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H. H. BROWN

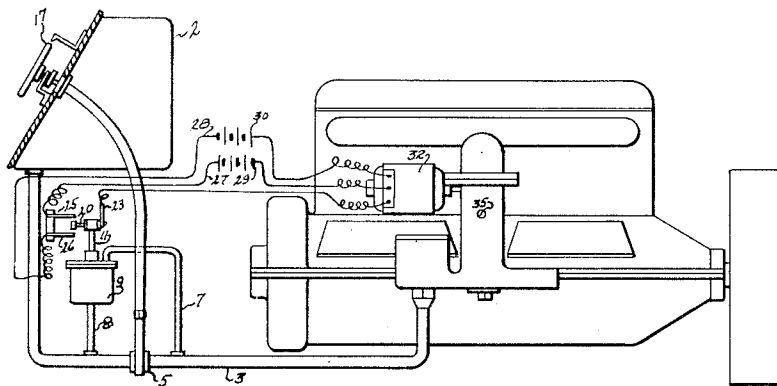
1,829,887

CONTROL DEVICE

Filed April 2, 1928

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Fig. 1.



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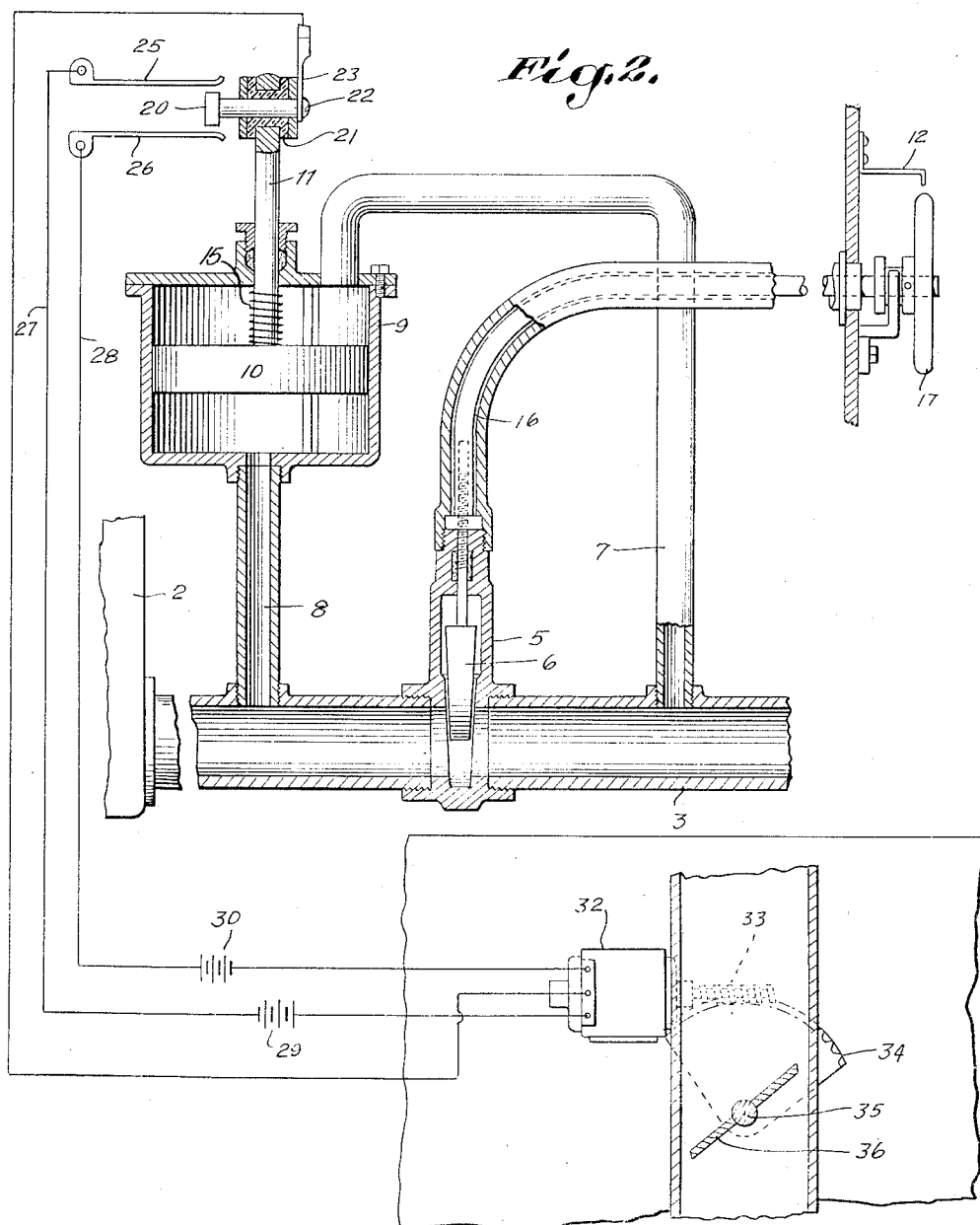
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2 Sheets-Sheet 2



