O. C. MOORE.

FLOW MOTOR.

APPLICATION FILED DEC. 24, 1910.

**1,042,366.** Patented Oct. 22, 1912.

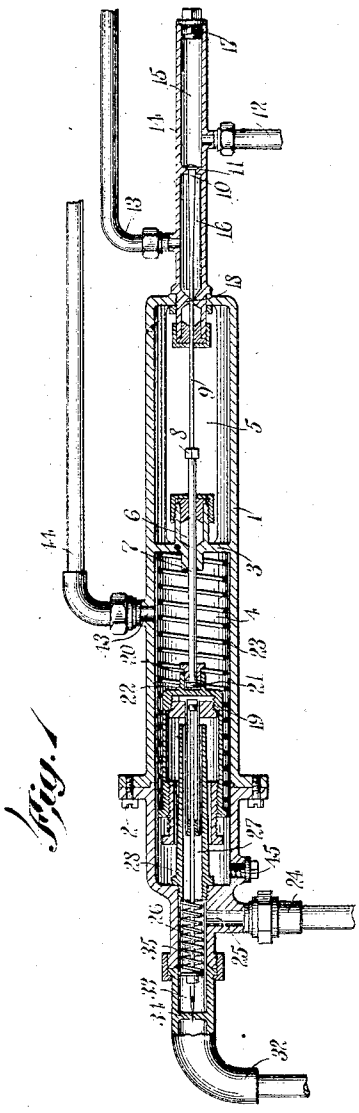

Fig. 1.

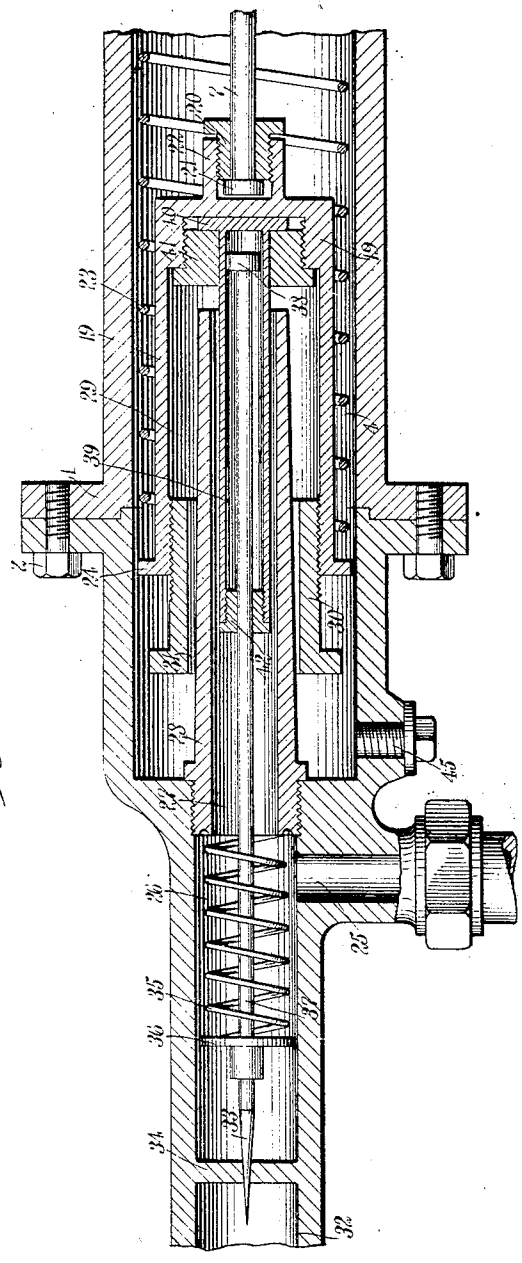

Fig. 2.

WITNESSES

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ORLANDO C. MOORE, OF MORROW, OHIO.

## FLOW-MOTOR.

1,042,366. Specification of Letters Patent. Patented Oct. 22, 1912.

Application filed December 24, 1910. Serial No. 599,177.

*To all whom it may concern:*

Be it known that I, ORLANDO C. MOORE, a citizen of the United States, and a resident of Morrow, in the county of Warren and State of Ohio, have invented a new and Improved Flow-Motor, of which the following is a full, clear, and exact description.

