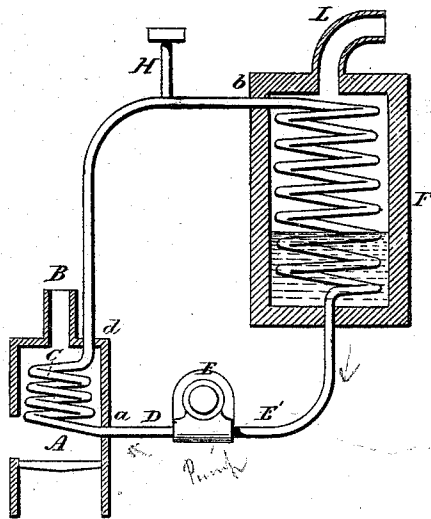


W. P. TROWBRIDGE.

Steam-Generators.

No. 142,534.

Patented September 2, 1873.



Witnesses:

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WILLIAM P. TROWBRIDGE, OF NEW HAVEN, CONNECTICUT.

IMPROVEMENT IN STEAM-GENERATORS.

Specification forming part of Letters Patent No. **142,534**, dated September 2, 1873; application filed March 26, 1873.

To all whom it may concern:

Be it known that I, WILLIAM P. TROWBRIDGE, of New Haven, in the county of New Haven and State of Connecticut, have invented a new Improvement in Steam-Generators; and I do hereby declare the following, when taken in connection with the accompanying drawing and the letters of reference marked thereon, to be a full, clear, and exact description of the same, and which said drawing constitutes a part of this specification, and represents a vertical section.

This invention relates to an improvement in apparatus for generating steam or evaporating purposes by means of a medium passing through a coil or succession of pipes within a boiler or evaporating chamber.

It is a well-known fact that water or other medium entering a heated vessel below, passing therethrough, will, as it becomes heated, pass out at the upper portion, thence to any desired point or vessel, returning through the lower tube to be again reheated, and so continuing, the circulation of the fluid causing the heating of that portion outside that immediately in contact with the fire. For evaporating purposes a succession of pipes or coils are sometimes arranged in the bottom of an evaporating pan or chamber, these pipes having connections with other coils or chamber in or around the fire-box, so that one end of the tube will lead into the lower portion and the other end into the upper portion. When heated the circulation will be maintained, as before described, heating the pipes in the evaporating chamber or pan to cause the heating or evaporating of the contents; but in such construction, in proportion as the tubes outside or away from the fire become heated, the rapidity of the circulation diminishes—that is, if the fluid or medium in the tube outside the fire-box is of the same temperature as that where the heat is applied, there will be no circulation; hence such a means of generating heat is considerably limited.

The object of this invention is to utilize the heating by circulation to an indefinite extent; and it consists in a coil or succession of connected pipes or a chamber arranged so that heat may be applied thereto, the said coil or

chamber in connection with a second coil or succession of pipes leading from the upper portion of the first and returning into the lower portion of the first, combined with a pump in connection with or between the said heating chamber or coil and the second coil, whereby a forced circulation of the liquid from the first chamber through a circuit embracing the second coil is maintained through both, and not dependent upon the evaporation in the first or condensation in the second, as more fully hereinafter described.

I illustrate my invention as for generating steam within a close boiler.

A is a fire-box of any convenient construction; B, the outlet for the products of combustion. Within the fire-box a coil, C, of tubing is arranged, one end extending out below, as at *a*, the other above, as at *d*. From the point *a* a tube, D, leads to a pump, E, of any suitable construction for forcing the fluid. From the pump, in the opposite direction, the pipe E', which is practically a continuation of the pipe D, leads into a boiler, F, at or near the bottom. Within the boiler the pipe is coiled, passing out near the top, as at *b*, thence running into connection with the fire-box coil, as at *d*. At any convenient point a stand-pipe, H, is arranged in connection with the said tube extending above the highest point. Through this stand-pipe H the tube is filled, but not so as to completely fill the stand-pipe. The stand-pipe is then closed, the space within allowing the expansion of the medium within the tube when heated. This pipe may be closed by a regulated pressure, if desirable.

The boiler F is preferably made from strong cast metal, so as to be capable of standing a very great pressure, and from this an outlet, L, permits the taking of the steam from the boiler to any desired point. The boiler is partly filled with water or fluid from which it is desired to generate steam, say, up to the broken lines. This completes the apparatus.

The fire made within the fire-box rapidly heats the coil C. The pump E is started and kept in motion, drawing the water from the coil in the boiler and forcing it through the coil in the fire-box back into the boiler, thus maintaining a rapid circulation within the tube, and this, as rapidly heated within the fire-box,

passing to the boiler quickly causes the boiling of water therein, generating steam therefrom, which rapidly rises through the upper portion of the coil; there superheated by the coil to a high degree; thence to be taken to the point of utilization.

By this construction I am enabled to generate a large amount of very high pressure steam within a compass very small when compared to other steam-generating apparatus of equal capacity, and such a steam-generating apparatus is peculiarly adapted for steam-engines for light work, which is now done by foot or hand for want of a competent power of little cost.

In such class of apparatus the firing or principal heating may be done by the use of gas or equivalent means, so that when a constant use is not required, the getting up of steam may be done so quickly that the expense of fire is avoided, except for the time the use of the steam is required.

The same arrangement may be applied to evaporating purposes, the coil lying in the evaporating-chamber and the force of the circulation maintained, and in this, as in generating steam, a great rapidity of action is maintained.

Water may be used as the medium to circulate in the pipes, but for very high temperature some other medium which does not boil until a much higher temperature would be preferable.

I claim as my invention—

In an apparatus for generating steam or evaporating, consisting of a coil or succession of connected pipes, or a chamber, arranged so that heat may be applied thereto, the said coil or chamber in connection with a second coil or succession of pipes leading from the upper portion of the first and returning into the lower portion of the first, a pump, E, in connection with or between the said heating-chamber or coil and the second coil, whereby a forced circulation of the liquid from the first chamber through a circuit embracing the second coil is maintained through both, and not dependent upon the evaporation in the first or condensation in the second, substantially as and for the purpose described.

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Witnesses:

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