(No Model.)

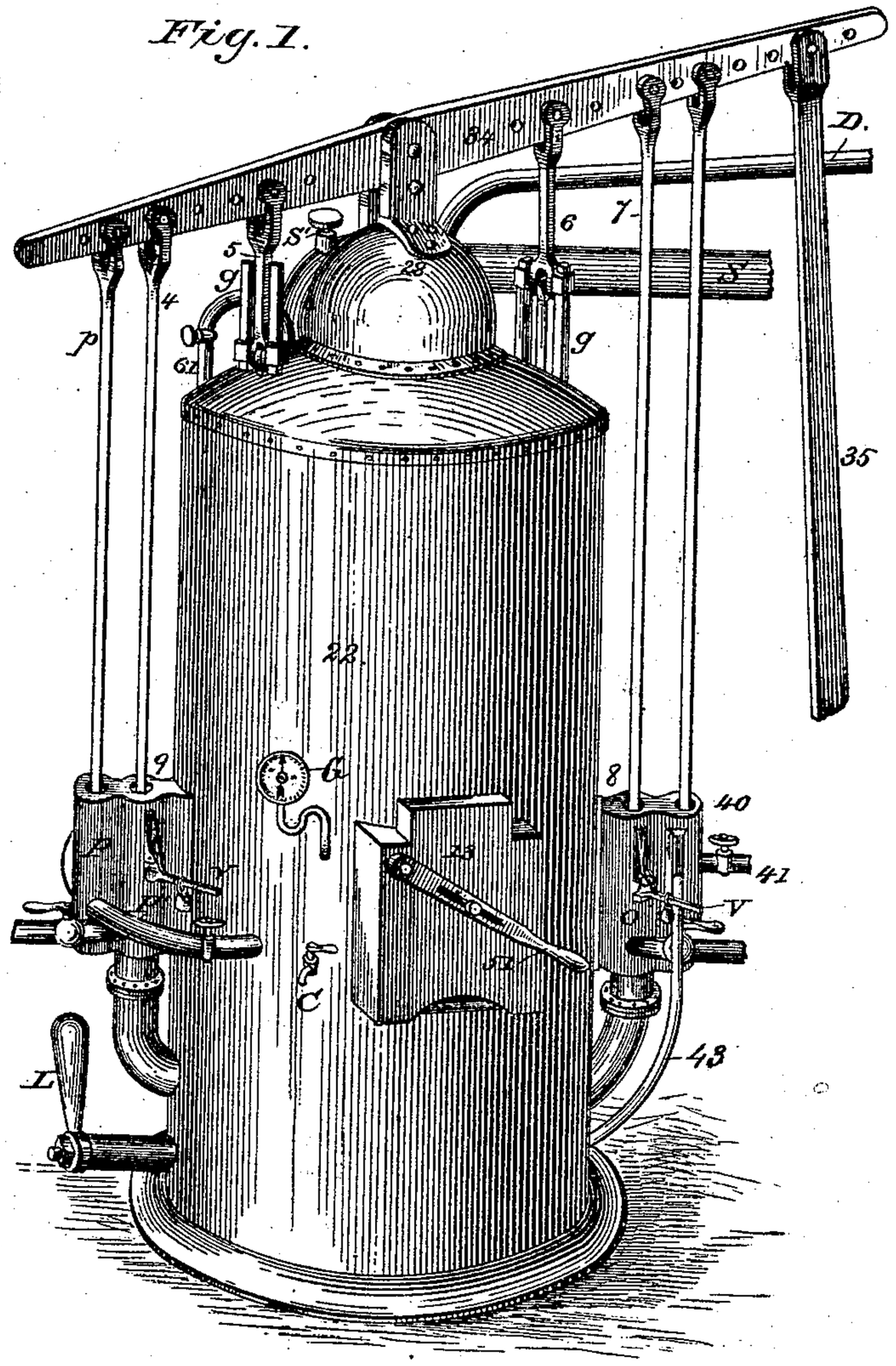
2 Sheets—Sheet 1.

