R. H. WHITE.

FLOW MOTOR AND VALVE OPERATED THEREBY.

APPLICATION FILED NOV. 12, 1906.

987,932. Patented Mar. 28, 1911

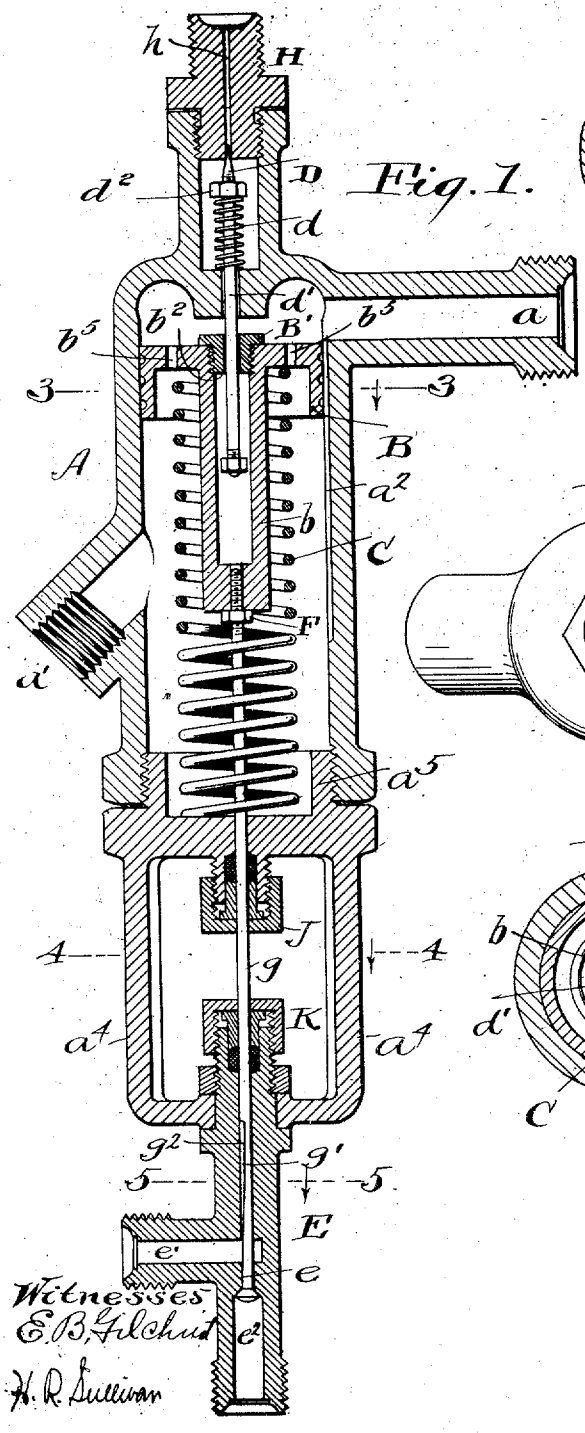

Fig. 1.

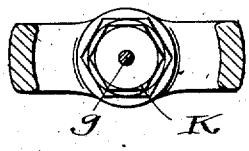

Fig. 4.

Fig. 5

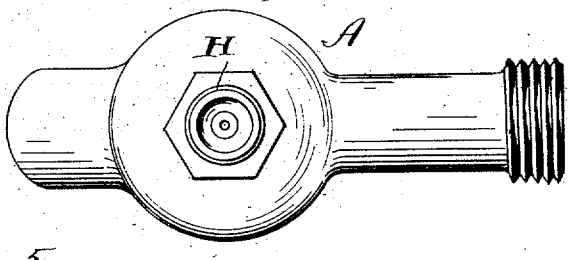

Fig. 2.

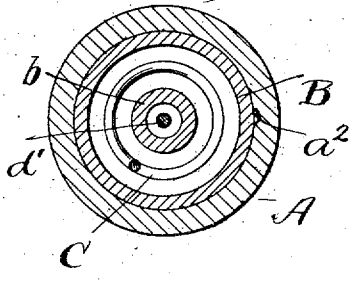

Fig. 3.

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UNITED STATES PATENT OFFICE.