This invention relates to a new and improved device for supplying a fuel to a steam generator in proportion to the water supplied to said generator, and is what is commonly known as a flow motor; and is adapted to be used in connection with the invention disclosed in my application for a feed-water and fuel control, Serial No. 599,175, filed December 24, 1910.

In such types of flow motors with which we are familiar, there is generally provided a movable member, in the form of a piston, which contacts slightly at all sides with a casing in which it is adapted to move, except at a point where a graduated groove is provided, through which the fluid, such as water, is permitted to pass. With such an arrangement, the movements of the piston become ununiform, thus disturbing the delicate operation of the device. The causes of ununiform piston travel are, the irregular lubrication periods and the presence of grit or other foreign matter, other than oil—and leakage. As the adjustments on these automatic devices are very delicate, the slightest change in any of the operating conditions is at once reflected in a greater or a lessened volume of water going to the generator in proportion to the volume of fuel admitted to the burner. Grit in the water results in irregular travel, sometimes causing the piston to move sluggishly, to the extent of holding the fire on when it should be off, and in the reverse action, bringing the fire on tardily when it should come on quickly and strongly. The friction that is ever present with the piston in close contact with its ways of travel is, from courses noted above, irregular in degree, and from the fact that these adverse conditions may develop at any time and in a degree of varying potency, uniform flow motors action cannot be assured, and the most careful adjustments on the automatic may be upset from sources that are difficult to get at and remove.

An object therefore, of this invention is to provide a device of this character, in which, in place of the piston positively engaging the casing on substantially all sides, there is provided a movable or floating member, out of contact with the casing and having a chamber therein whereby the force of the fluid or water may be utilized in controlling the operation of the device, without any danger of leakage due to wear and without the necessity of the careful oiling of the parts.

A further object of this invention is to provide means for controlling the fuel supply in proportion to the quantity of water to be supplied to the steam generator, with means for automatically diverting any surplus of water beyond the limit of that quantity which the fuel supply is capable of generating into steam.

A still further object of this invention is to provide means for controlling the fuel supply, which are operated in one direction by a constant force, and in the opposite direction by the water to be supplied to the steam generator, with means for allowing for any variation in the constant force, and with means for adjusting the control of the initial movement of said first-mentioned means.

These and further objects, together with the construction and combination of parts, will be more fully described hereinafter and particularly set forth in the claims.

Reference is to be had to the accompanying drawings forming a part of this specification, in which similar characters of reference indicate corresponding parts in both views, and in which—

Figure 1 is a longitudinal section; and Fig. 2 is an enlarged section of a portion of Fig. 1.

Referring more particularly to the separate parts of the device as embodied in the form illustrated in the drawings, 1 indicates a casing, which may be formed in two parts, connected together by any suitable means, such as screw bolts 2 engaging coöperating flanges on said parts.

The casing 1 is divided in any suitable manner, as by means of a partition 3, into a plurality of chambers 4 and 5, the former of which may be termed the working chamber. The partition 3 may be provided with a stuffing box 6, so that a rod 7 may extend into both of the chambers and be moved in

and out, without the danger of leakage. This rod may be adjustably connected in any suitable manner, as by means of nuts 8, to a valve spindle 9, having connected to its opposite end a valve 10. The valve 10 is preferably provided with a gradual taper, as will be seen by reference to Fig. 1, so that the size of the opening between its seat 11 and itself will be varied according to the extent of movement of the valve. The valve 10 is adapted to control the passage of fluid from an inlet or supply pipe 12 and an outlet or generator pipe 13. The supply pipe 12 is connected to any suitable source of fuel, such as a gasolene tank, and may have the fuel supplied thereto by means of a pump, if desired. The outlet pipe 13 is connected to any suitable type of steam generator, such as a flash boiler. The valve 10, of course, might be located in a single pipe formed of the juxtaposed pipes 12 and 13, but in this case it is shown as located intermediate a valve casing 14, in which are provided chambers 15 and 16, communicating respectively with the pipes 12 and 13. This casing 14 may be provided with a removable plug 17 at one end, whereby the interior may be cleaned, and it may also be provided with a stuffing box 18 at its opposite end, whereby the spindle 9 may reciprocate without the danger of loss of fuel due to leakage.