B. F. WRIGHT.

STEAM BOILER.

No. 321,929. Patented July 7, 1885.

Fig. 1.



WITNESSES:

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(No Model.) 2 Sheets—Sheet 2.

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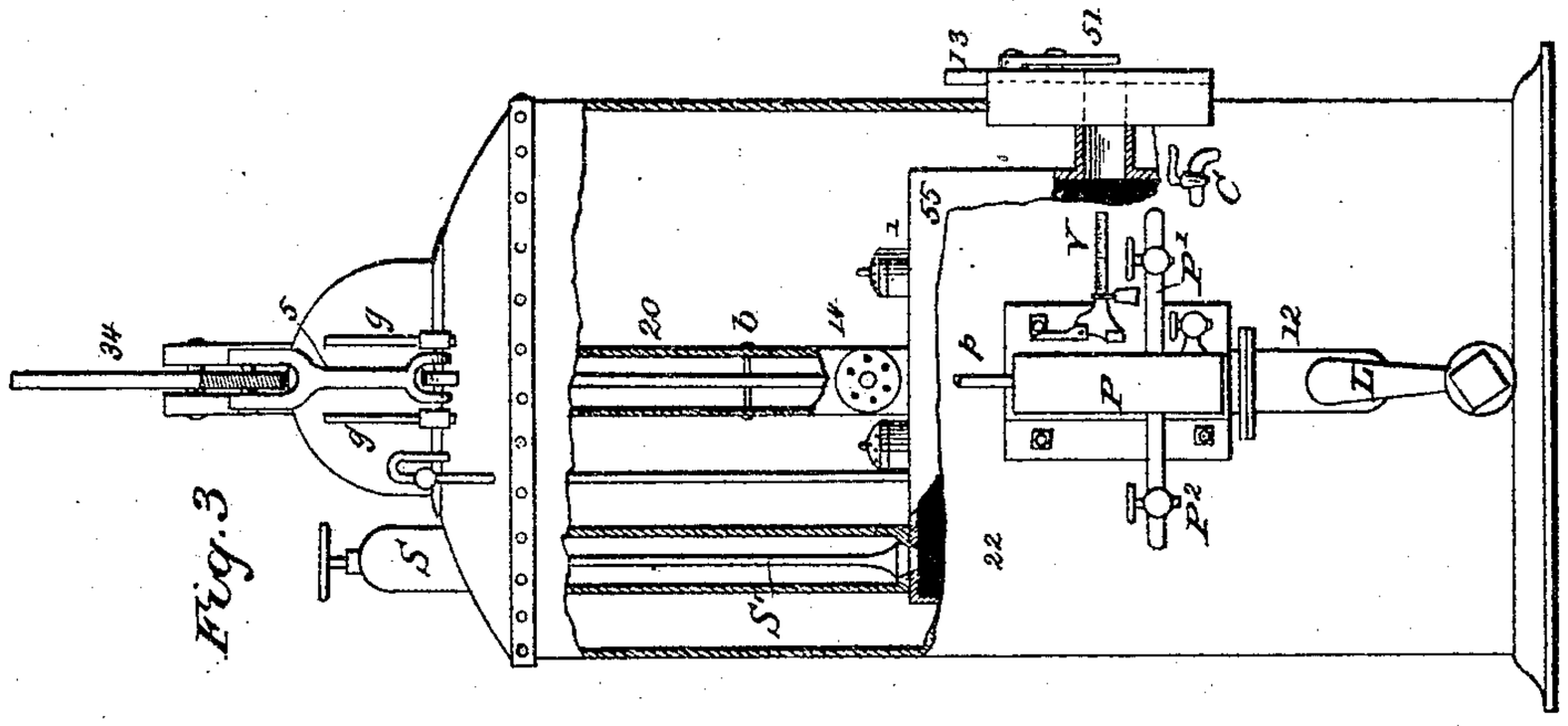

