G. H. SANDS.

STEAM GENERATOR.

APPLICATION FILED FEB. 8, 1916.

1,209,211.

Patented Dec. 19, 1916.

2 SHEETS—SHEET 1.

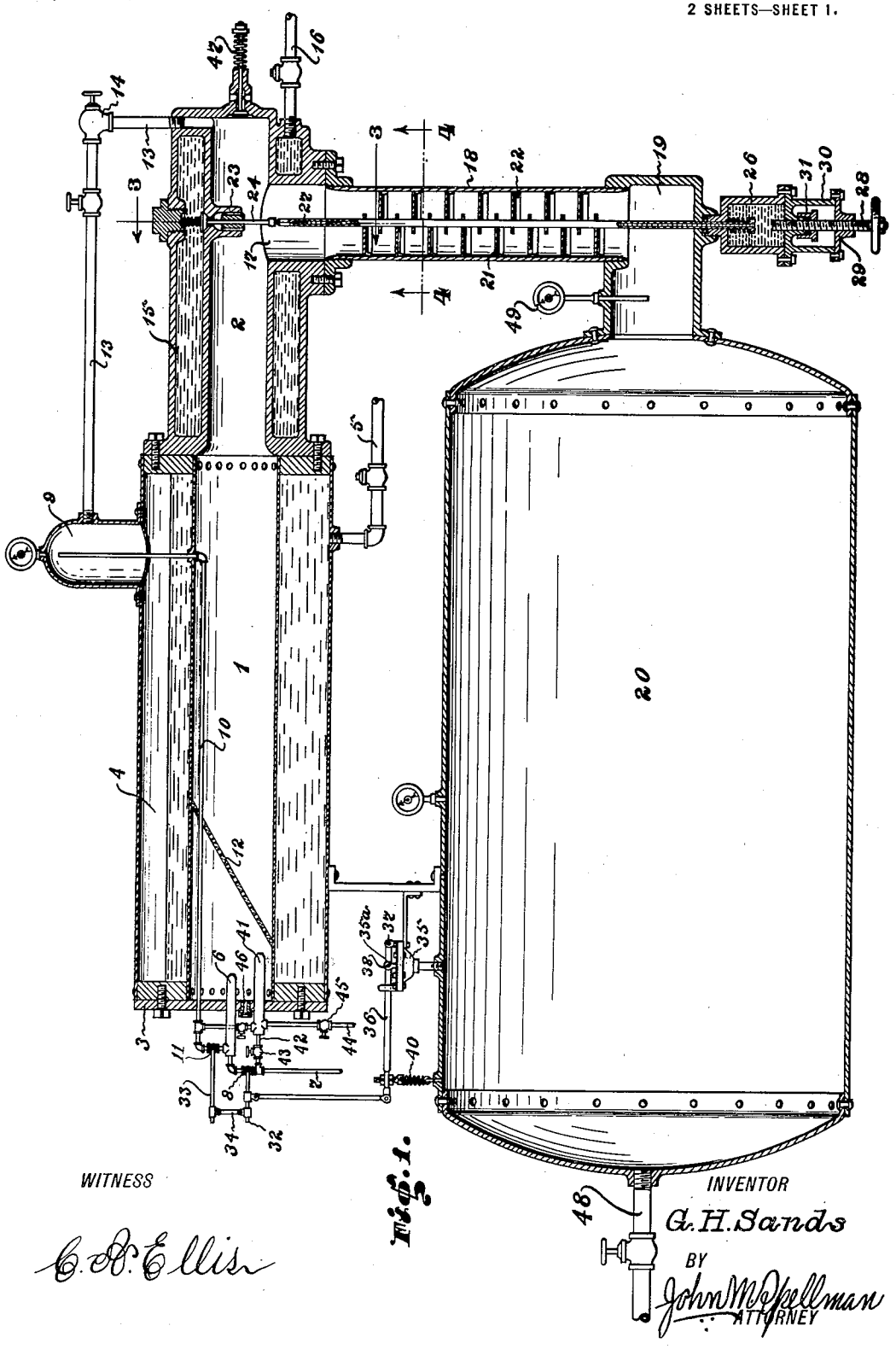


Fig. 1.

WITNESS

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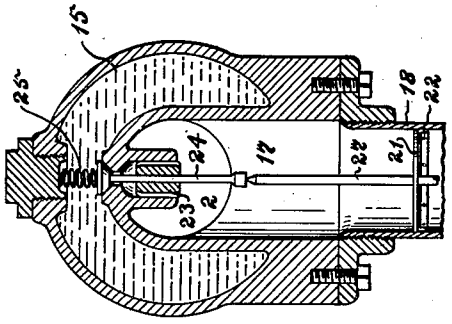


Fig. 3.