The opposite end of the rod 7 is adjustably connected to a floating member 19 in any suitable manner, as by means of a sleeve nut 20, engaging a flange 21 on the rod 7, and having a screw-threaded connection with an extension 22 on the floating member 19. This floating member 19 may be of any suitable character, but preferably is cylindrical, to conform to the cylindrical shape of the casing 1, and is also preferably out of contact with the interior of this casing at all points, so as to create no friction therebetween. This member 19, which is called a floating member, is normally urged in one direction by means of a spring 23, which abuts at one end against a flange 24 on the floating member 19, and at its opposite end on the partition 3. This spring 23 normally holds the valve 10 close to its seat, preventing the passage of fuel from the pipe 12 to the pipe 13 when no water is being supplied to the generator. The water which is to be supplied to the generator, is supplied to the casing 1 of the flow motor by means of an inlet pipe 24 at an inlet 25. This pipe communicates with a passage 26, located on an extension of the casing 1. This passage 26 communicates with a passage 27 in a nipple 28, the latter being adjustably mounted in the casing 1 in any suitable manner, as by means of a screw-threaded connection therewith. The nipple 28 extends up into a passage or chamber 29 in the floating member 19, so that there is formed a communication between the inlet pipe 24 and the interior of the floating member 19 by means of the passages 26 and 28.

Adjustably connected to the floating member 19 in any suitable manner, as by means of a screw-threaded connection therewith, there is provided a sleeve 30, preferably concentrically arranged with respect to the nipple 28, and spaced apart therefrom so as to provide an annular passage 31, through which the fluid in the passage or chamber 29 may exit.

It will be noted that the nipple 28 tapers from one end to the other, so that the size of the passage 31, at its outlet, will be varied according to the relative position of the sleeve 30 and the nipple 28. The purpose of this is to control the initial size of the passage 31, so as to vary the quantity of water necessary to operate the valve 10 any predetermined amount.

In case the valve 10 should be operated to the limit of its fuel-admitting motion, there is provided means for taking care of the surplus quantity of water supplied to the flow motor. For this purpose there is provided an outlet pipe 32, which may communicate with the passage 26, and thus with the interior of the member 29 and the chamber 4, but which is normally shut off therefrom by a needle valve 33, which has a seat in an opening in a partition 34, separating the pipe 32 from the passage 26. This valve 33 may be normally held on its seat so as to close the communication between the outlet pipe 32 and the passage 26 in any suitable manner, as by means of a spring 35, which abuts against a collar 36 on the spindle 37 of the valve 33. This spindle extends through the nipple 28, and is provided at its opposite end with a flange or collar 38, and is adapted to be operated from the movable member 19 thereby. The connection between the movable member 19 and the spindle 36 is preferably of such a nature that the member 19 will be free to move until the limit of the valve 10 is reached, before it operates the valve 33. Any suitable connection may be provided for this purpose, and in this case there is shown a tube 39, which may be secured in any suitable manner to the member 19, as by having a flange or collar 40 thereon engaged adjustably by means of a nut sleeve 41, which adjustably engages a screw thread on the interior of the member 19. This tube 39 may be provided at its opposite end with an adjustable sleeve nut 42, through which the spindle 37 may extend, and which is adapted to engage the collar or flange 38 on the spindle when the member 19 reached the vertical limit of its motion.

The water, after having performed its work in the flow motor, passes out of the

chamber 4 through an outlet 43 and into an outlet pipe 44, which may be termed the generator pipe, inasmuch as it carries the water to the steam generator. The casing 1 may be provided with any number of drain openings, which are normally closed by drain plugs, such as that indicated at 45.

The operation of the device will be readily understood when taken in connection with the above description. The water for the generator enters the flow motor by means of the supply pipe 24, and exits to the generator through the generator pipe or outlet pipe 44 of the flow motor. The fuel for the generator enters the flow motor through the pipe 12 and passes out from the flow motor to the generator pipe or outlet pipe 13. The object is to control the quantity of fuel passing from the pipe 12 to the pipe 13, in such a manner that it will be proportionate to the flow of water from the pipe 24 to the pipe 44, so that there will be a sufficient quantity of fuel to transform the quantity of water passing to the generator, into steam. When there is no water entering the flow motor, the spring 23 holds the valve 10 firmly closed on its seat, so that there is no fuel passing to the generator, and thus there is no fire in the generator. The water enters the flow motor through the pipe 24 under a head or pressure produced by any suitable means, such as a pump.