Fig. 3

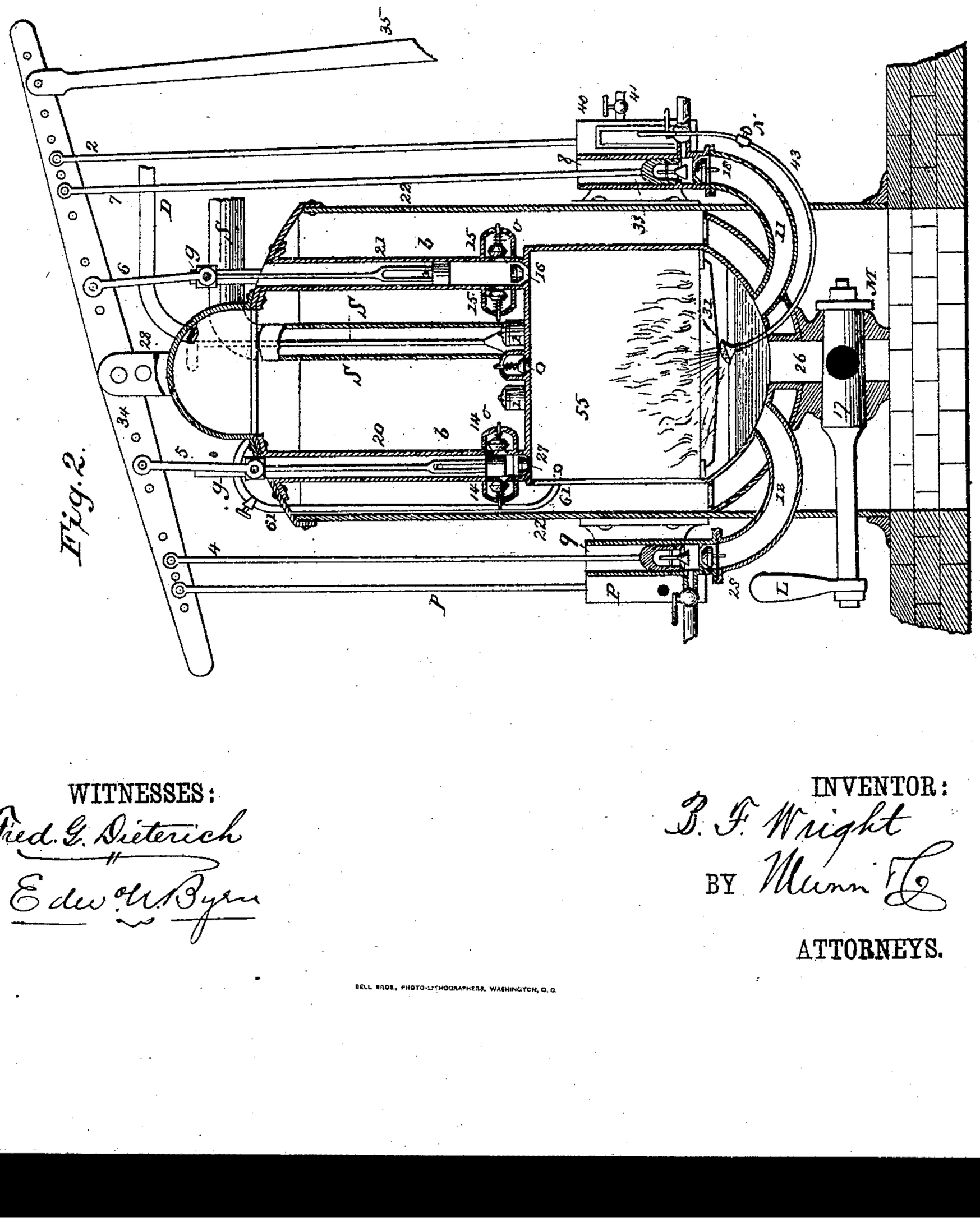

Fig. 2.

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UNITED STATES PATENT OFFICE.

BENJAMIN FRANKLIN WRIGHT, OF ONEIDA, KANSAS.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 321,929, dated July 7, 1885.

Application filed March 7, 1885. (No model.)

