March 16, 1937. C. STRANCKE 2,073,887

CHARGE MODIFYING ATTACHMENT FOR ENGINE INTAKE MANIFOLDS

Filed July 22, 1932

Fig. 1.

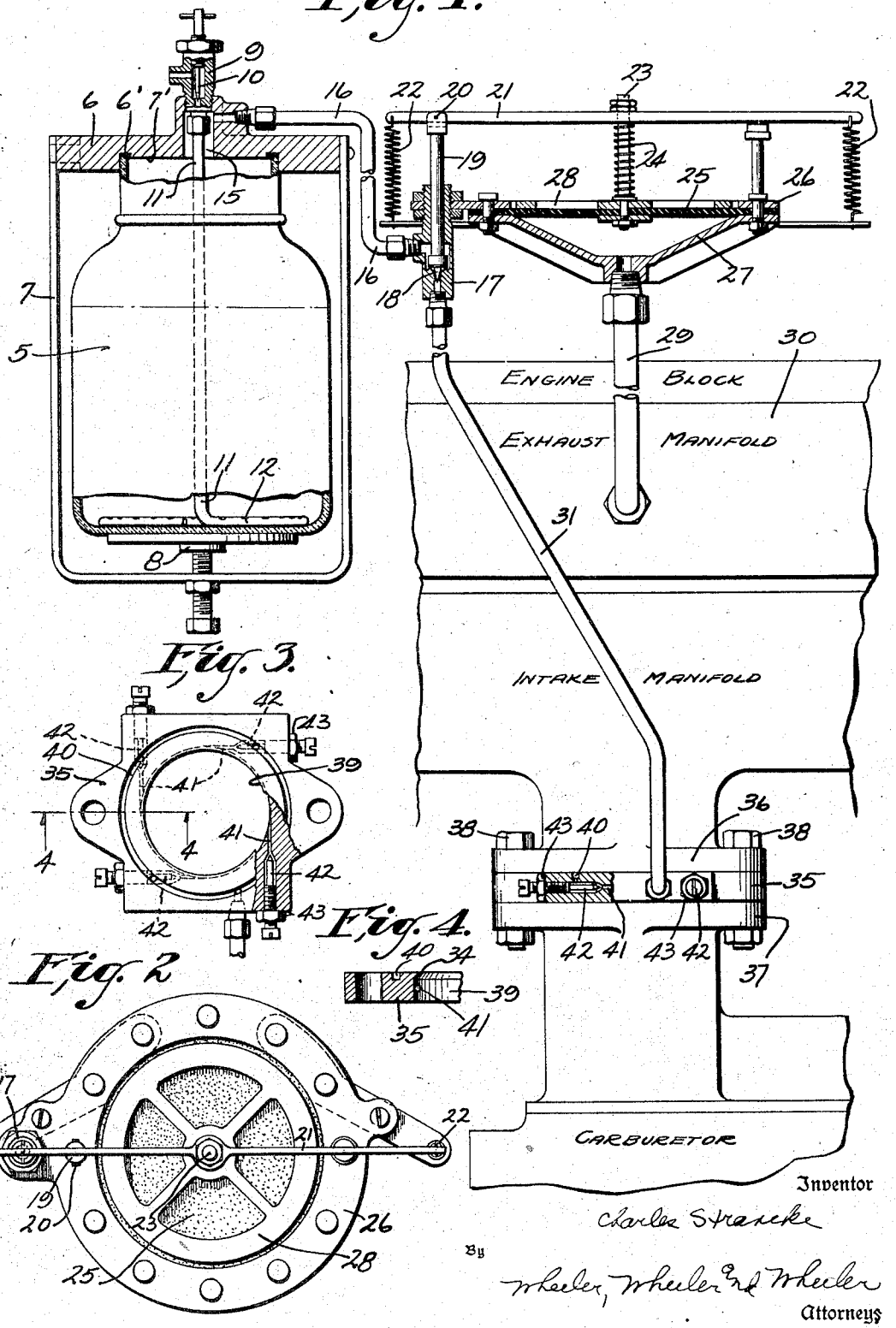

Fig. 3.

