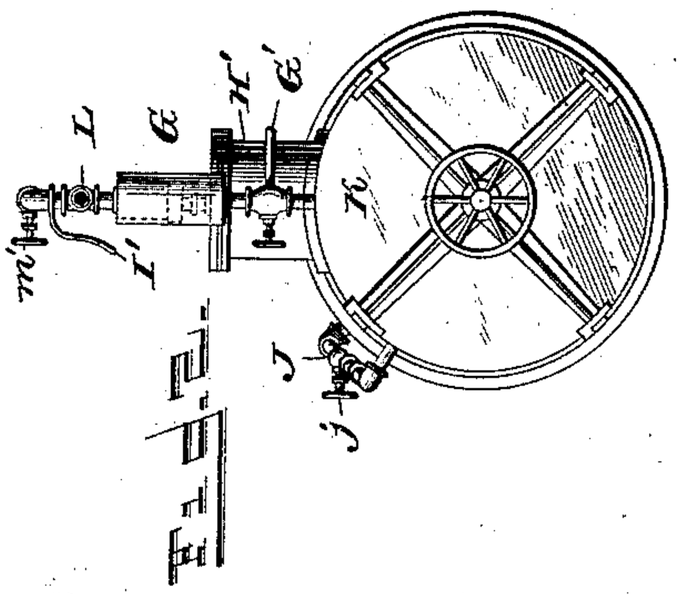
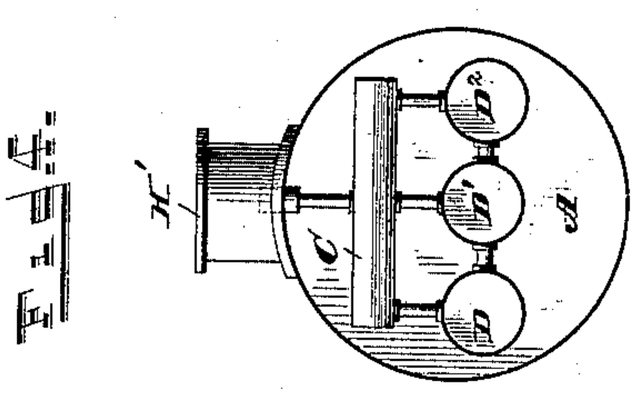
(No Model.)

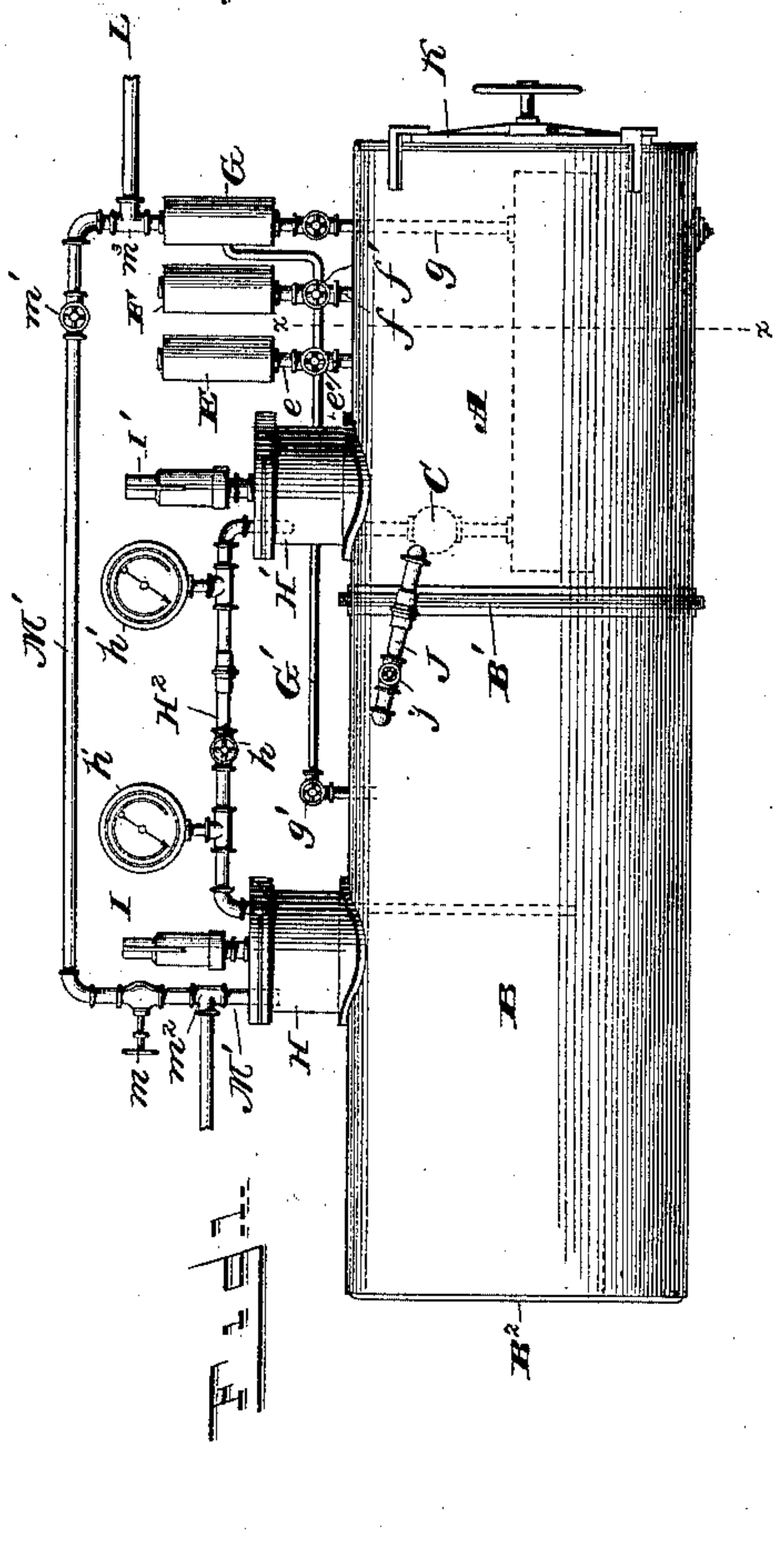
W. G. MacLAUGHLIN.