To all whom it may concern:

Be it known that I, BENJAMIN FRANKLIN WRIGHT, of Oneida, in the county of Nemaha and State of Kansas, United States of America, have invented certain new and useful Improvements in Steam-Boilers, of which the following is a description.

My invention relates to steam-boilers in which the gases, smoke, and heated air from the fire are driven directly through the water in the boiler without the aid of flues, thereby coming immediately in contact with the water, the objects being to prevent the escape and loss of heat, to provide a means for the rapid generation of steam by mixing hot compressed air through the water, to get the expansive force of the heated air, to secure perfect combustion without losing heat by an excessive supply of air, and to prevent the escape of sparks. I attain these objects by the mechanism shown in the drawings, which represent certain features of improvement upon the construction patented by me August 19, 1884, No. 303,690.

Figure 1 is a perspective view. Fig. 2 is a vertical section, and Fig. 3 is a side elevation partly broken away.

22 is the outside shell of the boiler, in which is contained the cylindrical fire-box 55, surrounded on all sides by water, and having sliding door 13, worked by lever 51. This sliding door is provided with air-tight packing that will not be affected by heat, and is arranged on the outside surface of the boiler, and opens into the fire-box for supplying solid fuel thereto. Inside the fire-box is the grate 31, with ash-pit 26, having air-tight plug-valve 17 with lever L at the bottom for taking out out the ashes. Entering the ash-pit are the air-pipes 11 and 12, connecting with cold-air pumps 8 and 9, and having drop-valves 18 and 25. To these pumps 8 and 9 are connected the escape-valves V V, for allowing the air to escape from the pump-barrels when desired. In the top of the fire-box are placed a number of valves, 1 1 1, three only of which are represented in the drawings. These valves open from the fire-box upwardly into the steam and water space of the boiler, and are held down to their seats by springs O. In the top of the fire-box there are also hot-air pumps 20 and 21, which have their cylinders extended to the top of the boiler, while guides *g g* project above the boiler to receive the cross-heads of the jointed piston-rods.

To the top of the steam-dome of the boiler is fastened upright 28, in which is fulcrumed a walking beam or lever, 34, to which are attached pump-rods 2, 4, 5, 6, 7, and *p*, working pumps 8, 9, 40, 20, 21, and P, beam 34 being operated by connecting-rod 35, through which power is transmitted from the engine. (Not shown.)

In the bottoms of the pump-cylinders 20 and 21 are valves 16 and 27, opening from the fire-box upwardly into the pump-cylinder, and at the bottoms of said pump-cylinders are side valves, 14 and 15, which open from the pump-cylinder into the water and steam space of the boiler, the said valves being provided with springs O, like valves 1, to hold them to their seats.

The operation of the boiler is as follows: When the piston in pump 8 descends, a drop-valve in said piston closes and valve 18 opens, forcing air through pipe 11 to the fire-box just beneath the grate 31. At the same time pump 21 also descends, closing valve 16, and forcing the heated air beneath the piston through valves 15 into the boiler. The compressed air in the fire-box now opens valve 27 and follows piston in pump 20, which in descending forces it through valve 14 into the volume of water in the boiler, and at the same time pump 9 descends, forcing cold air through valve 25 and pipe 12 into the fire-box, which raises valve 16 and follows piston in pump 21. Valves 1 1 1 also rise when the air is sufficiently compressed in the fire-box, allowing the air to escape from the fire-box direct into the boiler. A larger number of valves 1 are used than those shown in the drawings, as many valves being by preference used as can be placed in the top of the fire-box. All the pumps so far described are single acting, the object being to cause their pistons to always descend to the bottom of their cylinders without regard to the length of their stroke. Thus when the stroke is changed by changing the pump-piston rods to different holes in the walking-beam the fulcrum of the walking-beam is changed to corresponding holes in the

upright 28, thereby causing the pistons of said pumps to still work down to the bottom ends of their cylinders.