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CONTROL DEVICE

Application filed April 2, 1928. Serial No. 266,849.

This invention relates to control mechanism and particularly to devices for maintaining the consumption of fuel substantially uniform at all times.

6 A principal object of the invention is to maintain the consumption of fuel, e. g., by an engine, substantially constant.

One feature of the invention resides in the utilization of variations in the rate at which
10 fuel is passed to the engine to control the fuel consumption of the engine.

Other important objects and features of the invention will be apparent from the following description of a preferred form of
15 the invention.

The present invention is adapted for use in maintaining uniform fuel consumption of engines and particularly internal combustion engines but certain of the principles embodied
20 in the invention are of broader application and may be used in the control of furnaces or engines utilizing gaseous or powdered fuel.

The invention will be more clearly understood by reference to the accompanying drawings which illustrate a typical embodiment of the invention, in which

Fig. 1 is a side elevation showing a device made according to my invention as applied
30 to an internal combustion engine; and

Fig. 2 is a detail view showing in partial longitudinal section the cooperating parts of the device of my invention.

In the invention as illustrated a furnace
35 or internal combustion engine is provided with a source of fuel 2 from which a fuel conduit 3 passes to the carburetor of a furnace or engine.

A flow meter 5 of any suitable type such as that shown and described in my co-pending application, Serial No. 266,848, filed April 2, 1928, is located in the fuel supply conduit 3 between the source of fuel 2 and the engine. The flow meter may consist of a calibrated
45 valve 5 having a movable closure 6 positioned in the fuel supply conduit and provided with passageways 7 and 8 located on opposite sides of the calibrated valve. The passageways 7 and 8 connect with a cylinder 9 on the opposite
50 sides of the movable piston 10 to which a piston rod 11 is secured.

If desired, the piston may be urged toward one end of the cylinder by a light spring 15. The spring 15 serves to resist resiliently the movement of the piston 10 under the influence of pressure difference. Without the spring, the piston 10 would tend to remain in whatever position it happened to occupy at the instant that the pressure difference became equal to the force of gravity. The force of gravity, however, is substantially the same at any position within the cylinder, so that if vertical adjustment of the contacts 25 and 26 is to be provided, as in the embodiment illustrated, a spring should advantageously be used. This spring, as it is gradually compressed, increases in tension, and consequently the position of the piston 10 must depend upon the magnitude of the pressure difference in the two chambers of the cylinder 9. The position of the member 6 in
70 the valve 5 may be regulated by means of the operating member 17 and the flexible wire or chain 16 to maintain any desired fuel consumption or rate of flow of fuel to the furnace or engine. The rate of flow of fuel may be indicated by the pointer 12.
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In the form of the device as illustrated, electrically operated means are used to operate means for controlling the consumption of fuel by the engine although mechanical or
80 fluid means may be employed for this purpose if preferred. However, for the purposes of illustration the piston rod 11 is provided with a contact member 20 insulated from the piston rod by a bushing 21 and is provided with
85 a nut 22 for securing the conductor 23 thereto. Adjustable contacts 25 and 26 are spaced from the contact member 20 and are connected to conductors 27 and 28 respectively, which
90 lead to the oppositely poled batteries 29 and 30 respectively. The opposite sides of the batteries 29 and 30 are connected to the motor 32, while the circuit is completed through the conductor 23 connected to the contact 20. The
95 motor 32 is provided with a worm gear 33 meshing with the gear 34 mounted on the shaft 35 for operating the throttle valve 36 located between the carburettor and engine or any other suitable control device for regu-

lating the rate of consumption of fuel by the furnace or engine.