Fig. 4.

Fig. 2

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Patented Mar. 16, 1937

2,073,887

UNITED STATES PATENT OFFICE

2,073,887

CHARGE MODIFYING ATTACHMENT FOR ENGINE INTAKE MANIFOLDS

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Application July 22, 1932, Serial No. 623,957

5 Claims. (Cl. 123—25)

This invention relates to improvements in charge modifying attachments for engine intake manifolds.

It is the primary object of the invention to provide a novel and improved means for supplementing the charge formed in the carburetor by adding thereto a predetermined regulated flow of fluid which is introduced into the mixture only at higher engine speeds, and in ratios generally proportioned to increases and decreases in engine speeds.

It is a further very important object of the invention to provide means for the control of the gaseous mixture supplied to the charge, and moreover for the control of the delivery of such mixture to the charge. It has been found by experimentation that accuracy of control is very desirable to secure the best results.

It is my further purpose broadly to provide control means, which, by virtue of its connection to receive motion from a diaphragm exposed to exhaust gas pressures, will be automatically subject to operation in accordance with the engine speeds. From the standpoint of this broader aspect of the invention, it is immaterial whether said control means comprises a valve or some other mechanism, and it is also immaterial what is controlled by said means, there being many appliances requiring manipulation in general proportion to engine speeds which can conveniently be operated by means herein disclosed.

In the drawing:

Figure 1 is a diagrammatic view, largely in side elevation but partially in section, showing the component elements of the device in their proper relative sequence and relation to each other and the parts of the engine to which they are applied.

Figure 2 is a plan view of the control diaphragm valve.

Figure 3 is a plan view, partially broken away to a horizontal section, of the manifold inlet fitting.

Figure 4 is a fragmentary detail view taken in section in the plane indicated at 4—4 in Figure 3.

Like parts are identified by the same reference characters throughout the several views.

The device comprises three elements interconnected by piping. The first of these is a humidifier and air washer, wherein the air to be added to the charge is washed and mixed with water vapor. The second unit comprises a control valve which is automatically operated to regulate the flow of the washed and humidified air to the manifold. The third unit is the manifold fitting through which the air and vapor are admitted in the form of gases to the intake manifold in the path of the charge formed in the carburetor.

The air washer and humidifier

This device comprises a jar 5 adapted to contain water or some other suitable liquid and supported in a bracket which includes a head 6 constituting a closure for the jar, a strap 7, and a pressure clamp 8 adjustably supporting the jar from beneath and holding it in air-tight relation to the closure head 6 which is recessed at 7' and provided at 6' with a gasket for the mouth of the jar.

The pressure head carries a valved fitting 9 whereby air is admitted under control of needle valve 10 to a pipe 11 extending to the bottom of the jar, and there terminating in a coil 12 having apertures from which the air supplied to the pipe can bubble up through the liquid in jar 5. The jar will ordinarily be filled with liquid to the depth indicated in Figure 1.

The air reaching the top of the jar, together with such gaseous vapor as has been picked up thereby from the liquid in the jar, escapes through port 15 in head 6 to a pipe 16, whence it passes to the control valve casing 17.

The control valve

The control valve comprises a needle valve 18 reciprocable to and from its seat in casing 17 and having a valve stem 19 pivotally connected at 20 to a bar 21 which is subject at its ends to the tension of springs 22. This bar is adjustably connected by means of bolt 23 and compression spring 24 with a diaphragm 25. The diaphragm is clamped by a ring 26 to the face of a diaphragm chamber 27. A floating ring 28 may be used to reenforce the face of the diaphragm and provide a convenient means to which the bolt 23 is connected. The diaphragm chamber communicates through pipe 29 with the exhaust manifold 30 of the engine, thereby being subject to pressure in the exhaust manifold which is fairly closely proportional to the engine speed, the arrangement being such that when a sufficient exhaust pressure is reached the valve 18 will be lifted from its seat and its further opening will depend upon the degree of such pressure.

