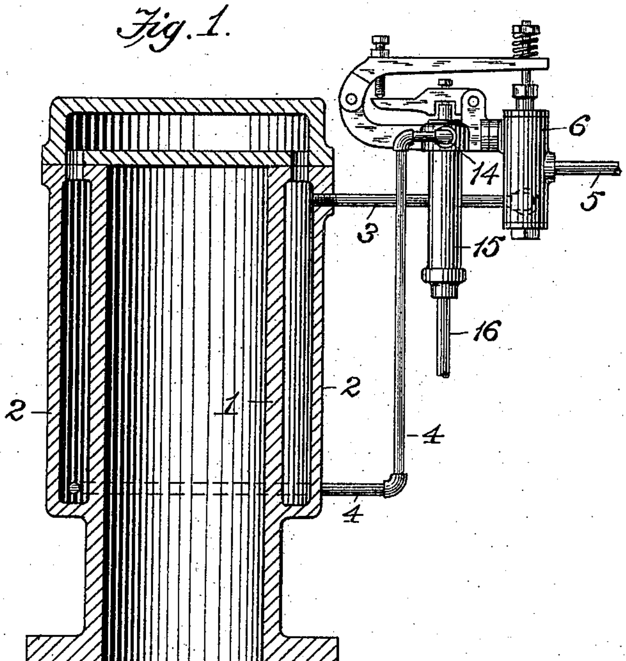
No. 710,385. Patented Sept. 30, 1902.

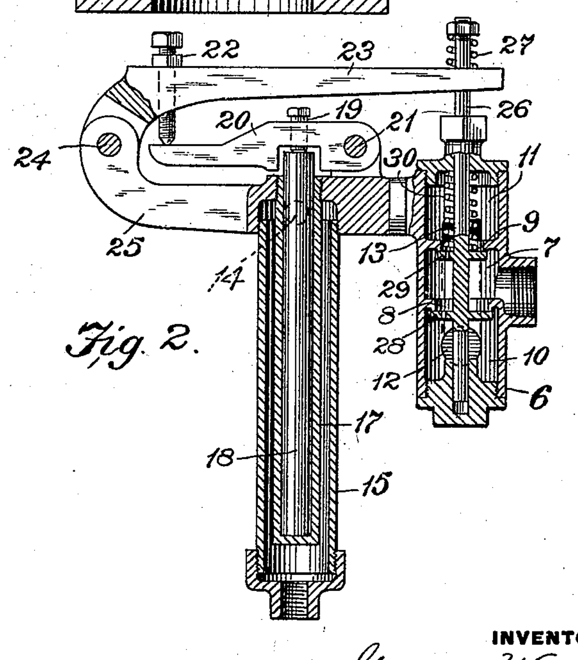
G. WESTINGHOUSE.

GAS ENGINE.

(Application filed Jan. 31, 1898.)

(No Model.)





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UNITED STATES PATENT OFFICE.

GEORGE WESTINGHOUSE, OF PITTSBURG, PENNSYLVANIA.

GAS-ENGINE.

SPECIFICATION forming part of Letters Patent No. 710,385, dated September 30, 1902.

Application filed January 31, 1898. Serial No. 668,558. (No model.)

To all whom it may concern:

Be it known that I, GEORGE WESTINGHOUSE, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented or discovered a certain new and useful Improvement in Gas-Engines, of which improvement the following is a specification.

The object of my invention is to provide an improvement in gas-engines; and to this end it consists in new and improved means for automatically controlling and regulating the cooling-water supplied to the jacket of a gas-engine.

In the accompanying drawings, Figure 1 is a central longitudinal section through the cylinder and jacket of a gas-engine provided with my improvement; and Fig. 2 is a detail view, partly in section and partly in elevation, showing the thermal regulating device.

In case the supply of water to the jacket of a gas-engine be greater than is necessary the temperature of the cylinder-walls may be kept too low for efficient working, and in districts where water is scarce or expensive the cost of the water may add materially to the expense of operation. On the other hand, it is essential that the quantity of water used in the jacket should not be less than is necessary to keep the inner surface of the cylinder-walls in good working condition, so as to prevent injurious action by the piston, such as might occur if the temperature of the cylinder-walls should be permitted to become too great.

If the quantity of heat generated in the gas-engine cylinder were invariable, there would be no need for variation in the quantity of cooling-water supplied to the jacket; but as the load on the engine is liable to variation the quantity of work done by the engine and the quantity of heat generated in the cylinder will be correspondingly varied; and the special object of my invention is to provide new and improved means for varying the supply of cooling-water supplied to the jacket in accordance with the variations in the load and work done and with the quantity of heat generated in the cylinder.

In accordance with my invention I provide means whereby variations in the temperature of the cooling-water will cause variations in the quantity of water passing through the jacket, and in the embodiment of my invention, as shown in the drawings, I provide a thermal regulating device which is operative by variations in the temperature of the cooling-water to vary the size of a port or passage through which the water may be admitted to or released from the jacket.

My invention is not limited to the particular form of regulating device shown in the drawings.