ROLLIN H. WHITE, OF CLEVELAND, OHIO, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE WHITE COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

FLOW-MOTOR AND VALVE OPERATED THEREBY.

987,932. Specification of Letters Patent. Patented Mar. 28, 1911.

Application filed November 12, 1906. Serial No. 342,971.

To all whom it may concern:

Be it known that I, ROLLIN H. WHITE, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Flow-Motors and Valves Operated Thereby, of which the following is a full, clear, and exact description.

This invention is intended particularly for use as a part of an apparatus for automatically controlling the flow of water to a steam generator and the flow of fuel to a burner for heating the generator,—particularly when said apparatus is a part of the steam producing plant of a steam motor car.

The objects of the invention are, first, to preserve a definite quantitative relation between the fuel allowed to pass to the burner and the water allowed to pass into the generator through the flow motor; and, second, to limit the rate of flow of water through the motor so that it shall never exceed the capacity of the generator, regardless of the rate at which water is forced into the flow motor casing.

The apparatus of which the present invention may be a part, forms the subject matters of an application filed contemporaneously with this application.

The present invention consists of the construction and combinations of parts hereinafter described and pointed out definitely in the claims.

In the drawings, Figure 1 is a central longitudinal sectional view of the invention; and Fig. 2 is a plan view thereof. Figs. 3, 4 and 5 are transverse sectional views in the planes of lines 3—3, 4—4 and 5—5 respectively on Fig. 1.

Referring to the parts by letters A represents the motor casing having an inlet opening a at one end and an outlet opening a' near the other end,—said openings being preferably through the sides of the casing. Within the casing is a piston B which always occupies a position between said inlet and outlet,—said piston being subject to the influence of a spring C acting to force it toward the inlet end of the casing. There must be within the casing a restricted passage through which water may flow past the piston from the inlet to the outlet ends thereof. This restricted passage may be secured by making the piston of smaller diameter than the casing, so that there will be sufficient clearance between the piston and casing for the passage of said water. The restricted passage required may be provided by one or more holes b^5 through the piston, as indicated in Fig. 1, or by a horizontal groove a^2 formed in the interior of the casing wall. Any or all of these constructions may be adopted; but only one of them is necessary,—the preferred construction being groove a^2. When water is forced into the casing through the inlet a the piston will be moved in opposition to the spring. The higher the rate at which water is forced into the casing, the more rapidly will the water flow past the piston through the restricted passage; but the pressure upon the piston will be correspondingly greater and consequently the piston will be moved from its normal position, which is shown in Fig. 1; and the movement of the piston from its normal position will be substantially proportionate to the rate of flow of water through the motor casing past said piston. The upper end of this casing is closed by a screw plug H through which is a relief port h. This relief port is normally closed by a valve D, which is pressed to its seat by a spring d. The stem d' of this valve passes a part of the piston, and is provided with a shoulder d^2, which is adapted to be engaged by a shoulder b^2 on the piston, after the latter has been moved a certain distance. It follows, therefore, that when the piston moves still farther in the same direction the valve D will be drawn open, thereby permitting some of the water forced into the casing to escape therefrom through said relief port.

The specific construction by which the piston is able to open the valve D, as shown in the drawing, is as follows: The piston B is provided with a hollow stem b, the upper end of which is closed by a screw nut B'. The stem of the valve D passes loosely through this nut, and has a nut D' screwed upon its lower end. These two nuts furnish the shoulders d^2 and b^2, before referred to.

The described parts are to be so proportioned, and the spring C is to be under such tension, that when water is flowing through the motor casing at the maximum rate at which it is desired to have it so flow, the two shoulders d^2 and b^2 will be in contact. When water is forced into the motor casing

at a higher rate, it will move the piston still farther, and this will result in opening the valve D and permitting the excess of water to escape through the relief-port *h*.

