March 31, 1925. 1,531,382

W. S. FRANKLIN

VALVE OPERATING DEVICE FOR INTERNAL COMBUSTION ENGINES

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Fig. 1.

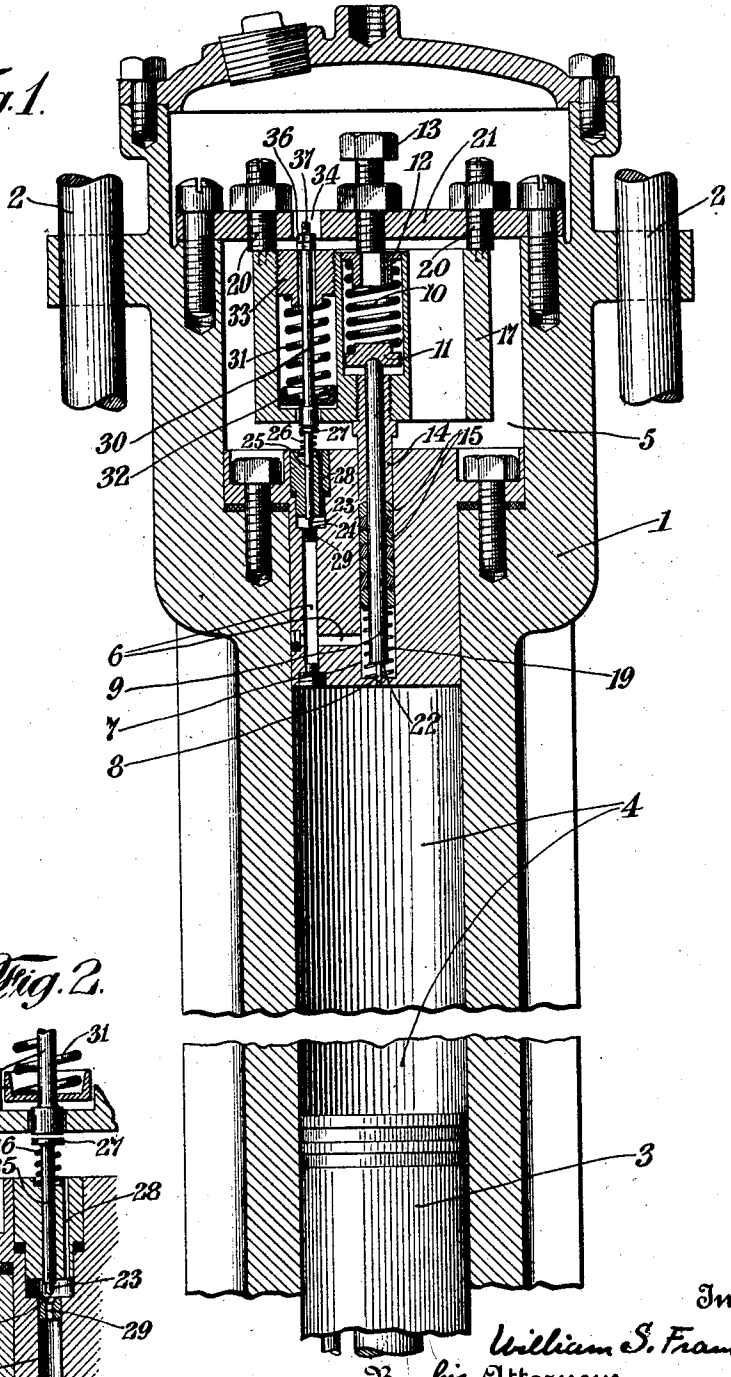


Fig. 2.

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VALVE-OPERATING DEVICE FOR INTERNAL-COMBUSTION ENGINES.

Application filed January 21, 1921. Serial No. 438,958.

To all whom it may concern:

Be it known that I, WILLIAM S. FRANKLIN, a citizen of the United States, residing at Cambridge, in the county of Middlesex and State of Massachusetts, have invented a certain new and useful Improved Valve-Operating Device for Internal-Combustion Engines, of which the following is a specification.

The invention has for an object to provide a fuel-feeding device for an internal combustion engine which shall be readily operable or adjustable to effect the feed of the fuel into the cylinder chamber in the desired quantities and at the proper time in the stroke of the engine.

Further objects and advantages of the invention will be in part obvious and in part specifically pointed out in the description hereinafter contained which, taken in connection with the accompanying drawing, shows a preferred embodiment thereof. Such embodiment, however, is to be considered merely as illustrative of its principle. In the drawing:—

Fig. 1 is a vertical section of certain parts of an internal combustion engine embodying a fuel-feeding device made according to the invention.