As shown in the drawings, the cylinder 1 of the engine is surrounded by a jacket 2, and the cooling-water is admitted to the interior of the jacket through the pipe 3 and is discharged therefrom through the pipe 4. The water-pipe 5 from the main or other source of water-supply is connected with the casing 6 and opens into a chamber 7, from which the water flows through the valve-controlled ports or passages 8 and 9 into the chambers 10 and 11 and thence through the ports 12 and 13, respectively, into the pipe 3 and into the jacket. After passing through the interior of the jacket 2 the water flows through the pipe 4 and passes through a port 14 into a tube 15, from which it is discharged through the pipe 16.

A tube 17, of brass or other material, having a large coefficient of expansion, extends into the tube 15 and expands or contracts in accordance with the variation in the temperature of the water discharged from the jacket. A rod 18, preferably of steel, is fitted in the tube 17 and bears at one end on the bottom of the tube 17 and at the other end engages with an adjusting-screw 19, which is screwed into the lever 20. The lever 20 is pivoted at one end on a pin 21, and at its other end engages with an adjusting-screw 22, which is screwed into a lever 23. The lever 23 is pivoted at one end on a pin 24 on the fixed arm 25, and the other end of the lever 23 embraces the valve-stem 26 and engages with a spring 27 thereon. The stem 26 passes into the casing 6 and is adapted by its movement to open and close the valve-disks 28 and 29, which control the passage of water from the supply-pipe 5 to the pipe 3 and to the jacket of the engine. The valve-disks 28 and 29 are of different area, and since they are located at opposite ends of the chamber 7 they constitute a differential piston, which tends to move downward under the resultant pressure of the cooling fluid supplied by the pipe 5. The valve-opening action of the fluid-pressure is supplemented by the downward pressure of a coiled spring 30 and is opposed by the spring 27, located above the lever 23.

The valve-disks 28 29 will normally be open, so as to permit a flow of water into the jacket, and the extent of the opening will depend on the temperature of the water passing through the jacket and through the tube 15.

When the engine is in operation and the proper amount of water is passing through the jacket, if the load be increased the heat generated in the cylinder will be increased, the temperature of the water passing through the jacket and through the tube 15 will be increased, and the tube 17 will be expanded, so as to permit movement of the rod 18 and levers 20 and 23 under the action of the spring 30, the valve-disks 28 and 29 will be moved farther away from their seats, and the supply of water to the jacket will be increased.

If the load on the engine be decreased, the heat generated in the cylinder and the temperature of the water in the jacket will be less, and the tube 17 will contract, so as to move the rod 18, levers 20 and 23, stem 26, and valve-disks 28 and 29 in direction to diminish the supply of water to the jacket.

My invention is not limited to the particular construction or arrangement shown and is not limited to the employment of the particular form of thermal regulating device shown in the drawings. The position of the controlling-valve is not limited to the particular position in which it is shown. It is also immaterial what part or parts of the engine are to be cooled or whether the cylinder and cylinder-head or other parts are covered by one continuous jacket. The employment of air or other fluid instead of water may sometimes be preferred, and my invention is therefore not limited to a water-cooled engine.

By locating the thermal regulating device at or near the outlet from the jacket or in a position where it will be acted on by the cooling fluid after the transfer of heat from the cylinder to the cooling fluid I secure an operation of the controlling-valve in accordance with the quantity of heat in the cylinder, and by locating the controlling-valve device in the supply-passage it is subjected only to a substantially uniform temperature of comparatively low degree, and is therefore not liable to the injurious action of a high heat and great variations of temperature.

I claim as my invention and desire to secure by Letters Patent—

1. In a gas-engine, the combination with a cylinder having a cooling-jacket provided with an inlet-port at one end and an outlet-port at the other end, of a cooling-fluid-inlet pipe provided with a controlling-valve, a cooling-fluid-outlet pipe containing a thermostatic device and a pair of coacting levers interposed between the thermostatic device and the inlet-controlling valve, whereby the inflow of the cooling fluid is controlled by the temperature of the fluid as it is discharged from the jacket.

2. The combination with a gas-engine cylinder provided with a cooling-jacket, of a cooling-fluid-inlet pipe provided with a differential valve, a cooling-fluid-outlet pipe containing a thermostatic device and valve-adjusting levers interposed between the thermostatic device and the inlet-controlling valve, whereby the inflow of the cooling fluid is controlled by the temperature of the cooling fluid as it is discharged from the jacket.

3. The combination with a gas-engine cylinder having a cooling-jacket, of a cooling-fluid-inlet pipe, a differential controlling-valve therein, a spring acting in conjunction with the fluid-pressure to open the valve, a cooling-fluid-outlet pipe, a thermostatic device therein and valve-adjusting connections between said device and the controlling-valve, whereby the inflow of cooling fluid is controlled by the temperature of the cooling fluid as it is discharged from the jacket.

4. The combination with a gas-engine cylinder having a cooling-jacket, of a cooling-fluid-inlet passage, a differential controlling-valve therein, two springs acting upon said valve, one in conjunction with and the other in opposition to the pressure of the cooling fluid, a cooling-fluid-outlet passage, a thermostatic device in said passage and valve-adjusting connections between said device and the controlling-valve.

5. In a gas-engine, the combination with a cylinder having a cooling-jacket, of a cooling-fluid-inlet passage provided with a valve, a cooling-fluid-outlet passage provided with a thermostatic device and a pair of reversely-pivoted levers interposed between the thermostatic device and the inlet-valve, substantially as set forth.

In testimony whereof I have hereunto set my hand.

GEO. WESTINGHOUSE.

Witnesses:

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WILLIAM J. KNOX.