Mar. 3, 1925. 1,528,405

W. CRAIG

CONSTANT FLOW MOTOR

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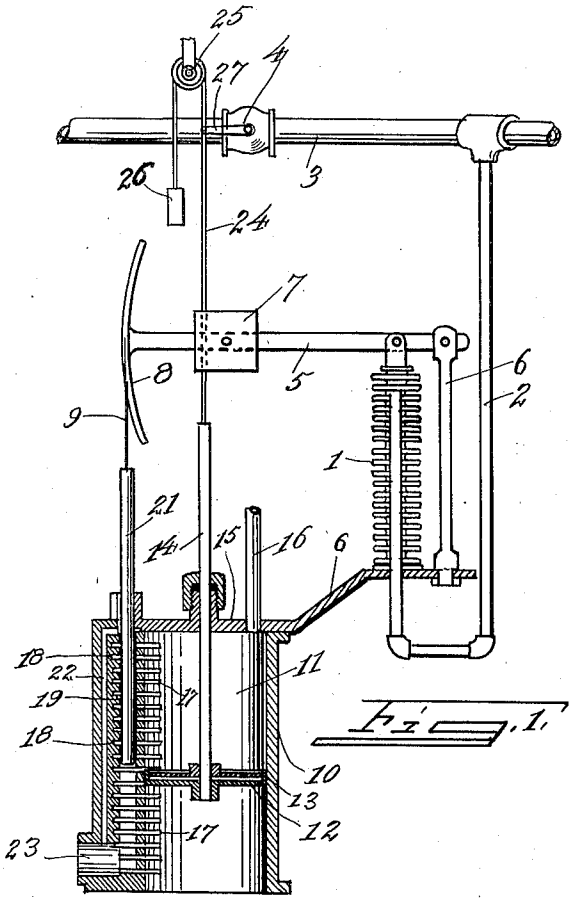


Fig. 1.

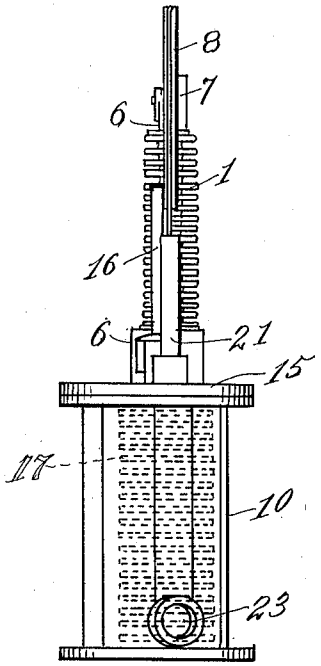


Fig. 3.

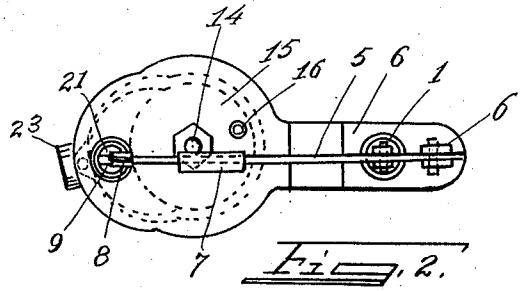


Fig. 2.

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UNITED STATES PATENT OFFICE.

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CONSTANT FLOW MOTOR.

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To all whom it may concern:

Be it known that I, WILEY CRAIG, a citizen of the United States, and a resident of Cincinnati, in the county of Hamilton and State of Ohio, have invented a certain new and useful Constant Flow Motor, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to devices adapted to be used in connection with gauges or indicating devices of various characters for the transmission of an impressed movement by the gauge or indicator to some other element, such as a valve, switch or damper.

Thus in combination with a pressure gauge in a steam line, where a uniform pressure of steam is desired, the movable element of the pressure gauge is connected to my constant flow motor and the motor itself is connected to a steam valve and in gas furnaces, if desired, to a gas valve, to cut down the steam pressure to a point for which the device has been set.

I am aware that there are various types of motors, including water motors used with diaphragms, floats and the like, for transmitting a properly energized and damped movement to a control member, but in these devices so far as I am advised the oscillating effect is poorly compensated, and the delicacy of adjustment to various positions not fully provided for. Some of the devices with which I am familiar require too much expenditure of force to adapt themselves to the more delicate metering and indicating devices.

In my device the primary object is to provide a piston which moves from one position to another as controlled by a sliding valve or plunger, and in which the plunger is at all times surrounded by a constant flow of the power medium, so that it is substantially frictionless in operation.

While I have illustrated my invention as used with a sylphon bellows connected to a steam line, it will be understood that this is merely a showing of one of many possible uses of my invention.

I accomplish the objects set forth by that certain construction and arrangement of parts to be hereinafter more specifically pointed out and claimed.

In the drawings,

Figure 1 is a central vertical section through my device.

Figure 2 is a top plan view thereof.

Figure 3 is a side elevation thereof.

I have shown a sylphon bellows 1 connected to a by-pass steam pipe 2 in a steam line 3. I have also shown a steam valve 4 to control steam pressure.

Secured to the sylphon bellows is a lever 5 pivoted to a framework 6 and equipped with a counterweight 7, which is adjustable.

