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H. H. GILBERT

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FUEL SHUT-OFF VALVE

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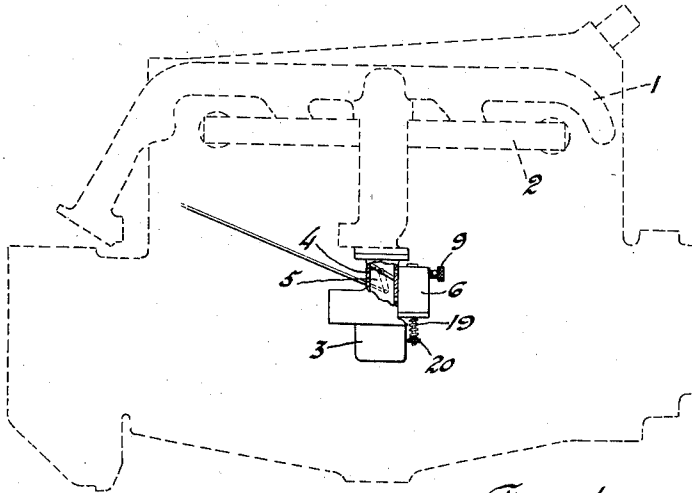


Fig. 1

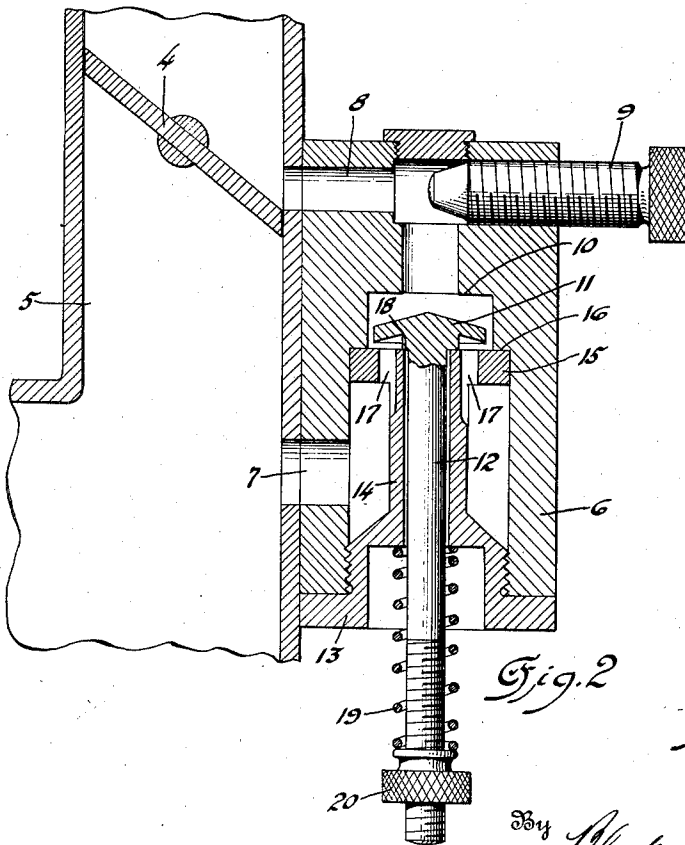


Fig. 2

Inventor
Henry H. Gilbert

By Blackman & Spencer & Flint
Attorneys

UNITED STATES PATENT OFFICE.

HENRY H. GILBERT, OF HIGHLAND PARK, MICHIGAN, ASSIGNOR TO GENERAL MOTORS CORPORATION, OF DETROIT, MICHIGAN, A CORPORATION OF DELAWARE.

FUEL-SHUT-OFF VALVE.

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This invention relates to an improvement in internal combustion engines for motor vehicles and the like, and more particularly to the control of fuel to be supplied during idling or low engine speed.

The general practice has been to employ a throttle valve which does not entirely close the fuel passageway, so that even at the extreme throttle limit, some fuel is supplied for idling or slow engine operation to prevent stalling. However, upon sudden throttle closure, when the engine has been propelling the vehicle at a fair rate of speed, the momentum continues to turn the engine, but the amount of fuel mixture being drawn past the sides of the closed throttle is not sufficient to provide an explosive mixture in each cylinder of a multiple cylinder engine. Due to uneven fuel distribution the cylinders fail to fire simultaneously or uniformly, resulting in a somewhat jerky or irregular action until the speed slows down to approximately three to five miles per hour and the engine settles to rhythmic idling.

The present invention overcomes the difficulty by employing an accurate or precisely fitting throttle valve to completely close the fuel supply conduit, preventing any fuel passing at closed throttle. A by-pass around the throttle conveys fuel for idling engine operation, which at times of sudden deceleration, is closed by an automatically controlled valve, until engine operation approaches idling speed, when the by-pass valve again opens. When both throttle and by-pass valves are thus closed, no fuel reaches the cylinders, obviating irregularity of engine operation, and since no explosive action occurs, the full value of engine compression acts to retard or brake the momentum without waste of fuel.

