S. N. CARVALHO.

Heating Attachment to Boiler and other Furnaces.

No. 202,148. Patented April 9, 1878.

Fig: 1.

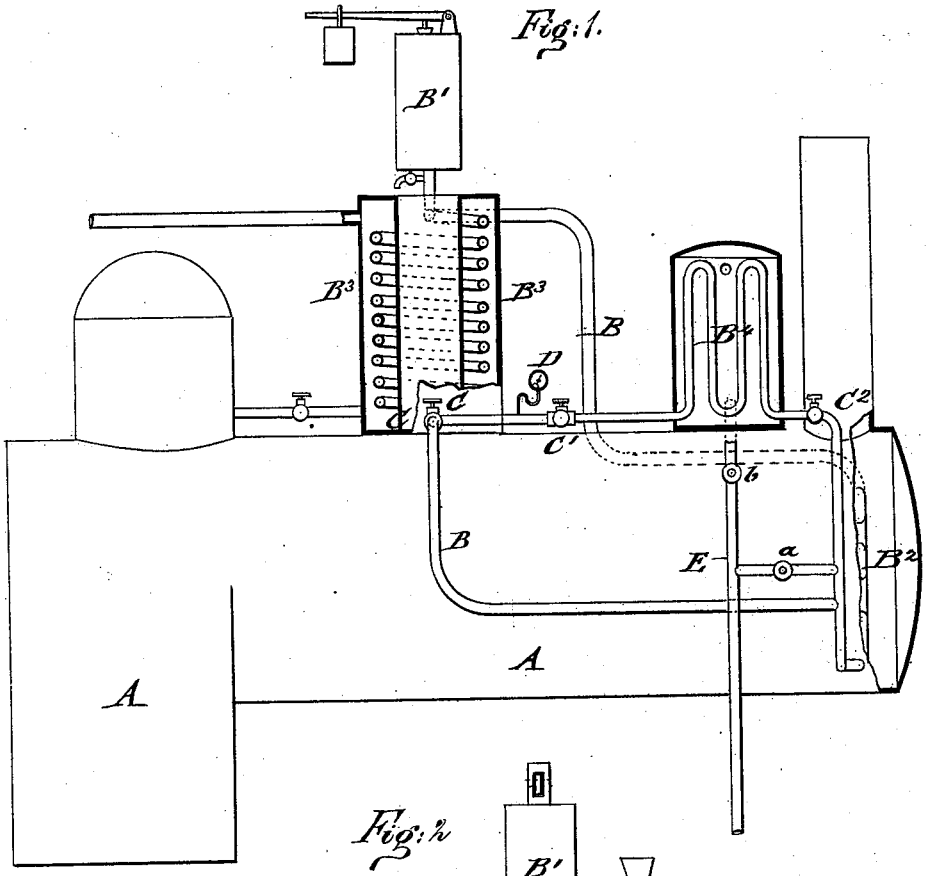


Fig: 2.

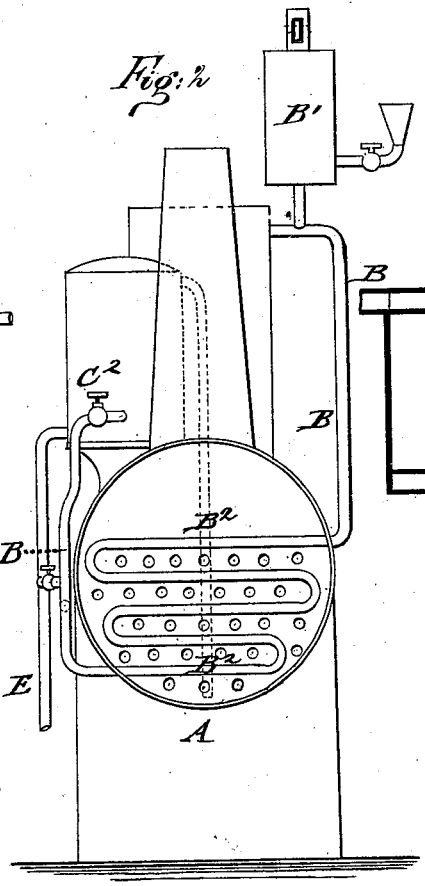


Fig: 3.

