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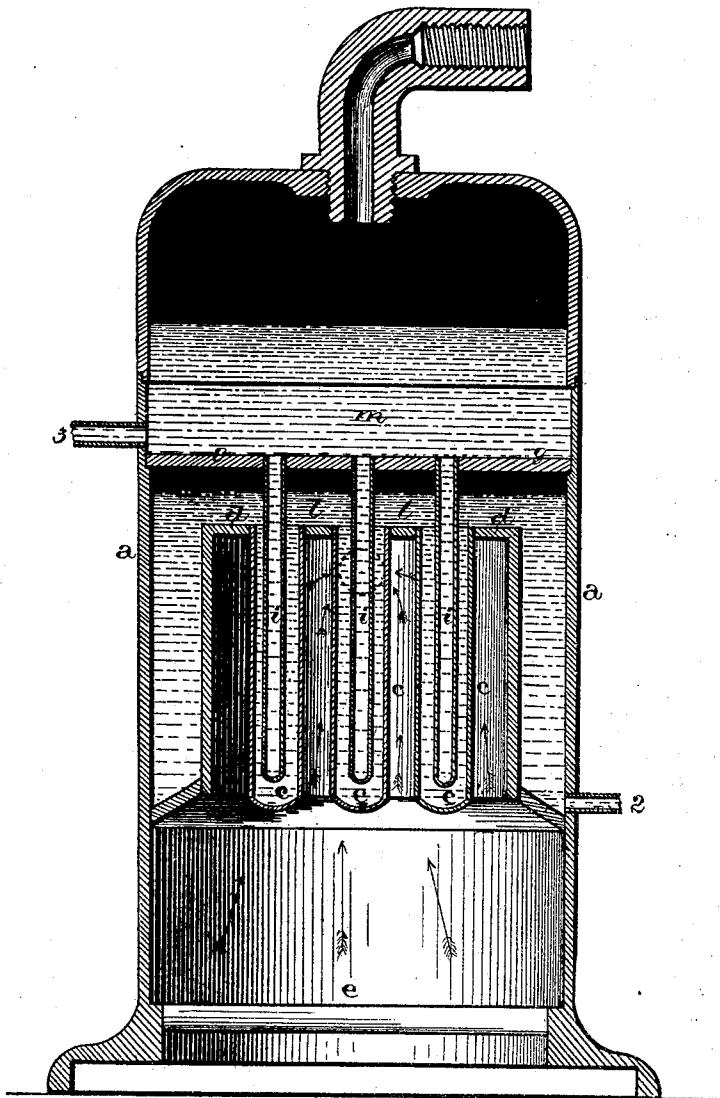
J. F. HASKINS.

Boilers for Vaporizing Volatile Fluids.

No. 145,175.

Patented Dec. 2, 1873.

Fig. 1.



WITNESSES.

Wm. Hale
Atty. Gen. Murphy

INVENTOR.

Jno. F. Haskins
per
F. A. Lehmann, Atty.

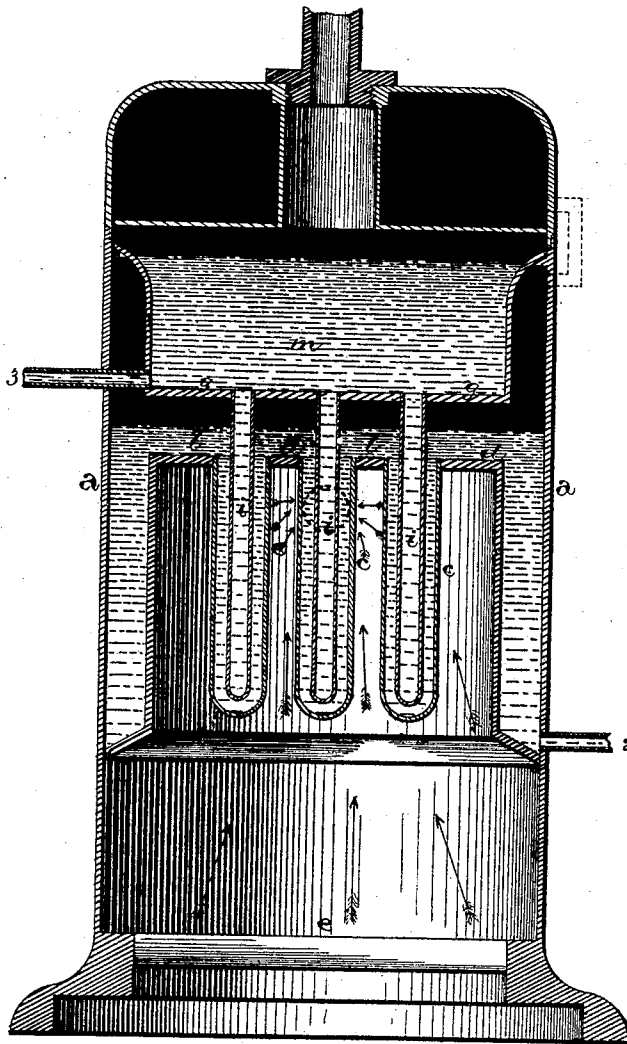
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Fig. 2.



