G. A. KROHN & E. M. ARREAGADA.

POWER GENERATOR.

APPLICATION FILED MAR. 29, 1911.

1,019,164. Patented Mar. 5, 1912.

Fig. 1.

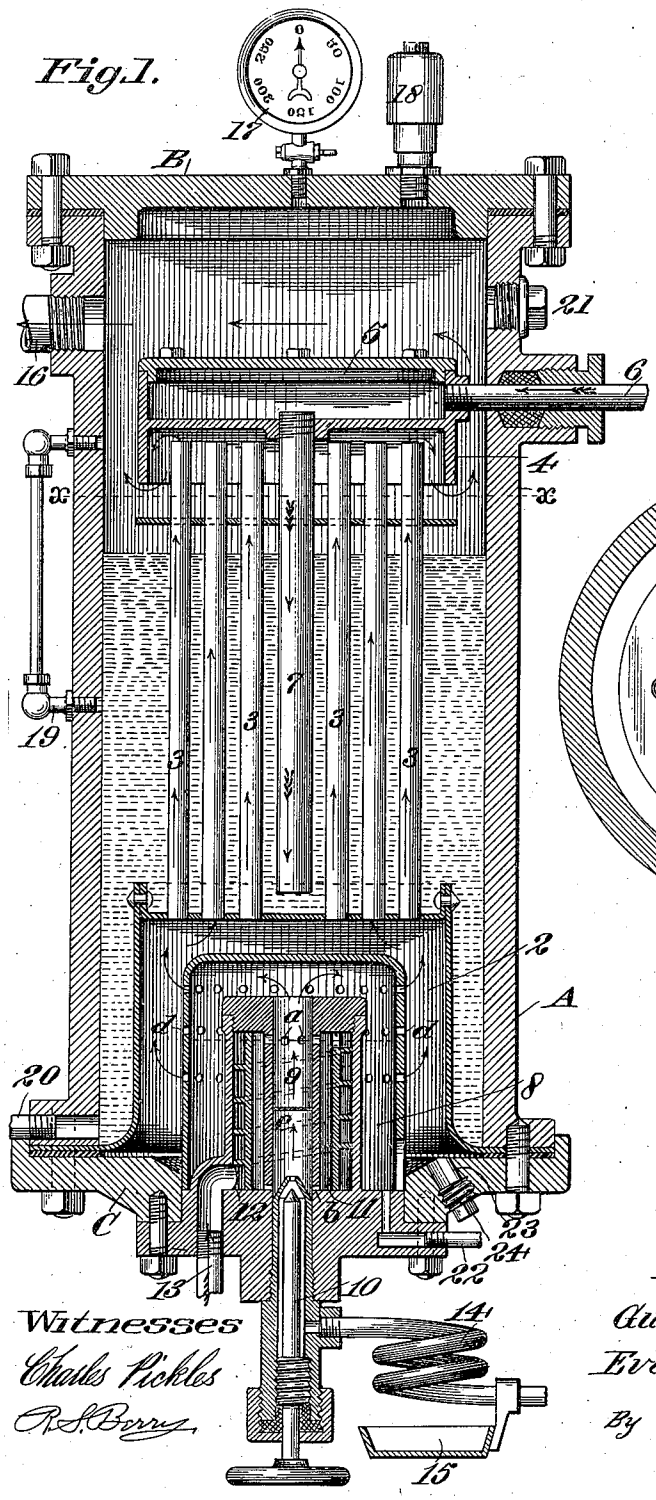


Fig. 2.

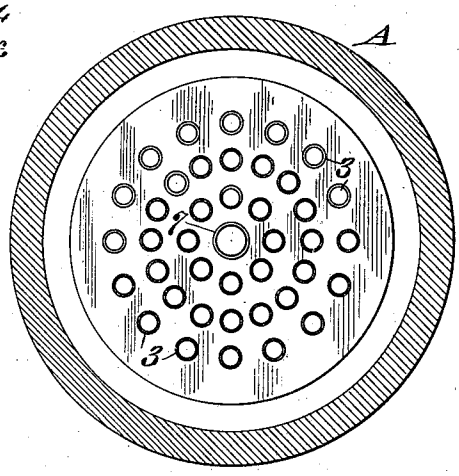
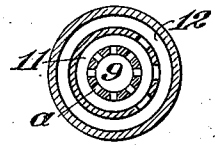


Fig. 3.



Witnesses

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UNITED STATES PATENT OFFICE.

GUSTAVE A. KROHN, OF COARSEGOLD, AND EVERALDO M. ARREAGADA, OF SAN FRANCISCO, CALIFORNIA, ASSIGNORS, BY DIRECT AND MESNE ASSIGNMENTS, TO THE IDEAL POWER GENERATOR COMPANY, OF RAYMOND, CALIFORNIA, A CORPORATION OF CALIFORNIA.

