D. A. MACLEAN.

STEAM GENERATOR.

APPLICATION FILED JAN. 29, 1919.

1,324,607.

Patented Dec. 9, 1919.

FIG 1.

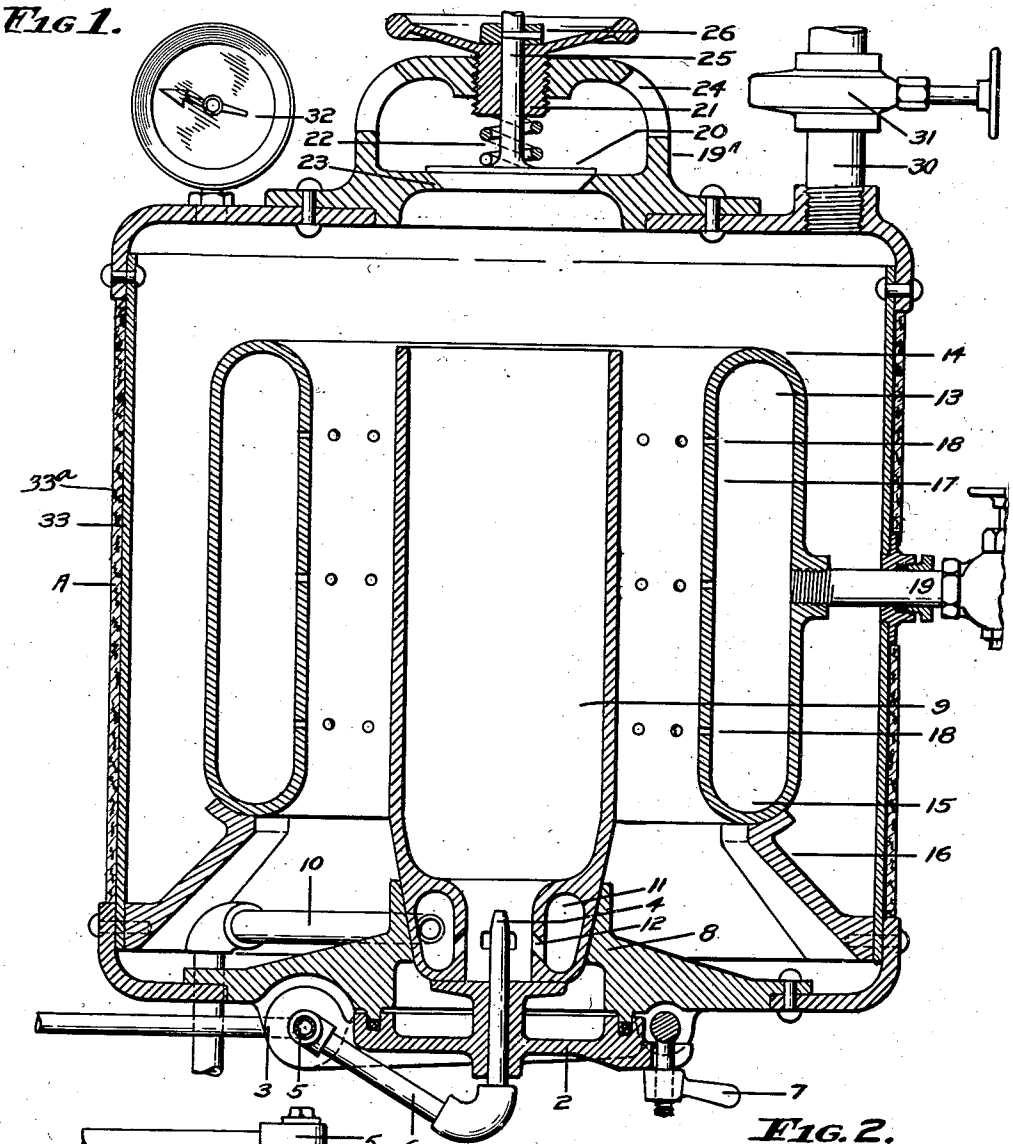
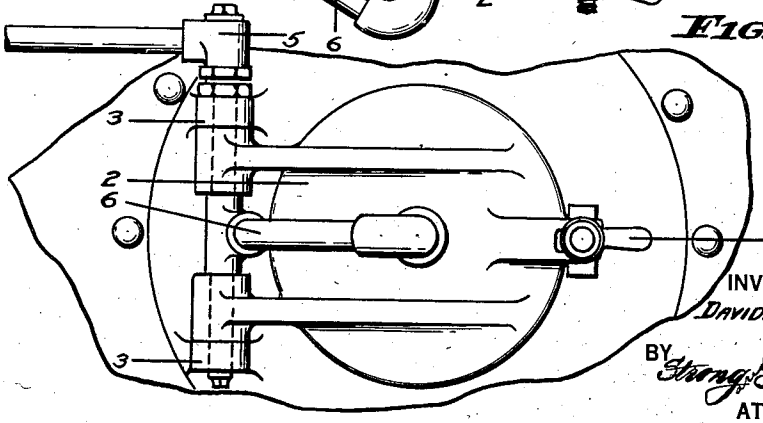