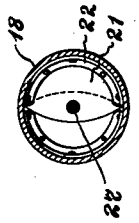


Fig. 4.

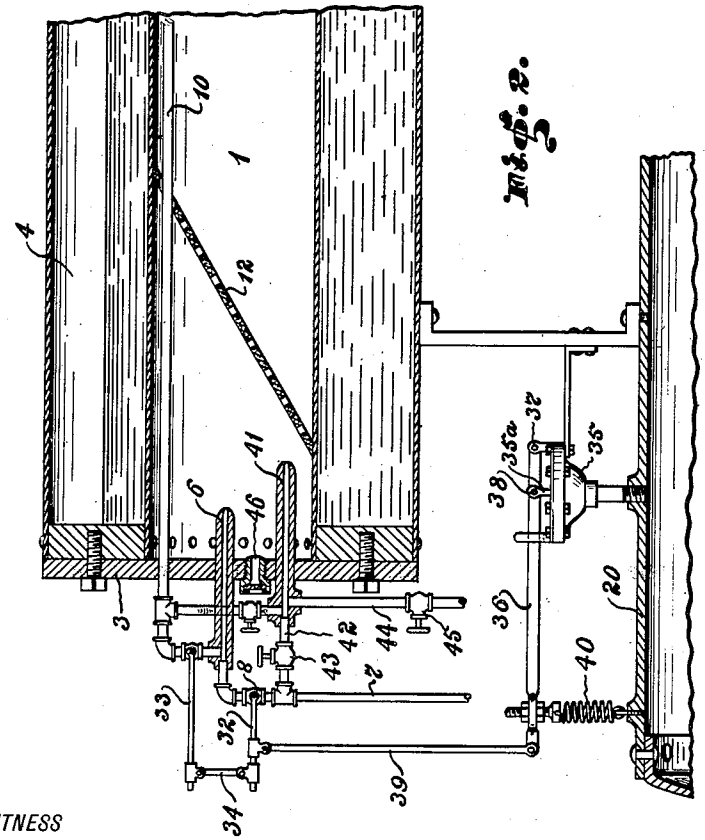


Fig. 2.

WITNESS

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GEORGE H. SANDS, OF ELECTRA, TEXAS.

STEAM-GENERATOR.

1,209,211. Specification of Letters Patent. Patented Dec. 19, 1916.

Application filed February 8, 1916. Serial No. 76,890.

To all whom it may concern:

Be it known that I, GEORGE H. SANDS, a citizen of the United States, residing at Electra, in the county of Wichita and State of Texas, have invented certain new and useful Improvements in Steam-Generators, of which the following is a specification.

My invention has relation to an improvement in steam generating apparatus and in such connection it relates more particularly to the novel construction, combination and arrangement of the parts constituting such an apparatus.

The principal objects of my invention are: first, to greatly economize in the heat necessary to produce a given quantity of steam, the apparatus hereinafter described doing away entirely with the old style boiler so that practically every particle of heat contained in the fuel may be utilized in the generation of steam to which is added the expansive quality of the gas produced from the fuel employed; second, to produce an internal combustion steam generator in which all kinds of liquid fuel and gas may be used; and third, to produce a means whereby the proper supply of oxygen (contained in super-heated steam), water and fuel to the combustion and mixing chambers may be automatically regulated in accordance with the steam pressure.

With the above and other objects in view, the nature and scope of my invention will be more fully understood from the following description taken in connection with the accompanying drawings, forming part hereof, in which,—

Figure 1, is a diagrammatic view showing in longitudinal section an apparatus embodying the main features of my invention; Fig. 2, is an enlarged sectional view of the combustion chamber head, showing means for automatically controlling the inlet of fuel and air or steam to the combustion chamber; Fig. 3, is a vertical sectional view taken on line 3—3 of Fig. 1; and Fig. 4, is a cross-sectional view taken on line 4—4 of Fig. 1.

Referring to the drawings, 1 represents the combustion chamber, said chamber being in open communication at one end with a mixing chamber 2, and closed at the other end by head 3. Surrounding combustion chamber 1 is a water jacket or tubular boiler 4 adapted to be fed and kept at a constant level through feed pipe 5, leading from a source of water feed (not shown). Heat is applied to the combustion chamber by means of a jet burner 6, traversing head 3. Leading from burner 6, is a fuel feed pipe 7 connected with a pressure tank (not shown). A fuel regulating or control valve 8 is arranged in the fuel feed pipe 7. Leading preferably from a steam dome 9 of boiler 4, down through combustion chamber and on through head 3, and thence to burner 6, is a steam pipe 10, a regulating or control valve 11 similar to valve 8 being arranged on said pipe outside of the combustion chamber. The object in carrying steam pipe 10 through combustion chamber 1 is to dry or superheat the steam before introducing it to the burner 6, thereby producing a super-heated steam free from the products of combustion but rich in oxygen to assist combustion in burner 6. Located directly in front of the burner 6 in the combustion chamber is an inclined, perforated partition wall 12, preferably made of a heavy sheet of carbon. This wall is in fact a baffle plate to spread the flames or gases issuing from the burner.

