Nov. 4, 1930. L. S. LANTERMAN 1,780,529

STEAM OR VAPOR GENERATOR

Filed Nov. 14, 1927

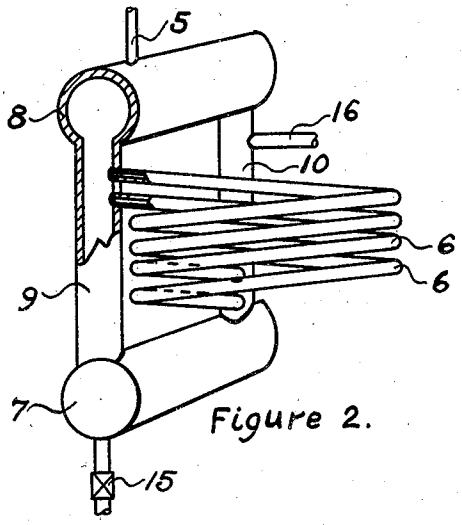


Figure 2.

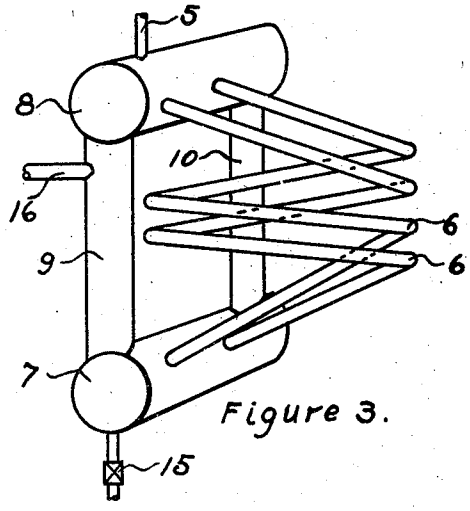


Figure 3.

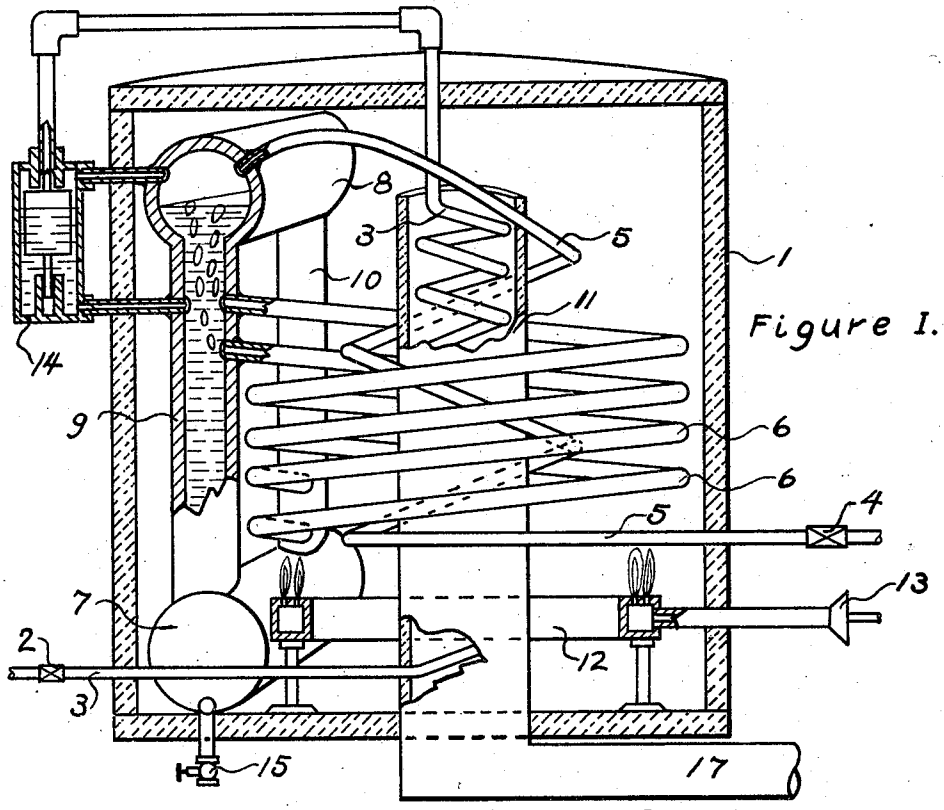


Figure 1.

Witness:

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UNITED STATES PATENT OFFICE

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STEAM OR VAPOR GENERATOR

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The invention relates to an evaporating apparatus or boiler and particularly to an evaporating system comprising heat transfer coils of the circulating type, in connection with constant level liquid reserve chambers and a vapor or gas accumulation space in the upper chamber. An object of the invention is to provide means of rapidly generating and collecting steam or other vapors under pressure. Another object is to provide for expansion and contraction of the parts, so that no distortion and consequent leaks will occur in the generator.

The invention possesses other advantages, some of which, with those referred to above will be described in detail in the following description.

In the drawings:

Figure 1 is an elevation of a vapor generator made in accordance with my invention, with the casing sectioned so as to show the construction of the vapor generator. Figure 2 is a view of the circulation system. Figure 3 is a view of a circulation system with the circulating coils beginning and ending in the horizontal drums instead of in the upright stand-pipes as shown in Figure 2.

Referring to the drawings by reference characters 7 and 8 are horizontal tubular metal drums, 9 and 10 are upright tubular metal stand-pipes suitably secured to and in communication with the drums 7 and 8 so as to form a continuous rectangular passage-way or chamber. The stand-pipes 9 and 10 and the drums 7 and 8 are preferably secured together by autogenous welding as shown in the drawings but may be fabricated in any suitable manner. The coils 6, 6 are metal tubes preferably helically coiled with a coarse pitch so as to cause the liquid circulating through them to travel at a high rate of speed. Said coils 6, 6 may start in the lower end of one of the stand-pipes such as 10 and end in the other stand-pipe. The interior of these coiled tubes 6, 6 is in communication at both ends with the interior of the stand-pipes which are suitably secured into them, preferably by autogenous welding. 5 is a tube for conducting escaping vapors. 15 is a mud and sediment blow-off valve. 16 is a tube for replenishing the supply of liquid.