FIG. 2.



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STEAM-GENERATOR.

1,324,607. Specification of Letters Patent. Patented Dec. 9, 1919.

Application filed January 29, 1919. Serial No. 273,697.

To all whom it may concern:

Be it known that I, DAVID A. MACLEAN, a citizen of the United States, residing at the city and county of San Francisco and State of California, have invented new and useful Improvements in Steam-Generators, of which the following is a specification.

This invention relates to a steam generator.

One of the objects of the present invention is to provide a simple, compact, easily operated steam generator in which steam is instantly produced by bringing the water in direct contact with the flames or heat of combustion and in which practically every heat unit produced by the fuel employed, whether oil or gas, may be retained and not lost as in common practice by conduction and radiation, nor by escape through flues and stacks. Another object of the invention is to provide a novel form of combustion chamber and a burner therefor which permits the use of any fluid or liquid fuel; and, furthermore, a means for admitting air under pressure and so distributing the same around the burner that, practically speaking, perfect combustion may be obtained. Further objects will hereinafter appear.

The invention consists of the parts and the construction, combination and arrangements of parts as hereinafter more fully described and claimed, having reference to the accompanying drawing, in which—

Figure 1 is a central vertical section of the steam generator.

Fig. 2 is a bottom view of the boiler, partly broken away.

Referring to the drawings in detail, A indicates a boiler, which, in this instance, is provided with a door 2 supported by hinges 3. This door is located in the bottom of the boiler and supports a burner 4 of suitable construction which may employ any fluid or liquid fuel, the fuel employed being admitted through a hinge pintle 5 and a pipe 6, thus permitting the door to be opened or closed without interfering with the fuel connections. The door is otherwise heavy in construction and may be provided with a gasket or ground seat to permit it, when closed, to stand comparatively high pressures without leaking, a hand-operated screw 7 or other similar means being employed for securing the same in closed position.

Supported by spider legs 8 directly in alinement with the door is a tube 9 into which the burner 4 projects. Combustion takes place within this tube and air is admitted thereto under pressure to support combustion, said air being supplied from any suitable source under pressure by means of a pipe 10. This pipe is connected with an annular chamber 11 formed in the lower end of the tube and it enters the lower end of the tube through a series of radially disposed small openings 12 to permit an even distribution of the air when admitted.

Surrounding the tube 9 is a water spraying mechanism, generally indicated at 13. This member consists of a hollow circular double-walled tube closed at the top and bottom, as shown at 14 and 15 respectively. The spraying device is concentrically positioned with relation to the tube 9 and is supported by legs 16 or any other suitable means. The inner wall 17 is provided with a series of fine perforations 18 which permit water under pressure to be sprayed against the outer wall of the tube 9, said water being supplied by means of a pipe 19 from any suitable source. Mounted on the top end of the boiler is a safety valve comprising a housing 19^a in which is fitted a valve 20. This valve is vertically slidable in a bearing bushing 21 which is screwed into the top of the housing 19. A spring 22 interposed between the bushing and the valve normally serves the function of retaining this against its seat 23. The valve may therefore serve as a safety valve, as the moment the pressure within the boiler exceeds a certain number of pounds pressure, it will lift away from the seat to permit steam to escape through the openings 24 formed in the housing. Again, the valve may be employed as a starting valve as will hereinafter be described by merely unscrewing the bushing 21. This will lift the valve away from the seat and form an open communication through which a draft may be obtained when starting, the valve being lifted away from its seat when the bushing 21 is unscrewed as the stem 25 is provided with a stop collar 26.