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UNITED STATES PATENT OFFICE.

JOHN F. HASKINS, OF FITCHBURG, MASSACHUSETTS.

IMPROVEMENT IN BOILERS FOR VAPORIZING VOLATILE FLUIDS.

Specification forming part of Letters Patent No. **145,175**, dated December 2, 1873; application filed November 12, 1873.

To all whom it may concern:

Be it known that I, JNO. F. HASKINS, of Fitchburg, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Boilers for Vaporizing Volatile Fluids; 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 pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification.

The nature of my invention relates to that class of evaporators or boilers which are used to generate vapor from fluids which are volatilized at a lower temperature than water; and it consists in hanging directly over the furnace a number of water-tubes, inside of which are suspended similar smaller tubes containing the volatile fluid, there being a sufficient space left between the tubes for a thin sheet of water, which entirely surrounds the inner ones, as will be more fully described hereafter.

The accompanying drawings represent my invention.

a represents an ordinary vertical boiler, of any desired shape or size, in which are hung a number of vertical water-tubes, *c*, which extend down directly over the fire built upon the grate *e*. These tubes are preferably suspended vertically from the plate *d*, which corresponds to the usual crown-sheet of vertical boilers; but, if so desired, they may be arranged horizontally, or in any other position, the object being to place them directly over the fire in such a manner as to receive the greatest amount of heat. Above the crown-sheet *d*, at a suitable distance, is supported a second or inner crown-sheet, *g*, from which are suspended a number of tubes, *i*, smaller in diameter, but corresponding in number to the water-tubes, and which project down into the water-tubes to any desired distance, there being a sufficient distance left between the two sets of tubes for a thin sheet of water to settle down between them and completely immerse the inner ones.

The tubes *c* and space *l* above the crown-sheet *d* having been supplied with water through the pipe or inlet 2, and the tubes *i* and space

m above the inner crown-sheet *g* having been filled with any suitable fluid which volatilizes at a lower temperature than water, through the inlet 3, the boiler is ready for operation. The water, having been broken up into thin sheets or stratum, and being exposed to so large a heating-surface, is quickly and readily heated to the boiling-point, or to a higher point, if so desired, which heat will at once pass, by radiation, into the volatile liquid contained in the pipes *i*, causing it to become vaporized and to assume a pressure in proportion to the amount of heat it receives. Both outer and inner boilers are supplied with any convenient means of supplying them with fresh fluid to replenish that which is used or wasted, test-cocks and glasses to determine the quantity of fluid contained, and pressure-gages and safety-valves to register and control pressures, none of which form a part of this invention.

It sometimes occurs that in the use of the vapors of volatile fluids, such as ether, the products of petroleum, or the bisulphide of carbon, leaks occur in those parts of the evaporator-pipes or engine in which the vapor created passes or is used, and which continue as long as the production of the vapor by heat is carried on. In order to check the leak at once, the generation of the gas must be instantly stopped, which I accomplish by injecting cold water into the annular spaces between the two sets of tubes, and thus use what was heating-surface for condensing-surface, as is fully shown and described in the patent granted to me February 25, 1873, No. 136,241.

The great advantage of this system over all others which have been used for the same purpose is, that by the breaking up of the water or less volatile fluid into thin stratum or layers in the annular spaces between the tubes, and hanging these spaces directly over the fire, the heat is all utilized, or more nearly so, than where large volumes of water are to be heated. The fire-surface is all available, and there will be a constant circulation of water as it becomes heated, thus bringing new particles constantly in contact with the surfaces receiving heat from the fire underneath.

If so desired, live or exhaust steam may be

used in the water-pipes to volatilize the fluid contained in the pipes *i*, or the steam may be allowed to circulate outside of the water-pipes, as does the flame when a fire is built in the furnace under the tubes.

In Fig. 2 is shown a slight modification of my invention, in which the water or steam space is carried up around the volatile-fluid chamber, so as to increase the heating-surface, and the top or cover is made hollow, so as to contain steam, hot water, or heated air, which may be supplied from the boiler below, or any other source.

Having thus described my invention, I claim—

1. In a vapor-generator, two sets of tubes,

one placed within the other, so as to break up both the water and volatile fluid into thin layers or stratum, substantially as specified.

2. A boiler for vaporizing volatile fluids, consisting of the shell *a*, water tubes and space *e l*, and fluid tubes and space *i m*, arranged and combined for operation substantially as shown and described.

In testimony that I claim the foregoing I have hereunto set my hand this 6th day of November, 1873.

JOHN F. HASKINS.

Witnesses:

H. C. HITCHCOCK,
C. HAYWARD.