In the accompanying drawings illustrating a preferred, but not necessarily the only embodiment of the invention, Figure 1 is a side elevation of an automobile explosive engine in dotted outline, with the present invention applied thereto.

Figure 2 is a vertical sectional view of the carbureted fuel passage with the throttle valve therein and a by-pass arrangement.

The multiple cylinder engine shown in the drawing is provided with an exhaust manifold 1 and an intake manifold or chamber 2 with suitable branches leading from and to the several cylinders. Valves control communication between such branches and cylinders

in accordance with piston strokes. A carburetor 3 causes liquid fuel, such as gasoline and the like, to be vaporized and mixed with air, producing a highly explosive mixture, which is then drawn into the intake chamber 2 and distributed to the several cylinders, under influence of suction created by the engine. A manually operated throttle valve 4, in the carbureted fuel passageway 5, controls the volume of fuel charge supplied to the engine and consequently the power or speed developed. In the present case the throttle valve 4 is so constructed that when moved to closed position, it precisely fits the passageway or conduit 5 to completely preclude passage of fuel.

In order to prevent stalling of the engine at closed throttle, a by-pass around the throttle permits a small charge of fuel to reach the cylinders for idling operation. In the present showing this consists of a chambered housing 6, attached on the side of the fuel supply conduit 5, and communicating with the conduit thru an inlet opening 7 below the throttle and an outlet opening 8 beyond the throttle. To control the volume of fuel supplied thru this by-pass, there may be provided an adjustable screw stud 9 regulating the size of the by-pass in accordance with fuel requirement for idling speed.

A shoulder 10 in the chambered housing 6, forms a seat for a conical valve head 11, whose stem 12 has sliding engagement in the guide or sleeve 13 and projects out of the housing 6. The sleeve 13 is screw threaded into engagement with the housing 6 and has a reduced neck portion 14 opposite the inlet opening 7, with the head 15 abutting a shoulder 16. Passageways or holes 17 provide constant communication between the chambers on opposite sides of the head 15, the valve head 11 being located directly over and above the communicating openings 17 and spaced a short distance from such openings by a shoulder 18 resting on top of the head 15. The under surface of the conical valve head 11 is preferably concaved, and the concavo-convex characteristics of the head greatly facilitate the closing of the valve against its seat under the action of engine suction, as will be described. For the purpose of maintaining the valve off its seat and the by-pass open, a tensioned spring 19 seated in a cavity in the sleeve 13, surrounds the valve stem 12 and bears in opposition to engine suction, against the thumb

nut 20, adjustably screw threaded on the stem to control the balance point of the opposing forces.

Engine operation is controlled by the throttle 4 in the usual manner. When the throttle is open, engine suction draws carbureted fuel past the throttle to the cylinders in accordance with the degree of throttle opening. When the throttle is closed the engine suction acts thru the by-pass to draw its fuel charge. The tension of the spring 19 is calibrated to equal engine suction at idling speeds. So long as engine suction acting on the valve head 11 does not exceed the opposing force of spring 19, the by-pass permits fuel to reach the cylinders. It will be obvious that in event of sudden throttle closure, the value of engine suction will exceed the spring tension and the valve 11 will be held tight against its seat. Upon the entire failure of fuel, the dead weight of the engine turning over against its own compression checks speed and consequently the suction developed. When engine suction falls below the force of spring tension, which would occur at idling speed, the by-pass opens and fuel is drawn into the cylinders for uniform idling engine operation until the throttle is again manipulated. Thus the operation of the by-pass valve is entirely automatic.

It will be apparent that for a particular type of engine, the value of suction developed and volume of fuel required for idling operation, may be predetermined so that tension of the spring and size of by-pass opening can be fixed, thus eliminating the adjustable screw 9 and thumb nut 20.

While the invention has been described

more or less specifically, it is obvious that various modifications may be made as come within the scope of the appended claims.

Having described the invention, I claim:

1. In an internal combustion engine, the combination of a fuel supply conduit, a throttle valve adapted to completely close the conduit, an automatically controlled by-pass device comprising a casing associated with and secured on the outside of said conduit and having an inlet passage and an outlet passage communicating with openings in the wall of the conduit in advance of and beyond the throttle valve respectively, and also having a passageway connecting said inlet and outlet passages, a valve stem guide located within said connecting passageway, having a reduced neck portion affording a chamber opposite the inlet passage, and an enlarged head at the end of said neck portion provided with a plurality of ports therein, a valve element consisting of a concavo-convex head overlying said ports and adapted to be closed by suction, the underside of the head having a shoulder adapted to rest on said guide element to maintain said ports opened, and a valve stem slidable in said guide, and a spring acting on said stem to hold the valve head off its seat when the action of engine suction thereon is of less value than the spring tension.

2. The combination set forth in claim 1 and a manually adjustable valve element associated with the outlet passage for controlling the volume of fuel mixture to be by-passed.

In testimony whereof I affix my signature.

HENRY H. GILBERT.