C. W. WELLMAN.

FLUID HEATING APPARATUS.

APPLICATION FILED OCT. 10, 1908.

949,512. Patented Feb. 15, 1910.

3 SHEETS—SHEET 1.

Fig. 1.

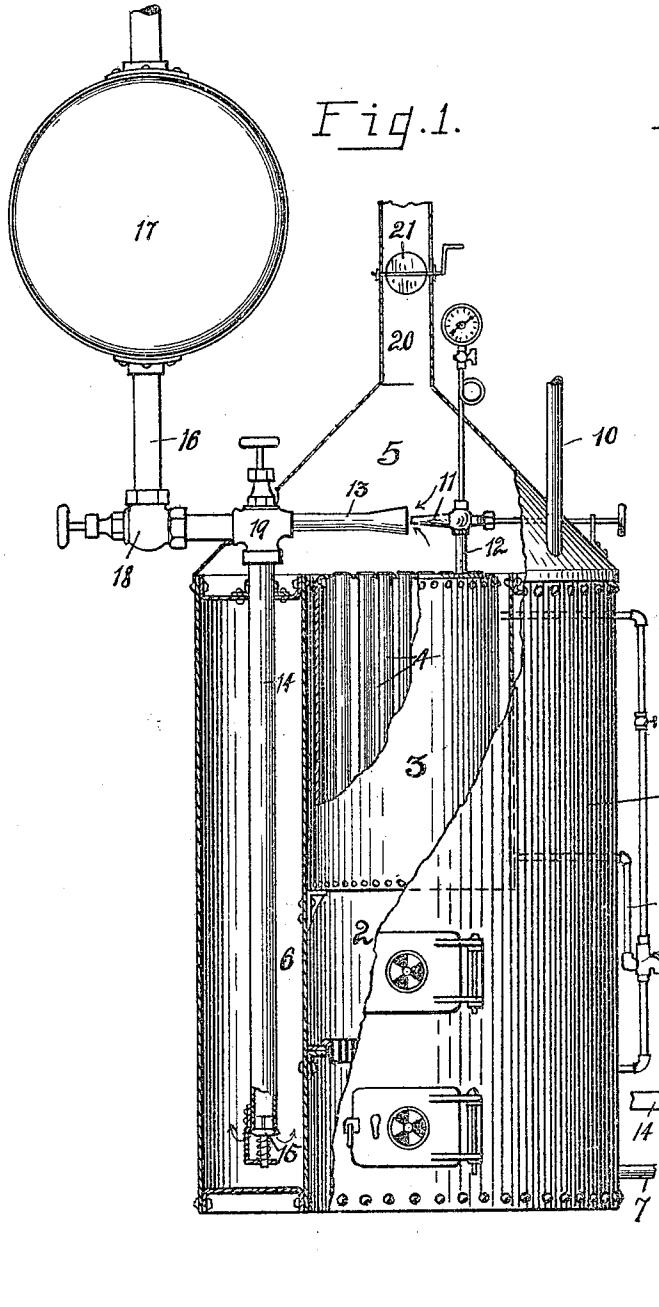


Fig. 2.

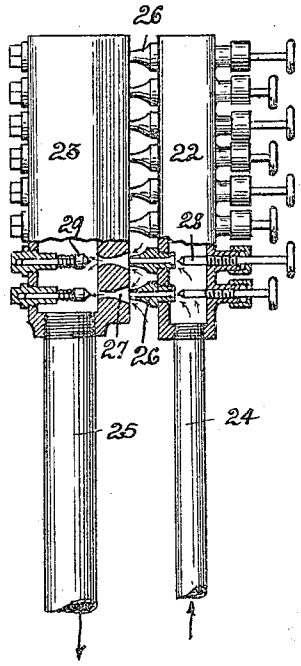
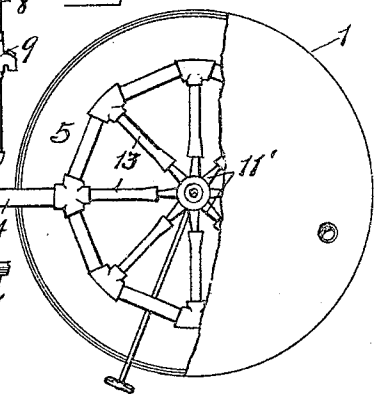


Fig. 3.



WITNESSES:

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3 SHEETS—SHEET 2.

Fig. 4.