When a certain quantity of water has entered the flow motor, it will accumulate in the chamber or passage 29 in the floating member 19 faster than it can pass out through the passage 31, so that the floating member 19 will be moved against the tension of the spring 23 a sufficient amount to open the valve 10 and permit the fuel to pass to the generator. This amount will be proportionate to the supply of water, as a greater volume of water will move the member 19 a greater amount, thus increasing the size of opening between the valve 10 and its seat, by reason of the taper of the valve 10. The passageway 31 will be correspondingly increased, by reason of the taper of the nipple 28, to permit a greater volume of water to pass from the pipe 24 to the pipe 44. The initial size of the passage 31 can be adjusted by adjusting the sleeve 30 with respect to the member 19, and thus with respect to the taper of the nipple 28. It will thus be seen that for any given quantity of water passing through the flow motor, the member 19 will assume a position which represents an equilibrium between the spring 23 and the water accumulated in the passage or chamber 29, this point of equilibrium corresponding to an opening in the valve 10, which will permit a sufficient quantity of fuel to pass from the pipe 12 to the pipe 13, necessary to generate the water passing from the pipe 24 to the pipe 44, into steam. When the valve 10 has been moved such a distance that the limit of its taper is reached, and any further movement would not increase the supply of fuel passing from the pipe 12 to the generator, then the sleeve nut 42 will come in contact with the flange or collar 38 on the valve spindle 37, so that any further movement will open the valve 33 and permit the excess or surplus water to pass out through the pipe 32. When such excess water has passed out through the pipe 32, the member 39 will be relieved of some of the pressure in the chamber 29, so that it can return to a more nearly normal condition.

While I have shown one embodiment of my invention, I do not wish to be limited to the specific details thereof, but desire to be protected in various changes, alterations and modifications that may come within the scope of the appended claims.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:—

1. The combination with a casing, of a floating member mounted in said casing, out of contact with the sides thereof, a valve connected to said floating member and adapted to be operated thereby, a spring engaging said member and adapted to hold said valve in its closed position, said member having a chamber therein with a restricted outlet, and means for admitting water under pressure to the interior of said chamber, whereby an accumulation of water in said chamber will operate against said spring to open said valve.

2. The combination with a casing, of a fuel valve in said casing, a member movably mounted in said casing, connections between said member and said fuel valve, whereby said member is adapted to operate said fuel valve, means for normally holding said fuel valve closed, said member having a chamber therein with a constricted outlet, and means for admitting a fluid to said chamber, whereby the accumulation of said fluid in said chamber will generate sufficient force to open said valve.

3. The combination with a casing, of a member movably mounted in said casing, a fuel valve connected to said member and adapted to be operated thereby, means for holding said valve closed, said member having a chamber therein, a nipple extending up into said chamber, whereby a constricted outlet passage for said chamber is formed between said member and said nipple, and means for supplying a fluid to the interior of said chamber, for the purpose of moving said member to operate said valve.

4. The combination with a casing, of a member movably mounted in said casing, a fuel valve connected to said member and adapted to be operated thereby, means for

holding said valve closed, said member having a chamber therein, a nipple extending up into said chamber, whereby a constricted outlet passage for said chamber is formed between said member and said nipple, and means for supplying a fluid to the interior of said chamber, for the purpose of moving said member to operate said valve, said nipple being tapered so that the magnitude of the constricted outlet passage between said member and said nipple will be varied by relative movement of said member and said nipple.

5. The combination with a casing, of a member movably mounted in said casing, a fuel valve connected to said member and adapted to be operated thereby, means for holding said valve closed, said member having a chamber therein, a nipple extending up into said chamber, whereby a constricted outlet passage for said chamber is formed between said member and said nipple, means for supplying a fluid to the interior of said chamber, for the purpose of moving said member to operate said valve, said nipple being tapered so that the magnitude of the constricted outlet passage between said member and said nipple will be varied by relative movement of said member and said nipple, and means for adjusting the initial magnitude of said constricted outlet passage.

6. The combination with a casing, of a member movably mounted in said casing, a fuel valve connected to said member and adapted to be operated thereby, means for normally holding said valve closed, said member having a chamber therein, a nipple having a passage therein, extending up into said chamber, said nipple being adapted to supply a flow of fluid into the interior of said chamber, a sleeve adjustably mounted in said member in concentric relation with respect to said nipple and spaced apart therefrom so as to form a constricted outlet passage between said sleeve and said nipple, whereby the fluid in said chamber may pass therefrom, and means for supplying said nipple with said fluid.