POWER-GENERATOR.

1,019,164. Specification of Letters Patent. Patented Mar. 5, 1912.

Application filed March 29, 1911. Serial No. 617,740.

To all whom it may concern:

Be it known that we, GUSTAVE A. KROHN, of Coarsegold, Madera county, California, and EVERALDO M. ARREAGADA, of the city and county of San Francisco, State of California, both citizens of the United States, have invented new and useful Improvements in Power-Generators, of which the following is a specification.

This invention relates to a fluid pressure generator.

It is the object of this invention to provide a means for generating fluid pressure from the combustion of volatile oils, in which the products of combustion will be intermingled with steam at high pressure to be drawn off and utilized therewith in the operating of power generators, such as turbines, steam engines and the like.

A further object is to provide a fluid pressure generator of the above character, which is simple in construction and operation, economical in space, and readily accessible for cleaning and repairs.

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

Figure 1 is a vertical section of the invention. Fig. 2 is a horizontal section on the line X—X, Fig. 1. Fig. 3 is a horizontal section on the line Y—Y, Fig. 1.

In the drawings, A represents a vertically arranged, cylindrical boiler shell, the upper and lower ends of which are closed by means of plates B and C respectively in the usual manner. Extending upward a short distance within the shell A is a cylindrical fire box 2, the peripheral wall of which is spaced from the inner face of the shell A to form a water jacket.

A series of fire tubes 3 mounted on the fire box 2 extend upward in the shell A and open beneath a baffle plate 4 disposed horizontally a short distance below the upper end of the shell A on the interior thereof. The plate 4 forms the bottom of an inclosed drum or head 5, which is spaced from the inner wall of the shell A and is connected to a suitable source of water supply by means of a pipe 6. A discharge pipe 7 leads downward from the drum 5 and terminates a short distance above the top of the fire box 2 and opens to the interior of the shell A.

Mounted within the fire box 2 is a cylindrical combustion chamber 8, the side walls and top of which parallel those of the fire box 2 a short distance therefrom. Arranged in the combustion chamber 8 is a generator which is formed with a central, vertically disposed chamber 9, which opens at its upper end to the combustion chamber 8 and is closed at its lower end by the nozzle of a needle valve 10. The chamber 9 is surrounded by a thin wall or partition which separates it from an annular chamber 11, which chamber 11 communicates with the chamber 9 through perforations *a—b;* the perforations *a* leading from the top of the chamber 11 and the perforations *b* leading from the bottom thereof. The chamber 11 is inclosed by a cylindrical wall which separates the chamber 11 from an inclosed spiral passage 12, which winds around the chamber 11 and opens thereto at its upper end; the passage 12 being connected with a pipe 13 leading from any suitable source of air supply. The needle valve 10 has a pipe coil 14 connected therewith, which coil leads from any suitable source of liquid fuel supply and is disposed over a primary generating pan 15.

The upper portion of the shell A constitutes a steam chamber from which a pipe 16 leads to any suitable engine or power generator. The cap or end plate B is fitted with a pressure gage 17 and a blow-off cock or pop valve 18. A water gage 19 is mounted on the shell A in the usual manner and a draw-off pipe 20 is provided, through which the shell may be emptied when desired.

In operation, a volume of water is first admitted to the shell A through the pipe 6, drum 5 and pipe 7, the water filling the shell to a point a short distance below the upper ends of the tubes 3, as shown in Fig. 1; a vent plug 21 in the upper end of the shell A being removed to admit of the escape of the air displaced by the incoming volume of water. The shell A being thus filled, the plug 21 is replaced, whereupon a quantity of volatile or inflammable oil is delivered to the interior of the combustion chamber 8 through a pipe 22, and is ignited by the insertion of a flame through an ignition port

23, which is then closed by means of a plug 24. In the meantime a quantity of inflammable substance has been ignited in the generating pan 15, the blaze of which envelops the coil 14, heating it sufficiently to convert the volatile oil therein into a combustible gas. The needle valve 10 is then opened and the generated gas is discharged into the chamber 9 below a gauze screen *C* therein; this gas mingling with a small quantity of air delivered through the perforations *b*, which air has previously been superheated by its passage from the pipe 13 around the spiral passage 12, which passage has been heated by the burning of oil in the combustion chamber 8, as before described. This mixture of gas and air on passing through the screen *C* is mixed with heated air discharged through the perforations *a*, which air is of sufficient volume and temperature to cause combustion of the gases at this point. This having occurred, the use of the generating pan 15 is dispensed with, as the volatile oil will be vaporized by its passage through the screen *C*. The flames from the burning gases and the heat generated thereby pass through a number of perforations *d* in the walls of the combustion chamber and enter the fire box 2, thence pass upward through the flues 3 and impinge against the baffle plate 4 tending to heat the latter to a high degree. These gases then pass beneath a downwardly extending flange on the plate 4 and enter the steam space above the water level in the shell A. In the meantime, the heat in the fire box 2 and tubes 3 is transmitted to the water therearound, causing the water to boil and thus generate steam, which also collects in the steam space in the upper end of the shell A together with the heated air and products of combustion discharged from the flues 3.