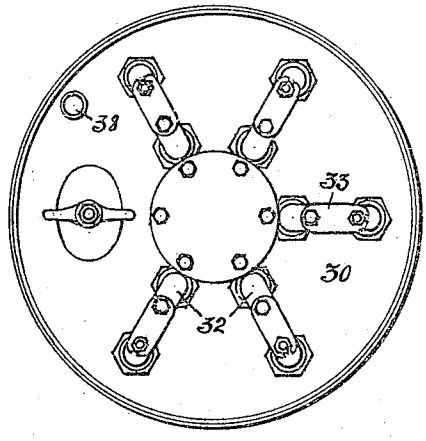
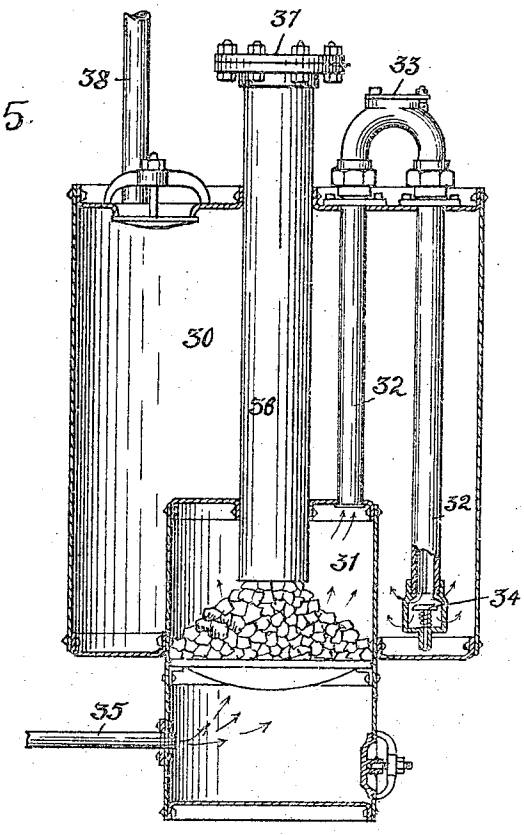


Fig. 5.



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3 SHEETS—SHEET 3.

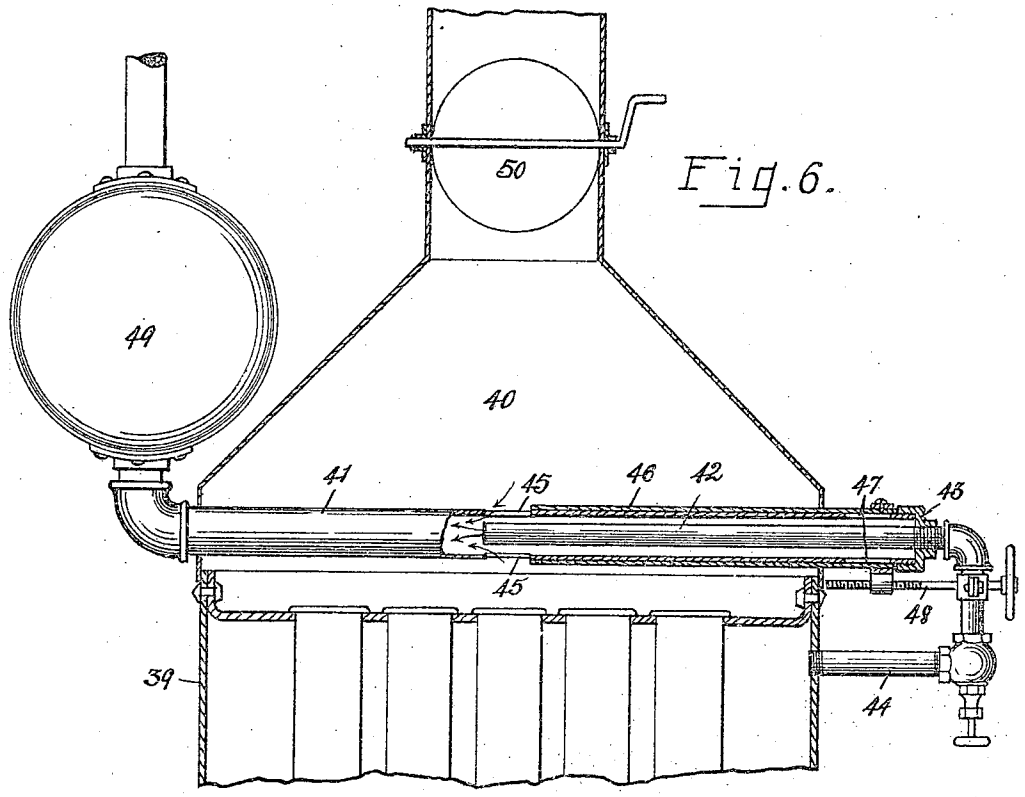
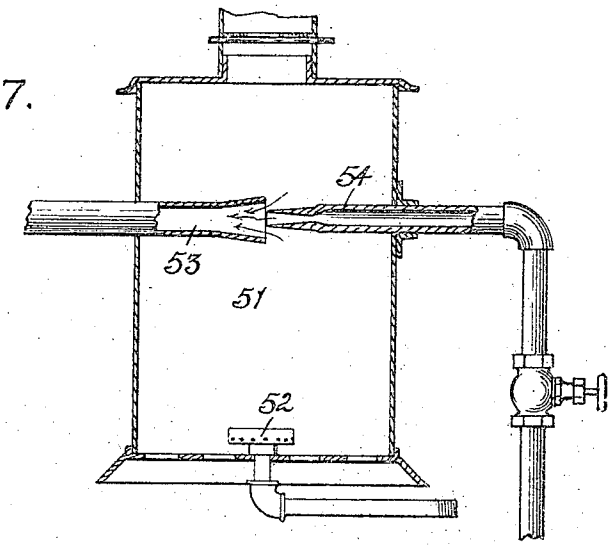