In actual operation, if it is desired to start the boiler, it is first necessary to lift the valve 20 away from its seat by unscrewing the bushing 21. It is then necessary to open the door 2 and turn on the gas or other fuel employed. The air is then turned on and the door is finally closed

after the fuel has been ignited. This permits combustion within the tube 9 as a combustible fuel, either in the form of a gas or oil, is admitted through the burner while air to support combustion is admitted through the radial openings 12. This even distribution of air permits a uniform mixture and therefore, practically speaking, perfect combustion. The products of combustion to begin with escape by the valve and through the openings 24, but this valve may be closed almost instantly after starting as it will only be necessary to turn on the water and cause it to discharge in the form of a series of sprays against the outer wall of the tube 9. This becoming instantly heated turns the water into steam and pressure will thus form within the boiler the moment the valve 20 is closed, an outlet pipe communicating with an engine, a turbine or any device employing steam, shown at 30, and a valve 31 is employed to regulate the pressure within the boiler. The boiler may otherwise be provided with a pressure gage 32 and means may also be provided for automatically maintaining a higher pressure on the feed water, the air and the fuel employed as it would otherwise be impossible to support combustion and to admit water unless they were injected under higher pressure than the steam pressure maintained.

From the foregoing it can be seen that steam is generated by bringing water in almost direct contact with the flame; secondly, that the products of combustion and steam mix within the boiler and discharge in unison as a mixture through the outlet pipe 30. Practically no heat units are wasted in the present instance as the boiler is entirely insulated against conduction by surrounding it with asbestos, such as shown at 33, or similar material. The usual losses by conduction, radiation and escape through the flues and stacks are thus obviated and a high fuel efficiency is obtained. Furthermore the danger of explosion is entirely eliminated as the worst that could happen would either be that the boiler might burn out if water was not admitted or that the fire might be extinguished if an excess of water should be admitted.

The boiler as a whole is simple in construction, easy to operate and is exceedingly small and compact for the quantity of steam developed, and while a specific design is here shown I wish it understood that the materials and finish of the several parts employed and the shape and arrangement of the same may be such as the experience and judgment of the manufacturer may dictate.

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

1. A steam generator comprising a boiler having a central tubular compartment, a door hinged to close the bottom of the tube, a burner extending upwardly through the door into the tube and having connection through the door hinge with a source of fuel supply, a circular chamber surrounding the tube, an air connection therewith, and jet openings directed toward the burner.

2. A steam generator comprising a boiler, a door hingedly secured to the boiler, a burner carried by said door, a burner tube within the boiler adapted to receive the burner when the door is closed, means for admitting air to said tube at a point adjacent the burner and for evenly distributing the same and means within the boiler for spraying water against the exterior surface of the tube.

3. A steam generator comprising a boiler, a door hingedly secured to the boiler, a burner carried by said door, a burner tube within the boiler adapted to receive the burner when the door is closed, means for admitting air to said tube at a point adjacent the burner and for evenly distributing the same, means within the boiler for spraying water against the exterior surface of the tube, and a combination safety and starting valve secured to the boiler.

4. A steam generator comprising a boiler, a door hingedly secured to the boiler, a burner carried by said door, a burner tube within the boiler adapted to receive the burner when the door is closed, means for admitting air to said tube at a point adjacent the burner and for evenly distributing the same, means within the boiler for spraying water against the exterior surface of the tube, a valve mounted on the boiler adapted to automatically open when a predetermined pressure is exceeded and means for manually opening said valve when starting the boiler.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

DAVID A. MACLEAN.

Witnesses:
W. W. HEALEY,
M. E. EWING.