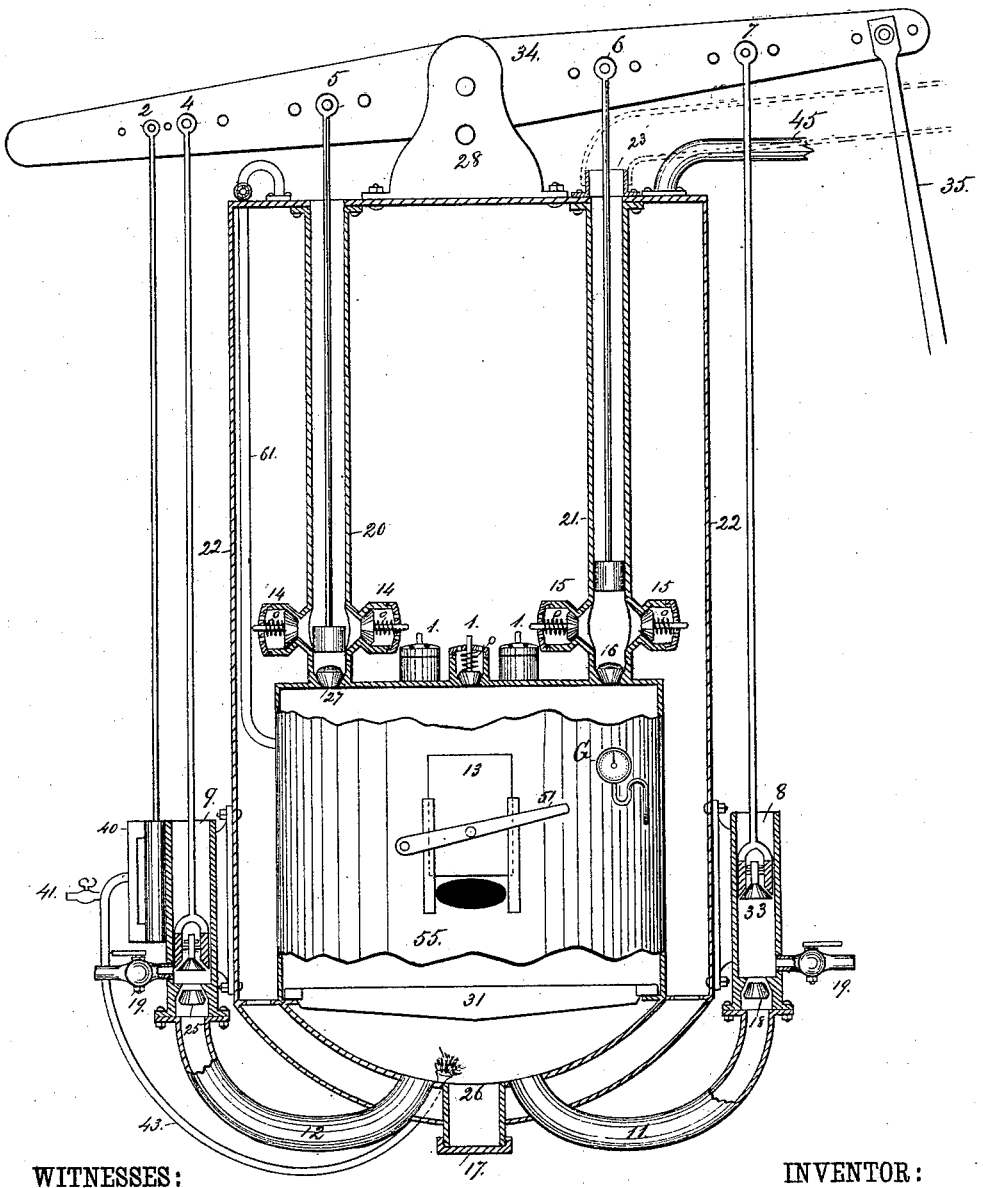
(No Model.)

B. F. WRIGHT.

STEAM BOILER.

No. 303,690. Patented Aug. 19, 1884.



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STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 303,690, dated August 19, 1884.

Application filed March 8, 1883. (No model.)

To all whom it may concern:

Be it known that I, BENJAMIN F. WRIGHT, a citizen of the United States, residing at Oneida, in the county of Nemaha and State of Kansas, 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 drawing, in which the figure is a vertical section of a steam-boiler embodying my invention.

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 removable screw-cap 17 at the bottom for taking 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 air-cocks 19 19, 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 drawing. These valves open from the fire-box upwardly into the steam-water space of the boiler, and are held down to their seats by springs 0. 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. To the top 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, and 7, working pumps 8, 9, 40, 20, and 21, 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 in an enlargement 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 0 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, admitting 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 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 drawing, 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 lowering the fulcrum of the walking-beam on the upright 28, or changing the pump piston-rods to different holes on the walking-beam, the pistons of said pumps are still made to 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 to regulate the quantity of gas or petroleum which enters the fire-box through pipe 43.

At the top of the boiler is a steam-pipe, 45, 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.

In starting the boiler, the cap 17 is first removed from the ash-pit, and valve 16 is then raised and propped up. Pump-rod 6 is detached from the walking-beam, and is dropped down to large part of pump-barrel just above valve 16. 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 fired as ordinary ones, a natural draft of air passing in at 17 through fire-box, and out through valve 16, pump 21, and pipe 23 to the smoke-stack. When a few pounds of steam are generated, cap 17 is replaced, and the valve 16 is let down, the pump-rod is attached to beam 34, and the door 13 is closed air-tight. When fresh fuel is to be added, the air-cocks 19 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 air-cocks being then closed; or, if desired, the boiler can be run with cap 17 removed 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.

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

1. The combination, with a boiler and a hermetically-sealed fire-box, of the walking-beam 34, the pumps 8 and 9, valves 18 and 25, and the pipes 11 and 12, leading to the ash-pit of the fire-box and valves 1, leading into the boiler, as and for the purpose described.

2. The combination, with a boiler and a fire-box, of the hot-air pumps 20 and 21, having valves 16 and 27, opening inwardly from the fire-box to the pumps, and valves 14 and 15, opening outwardly from the pumps into the boiler, and the walking-beam 34, attached to the pistons of said pumps, as and for the purpose described.

3. The combination of a steam-boiler, a hermetically-closed fire-box having valves opening inwardly to the same, and other valves opening outwardly from the fire-box and into the boiler, and a pressure-gage having communication with the fire-box for indicating the pressure in the fire-box for comparison with the boiler or when charging fuel into the fire-box, as described.

4. The combination of boiler 22, fire-box 55, cold-air pumps 8 and 9, valved pipes 11 and 12, hot-air pumps 20 and 21, with valves 16 and 17, and 14 and 15, the petroleum or gas pump 40, and a walking-beam, 34, connected to and operating all of said pumps, as and for the purpose described.

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Witnesses:
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