Leading from steam dome 5 to mixing chamber 2 is a steam pipe 13 which is provided with a relief valve 14 in the nature of a manually adjustable puppet valve. It may be stated at this point that when in operation the small boiler 4 will generate more steam than is needed to supply the burner 6 and when the pressure in the boiler goes above a predetermined point the relief valve 14 opens and allows the steam to pass down into the mixing chamber. 2. The chamber 2 is surrounded by a water jacket 15, said water jacket being fed and kept at a constant level through feed pipe 16, leading from a source of water feed (not shown). The mixing chamber has an outlet 17 at right angles to its main portion and this outlet is in communication with an auxiliary mixing chamber 18, which extends on down and is connected with head 19 of a storage tank 20. In the auxiliary mixing chamber 18 there are arranged transverse partitions 21, which, as illustrated in Fig. 1, are connected alternately to opposite walls of said mixing chamber to constitute baffle plates in staggered relationship to each other. One of said baffles is better illustrated in Fig. 4 and it will be observed that each baffle is in the form of a disk of eccentric formation, being slightly greater than

a semi-circle, a portion of the circle being removed to leave a space for the passage of the steam, as is clearly illustrated in the drawings.

The baffle plates may be fastened in any suitable manner to the inside walls of the mixing chamber, the means shown in the drawings consisting of a flanged strip of metal 22, said strip being riveted to the wall of chamber 18 and to the baffle plates.

Directly above mixing chamber 18 in chamber 2 is a valve 23, communicating with water jacket 15, the stem 24 of which valve being normally held down under tension of the spring 25. Underneath, and in alinement with the valve stem 24, is a thermostat, secured to the underside of head 19, said thermostat controlling the opening and closing, through stem 24, of valve 23. This thermostat may be of any desirable form which will accomplish the purpose. In the drawings there is shown a small chamber 26 secured to the head 19, said chamber being filled with mercury. Extending up through chamber 26 and on up through mixing chamber 18 and up to and resting against the under face of valve stem 24 is a hollow copper tube 27, open at the bottom and closed at the top, said tube being filled with mercury supplied from chamber 26. As the temperature rises in the mixing chamber the tube 27 becomes heated and the mercury in said tube and in the chamber 26 will expand and as it does so it will force the tube higher up out of chamber 26 and thus force valve stem 24 upward, opening valve 23, and thereby allowing the proper proportion of water to enter the mixing chamber in the form of a spray. To secure a proper adjustment of the valve 23, and to thereby control the extent to which it moves, there is provided on the underside of the thermostat an adjustable member 28, in the form of a valve stem, said member passing on up through head 29 of cylinder 30, thence on through stuffing box 31 and into chamber 26.

From the foregoing it is obvious that when the adjusting member 28 is advanced farther on up into the chamber 26, the capacity of said chamber is lessened proportionally, and the mercury in seeking an opening will advance in the tube 27 and force said tube up against valve stem 24. Conversely, when the member 28 is withdrawn from the chamber, the capacity of said chamber is increased, which allows tube 27 to fall farther back into said chamber.

Referring now to Fig. 2 as an illustration of the controlling means for fuel and steam regulating or control valves 8 and 11, the valves are each provided with lever arms 32 and 33, respectively, with a connecting link 34 between the same, as shown. The storage tank 20 is provided with a diaphragm or lever valve 35, said valve having a lever arm 36 fulcrumed at one end as at 37. The valve stem 35^a of valve 35 is pivotally connected to lever 36 as at 38. Extending up to lever arms 32 and 33 of valves 8 and 11 is a connecting link 39. When the steam pressure rises in storage tank 20 it acts on the diaphragm valve 35 to cause the valve stem 35^a to raise the lever arm 36. This arm in turn (through medium of link 39) raises lever arms 32 and 33, thus partially closing valves 8 and 11, and admitting less fuel and dry steam to the combustion chamber, hence decreasing the amount of steam being generated, or vice versa. For an adjustment of this control there is provided a coil spring 40, secured at one end to storage tank 20, the other end being adjustably secured to lever arm 36, as shown in the drawings.