Fig. 6.

Fig. 7.



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UNITED STATES PATENT OFFICE.

CALVIN W. WELLMAN, OF SOUTH BOARDMAN, MICHIGAN.

FLUID-HEATING APPARATUS.

949,512. Specification of Letters Patent. Patented Feb. 15, 1910.

Application filed October 10, 1908. Serial No. 457,084.

To all whom it may concern:

Be it known that I, CALVIN W. WELLMAN, a citizen of the United States, and a resident of South Boardman, in the county of Kalkaska and State of Michigan, have invented a certain new and useful Fluid-Heating Apparatus; 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 appertains to make and use the same, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

My invention relates to heating apparatus of the class adapted for the generation or superheating of steam, or the heating of other fluids such as air or water.

The object of my invention is the provision of simple, efficient and economical means for utilizing the highly heated gases arising from a fire or the exhaust products of explosive engines to superheat steam or to heat or superheat water or air by injecting such heated gases or exhaust products into or commingling them with the steam, water or air to be heated, as will hereinafter be more fully explained.

The invention is fully described in the following specification and several embodiments thereof illustrated in the accompanying drawings in which,—

Figure 1 is an elevation of a steam generating boiler partly in section and equipped with one form of my invention. Fig. 2 is an enlarged modified form of the draft-jets and an associated intake tube wherein the heated gases and draft-creating fluid are commingled. Fig. 3 is a top plan view of the boiler shown in Fig. 1 with a portion of the same broken away and equipped with a plurality of draft-jets and intake tubes. Fig. 4 is a plan view of Fig. 5 illustrating a plurality of flues leading from the furnace or fire-box to the interior of the boiler. Fig. 5 is a central vertical section of a boiler and furnace equipped with my invention and provided with an under feed forced draft. Fig. 6 is a central vertical section of the upper portion of an upright tubular boiler equipped with a modified form of my invention for superheating the steam, and Fig. 7 is a central vertical section of an apparatus embodying my invention adapted for the heating of steam, water or air.

Referring to Fig. 1 of the drawings, 1 designates a boiler-drum or shell in which is provided a furnace or fire-chamber 2, superimposed steam-generating drum 3 through which fire-tubes 4 pass to open communication between the furnace and dome or smoke-chamber 5, and the water-leg 6, which surrounds or partially surrounds the furnace 2 and drum 3. I wish it understood, however, that I do not desire to be restricted to any particular arrangement of such parts within the boiler, or to the use of all of such parts within the boiler, as the arrangement shown is merely illustrative of the idea.

Water is supplied to the chamber or leg 6 through a pipe 7 and to the steam-generating-drum 3 from said chamber through a pipe 8, such latter feed being assisted by a steam injector 9, or communication may be had between the two water chambers 3, 6 in any other suitable manner. Steam is taken from the top of the chamber or leg 6 through a pipe 10 leading therefrom.