Fig. 2 is an enlarged vertical section of certain parts appearing in Fig. 1.

The invention as disclosed is applied to an internal combustion engine of the type disclosed in my co-pending application, Serial No. 412,154, filed September 23, 1920, and entitled Pump and internal combustion engine therefor, to which application reference is made for a detailed disclosure of the features of the engine. It is to be understood, however, that the invention is not limited in utility to an engine of this character.

In general, the engine comprises a heavy cylinder 1, slidable up and down upon a plurality of guides 2 which will be understood as extending from a suitable base member (not illustrated). The cylinder is urged downwardly by the action of gravity in such manner that a piston 3 working within cylinder chamber 4 compresses the gases within such cylinder chamber.

Assuming the cylinder 1 to be in its lowest position, and an explosive gaseous mixture to be contained within chamber 4, such mixture will be subjected to compression between members 1 and 3, and may be ignited either by the heat of compression or otherwise if desired, the particular method of ignition not being essential to the present invention.

The explosion of the gaseous mixture when the cylinder 1 is at the lowest point in its travel, will raise such cylinder against the action of gravity, the motion thus imparted being utilized to perform useful work. During the upward movement of the cylinder the burnt gases will be exhausted from chamber 4 by suitable means, and a fresh charge of air injected into the cylinder.

Thus as the cylinder falls by gravity the fresh charge of air in the chamber will be compressed, checking the downward movement of the cylinder, and if a fresh supply of fuel is supplied to the chamber the engine will be in position to begin another cycle when cylinder 1 reaches its lowest position.

In the present embodiment fuel is fed into the chamber from a fuel supply reservoir 5 in the engine cylinder, a duct 6 being provided leading from said reservoir to a fuel pump chamber 7 located adjacent the chamber 4, a valve 8 however normally shutting off the fuel pump chamber 7 from the reservoir 5.

Valve 8 is carried by a valve rod 9, being resiliently urged to move the valve to closed position, for instance, by a coil spring 10 bearing against disc 11 on the end of the valve rod, at its lower end, and engaging a collar 12 at its upper end, which collar may be moved by an adjusting screw 13 to vary the pressure of the spring.

Valve rod 9 is surrounded by a sleeve pump 14 provided with suitable packing 15, and connected to a weight 17 within fuel supply reservoir 5. A spring 19 lies beneath the sleeve pump 14 and normally presses up on the latter to a sufficient extent to hold weight 17 up against a plurality of stops 20 carried by a plate 21 extending across a portion of the fuel supply reservoir 5. When the downward movement of cylinder 1 is checked by compression, however, the inertia of the weight causes the latter to move downwardly relative to the cylinder and advance sleeve 14 to exert high pressure upon the fuel contained within the fuel chamber 7. This pressure acts upon the

shoulder 22 underneath the valve rod 9, thus raising valve 8 and permitting fuel to be injected into the cylinder chamber 4.

In order to permit fuel to be forced from the fuel pump chamber 7 into cylinder chamber 4, it is necessary that communication between pump chamber 7 and the fuel supply reservoir 5 be shut off at the time when pump 14 is operating, in order that fuel will not be forced back into fuel supply reservoir 5 by the pump, instead of into the cylinder chamber.

It will be readily seen that a definite quantity of fuel should be delivered to the engine cylinder during each stroke, so that the operation of shutting off the fuel pump chamber 7 from fuel reservoir 5 should be carefully timed relative to the stroke of the pump 14.

Valve 23 co-operating with valve seat 24 and carried by valve rod 25 shuts off communication between the reservoir 5 and pump chamber 7 when in engagement with its seat, but such valve is elevated from its seat by spring 26 underneath head 27 of valve rod 25. When the valve 24 is in raised position as above described, communication is provided between the fuel reservoir and duct 6 through the passages 28 and 29 associated with the valve 24.

In order that the valve 23 may be timed properly in regard to the stroke of the pump 14, such valve, according to the present invention, derives its movement from the same member as does pump 14; that is, from the inertia action of weight 17. As illustrated, an actuating member for the valve 23 is carried by the weight 17 in the form of a rod 30 alined with valve 25, so that when the movement of cylinder 1 is retarded by compression in the cylinder chamber 4, rod 30 will close valve 23 when member 17 moves downward due to inertia action.

In order that the downward movement of weight 17 and the consequent further operation of sleeve pump 14 may continue after valve 23 has come into engagement with its seat 24, the actuating rod 30 is yieldably supported from the weight 17 by a coil spring 31 surrounding rod 30 and acting between a washer 32 on the lower end of the rod and a plug 33 closing the upper end of the recess of member 17 within which the spring and the actuating rod are contained.

