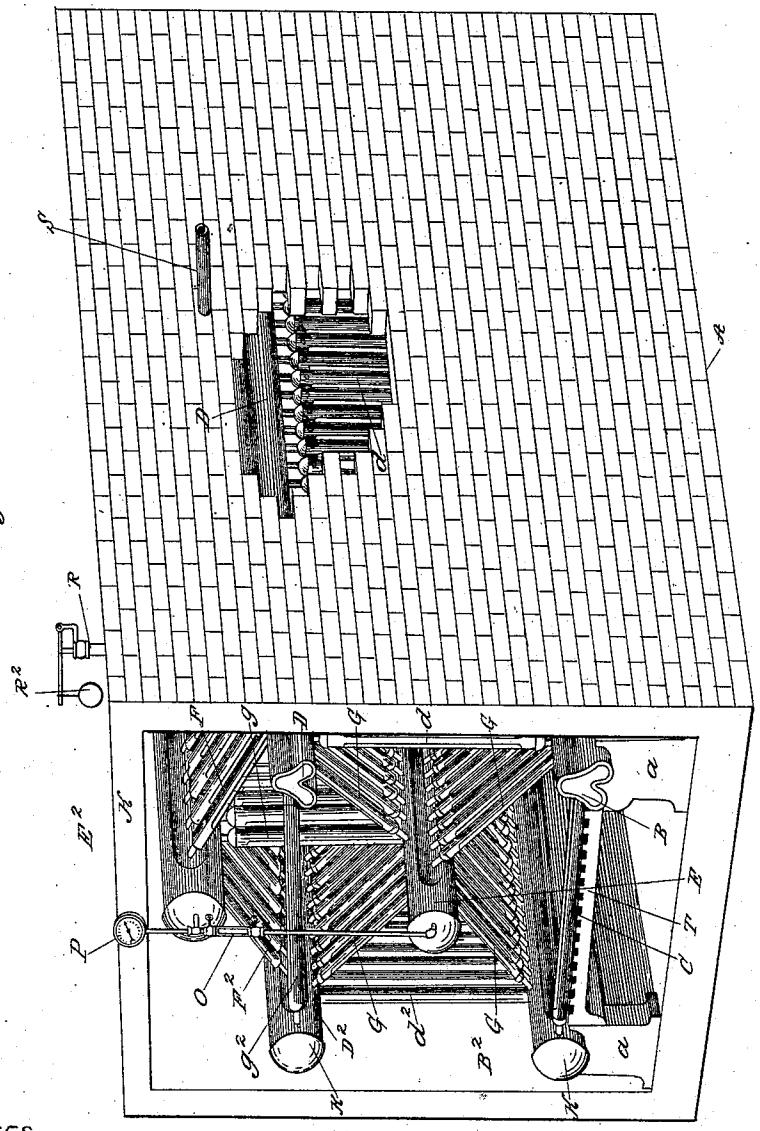
(No Model.) 2 Sheets—Sheet 1.

S. LACAVALERIE.

STEAM GENERATOR.

No. 565,907. Patented Aug. 18, 1896.

Fig. 1.



WITNESSES

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 2.