A valve G is connected with the piston and its purpose is to control the rate of flow of fluid fuel through a port *e* which connects a passage *e'* with a passage e^2,—these two passages being formed in a casing E which must be fixed in definite relation with the flow motor. In the construction shown, it is rigidly fastened to two yoke arms a^4, which extend downward from the screw plug a^5 which forms the bottom of the motor casing; so that the axis of port *e* is alined with the axis of the piston B. The stem *g* of the valve G passes through port *e* and through an alined hole out of the top of the casing E and through a stuffing box K fitted thereto; then through another stuffing box J into the flow motor casing; and said stem is adjustably connected with the piston. It is preferably screwed into the piston a suitable distance and locked in position by the lock nut F. The spring C, therefore, not only pushes the piston B upward in the motor casing, but it also draws the conical valve G on the lower end of said valve stem *g* tight against its seat. The seating of the valve determines the position of the piston in the motor casing, and therefore determines the tension of the spring when this piston is in its normal position.

From a point just above the partition through which port *e* extends, the cross sectional area of the valve stem *g* is reduced as at *g'* and this reduction in cross sectional area gradually increases for a short distance upward therefrom; and above this tapered or gradually reduced part of the valve stem, said stem, for a short distance, remains at the same cross sectional area as at g^2,—which is obviously less than the cross sectional area of the port *e*. Now, when water is forced into the motor casing, a very slight pressure due to the income of water will move the piston far enough to bring the tapered or reduced part of the valve stem G into the port *e*, and thereby permitting a very small quantity of fuel to flow through said port. The farther the piston is moved by the water pressure the farther will this stem be moved through said port, and consequently the larger will be the opening through the port for the passage of the fuel. The gradual reduction in cross sectional area of the valve stem must be made with due regard for the size of the restricted opening a^2, and the tension of the spring C, so that whatever may be the actual rate of flow of water past the piston in the motor casing the ratio between said flow of water and the flow of fuel through the port *e* will remain constant.

Having described my invention, I claim:

1. The combination of a flow motor whose casing has an inlet, an outlet, and a relief port at the inlet end, a self closing valve for said relief port, a movable piston within the flow motor casing,—said piston and valve being respectively provided with shoulders which will be brought into engagement by the movement of the piston to a predetermined position whereby a further movement of the piston in the same direction will cause a like movement of the valve in the opening direction.

2. The combination of a flow motor casing having an inlet and a relief port at one end and an outlet at the other end, a movable piston within said casing, which will be moved by the water flowing through said casing a distance proportionate to the rate of flow of water through said casing, there being within the casing a restricted passage through which water may flow past the piston from the inlet to the outlet thereof, a self-closing valve for the relief port, said valve and piston being provided respectively with shoulders adapted to be brought into engagement after the piston has moved a determined distance in opposition to its spring whereby the relief valve will be opened by a further movement of said piston.

3. The combination of a flow motor casing having a relief port through one end, an inlet through its side near said end and an outlet through its side near the other end, a piston within said casing, a spring acting to move it toward the inlet end thereof, a self-closing valve for the relief port, and two shoulders secured respectively to the piston and stem of the relief valve which are adapted to be brought into engagement by a definite movement of the piston, whereby the relief valve may be opened.

4. The combination of a flow motor casing having an inlet near one end, an outlet near the other end, a plug screwing into the inlet end of said casing and having a centrally placed relief port passing through it, a spring actuated piston within said casing having a tubular stem, a nut screwing into the end of said stem, a self-closing valve for the relief port,—the stem of said valve being extended loosely through said nut and into the hollow stem of the piston, a nut adjustably secured upon the end of said stem, and a spring acting to force the piston toward the inlet end of the casing,—there being within the casing a restricted passage through which water will flow past the piston from the inlet to the outlet of the casing.

5. The combination of a flow motor casing having an inlet near one end, an outlet near the other end, a piston within said casing, a spring acting to force the piston toward the inlet end of the casing,—there being within said casing a restricted passage

through which water may flow past the piston from the inlet to the outlet of said casing, a casing secured to said motor casing and containing a port, a valve for closing said port having a stem which passes through said port and enters the motor casing and is secured to said piston, said stem being of gradually reduced cross sectional area upward from a point adjacent to said fuel port.

In testimony whereof, I hereunto affix my signature in the presence of two witnesses.

ROLLIN H. WHITE.

Witnesses:
E. B. GILCHRIST,
H. R. SULLIVAN.