It is to be noted at this point that the air delivered through the pipe 13 to the passage 12 and combustion chamber 8 is under a certain forced pressure and that the volatile oil delivered through the needle valve 10 enters the combustion chamber 8 at a like pressure, which pressure is necessarily in excess of the steam pressure permitted in the steam space, so as to insure the passage of the air upward through the flues 3; the blow-off or safety valve 18 being set to admit of the automatic release of the steam pressure when the latter reaches a point approximately that of the air pressure when the pressure generated as before described is not discharged sufficiently fast through the delivery pipe 16. As soon as the pressure of steam in the steam space or dome reaches the desired degree, water is discharged into the drum 5 through pipe 6 at a pressure equal to that of the air delivered through the pipe 13, which is in excess of the normal steam pressure. The water in the drum 5 becomes heated by the action of the hot air from the tubes 3 striking the plate 4 and by the heat in the steam space so that it will be discharged from the lower end of the pipe 7 at a high temperature.

When the generator is in operation, there will be a constant flow of cold air, volatile liquid and water to the interior of the shell A; the cold air being heated and consequently expanded in the spiral passage 12 and the volatile liquids being vaporized in the chamber 9 under pressure. The pressure thus generated will be delivered to the steam dome from whence it is drawn off through the pipe 16.

From the foregoing it will be seen that as the steam and air mixture in the steam dome is drawn off, additional water to take the place of that evaporated will be discharged through the pipe 7; the inflow of water being regulated to correspond with the amount evaporated to maintain a fixed water level, and that by reason of the constant drawing off of the pressure above the water level there will be a constant flow of air and combustible gases from the fire box 2. The faster the pressure is drawn off through the pipe 16, the greater the velocity of the air discharged through the perforations *a*, thereby increasing the flame at this point.

As a means for preventing the steam rising from the surface of the water in the shell from coming in contact with the underside of the plate 4 and there condensing and dropping into the tubes 3, a baffle plate or barrier 25 is mounted on the pipes 3 between the normal level of the water and the plate 4.

When it is desired to gain access to the interior of the shell 4 or fire box 2, the plate C is removed after the shell has been emptied through the draw-off pipe 20. The fire box with the flues 3 may then be withdrawn from the shell A for cleaning. It is manifest that by reason of the pressure on both sides of the fire box being practically equal, the shell of the box may be formed of a very light material.

Having thus described our invention, what we claim and desire to secure by Letters Patent is—

1. In an apparatus of the character described, the combination of a boiler having a lower water space and an upper steam space, a water drum located in the boiler steam space and having a water inlet, a discharge pipe leading downwardly from said drum within the water space, a fire-box located in the water space, flues extending upwardly from said fire-box and opening directly beneath said drum, and a burner within the fire-box having air and oil inlets.

2. In an apparatus of the character described, the combination of a boiler having a lower water space and an upper steam

space, a water drum located in the boiler steam space, and having a water inlet, a discharge pipe leading downwardly from said drum within the water space, a fire-box located in the water space, flues extending upwardly from said fire-box, and opening directly beneath said drum, a baffle plate surrounding the upper portions of the flues, within the steam space and below said drum and a burner within the fire-box having air and oil inlets.

3. In an apparatus of the character described, the combination with a boiler and a fire box, of flues leading from the fire box and opening to the interior of the boiler, a drum in said boiler disposed above the open terminations of the flues, means for directing a volume of water into said drum, a pipe for discharging water from said drum to a point adjacent to the fire box, a cylindrical combustion chamber disposed in said fire box, the peripheral wall of which is perforated to render the combustion chamber and fire box intercommunicative, an oil burner in said combustion chamber, and means for delivering superheated air and volatile oil to said burner under pressure.

4. In an apparatus of the character described, the combination of a boiler having a lower water space, and an upper steam space, and provided with a water inlet, a fire-box located in the water space, flues extending upwardly from said fire-box and into the steam space, a combustion chamber within said fire-box having a perforated wall, and a burner located within said combustion chamber comprising a central mixing tube apertured at its upper end and having an oil inlet, a tubular member surrounding said mixing tube also apertured at its upper end and having an outer continuous spiral vane forming a spiral passage, a casing surrounding said tubular member, and an air inlet pipe leading through the said casing and opening into said spiral passage.

In testimony whereof we have hereunto set our hands in the presence of two subscribing witnesses.

GUSTAVE A. KROHN.
EVERALDO M. ARREAGADA.

Witnesses:
JOHN H. HERRING,
CHARLES EDELMAN.