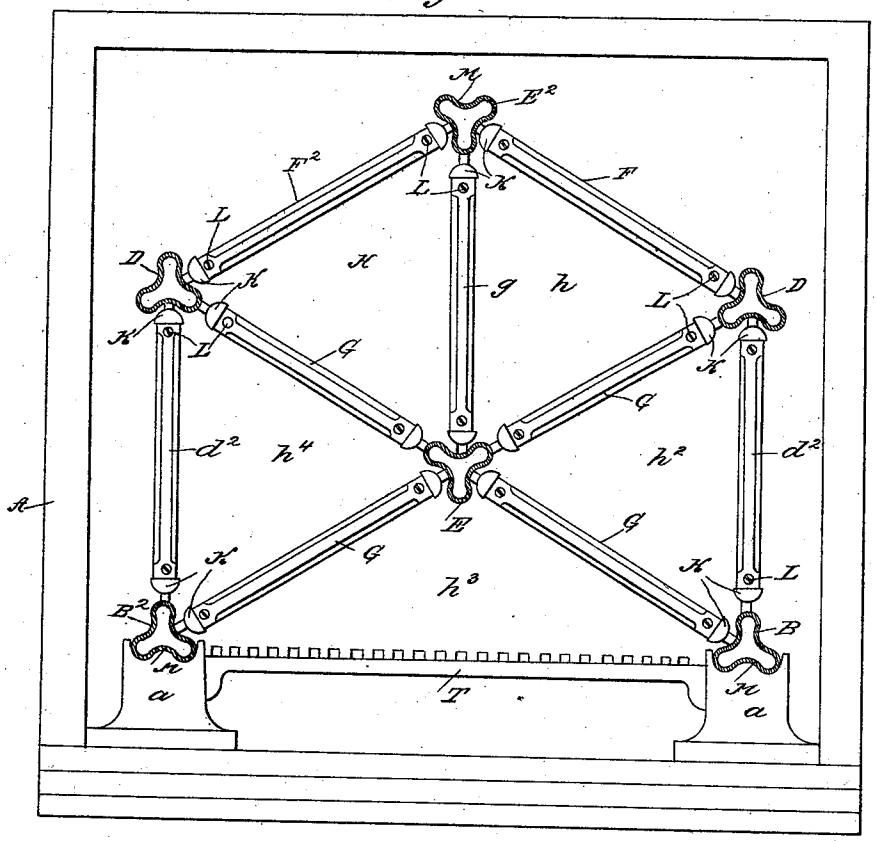


Fig. 3.

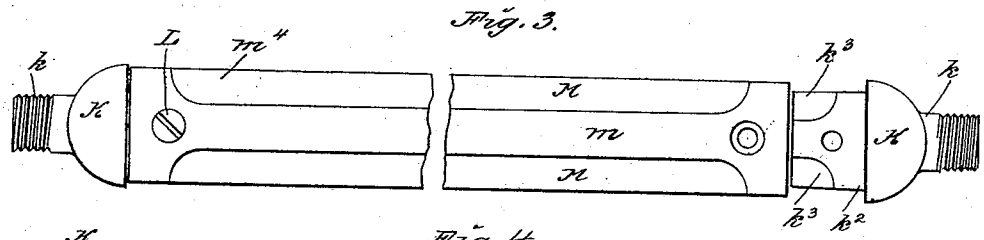


Fig. 4.

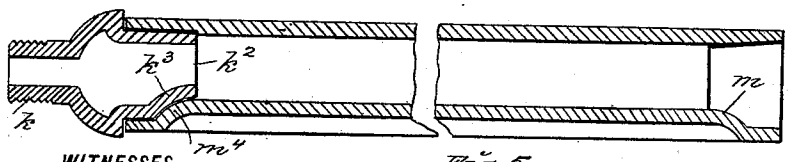
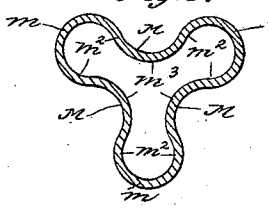


Fig. 5.



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UNITED STATES PATENT OFFICE.

SEBASTIEN LACAVALERIE, OF CARÁCAS, VENEZUELA.

STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 565,907, dated August 18, 1896.

Application filed May 2, 1896. Serial No. 590,006. (No model.)

To all whom it may concern:

Be it known that I, SEBASTIEN LACAVALERIE, a citizen of the Republic of France, and a resident of Carácas, Venezuela, have invented certain new and useful Improvements in Steam-Generators, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof, in which similar letters of reference indicate corresponding parts.

This invention relates to steam-generators, and the object thereof is to provide an improved steam generator or boiler which is simple in construction and operation, and whereby steam may be more quickly and easily generated than in ordinary devices of this class now in use, a further object being to provide a steam-generator in which the danger of explosion is reduced to a minimum, and in which the water to be heated is contained in a plurality of main horizontal pipes, which are connected by vertical and transverse cross-pipes and by pipes which are arranged at an inclination or angle to the transverse and vertical pipes, and with this and other objects in view the invention consists in the construction, combination, and arrangement of parts hereinafter described and claimed.