Within the dome 5 is disposed a steam injector nozzle or jet 11, or a plurality of nozzles 11′, as shown in Fig. 3, which have valve-controlled communication with the interior of the drum 3 through a pipe 12, the valve thereof having its stem projecting without the dome, as shown. The jet 11, or each jet if a plurality be used, has its discharge directed into the open end of an associated intake pipe 13 to create a forced draft therethrough for the purpose of drawing gaseous matter into the pipe from the dome, the mouth of each pipe 13 being preferably enlarged to facilitate such action. The intake pipe or pipes 12 connect with a pipe 14 which extends down into the water leg 6 to near the bottom thereof, thus directing the highly heated products of combustion from the dome 5 into the water contained in said leg. A check-valve 15 is provided at the outlet end of the pipe 14 and is adapted to close under back-pressure when the pressure in the boiler or leg 6 equals or substantially equals the injecting pressure of the fluid passing through the pipes 13, 14, thus preventing a back-pressure through said pipes.

If it is desired to utilize the exhaust from an explosive engine to heat the water in the boiler, or to coöperate with the furnace fire to such end, the pipe 14 may be connected to the exhaust port of an explosive engine by a pipe 16. The pipe 16 preferably has an

expansion chamber 17 therein, which permits an expansion of the released gases before entering the boiler. 18 and 19 designate valves, the former of which is adapted to control the communication between the pipes 14 and 16, while the latter controls the communication between the pipes 13 and 14. As the only purpose of the drum 3 is to generate steam to be used to create a forced draft through the pipes 13, 14, it may be eliminated if the forced draft is created by other means or if exhaust gases alone are utilized to heat the water in the boiler. The pipe 14 may also serve as a pipe for supplying steam to an engine cylinder, in which case the steam injected into the pipe 13 is superheated by the hot gases drawn therein from the dome 5 before passing to the engine.

The dome 5 is provided with the usual exit flue 20 having a damper 21 therein to enable the natural draft of the furnace to be closed when a forced draft is being created by the discharge of steam from the jet 11 into the pipe 13.

In the operation of the apparatus shown in Fig. 1, a fire is started in the furnace 1 to heat the water in the drum 3 as in the case of the ordinary boiler, the damper in the pipe 20 being open. When a desired pressure of steam has been generated in the drum, the natural draft is shut off by closing the damper 21 and a forced draft created through the pipes 13—14 by opening the steam jet 11 to permit its discharge into the mouth of the pipe 13, thus drawing into the pipe 13 and forcing into the water in the chamber or water-leg 6 the highly heated products of combustion which arise into the dome 5 from the fire. The injection of these heated gases into the boiler water now continues until the pressure in the chamber or water-leg 6 equals or substantially equals that in the drum 3, when the check-valve 15 closes to prevent back pressure through the injection pipes. As the water, however, is fed from the chamber 6 into the drum 3, and the drum has the extra heating surface provided by the fire-tubes 4, a pressure will, under normal conditions, be maintained in the drum 3 in excess of the pressure in the chamber 6, thus maintaining a continual flow of heated gases through the injection pipes into the latter chamber so long as the steam-jet valve is left open. It is apparent that the forced draft may be diminished or increased by opening the jet valve to permit a greater or less flow of steam from the jet, or by using a plurality of jets and cutting different ones in or out. To utilize the exhaust from an explosive engine it is only necessary to connect the pipe 16 to the exhaust port or pipe of the engine and open the valve 18 and close the valve 19.

In Fig. 2 is illustrated a forced draft and injection device which is particularly adapted for use in uptake flues or other narrow spaces. This device comprises the two oblong hollow castings or members 22 and 23, which are closed at one end and have pipes 24 and 25, respectively, tapped into their other ends, the former of which pipes leads to a source of fluid energy, such as compressed air, steam, or the like, while the latter leads to a chamber containing the fluid to be heated or which is to be supplied with superheated steam. The member 22 is provided in one side thereof with a plurality of jets 26, which are intended to have their discharge into registering orifices 27 provided in a side of the member 23, said orifices having enlarged mouths to permit hot gases to be drawn therein around the ends of the jets by the draft induced by the discharge of the fluid from the jets. Associated with each jet is a valve 28 for controlling its discharge orifice, the stems of said valves being intended to extend out through the casing of the flue. A check-valve 29 is provided within the member 23 for closing the inner end of each orifice 27 under back-pressure through the pipe 25.