The lever 5 has an arc-shaped shoe 8 on its outer end, to the upper end of which is connected a cable 9, said cable being secured to the plunger valve of the constant flow motor.

The flow motor is formed of a cylinder 10 having a main bore 11 of true cylindrical shape, in which bore 11 the piston 12 is operated. This piston as shown has suitable cup leathers 13 and a piston rod 14 passing through a suitable boss in the cylinder head 15. The inflow pipe 16 enters the cylinder head, in this instance comprising a water pipe carrying water under any normal city pressure.

At one side of the cylinder are formed series of slots 17, forming a vertical row of wide and narrow ports from the cylinder bore 11.

The slots each open into a segmental pocket 18, there being a web of metal 19 between each pocket. The webs 19 are bored with aligned holes and a valve plunger 21 is guided and reciprocates in these holes. The plunger passes out through the cylinder head, as in the case of the piston rod, and is secured to the cable 9.

A bleed passage 22 is provided extending into the topmost pocket 18, and to the outflow port 23. This outflow port is connected to the lowermost segmental pockets, and water flowing through the chamber formed by the pockets and the bored webs, passes out through the said port. The fit of the plunger in the bores of the pocket partitions is preferably a loose one to avoid friction.

It may now be observed that the valve plunger in any of its positions is surrounded by water filling the segmental pockets. This relieves the plunger of the necessity of overcoming water pressure in its movement in either direction.

The movement of the plunger can be accomplished by dropping of its own weight and the leakage around it acts as a further lubricant and pressure equalizer.

Connected to the piston rod is some desired counterforce, in this instance a cable 24 passing over a pulley 25 where a weight or weights 26 are secured to the cable. Along the cable at some desired point is connected the device to be operated, in this instance the steam valve handle 27.

The piston is thus held upwardly in the cylinder by a weight sufficient to counteract the action of the water on the piston, as controlled by the valve.

Thus in any position of the valve the counterweight and water pressure will act on the piston to move it to a position to uncover the next segmental pocket port below the lower end of the plunger. When the plunger is depressed, the water cannot flow past the piston so it forces the piston down at the same time operating the valve as at 27 and raising the counterweight until the piston uncovers a port not blocked by the valve plunger. When it has reached such a position which it will do by a steady as distinguished from a "jerky" manner, a position of balance will be maintained by the counterweight and such friction as may be inherent in the device being operated as the valve 27. It will be understood that the port through which the water is discharged is opened only sufficiently to balance the water pressure and permit a constant flow.

Upon raising of the plunger the port or ports above the piston will be opened increasing the discharge of fluid and relieving the pressure on the piston as to permit the counterweight to lift it and at the same time operate the member to be operated. This again will be a gradual operation.

As will be evident, my construction embodies a moving control member under substantially no strain in overcoming water pressure as it moves from one position to another. Thus on the lower end of the plunger there is no pressure, nor at the upper end. Also lateral pressure is equalized except at the pocket partitions, which are more or less negligible. It also embodies a piston which is always acted upon by two opposing forces seeking to come to balance, i. e. the counterforce and the water pressure.

The resulting device I have termed a constant flow motor for lack of a better term, since water continually flows through the device, except when momentarily blocked. The primary purpose of the device is not supplying excess motive power so much as transmitting the action of an undamped gauge indicator in a fully damped manner, resulting from the counter-action of two forces on the motor piston. As is apparent, the counterforce does the work in one direction and the water in the other.

If high water pressure steam or compressed air were used as motive power and a heavy spring or weight as a counterforce, then considerable work might be done by the device. Any member strong enough to overcome the weight of the valve plunger is all that would be needed to operate it.

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

1. A device of the character described, comprising a cylinder and piston therein, a series of ports in the cylinder, an inflow and outflow port for ingress and egress of motive fluid for the cylinder, the outflow port connected to said series of ports, and a plunger movable to close and open the ports of said series, and means for equalizing pressure of the motive fluid about said plunger.

2. A device of the character described, comprising a cylinder, a series of ports in the side thereof, pockets opening into said ports, said pockets having partitions between them, a valve plunger sliding through said partitions, a piston in the cylinder, a counterforce for the piston, a motive fluid inlet to the cylinder at one end of the series of ports, and a motive fluid outlet for the series of ports located at the other end of the series of ports, as and for the purpose described.

3. A counterforce transmission device, comprising a cylinder, a piston therein, a counterbalance for the piston, an inflow port and series of interconnected outflow ports lengthwise of the cylinder, and a valve plunger adapted to control the opening and closing of said ports.

4. A counterbalanced transmission device, comprising a cylinder, a piston therein, a counterbalance for the piston, an inflow port, and a series of interspaced outflow ports, having a restricted passage between them and an escape port at one end of the series, and a plunger lying in the restricted passage and movable to close the passage between the ports, for the purpose described.

5. A counterbalanced transmission device, comprising a cylinder, a piston therein, a counterforce for the piston, an inflow port, and a series of interspaced outflow ports, having a restricted passage between them and an escape port at one end of the series, and a plunger lying in the restricted passage and movable to close the passage between the ports, for the purpose described, and means for equalizing pressure on said plunger as against the motive fluid medium entering at the inflow port.

WILEY CRAIG.