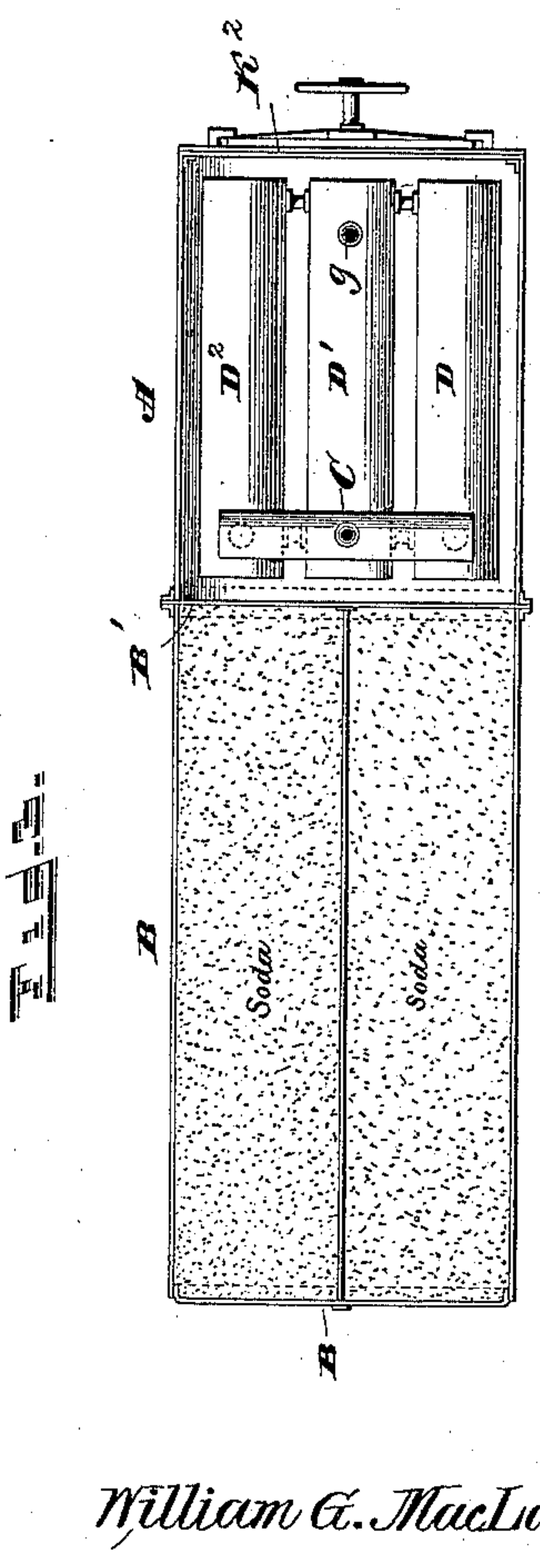
APPARATUS FOR CHEMICALLY HEATING WATER TO PRODUCE STEAM.

No. 387,088. Patented July 31, 1888.









WITNESSES

G. S. Elliott.

E. M. Johnson

William G. MacLaughlin.

INVENTOR

Attorney

UNITED STATES PATENT OFFICE.

WILLIAM G. MACLAUGHLIN, OF OMAHA, ASSIGNOR TO THE MACLAUGHLIN CHEMICAL MOTOR AND HEATING COMPANY, OF SEWARD, NEBRASKA.

APPARATUS FOR CHEMICALLY HEATING WATER TO PRODUCE STEAM.

SPECIFICATION forming part of Letters Patent No. 387,088, dated July 31, 1888.