In Figs. 4 and 5, which illustrate a form of steam generating apparatus embodying my invention in which the forced air draft is admitted beneath the fire, 30 designates the boiler drum and 31 the furnace. Leading upwardly from the top of the furnace through the boiler top and then describing a return bend and extending down into the boiler with their free ends open and terminating near the bottom thereof are one or more flues 32 for the exit from the furnace of the heated gases of combustion arising from the fire. Each of these flues is provided without the boiler with a damper 33, which may be opened to secure a direct draft when first starting the fire, and has the end thereof which opens into the boiler provided with a check-valve 34 adapted to close under back pressure from the boiler when the pressure therein equals that in the furnace. As it is necessary, for efficient operation, to keep the furnace tightly closed except for the forced draft admission pipe 35 and the exit flues 32, the fuel is fed thereto through a magazine 36, which has its outer end closed by a cap 37 except when replenishing the fuel therein. 38 designates the steam exit pipe. In the operation of this construction it is apparent that on starting a fire in the furnace the dampers 33 in the flues 32 are opened to provide a direct draft, and that when the fire is sufficiently under way they are then closed to cause all of the heated gases arising from the fire to be discharged into the boiler under a pressure equal to that of the forced draft.

In the construction illustrated in Fig. 6, which is especially adapted for the superheating of steam, 39 designates an ordinary

steam generating boiler through the dome 40 of which extends the pipe 41 which is intended to connect at one end with an engine cylinder, steam radiators or other objects to be supplied with highly heated steam. The free end of this pipe extends without the dome and has a smaller pipe 42, which forms an injector nozzle, projected therein through a cap 43, said pipe 42 having its outer end connected to the steam chamber of the boiler through a valve-controlled pipe 44. The pipe 41 is provided within the dome and near the discharge end of the nozzle 42 with the openings 45, through which the heated gases in the dome enter under the influence of the forced draft created within the pipe 41 by the discharge of steam from the injector nozzle. As the commingling of the steam and hot gases might so heat the mixture as to be injurious for certain uses, I provide the pipe 41 with a tubular slide valve 46, which may be moved to restrict the size of the gas inlet openings 45 and at the same time uncover openings 47 to the atmosphere, which are provided near the outer end of the pipe 41, thus admitting cool air to mix with and partially cool the heated mixture. The opening of the valve 47 is controlled by a hand-screw 48 which coacts with a collar or boss on the valve. 49 designates an expansion or storage chamber which may be disposed between the pipe 41 and article to which the steam is supplied. It will be understood that the damper 50 in the exit flue of the boiler is closed when the forced draft is being used.

In the modification shown in Fig. 7, 51 designates a combustion or heating chamber having a gas burner 52 or other heat supplying means therein. 53 designates the intake pipe which opens into the heating chamber and has an induced draft created therein by a stream of fluid from an injector pipe 54. This jet connects with a source of fluid under pressure which may be air, steam or water. It is apparent that this construction would form a very efficient water-heater of the instantaneous type, as the commingling of the hot gases arising from the fire with a small stream of water injected into the pipe 53 from the jet 54 would quickly heat the water to a high temperature.

I desire it to be understood that my invention is not limited to any specific form or arrangement of parts except in so far as such limitations are specified in the claims.

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

1. The combination of a pair of fluid chambers, a chamber containing heated products of combustion, and means influenced by fluid ejected from one of said fluid chambers for gathering the products of combustion in the chamber containing such products and injecting them into the other of said fluid chambers.

2. The combination of a pair of communicating fluid chambers, a common combustion chamber for said fluid chambers, a smoke-dome, and means influenced by fluid ejected from one of said fluid chambers for gathering the heated products of combustion contained in said dome and injecting them into the other of said fluid chambers.

3. The combination of a pair of communicating fluid chambers one at least having fire-tubes therethrough, a combustion chamber associated with said chambers, a smoke-dome having communication with the combustion-chamber through said tubes, and means influenced by fluid ejected from one of said fluid chambers for gathering, the heated products of combustion contained in said dome and ejecting them to a predetermined point.

4. The combination of a fire chamber, outer and inner communicating boilers having portions of their casings exposed to said chamber, a smoke-dome, fire-tubes opening communication between said chamber and dome through the inner boiler, and means influenced by fluid ejected from one of said boilers for gathering the heated products of combustion contained in the dome and injecting them into the other boiler.

In testimony whereof I have hereunto signed my name to this specification in the presence of two subscribing witnesses.

CALVIN W. WELLMAN.

Witnesses:
C. W. Owen,
Cornell Schreiber.