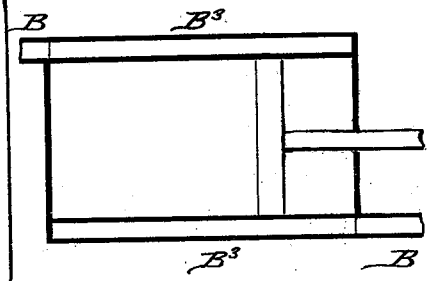
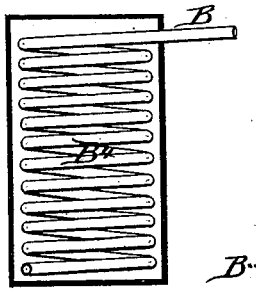


Fig: 4.



WITNESSES:

Chas. Nida

Sedgwick

INVENTOR:

S. N. Carvalho

BY Munn & Co

ATTORNEYS.

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

SOLOMON N. CARVALHO, OF NEW YORK, N. Y., ASSIGNOR TO HIMSELF AND JAMES M. PATTEE, OF SAME PLACE.

IMPROVEMENT IN HEATING ATTACHMENTS TO BOILER AND OTHER FURNACES.

Specification forming part of Letters Patent No. **202,148**, dated April 9, 1878; application filed January 12, 1878.

To all whom it may concern:

Be it known that I, SOLOMON N. CARVALHO, of the city, county, and State of New York, have invented a new and Improved Heating Attachment to Boiler and other Furnaces, of which the following is a specification:

In the accompanying drawing, Figure 1 represents a sectional side elevation of my improved heating attachment to furnaces; Fig. 2, a front elevation of the same; and Figs. 3 and 4 are horizontal sections, respectively, of a steam-cylinder of an engine having a water-jacket, and of a baking-oven, showing method of heating up the same.

Similar letters of reference indicate corresponding parts.

This invention is an improvement in the system of superheating steam and heating up the water in a steam-boiler for which Letters Patent have been granted to me under date of July 3, 1877, No. 192,678, so that that system may not only be extended to and used in connection with any furnace, whether it be a steam-boiler, cooking-stove, or other furnace or grate, but also the degree of absorbed heat regulated in any effective manner.

The invention consists of a closed system or circuit of pipes filled entirely with water, of which one part is subjected to the heat of the fire in a steam-boiler or other furnace. Another part of the upper circuit is used for superheating the steam on its way to the engine, while a third part or coil of the system, which may be thrown in or out of connection with the main circuit, is employed to heat up the feed-water of a steam-boiler, to radiate its heat to an oven for baking or drying purposes, so as to form a means for regulating thereby effectively the pressure and temperature in the main circuit.

Referring to the drawing, A represents the furnace of a steam-boiler, range, cooking-stove, heater, &c., and B a closed system or circuit of wrought-iron or other metallic tubes or pipes, which are entirely filled with water by means of a funnel on the expansion-chamber B^1, having a safety-valve stop-cock, and being arranged above the level of the entire circuit. One part or coil, B^2, of this closed system or circuit of water-pipes is placed at any suitable part of the furnace where it may be subjected to the heat of the fire-gases. In a locomotive-boiler it may be below the smoke-stack at the point where the fire-gases issue from the boiler-tubes, or at any other point of the furnace where the gases are thrown effectively on that portion of the system, so as to impart a considerable degree of heat thereto without requiring any additional quantity of fuel. The heating up of one section of the pipe-circuit forces the water through the entire circuit by the difference in the specific gravity of the two columns of water—viz., of the hot, and consequently lighter, ascending column of water and of the colder descending column of water. As the pipe-circuit is closed, a much higher pressure is carried in it than in the boiler, and a correspondingly higher temperature obtained. A second part or coil, B^3, of the pipe-circuit B encircles a steam-tight drum, through which the boiler-steam passes on its way to the engine, so as to superheat the same and evaporate all the water in the steam. In place of a separate superheater, the steam may be superheated in the cylinder of the engine by connecting the pipe-circuit with a water-jacket of the cylinder, as in Fig. 3. A third coil or section, B^4, of the pipe-circuit is arranged in an open or inclosed tank, which, when connected with a steam-boiler, serves to heat the feed-water, while, in connection with any other furnace, it may heat up the water in a boiler, or be utilized in other manner. The third coil serves to refrigerate the water in the pipe-system on its way back to the heat-absorbing coil, so that it re-enters there at a much lower temperature than when it passes out, and promotes thereby the circulation of the water in the closed system.