The invention is fully disclosed in the following specification, of which the accompanying drawings form a part, in which—

Figure 1 is a perspective view of a furnace and showing also, in perspective, a portion of my improved generator; Fig. 2, an end view thereof, a portion of the main horizontal water-pipes being shown in section; Fig. 3, a plan view of one of the cross or connecting pipes which I employ, said pipe being provided at one end with a head which is connected therewith, and at the other with a similar head which is detached therefrom so as to better show the construction; Fig. 4, a longitudinal section of said pipe, showing one of the heads in position; and Fig. 5, a transverse section of one of the main horizontal pipes.

In the practice of my invention I provide a furnace A, which is preferably oblong in form and which may be of any desired form and construction, and which is provided at the bottom thereof and near each side with a longitudinal base wall or support *a*, and these base walls or supports may be composed of fire-brick or of any desired material.

In the construction of my improved steam generator or boiler I provide two main horizontal water-pipes B and B^2, which are supported longitudinally by the base walls or supports *a*, and which are connected at the ends by a transverse pipe C. I also provide two other main horizontal water-pipes D and D^2, which are arranged directly over the pipes B and B^2, respectively, and which are connected therewith by vertical pipes *d* and d^2, and two other main horizontal pipes E and E^2 are employed, the first of which is arranged centrally of the first four and in line therewith, and the pipe E^2 is arranged directly over the pipe E and also above the pipes D and D^2, and is connected with said pipes D and D^2 by inclined pipes F and F^2.

The central pipe E is connected with the pipes B and B^2 and D and D^2 by diagonal or inclined pipes G, and the central pipe E is also connected with the upper pipe E^2 by vertical pipes *g* and the pipes D and D^2, and connected at their ends by transverse pipes g^2, which correspond with the transverse pipes C, by means of which the pipes B and B^2 are connected at their ends. By this arrangement of the main horizontal and the connecting-pipes horizontal chambers H, *h*, h^2, h^3, and h^4 are formed, and these chambers are all triangular in cross-section, and are of such size as to permit of the passage of a man therethrough, whereby the various parts of the generator may be repaired whenever desired.

The main horizontal pipes are of novel form and construction, and the body portions thereof are of the form in cross-section shown in Fig. 5, and each is provided with a circular end, which is closed by a cap K, and in this respect the main horizontal pipes and the cross or connecting pipes are of the same construction, and this construction is clearly shown in Figs. 3 and 4.

The main or body portions of the cross or connecting pipes are also of the same form as the main or body portions of the main horizontal pipes, and by reason of this fact the construction of all of these pipes will be clearly understood by reference to Figs. 3, 4, and 5 and the following description thereof:

The body portion of the main horizontal

pipes, and also of the cross or connecting pipes, is provided with three longitudinal inwardly-directed grooves M, whereby three corresponding longitudinal projections m are formed, and the cross-section view, reference being made to Fig. 5, shows that the curves of these portions are regular, and by means of this arrangement I provide for counterbalancing the pressure of the steam therein, and thus prevent, under ordinary circumstances, an explosion thereof.

The pressure of the steam at the points m^3 operates to force the inwardly-curved surfaces m^3 together, and the pressure of the steam on the surfaces m^3 counterbalances them at the points or on the surfaces m^2, and thus a counterbalancing of the pressure within the pipe is secured. Each of these pipes is also closed by tubular heads K, which are provided at one end with a screw-threaded extension k and at the inner end with a tubular extension k^2, which is adapted to be inserted into the ends of the pipes and to be secured therein by rivets or bolts L, and the ends of the longitudinal grooves M are also curved, as shown at m^4, and the tubular extensions k^2 are provided with similar grooves or recesses k^3, whereby a perfectly secure and tight coupling is made between the heads and the pipes, and the heads K of the cross-pipe are adapted to be connected with the main horizontal pipes by means of the screw-threaded extension k formed thereon, this connection being clearly shown in Figs. 1 and 2.