7. The combination with a casing, of a member movably mounted in said casing, a fuel valve connected to said member and adapted to be operated thereby, means for normally holding said valve closed, said member having a chamber therein, a nipple having a passage therein, extending up into said chamber, said nipple being adapted to supply a flow of fluid into the interior of said chamber, a sleeve adjustably mounted in said member in concentric relation with respect to said nipple and spaced apart therefrom so as to form a constricted outlet passage between said sleeve and said nipple, whereby the fluid in said chamber may pass therefrom, and means for supplying said nipple with said fluid, said nipple being tapered so that a relative movement of said sleeve and said nipple will vary the magnitude of said constricted outlet passage.

8. The combination with a casing, of a water inlet for said casing, a water outlet for said casing, a surplus water outlet for said casing, a valve for controlling said surplus water outlet, means for normally holding said valve closed, a member movably mounted in said casing and operatively connected to said valve in such a manner as to have a normally inactive movement relative to said valve, a fuel supply pipe, a fuel outlet pipe, a fuel valve for controlling the flow of fluid between said fuel pipes, connections between said fuel valve and said member, whereby said member is adapted to operate said fuel valve, a spring for operating said member in one direction, said member having a chamber with a restricted outlet passage, and means for supplying a fluid under pressure to the interior of said chamber, whereby said member is adapted to be operated against the tension of said spring.

9. The combination with a casing, of a member movably mounted in said casing, said member having a chamber therein, a nipple extending into said chamber whereby a constricted outlet passage for said chamber is formed between said member and said nipple, a valve controlled by the movement of said member, and means for supplying a fluid to the interior of said chamber for the purpose of operating said member.

10. The combination with a casing, of a member movably mounted in said casing, a valve controlled by the movement of said member, said member having a chamber therein, a nipple extending into said chamber whereby a constricted outlet passage for said chamber is formed between said member and said nipple, and means for supplying a fluid to the interior of said chamber for the purpose of operating said member, said nipple being tapered so that the magnitude of the restricted outlet passage between said member and said nipple will be varied by the relative movement of the member and the nipple.

11. The combination with a casing, of a member movably mounted in said casing, a valve connected with, and controlled by the movement of said member said member having a chamber therein, a nipple extending up into said chamber, whereby a constricted outlet passage for said chamber is formed between said member and said nipple, means for supplying a fluid to the interior of said chamber for the purpose of operating said member, said nipple being tapered so that the magnitude of the constricted outlet passage between said member and said nipple will be varied by the relative movement of

said member and said nipple, and means for adjusting the initial magnitude of said constricted outlet passage.

12. The combination with a casing, of a member movably mounted in said casing, a valve connected with, and controlled by the movement of said member said member having a chamber therein, a nipple having a passage therein extending up into said chamber, said nipple being adapted to supply a flow of fluid into the interior of said chamber, a sleeve adjustably mounted in said member in concentric relation with respect to said nipple and spaced apart therefrom so as to form a constricted outlet passage between said sleeve and said nipple, whereby the fluid in said chamber may pass therefrom, and means for supplying said nipple with said fluid.

13. The combination with a casing, of a member movably mounted in said casing, a valve connected with, and controlled by the movement of said member said member having a chamber therein, a nipple having a passage therein extending up into said chamber, said nipple being adapted to supply a flow of fluid into the interior of said chamber, a sleeve adjustably mounted in said member in concentric relation with respect to said nipple and spaced apart therefrom so as to form a constricted outlet passage between said sleeve and said nipple, whereby the fluid in said chamber may pass therefrom, and means for supplying said nipple with said fluid, said nipple being tapered, so that a relative movement of said sleeve and said nipple will vary the magnitude of said constricted outlet passage.

14. The combination with a casing, of a member floatingly supported in said casing, out of contact with the sides thereof, a spring for operating said member in one direction, said member having a chamber therein, a nipple extending into said chamber whereby a constricted outlet passage for said chamber is formed between said member and said nipple, means for supplying a fluid under pressure to the interior of said chamber in such a manner as to counteract the action of said spring, and a fuel valve and auxiliary fluid valve both connected to said member and adapted to be operated thereby.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ORLANDO C. MOORE.

Witnesses:
A. J. SCHEURER,
ERNEST P. LOEHER.