The pipe-circuit B is provided, between the superheater and feed-water tank, with three valves, C C^1 C^2, by which the pressure and corresponding heat in the pipes of the superheater are regulated. Thus when the feed-water tank is not needed, valves C^1 and C^2 are closed, and thereby the feed-water coil cut off from the main system, and the water then passed from the superheater directly back to the absorbing-surfaces or coil, having given off only the heat which was abstracted from

it by the steam on its way to the engine. Should, however, the heat and pressure in the superheater be greater than desired, then the valves c^1 and c^2 may be partly or entirely opened, as required. The high-temperature water of the superheating-coil enters the coil of pipe in the feed-water tank, and is affected by the colder feed-water, and thereby refrigerated in proportion to the opening of the valves. The pressure-gage D of pipe-section B^4 instantly records the variation, and when the desired temperature is reached the valves are set in accordance with it. Thus the extra heat abstracted from the superheating dome or drum is transferred to the feed-water tank, and employed not only for regulating the heat of the superheated steam, but also for making its surplus heat to heat up the feed-water. Instead of using the feed-water tank as a means of regulating the heat in the superheater, the coil of pipe may be inclosed by a sheet-metal covering, and employed as an oven, as shown in Fig. 4, for baking bread, &c. This is of special advantage when the entire pipe-system is applied to the furnace of a cooking or other stove.

The expansion-chamber B^1 is made of wrought-iron, and capable of sustaining a high pressure, and of sufficient size to provide for the expansion of the water in the pipe-circuit. The system of pipes used in this apparatus ought to be able to resist a very high pressure, and should be tested to a pressure of at least four hundred pounds to the square inch, though they will probably be not subjected to half of this pressure.

Though the closed system of water-pipes needs no replenishing for weeks, it is well to test it from time to time, when there is no fire in the furnace, by opening the stop-cock of the expansion-chamber. When the system is full, water will escape; when not full, it may be filled up to the stop-cock, which is then closed again for the working of the circuit. The pipe-system can also be filled under pressure by connection with a donkey-engine, and by opening valve *a* of the short pipe-section connecting the feed-water pipe with the pipe-circuit B and closing-valve of the feed-water pipes E.

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

1. The combination, with a steam-boiler or other furnace, of a closed system or circuit of pipes filled with water, and composed of three sections or coils, of which one is exposed to the heat of the fire-gases of the furnace, the second used for superheating steam or for other heating purposes, and the third arranged to be cut out from the main section for regulating the pressure and heat in the main circuit, substantially as and for the purpose described.

2. The combination, with a steam-boiler or other furnace, of a closed system or circuit of pipes filled with water, and arranged with one section or coil that absorbs the heat of the furnace, and with a second section or coil that is employed for superheating steam or for other heating purposes, substantially as specified.

3. The combination, with a steam-boiler or other furnace, of a closed system or circuit of pipes filled with water, provided with an expansion-chamber, and composed of three sections or coils, of which one absorbs the heat of the fire-gases, while the second is used for superheating steam or for other heating purposes, and the third for regulating the heat and pressure in the pipe-circuit, the last section being thrown in or out of the system by suitable valves, substantially as described, and for the purpose specified.

SOLOMON N. CARVALHO.

Witnesses:
PAUL GOEPEL,
C. SEDGWICK.