dry soda in a regenerating-chamber producing hot air in the generating-chamber, and commingling the two in the regenerating-chamber.

In my improved method of generating steam or heat to be used on cars, vehicles, or other propelling purposes the rougher the road or track upon which said devices move or run the greater will be the propelling quantity of steam.

To fully set forth my improved process I will describe the same in connection with the apparatus shown in the accompanying drawings, wherein like letter of reference indicate similar parts throughout the several views, and in which—

Figure 1 is a side elevation of the chemical boiler and accompanying connections and appurtenances constructed in accordance with my invention. Fig. 2 is a front end elevation thereof. Fig. 3 is a horizontal section of the same. Fig. 4 is a transverse vertical section on line *x x* of Fig. 1.

I construct the boiler preferably of cylindrical shape and subdivide the same in two compartments, A and B, by a partition plate or head, B'. The compartment A may be termed the "initial generating-chamber" and the compartment B the "regenerating-chamber." The open end of the chamber B is provided with a removable head, B<sup>2</sup>, for the purpose of giving access to said chemical chamber to replenish the same with soda or otherwise manipulate the same. The open end of the chamber A is also provided with a removable head, K, having suitable clamps for securing said head in air-tight connection with the said chamber by a construction which is



well known in the art and well understood. Within the chamber A a series of boilers, D, D', and D'', are suspended, and are connected by suitable pipes to produce a circulation therethrough, one of said boilers being connected by a pipe, *g*, with feed-water tank G, and a suitable valve being used to regulate the feeding of the water to said boilers. A transversely-arranged steam-box, C, is connected to the several boilers, and by a suitable pipe to the steam-dome H', which is provided with a safety-valve, I', and mounted on the chamber A. A pipe, H<sup>2</sup>, is connected at one end to the upper part of the steam-dome H' and enters a similar dome, H, situated on the chamber B at its opposite end. The said pipe H<sup>2</sup> is provided with a suitable cut-off valve, *h*, and pressure-gages *h'* *h''*. The dome H is also provided with a safety-valve, I.

The end of the pipe H<sup>2</sup> entering the receiving-dome H passes down into the regenerating-chamber B some distance below the lower side of said dome. To the upper part of the side of the dome H opposite to that with which the pipe H<sup>2</sup> connects a pipe, M', is attached, having a cut-off valve, *m*, immediately above the dome, and, extending over the mechanism above described, is secured at its opposite end to the upper part of the water-tank G. Another valve, *m'*, is also mounted in said pipe above the said water-tank. Below the valve *m* a T-joint, *m*<sup>2</sup>, is secured to the pipe M' for the connection of an exhaust-pipe, or for a pipe running to a suitable mechanical motor or engine for the transmission of steam, or to a radiator or storage-tank for heating purposes, as may be desirable and required.

Immediately above the tank G in the pipe M' a T-joint, *m*<sup>3</sup>, is mounted, to which a water-supply pipe, L, is attached and adapted to feed water to the tank G from a suitable source. This pipe L may be provided with a suitable valve for cutting off the water or for closing exit through the pipe.

Above the chamber A, adjacent to the tank G, a water-tank, E, is mounted, and in connection with said chamber by a pipe, *e*, extending downward from the bottom thereof, and having a cut-off valve, *e'*, therein. Between the water-tanks E and G an acid-tank, F, is mounted in connection with the chamber A, in a manner similar to the tank E, and has a lower connecting-pipe, *f*, carrying a valve, *f'*. The tank E will be filled with water from time to time from a suitable source and tank F with a charge of sulphuric acid.

The chamber B, when used as a regenerator, will be supplied at all times with a bed of dry soda; but if said chamber is used as a hot-air storage-chamber the soda will be removed.

The chambers A and B have a connecting-pipe, J, provided with a suitable cut-off valve, *j*, the said pipe being arranged at an angle of inclination to prevent the return of any moisture, and thereby obviate the formation of crystals, which would clog the same. This pipe J is also intended to relieve the pressure

in the chamber A by allowing the hot air or vapor generated to flow into the chamber B to facilitate the operation of the latter chamber. The said pipe is further intended for connection between the two chambers when it is desired to generate and store hot air alone.

If the boilers D, D', and D'' should at any time become unfit for use through accident or otherwise, I propose to form steam in the chamber B by allowing water to slowly drip therein through a pipe, G', from the water-tank G, a valve, *g'*, in said tank being used to regulate the passage of the water therethrough. In this instance hot air only will be generated in the chamber A and flow through the pipe J into the chamber B. It will be understood that in this operation a bed of dry soda will be used in the chamber B.

Having thus described the apparatus, my improved method or process will be as follows: A bed of soda having been previously placed within the chamber A, the boilers D, D', and D'' are filled with water from the tank G. I then open the cock or valve of the water-tank E and allow the water therefrom to flow into the chamber A upon the bed of soda therein. After the soda becomes thoroughly saturated with water, the flow from the tank E is made regulable, and the valve in the connection of the acid-tank F is opened and a quantity of the sulphuric acid is permitted to commingle with the soda and water, the proportions of the soda and acid entering the water being determined by experiment and found necessary to the best results. The combination of these chemicals generates heat, and the ascending hot air and vapor surrounds the boiler and vaporizes the water therein, or, in other words, forms steam. As the steam is formed it passes from the boiler into the steam-box C, where it is superheated by the hot air, surrounds the same, and then passes up into the dome H', and from said dome it is conveyed by the pipe H<sup>2</sup> into the receiving-dome H, and is caused to contact with the bed of dry soda in the chamber B, where it is re-created or regenerated and passes out through the pipe M, to be used for any purpose desired. By superheating the steam in the box C the same is dried to a greater or less extent and effects a more perfect and desirable operation with the bed of soda in the chemical-chamber B.