In Figure 1, 1 is a casing enclosing the entire liquid vaporizing system, said casing being composed of any suitable refractory and insulating material such as moulded asbestos board, or infusorial earth, or magnesium carbonate. 2 is a valve on the liquid supply pipe 3. 4 is a shut-off valve or throttle valve on the helically coiled vapor and super-heating pipe 5. 6, 6 are helically coiled liquid circulating tubes referred to above and shown in Figures 2 and 3. 7 and 8 are the horizontal drums connected by the stand-pipes 9 and 10, all described above and shown in Figures 2 and 3. 11 is an exhaust-pipe placed in the center of the coils of tubing 6, 6 and 5, it also being composed of moulded refractory material. The liquid supply pipe 3 is spirally coiled inside the exhaust pipe 11, and is connected to and in communication with the circulating system through the liquid level regulator 14. 17 is an extension of the exhaust pipe 11. 12 is the burner casting and 13 is the fuel and air mixing valve to supply the burner 12 with a suitable fuel and air mixture.

As shown in Figure 1 the horizontal drum or tube 7 is below the burner and the fire and is therefore relatively cooler than the rest of the circulating system, this gives the accumulating mud, sediment and scale a chance to collect in the drum and still not be burned onto the metal of said drum, and could thus be blown from the drum 7 by a suitable blow-off valve 15. The upper horizontal drum 8 serves two purposes, as the liquid level is maintained near the center of the drum 8 by any suitable liquid level regulating device such as the float and valve type 14, as shown, or may be of the expanding tube type, said regulator is not claimed as new; one purpose is that the drum 8 provides a separating surface to allow the gases or steam to separate from the liquid, also it provides a storage space for the steam, vapor or gases. The stand-pipes 9 and 10 serve as connecting passages between the two horizontal drums 7 and 8, also serve as supports for the circulating coils 6, 6 when the circulating system is formed as shown by Figure 2. The rectan-

gular passage-way formed by the two horizontal drums 7 and 8 and the vertical stand-pipes 9 and 10 has a continuous slow circulation maintained in it by the rising column of steam and hot water in one of the stand-pipes, and thereby carries all scale to the lower drum where it settles and can be blown out. The plurality of circulating coils 6, 6 form a large surface for the absorption of heat and by their small cross-sectional area and their inclination cause the liquid and gases in them to circulate at high speeds, thereby absorbing a greater quantity of heat. The circulating tubes 6, 6 being directly exposed to the fire or hot gases of combustion, must expand and being coiled are free to expand without injury to their joints. The wet steam or gases pass from the drum 8 through the super-heating tubing 5 which presents a still greater heat absorbing surface to the gases of combustion thereby extracting more heat also super-heating the steam or other gases; this tubing is also coiled and free to expand. The cold liquid from the source of supply passes through the economizer tubing 3 which is coiled inside of the exhaust stack 11 and is thus heated by the otherwise waste heat of the exhausted gases of combustion. This liquid is therefore preheated before being fed as required to the circulating and steam generating system composed of the horizontal drums 7 and 8 with their vertical stand-pipes 9 and 10 and the circulating coils 6, 6. The burner 12 may be of any suitable type and consume any suitable fuel, said burner is not claimed as new.

Having thus described my invention, what I claim is new and desire to secure by Letters Patent of the United States is:

1. In a tubular vapor generator, an upper steam and water drum and a lower mud drum spaced from said steam drum, a pair of spaced pipes connecting said steam and water drum and said mud drum, a coil of hollow pipe arranged adjacent said drums, said coil having the upper end thereof communicating with one end portion of one of said pipes and having the other end thereof communicating with the lower end portion of the other pipe, a steam discharge line extending from the upper portion of the steam and water drum, said steam discharge line passing through said coil.

2. In a tubular vapor generator, the combination of a casing enclosing a circulation system comprising two horizontal drums spaced apart vertically, means to afford communication between said drums, said means including spaced conductors, and a plurality of tubes coiled with a coarse pitch, said coils ascending vertically with their lower ends in communication with the lower end of one of the conductors and with their upper ends in communication with the upper end of the other conductor, a super-heater coil communicating with the top of the upper drum and descending vertically downward within the said coils, and a fuel burner under the circulation coils and the super-heater coil, and a coil of tubing adjacent to said super-heater coil, said coil of tubing being in communication with the upper drum and with a suitable source of fluid supply.

3. In a tubular vapor generator, the combination of a casing enclosing a circulation system comprising two horizontal drums spaced apart vertically, means to afford communication between said drums, said means including spaced conductors, and a plurality of tubes coiled with a coarse pitch, said coils ascending vertically with their lower ends in communication with and each engaging the lower end of one of the conductors and with their upper ends communicating with and engaging the upper end of the other conductor, means for regulating the fluid level in the circulating system, a super-heater coil communicating with the top of the upper drum and descending vertically downward within the said coils, a fuel burner under said coils and the super-heater coil, an exhaust stack, said exhaust stack being surrounded by said super-heater coil and the upper end of said exhaust stack being spaced from the ceiling of the casing and its lower end extending through the bottom of said casing, and a coil of tubing within said exhaust stack with the upper end of the coil in communication with the fluid level regulator and its lower end connected with a suitable source of fluid supply.

LLOYD S. LANTERMAN.