The actuating member 30 for shutting off communication between fuel supply reservoir 5 and fuel pump chamber 7, being moved by the weight 17, acts to bring about the closing of valve 23 at a certain time after the inertia action of weight 17 comes into play. The time of closing of the valve 23 may be adjusted to correspond to the speed at which the engine is operating, and to cause the proper amount of fuel to be fed by pump 14 for the work required from the engine. In the present instance the rod projects upwardly so as to be accessible through a hole 34 in the plate 21, the upper end of the rod being threaded whereby the adjustment of the nuts 36 or the turning of the rod by means of a screw drive slot 37, will position the lower end of the rod at the proper distance from head 27 of valve rod 25.

Since the valve which shuts off communication between the fuel reservoir 5 and the pump chamber 7 derives its motion from the same source as the pump, the operation of which necessitates the closing of such valve, it is insured that the movements of the two members will take place as desired, and furthermore since the position of the valve actuating member is adjustable in regard to the position of such common source of motion (weight 17), such actuating member may be adjusted to come into operation at the desired point in the stroke of the fuel pump, according to the requirements of the engine.

While a specific embodiment of the invention has been described, it is obvious that many changes may be made without departing from its principle as defined in the following claims.

I claim:

1. A fuel-feeding device for internal combustion engines, comprising a weight moving in general with the main movable member of the engine, but yieldably supported therefrom, a fuel reservoir, a fuel pump chamber normally in communication therewith, means whereby the inertia action of said weight will force fuel into the cylinder chamber from said pump chamber when the rate of movement of said movable member changes to a predetermined extent, and means actuated by the inertia action of said weight for shutting off communication from said member to said reservoir when said fuel forcing means is in operation.

2. A fuel-feeding device for internal combustion engines, comprising a weight moving in general with the main movable member of the engine, but yieldably supported therefrom, a fuel reservoir, a fuel pump chamber provided with a duct leading to said fuel reservoir, a normally open valve in said duct, means whereby the inertia action of said weight will force fuel into the cylinder chamber from said pump chamber when the rate of movement of said movable member changes to a predetermined extent, and a member deriving its motion from said weight for engaging said valve to shut off communication between said reservoir and said chamber when said fuel forcing means is in operation.

3. A fuel-feeding device for internal com-

bustion engines, comprising a weight moving in general with the main movable member of the engine, but yieldably supported therefrom, a fuel reservoir, a fuel pump chamber, a valve adapted to shut off communication between said reservoir and said chamber, whereby the inertia action of said weight will force fuel into the cylinder chamber from said pump chamber when the rate of movement of said movable member changes to a predetermined extent, and a member carried by said weight adapted to engage said valve to close the same when said weight moves to operate said fuel-forcing means, said member being yieldably mounted on said weight.

4. A fuel-feeding device for internal combustion engines, comprising a weight moving in general with the main movable member of the engine, but yieldably supported therefrom, a fuel reservoir, a fuel pump chamber, a valve adapted to shut off communication between said reservoir and said chamber, means whereby the inertia action of said weight will force fuel into the cylinder chamber from said pump chamber when the rate of movement of said movable member changes to a predetermined extent, a member carried by said weight adapted to engage said valve to close the same when said weight moves to operate said fuel-forcing means, and means for adjusting the position of said member with regard to the weight.

5. A fuel-feeding device for internal combustion engines, comprising a weight moving in general with the main movable member of the engine, but yieldably supported therefrom, a fuel reservoir, a fuel pump chamber, a valve adapted to shut off communication between said reservoir and said chamber, means whereby the inertia action of said weight will force fuel into the cylinder chamber from said pump chamber when the rate of movement of said movable member changes to a predetermined extent, a member carried by said weight adapted to engage said valve to close the same when said weight moves to operate said fuel-forcing means, said member comprising a spring-pressed rod mounted within said weight, and means for adjusting the forward end of said rod toward or from said valve.

6. A fuel-feeding device for internal combustion engines, comprising a fuel reservoir, a fuel pump chamber normally in communication therewith, inertia operated means for forcing fuel from said pump chamber into the engine cylinder, and means mechanically connected to said fuel forcing means for shutting off communication between said fuel reservoir and said fuel pump chamber when said inertia operated fuel-forcing means is in operation.

In testimony that I claim the foregoing, I have hereunto set my hand this 17 day of Jan., 1921.

WILLIAM S. FRANKLIN.