Application filed April 11, 1888. Serial No. 270,331. (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 Apparatus for Chemically Heating Water to Produce Steam; 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 an apparatus for use in 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 operation of the apparatus relying to a great extent upon vibration to cause a deposit of condensed moisture upon a chemical compound, and the prevention of crystallization by a continuous exhaust.

My invention consists in a novel construction and combination of certain mechanical elements, which will be more fully hereinafter described, and pointed out in the claims.

I make no claim to the method employed in the apparatus herein set forth, as the subject-matter thereof is fully described and claimed in a pending application filed by me December 30, 1887, Serial No. 259,411.

In my improved apparatus for chemically generating steam or heated air to be used upon cars, vehicles, generally heating apartments, or for purposes of propulsion the rougher the road or track upon which said vehicles may move or run or the faster they run the vibration will be increased, thus causing an increase in the motive power.

To carry my invention into effect I construct the preferred form of apparatus illustrated in the accompanying drawings, wherein like letters of reference indicate similar parts in 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 into 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^2, 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 chamber A by a construction which is well known in the art and readily 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, 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 is mounted on the chamber A.

A pipe, H^2, 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^2 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^2, 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^2 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^2, is secured to the pipe M′ for the connection of an ex-

haust-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^3, 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 retention 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 drop therein through a pipe, G′, or by forcing a fine spray through the nozzle attached to the pipe G′ inside of the chamber B from the water-tank G, a valve, *g′*, in said pipe 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 best result being obtained by a mixture three pounds of soda and one and one-half pound of water, or a proportionate quantity. 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, which 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^2 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 great extent and effects a more perfect and desirable operation with the bed of soda in the chemical chamber B, and by becoming drained of all moisture is more powerful and requires less steam to do the work that damp steam does.

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 the 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 into 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. The vibration of the chamber need 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 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′ adjacent 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, 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, or into some suitable tank, to be used over again.

In generating and storing hot air the chamber A has the same operation, and 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 is generated into 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 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 chamber 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 in about 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 devours 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 chamber B in connection therewith.

The soda in the chamber B should be removed 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 is preferred in my process, as it is much cheaper than other soda. The quantity of soda diminished in chamber B is not noticeable, but it will be well to add a small quantity of new soda each three months.

The boiler should be built entirely of iron with wrought-iron, cast-iron, or lead pipes. No brass should be used except for outside trimmings and steam-gages.

It will be understood that I do not wish to confine myself to the uses to which my invention may be applied either for generating or heating purposes.

Having thus described my invention, I claim—

1. In a steam and heat generating apparatus, the combination, substantially as before set forth, of a boiler divided into generating and regenerating chambers by a partition-head, the said chambers having closed ends, a series of boilers suspended within the generating-chamber, the feed-water tank connected to said boilers, the steam domes, and the connecting-pipes.

2. In a steam and heat generating apparatus, the combination, substantially as before set forth, of a boiler divided into generating and regenerating chambers by a partitional head, and a series of boilers suspended within the generating-chamber.

3. In a steam and heat generating apparatus, the combination, substantially as before set forth, of the boiler divided into generating and regenerating chambers by a partitional head, a series of boilers suspended in the generating-chamber, and a steam-box in connection with said boilers and also with the generating-chamber.

4. The combination of the generating-chamber A, adapted to receive a chemical compound, the regenerating-chamber B, containing a bed of dry soda, the acid and water feeding tanks in connection with the generating-chamber A, the series of boilers suspended within said generating-chamber, the several receiving and conveying connections, and the inclined pipe J, connecting the chambers A and B, substantially as described.

5. The combination of the chambers A and B, the partition B′, dividing the same, water-tanks E and G, the acid-tank F, the series of boilers D, D′, and D″, suspended in the chamber A and connected to the water-tank G, the steam-box C, attached to the boilers D, D′, and D″, the steam-dome H′, receiving-dome H, the pipe H^2, connecting said domes, exhaust or conveying pipe M, connecting-pipe M′, running to the water-tank G from the dome H, and the pipe L, substantially as described.

6. The combination, with the chambers A and B, supplied with boilers and connections, as set forth, and having closed ends, of the divisional partition B′ and the inclined connecting-pipe J, substantially as described.

7. The combination, with the chambers A and B, having the dividing partition B′, the boilers suspended within the chamber A, adapted to be filled with water and connected with a suitable steam-dome, the removable head K for the purpose of giving access to the chamber A, and the water-tank E and acid-tank F, both of which are connected to the chamber A, substantially as described.

8. The combination, with the chambers A and B, having a dividing partition, of the connecting-pipe J, the water-tank G, the feed-pipe G′, running from said acid-tank G to the chamber B, and the exhaust-pipe from the latter chamber, substantially as described.

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

WILLIAM G. MACLAUGHLIN.

Witnesses:
R. S. MAULSBY,
H. T. JONES.