At 40 is a double-acting gas or petroleum pump with a supply-pipe, 41, having a screw-valve, N, to regulate the quantity of gas or petroleum which enters the fire-box through pipe 43. At the top of the dome on the boiler is a steam-pipe, D, with throttle-valve, leading to the engine, while 61 is a return-pipe that takes steam from the top of the boiler and carries it to the fire-box. This pipe is provided with a screw-valve, and is used for increasing the blast in the fire-box and reheating the steam and air, also for the purpose of producing an equilibrium, when necessary, between the pressure in fire-box and pressure in top of boiler, or to carry the heated air, gases, and steam from fire-box to top of boiler whenever pressure in fire-box exceeds that of boiler.

At *b* are shown bolts that pass through the pump-barrels 20 and 21 and through forks or slots in the piston-rods, which bolts *b* prevent the piston from passing up beyond a given distance by the pressure in the chamber 55 when the piston-rods are detached from the walking-beam.

S represents the smoke or draft pipe of the furnace, which is provided with a screw-valve, S′, to shut off the draft after the engine is started in action.

The water-pump P is designed to take hot water from the boiler through pipe P^2, Fig. 3, and force it through pipe P′ into the bottom of the furnace, where it floats the liquid hydrocarbon, as in Fig. 2, when that kind of fuel is used. Both the pipes P′ and P^2 have cocks in them to regulate the supply of water.

The gage V regulates the supply of air from the pumps 8 and 9, the pea or balance-weight being set farther in or out on the lever, according to the pressure required. These gages act as safety-valves in that they allow the air to blow off when a given pressure is exceeded.

C is a water-cock to determine the height of water in the bottom of the furnace.

In starting the boiler the lever L is turned so as to open the bottom of the ash-pit and valve S′ is raised. If solid fuel is used, door 13 is raised by lever 51. If gas or petroleum is used, this door is kept closed after lighting and supplying the gas or petroleum through pipe 43. The boiler can now be fixed as ordinary ones, a natural draft of air passing in at 17 through fire-box and out through valve S′ to the smoke-stack S. When a few pounds of steam are generated, plug 17 and valve S are closed and the door 13 is closed air-tight. When fresh fuel is to be added, the cocks V are opened, which allows the hot-air pumps 20 and 21 to take the expansive force from the air in the fire-box, and the door can then be opened and new fuel added, the door and cocks V being then closed; or, if desired, the boiler can be run with plug 17 and air-cocks open, causing pumps 20 and 21 to furnish draft by suction. To the boiler as thus described there are to be attached the usual appendages—such as steam-pipes, water-gages, safety-valve, steam-valve, governor, &c. There is also a pressure-gage, G, connecting with the fire-box, in order that the engineer can compare the pressure in the fire-box with the pressure in the boiler.

In defining my invention more clearly I would state that the function of the valves V is, specifically, to regulate the supply of cold air to be admitted to the fire-box before it is admitted. Any excess of cold air entering the fire-box beyond that which is actually necessary to support combustion produces a disadvantageous reduction of heat. The water-pump P also, in connecting with the boiler below the water-line and delivering its water into the furnace, serves a distinctive purpose in that said water both absorbs the heat by direct contact and facilitates the rapid generation of steam, and, also, by its greater specific gravity and inherent heat, it floats the liquid petroleum, when that fuel is used, and facilitates the evaporation and combustion of the same.

Having thus described my invention, what I claim as new is—

1. In combination with a steam-boiler, its furnace, and valves for permitting the products of combustion to pass into the boiler from the furnace, the air-pumps connecting with the furnace, and automatic escape-valves located between the pump and furnace for preventing an excessive admission of cold air to the furnace, substantially as shown and described.

2. In combination with a steam-boiler, its furnace, and valves for permitting the products of combustion to pass into the boiler from the furnace, a water-pump having its inlet-pipe communicating with the boiler below the water-line, and its outlet-pipe communicating with the furnace to increase the absorption of heat and promote the evaporation of the water and petroleum, substantially as shown and described.

BENJAMIN FRANKLIN WRIGHT.

Witnesses:
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W. E. SPARLING.