The connection of the cross and connecting pipes with the main horizontal pipes may be made either in the longitudinal grooves or depressions M or with the outwardly-directed longitudinal portions or projections m thereof, and by means of this arrangement the main horizontal pipes, six of which are employed, and the connecting-pipes are securely bound and held together throughout the entire lengths of said main horizontal pipes, and the danger of an explosion or other accident is reduced to a minimum.

In Fig. 1 I have shown a water-gage O, which is connected with the central main pipe E, and a steam-gage P, which is connected with the upper main horizontal pipe E^2, and said upper pipe also serves as a steam-drum, and in practice the entire apparatus is filled with water up to said main pipe E^2, which is also preferably partly filled, and I also provide a safety-valve R, which is controlled by a weighted lever R^2, and passing through the side of the furnace is a steam-pipe S, which connects with the upper main pipe or drum E^2, and by means of which the steam may be conveyed to an engine or motor, or to a heater or heaters.

The grate T is supported by the furnace or base walls a, by which the generator is supported, and said grate may be of any desired form or construction, and may also be made removable, if desired, and when the separate parts of my improved generator are united, as hereinbefore described, it will be seen that four of the main horizontal pipes thereof, B and B^2 and D and D^2, are arranged in the form of a rectangle, or constitute a rectangular figure, and the horizontal pipe E is arranged centrally thereof and the pipe or drum E^2 directly over the central pipe and also over the horizontal pipes D and D^2 and B and B^2, and in practice all of these parts are filled with water and the heat or products of combustion are free to pass and circulate between and around all of them, with the exception of the bottom horizontal pipes B and B^2, over which the heat or products of combustion may also pass.

It will be apparent that by reason of this construction the water may be quickly and economically heated and steam at any desired pressure supplied, and my invention is not limited to the material of which the generator is composed, and I reserve the right to make all such alterations therein and modifications thereof as fairly come within the scope of the invention.

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

1. The herein-described steam-generator which consists of six main horizontal pipes, four of which are arranged in the form of a rectangle, and one of which is arranged centrally of the said four, the other being arranged over and in vertical line with the central one, and also over the upper two of the first four, and said horizontal pipes being connected by vertical and diagonal or inclined pipes, the side pipes of the first four being connected by vertical pipes, and also by upper and lower transverse pipes, the central pipe being connected with the first four by diagonal or inclined pipes, and the upper pipe being connected with the central pipe, by vertical pipes, and with the upper two of the first four by inclined pipes, substantially as shown and described.

2. A steam-generator, substantially as herein shown and described, which consists of six main horizontal pipes four of which are arranged in the form of a rectangle, one of which is arranged centrally of said four, the other being arranged over and in vertical lines with the central one and above the upper two of the first four, the side pipes of the first four being connected by vertical pipes, and the first four pipes, being connected by diagonal pipes with the central pipe, the superimposed pipe being connected by an obliquely-inclined pipe to the upper pipes of the first four and by vertical pipes with the central pipe, said main pipes and connecting-pipes being triangular in cross-section, being provided with longitudinal depressions by means of which construction, the pressure of the steam is equalized as and for the purpose specified.

3. A steam-pipe for steam-generators, provided with longitudinal inwardly-directed

grooves and corresponding longitudinal outwardly-directed portions three of each of which are employed, the curves formed by said grooves being regular in form, and arranged so as to counterbalance the pressure within the pipe, said pipe being also provided with circular ends and coupling-heads, substantially as shown and described.

4. A steam-pipe for steam-generators, provided with longitudinal inwardly-directed grooves and corresponding longitudinal outwardly-directed portions three of each of which are employed, the curves formed by said grooves being rectangular in form, and arranged so as to counterbalance the pressure within the pipe, said pipe being also provided with circular ends and coupling-heads, said coupling-heads being provided at one end with tubular extensions, which are adapted to be secured in the ends of the pipe, and at the other end with screw-threaded tubular extensions, substantially as shown and described.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of the subscribing witnesses, this 1st day of May, 1896.

SEBASTIEN LACAVALERIE.

Witnesses:
M. B. HARRIS,
C. GERST.