For the initial heating of the water in boiler 4 surrounding the combustion chamber there is provided a pilot or auxiliary burner 41, traversing head 3. The burner is connected to feed pipe 7 by pipe 42. To regulate the proper amount of fuel there is provided a globe valve 43 between the burner and fuel feed pipe. To assist initial combustion there is provided an air feed pipe 44 leading from an air pressure tank (not shown) to the burner 41, and a globe valve 45 on air pipe 44 controls the proper amount of air introduced to burner 41. To ignite the pilot burner it is necessary to first remove plug 46 in head 3 and to open the air valve 47 at the closed end of the mixing chamber 2. The fuel and air valves to pilot burner 41 are now opened and then through the opening made by removing the plug 46 the burner is lighted. The plug 46 is next replaced and the burner 41 continues to burn until enough heat has been generated in the boiler 4 to operate the main burner 6. When the main burner has been started the air valve 47 is closed and fuel combustion begins to take place under pressure, the oxygen necessary to support combustion being furnished by the steam passing through pipe 10. When the steam pressure in boiler 4 goes above a predetermined point the relief valve 14 automatically opens and allows the steam to pass through pipe 13 into the mixing chamber to thereby mix with the gases from the combustion chamber. As said steam is of a very high temperature, it heats tube 27 sufficiently to cause the mercury contained in said tube to expand sufficiently to open valve 23. This allows the proper proportion of water to pass through said valve. The water in jacket 15, being practically up to a boiling point due to the intense heat from the combustion and mixing chambers, as it passes through valve 23 enters the mixing chamber in the form of a spray which readily mixes with the gases contained in the mixing chamber. When

the proper porportion of water has passed through valve 23 the temperature of the mixing chamber will be somewhat lowered, thereby effecting the mercury in the thermostat tube 27, which contracts and allows valve 23 to approach its seat.

The products of combustion and steam in the mixing chamber 2, in passing on through auxiliary mixing chamber 18 to storage tank 20, are violently agitated by baffles 21. Thus highly heated steam is supplied to the storage tank 20 as rapidly as it is required, and practically every particle of heat is utilized, thus effecting a great saving as compared with the ordinary old style steam boiler now in use. The storage tank will be provided with a draw off or service pipe 48, and may also be provided with a pressure gage, heat gage, etc., as may be found desirable. The head 19 of said storage tank is provided with a heat gage 49 to properly adjust the thermostat. As there is a demand for more steam, the pressure in storage tank 20 decreases, thus acting on diaphragm valve 35 which in turn opens the fuel and steam valves 8 and 11, thus increasing the heat in the combustion chamber, which in turn generates more steam in boiler 4 which passes on through valve 14 into the mixing chamber 2.

From the foregoing description it will be understood that the generator as a whole is entirely automatic in its operation, after the initial heating of the combustion chamber. As there is a demand for more steam, more fuel and more air are automatically admitted to the combustion chamber and simultaneously therewith more water is admitted to mixing chamber through valve 23, and conversely, as there is a demand for less steam, the feed of the fuel, air and water is decreased. In this way the heat is conserved and practically all of the fuel is used without loss in the generation of steam.

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

1. In a device of the character described, a combustion chamber, a boiler jacketing the walls of said chamber, a fuel burner extending into the chamber, and a pipe leading from the boiler to said fuel burner, in combination with a pilot burner and a means for feeding fuel and air to said burner.

2. In a device of the character described, a combustion chamber, a mixing chamber in open communication with one end of said combustion chamber, a water jacket surrounding the mixing chamber, a burner extending into the combustion chamber, a boiler jacketing the combustion chamber, a pipe leading from the boiler to the burner and a pipe leading steam from the boiler to the mixing chamber combined with means controlled by the temperature of the mixing chamber and arranged to spray water from the jacket into said mixing chamber.

3. In a device of the character described, a combustion chamber, a mixing chamber in open communication with one end of said combustion chamber, a burner extending into the combustion chamber, a boiler jacketing the combustion chamber, a pipe leading steam from the boiler to the burner, a pipe leading steam from the boiler to the mixing chamber, a water jacket surrounding the mixing chamber and a means controlling the temperature of the mixing chamber and adapted to spray water from said jacket into said mixing chamber.

4. In a device of the character described, a mixing chamber wherein products of combustion and dry steam are commingled, in combination with an auxiliary mixing chamber extending therefrom and a series of superposed baffle plates arranged in said auxiliary mixing chamber and in staggered relationship therein, and a reservoir arranged below the staggered baffle plates.

5. In a device of the character described, a combustion chamber, a mixing chamber in open communication with one end of said combustion chamber, a burner, extending into the combustion chamber, a valve controlled exit from the mixing chamber arranged to permit of the exhaust of waste gases at the initial starting of the apparatus, a boiler jacketing the combustion chamber, a water jacket for the mixing chamber, a pipe leading from the steam chest of the boiler to the mixing chamber, a means controlled by the temperature of the mixing chamber, arranged to spray water from the jacket into said mixing chamber and a pipe leading from the steam chest of the boiler to the burner.

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

GEORGE H. SANDS.

Witnesses:
HY NEWSUM,
C. H. SCOTT.