It will be readily understood that steam entering the chamber B and striking the bed of soda will render the said soda in a moist condition, and the watery vapor arising therefrom will strike the sides of said chamber and condense. The water of condensation, falling back upon the dry bed of soda from the sides of the chamber B, will again form steam, which passes out behind the regenerated steam through pipe M, or may be conveyed through the pipe M' to the water-tank G to aid in heating the feed-water. Any moisture which may pass through the pipe J is thrown back into the chamber A and commingles with the heat-generating compound in the said chamber.



The falling of the moisture upon the dry bed of soda is caused by the vibration or jar of the chamber B, which must at all times be sustained. This vibration of the chamber need  
 5 not be violent, as a slight movement is all that is necessary to produce the desired result. The vehicle with which the apparatus is used will produce this movement.

When it is desired to stop the machine, the  
 10 valves *m* and *m'* are opened and that in the feed-water pipe *L* closed, when the steam from the chamber B will pass into the water-tank G, as hereinbefore set forth; or, if such operation is not required, the valve in the pipe *M'* ad-  
 15 jacent to the water-tank G is closed and the valve in the pipe *L* opened, when all the surplus steam from the chamber B may then pass into radiators placed in suitable apartments, being used for heating purposes in coaches,  
 20 street-cars, &c., and from said radiators through suitable condensing-traps, where it is liquefied and the water of condensation deposited upon the street or track.

In generating and storing hot air the cham-  
 25 ber A has the same operation, the connection between the dome *H'* and *H* is cut off, and the valve in the pipe *J* opened and the soda removed from chamber B, and the valve *m* in the pipe *M'* closed. As the hot air or vapor  
 30 is generated in the chamber A it flows into the chamber B through the pipe *J*. It will be readily understood that the divisional head *B'* will be in a heated condition, being adjacent to the heat-generating chamber. The air or  
 35 vapor in the chamber B will contact with said divisional head *B'*, and its generative temperature be sustained or increased. The air or vapor will be allowed to flow from the cham-  
 40 ber B through the pipe *M* to any suitable place and be used for heating purposes.

If so desired, the chamber B may be used alone for generating steam to propel motors of any horse-power, chemicals being used  
 45 about in the proportions of a charge of one hundred pounds of soda, twenty-five gallons of water, and one hundred pounds of sulphuric acid. As in the first instance, the acid de-  
 50 vours the soda heat readily and the mixture of the soda heat and acid gives an intensified result. It is obvious, however, that in order to lengthen the generative life of the chamber A it is preferable to use the chemical cham-  
 55 ber B in connection therewith.

The soda in the chamber B should be re-  
 55 moved about every three months and purified from all sediments that may have settled therein, and then returned to said chamber and be replenished by an additional chemical of the same nature. The use of caustic soda  
 60 is preferred in my process, as it is much cheaper than other sodas.

The boiler should be built entirely of iron,

with wrought-iron, cast-iron, or lead pipes. No brass should be used except for outside  
 65 trimmings and steam-gages.

It will be understood that I do not wish to confine myself to the uses to which my inven-  
 70 tion may be employed either for generating or heating purposes.

I make no claim herein to the apparatus  
 70 and method fully set forth and claimed in two pending applications filed by me April 11, 1888, and bearing Serial Nos. 270,331 and 270,332.

Having thus described my invention, what I  
 75 claim as new is—

1. The method herein described of generat-  
 80 ing and propelling steam, which consists in heating water to form steam in a heat-generating chamber by chemical action, conveying the steam thus formed to a regenerating-chamber  
 85 and contacting it with a chemical, and causing the water of condensation in the said re-generating-chamber to fall on the chemical to form steam, which propels the regenerated  
 85 steam continuously through the exhaust.

2. The method herein described of generat-  
 90 ing steam, which consists in suspending an in-closed volume of water in a chamber, placing a quantity of soda under said volume of water, 90  
 95 dissolving said soda by water fed thereon, at-tacking said soda and water by a charge of sulphuric acid, thereby generating heat which envelops the volume of water and vaporizes  
 95 the same into steam, and independently ex-  
 100 hausting the pressure from said chamber and the steam generated from the volume of water.

3. The herein-described method of generat-  
 100 ing steam and using the hot air or vapor of the initial generating medium as a regenera-  
 105 tive and propulsive medium, which consists in forming steam by a chemical compound, contacting it upon a bed of dry soda in a sepa-  
 110 rate compartment, allowing the heated air from the generating-chamber to flow into the  
 105 said separate compartment apart from the steam, and causing the water of condensation in the latter compartment to continuously fall upon the bed of soda by vibratory motion, as  
 110 set forth.

4. The herein described method of generat-  
 115 ing and propelling steam, which consists in allowing water to slowly fall upon a bed of dry soda contained in a closed chamber and feeding heated air or vapor generated by a  
 115 chemical compound in a separate chamber into said chamber containing the dry soda apart from the water, as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM G. MACLAUGHLIN.

Witnesses:

CHARLES S. HYER,

G. SARGENT ELLIOTT.