In the operation of the device illustrated fuel is passed to the carburetor of a furnace or engine by the conduit 3 and passes through the calibrated valve 5. The fluid pressure on the walls of the conduit 3 on the opposite sides of the calibrated valve 5 will differ materially and will vary in response to variations in the rate of flow of fuel past the movable closure 6.

As the difference in pressure communicated to the opposite sides of the piston 10 varies, the piston will be moved in one direction or the other from its normal position, and the amount of such movement of the piston will be dependent upon the difference in pressure applied to the opposite sides of the piston 10 and therefore will vary with the rate of flow of fuel through the conduit 3 and the calibrated valve 5.

The piston rod 11 can move within predetermined limits before making contact between the member 20 and on the other of the contacts 25 and 26. If the consumption of fuel by the engine and the rate of flow of fuel through the conduit 3 should vary more than the small predetermined amount determined by the position of the contacts 25 and 26 a circuit will be completed through one or the other of these contacts and the battery in circuit therewith so as to drive the motor in one direction or the other to open or close the throttle valve 36, or actuate the control device to which the shaft 35 is connected.

Thus, it will be seen that by utilizing the variations in the rate of flow of fuel to the engine the consumption of fuel by the engine may be readily and accurately controlled.

The invention is not limited to the construction shown and therefore it should be clearly understood that the form of flow meter shown is merely illustrative, since other similar devices which are responsive to variations in the rate of flow of fuel through the conduit 3 may be employed. For example, flow meters of the chronometric type may be employed or a flow meter of the variable pressure constant orifice type also may be used. When the device is to be used for controlling the supply of gaseous or powdered fuel to an engine or burner, the flow meter will ordinarily be of an entirely different character from that shown and may be responsive to the operation of any suitable feed mechanism employed for supplying the gas or powdered fuel to the engine or burner. The control device need not be in the form of a throttle valve and when the fuel employed is other than gases or fuel-air mixtures other controlling devices may be preferred. If desired, the control device may operate upon the spring of an engine governor or other part thereof as an alternative for the illustrative construction described herein.

What is claimed as new is:

1. The method of controlling an engine or other fuel consuming device which comprises passing fuel to be used in said engine or device through an orifice and controlling the rate of consumption of fuel by said engine or device by variations in the rate of passage of fuel through said orifice. 70
2. The method of controlling an engine which comprises passing fuel to be used in said engine through a conduit and utilizing variations in the rate of flow of fuel through said conduit to vary the fuel consumption of said engine. 75
3. The method of controlling an internal combustion engine operating on liquid fuel which comprises utilizing variations in the rate of flow of said liquid fuel from a source of supply to control the consumption of fuel by said engine. 80
4. In combination, an internal combustion engine, a fuel conduit, a device responsive to variations in the rate of flow of fuel through said conduit, means for controlling the consumption of fuel by said engine, and means actuated by said flow-responsive device for actuating said means to vary the consumption of fuel by said engine. 85
5. In combination, an engine, a source of fuel, means for conducting fuel from said source to said engine, a device responsive to the rate of passage of fuel from said source to said engine, a throttle for controlling the consumption of fuel by said engine, and means for operating said throttle, said means being actuated by said flow-responsive device. 90
6. In combination, an internal combustion engine, a fuel conduit, a flow meter in said conduit, and an electric circuit differentially energized by said flow meter when the flow of fuel in said conduit is greater or less than a predetermined rate, and electrical means in said circuit to vary the consumption of fuel by said engine. 95
7. In combination, an internal combustion engine, a throttle for controlling the consumption of fuel by said engine, a motor for actuating said throttle and an electric circuit actuated by variations in the rate of flow of fuel to said engine to alter the position of said throttle. 100
8. In combination, an internal combustion engine, a fuel conduit, means movable to take up a normal position corresponding to a predetermined rate of flow of fuel through said conduit, a throttle for controlling the consumption of fuel by said engine, a motor for operating said throttle and an electric circuit actuated by said movable means to alter the position of said throttle when the rate of flow of fuel varies more than a predetermined amount. 105
9. In combination, an internal combustion engine, a fuel conduit, means movable to 110

take up a normal position corresponding to a predetermined rate of flow of fuel through said conduit, means to vary the consumption of fuel by said engine actuated by said movable means, and means for varying the normal position of said movable means.

10. The method of controlling an engine which comprises passing liquid fuel from a reservoir, converting the liquid fuel into gaseous fuel supplying gaseous fuel to the engine and controlling the rate at which the gaseous fuel is supplied to the engine to counteract variations in the rate of flow of liquid fuel from said reservoir, thereby to maintain a substantially uniform rate of flow of said liquid.

11. The combination of an internal combustion engine, a source of liquid fuel, a conduit through which liquid fuel is passed from said reservoir, means for converting the liquid fuel into a gaseous fuel, a conduit through which gaseous fuel is supplied to said engine, means located in said liquid fuel conduit responsive to the rate of flow of liquid therein and a device for controlling the rate of consumption of gaseous fuel by said engine, said device being actuated by the means responsive to rate of flow of liquid fuel from said reservoir.

12. A governor for a fuel feed system which comprises a carburetor designed to mix with a gas stream an amount of liquid fuel proportionate to the amount of gas, a throttle valve, a flow meter in the liquid fuel line, means controlled by the flow meter for regulating the throttle valve so as to maintain a predetermined rate of flow of said liquid fuel, and means for adjusting the relation between the last-named means and the flow meter so as to change the rate of flow maintained thereby.

13. A governor for an internal combustion engine having a carburetor for liquid fuel and a throttle valve which comprises a flow meter in the liquid fuel line, means controlled by said flow meter for controlling the throttle valve, and means for adjusting the relation of the throttle control means to the flow meter so as to change the rate of flow which will be maintained thereby.

14. A feed regulator comprising a proportioning means, means adapted to feed one fluid into a stream of another fluid at a rate determined by the rate of flow of the second-named fluid through said proportioning means, a valve for controlling the rate of flow of the latter through the proportioning means, and means responsive to the rate of flow of said first-named fluid for controlling the rate of flow of the second-named fluid.

15. A feed regulator comprising a proportioning means adapted to feed one fluid into a stream of a second fluid at a rate determined by the rate of flow of the second fluid; a valve for controlling the rate of flow of the second

fluid, means responsive to the rate of flow of the first named fluid adapted to control said valve so as to maintain a predetermined rate of flow of said first-named fluid and means for adjusting said responsive means so as to change the rate of flow which it will maintain.

16. A fluid regulator comprising a proportioning means adapted to feed one fluid in amount regulated by the amount of another fluid passing therethrough, a valve to control the rate of flow of said second fluid, a constricted orifice in the line supplying the first fluid, pressure responsive means exposed on one side to the pressure of the fluid on one side of said orifice and on the other to the pressure of the fluid on the other side of said orifice, and electrical means for regulating said valve energized by a contact movable with said pressure responsive means.

17. A fluid regulator as defined in claim 16, which includes means for regulating the size of said orifice.

18. In combination an expansion engine, a throttle for controlling the supply of driving fluid to said engine, a conduit for supplying fuel to operate said engine, and means responsive to the flow of fuel through said conduit for controlling said throttle, said means being adapted to close the throttle upon increased flow of fuel and vice versa, whereby a substantially constant flow of fuel may be maintained.

19. The method of regulating the supply of fluent fuel to a combustion device which comprises intermingling the fuel with a stream of air by means adapted to give a substantially uniform mixture and regulating the flow of air by the flow of said fuel.

20. The method of regulating a combustion device in which a fluent fuel is distributed into a gas capable of supporting combustion which comprises passing the fuel through an orifice within a conduit for supplying said fuel controlling the rate of distribution of said fuel into said gas by the difference of pressures in said conduit on opposite sides of said orifice so as to maintain a substantially constant flow therethrough, and varying the rate of flow thus maintained, so as to meet varying conditions of operation, by adjusting the area of said orifice.

Signed at New York, N. Y., this 30th day of March, 1928.

HAROLD H. BROWN.