It is particularly to be noted that exhaust valve pressures are proportioned to engine speed independently of throttle positions. I am aware of the fact that it has heretofore been proposed to

bleed air into the intake manifold for the dilution of the mixture at high engine speeds, but in all such devices with which I am familiar the control has been effected through means subject to depression in the intake manifold or to manipulation of the throttle. In either case the device will act prematurely to dilute the mixture before the engine can respond to changes in pressure produced by throttle manipulation. The result seriously impedes a smooth operation of the engine.

Subject to the control of valve 18, the washed and humidified air passes through pipe 31 to the fitting which controls its admission to the intake manifold.

The intake fitting

I have found that it is very important in any air admission system to control the delivery of air not only as to amount but also as to the proportionate amount delivered to different parts of the manifold. Different engines vary as to their requirements in this regard even as between engines of the same make equipped with like carburetors.

My improved inlet fitting comprises a block 35 interposed between the intake manifold flange 36 and the complementary carburetor flange 37. The block 35 is preferably made to register with the aforesaid flanges and is apertured in registry with the holes which receive bolts 38. It has a central bore 39 which passes with a slight restriction at 34 to the intake manifold the charge originating in the carburetor.

Pipe 31 leads the diluting air to an annular distributing conduit 40 which may comprise a groove cut in the upper face of the block 35. From this conduit any desired number of ducts 41 lead tangentially into the mixture passage 39, each duct preferably being under the individual control of its own needle valve 42. To provide a convenient seat for the jamb nuts 43 for these valves the block 35 may be squared up as shown in Figure 3.

As above noted, it will be found that these valves should be adjusted individually according to the requirements of the particular engine. It will be found that best results may be secured with one valve relatively wide open and another relatively tightly closed, depending on factors unknown at the present time, but probably concerned with the manner in which the charge moves from the carburetor through fitting 35 to the intake manifold.

Operation

The total amount of air to be admitted to the intake manifold is regulated by manipulation of valve 10, after which the air reaches the washer and humidifier. The air passed by the valve bubbles through the opening in pipe 11 into intimate contact with the liquid contained in jar 5. Thence the air and entrained vapor is led through duct 16 under the control of valve 18 to the inlet fitting. As previously explained, valve 18 is opened at predetermined engine speeds by pressure in the exhaust manifold 30 acting on diaphragm 25, the degree of opening, above said speeds, being proportioned to the pressure in the exhaust manifold and hence to the speed of the engine.

The gases reaching the intake fitting 35 are distributed in groove 40 to the several tangential delivery ducts 41 and are apportioned by the individually adjusted needle valves 42 to flow in greater or less degree to the ducts. I have thus provided means for regulating the total flow, for proportioning flow to engine speeds and for cutting it off automatically below a predetermined speed, and I have also provided means for regulating the delivery of the bleed gases to the carbureted mixture of charge.

I claim:

1. In a device of the character described, the combination with an intake manifold fitting including a plurality of ports for delivery to the manifold at different points with reference to the flow of gases therethrough, of means for individually regulating relative flow through the respective ports, and means for regulating total flow through all of said ports, the last mentioned means including a pressure responsive valve operatively connected to be subject to exhaust manifold pressure.

2. A regulating device responsive to engine conditions comprising a valve casing, a valve operable therein, a diaphragm and a diaphragm chamber closed by said diaphragm and provided with a pipe for communication with an engine exhaust manifold, and a yieldable element connected between said diaphragm and said valve for actuation thereof.

3. The combination with an engine exhaust manifold, of a diaphragm chamber, a valve casing connected therewith, a valve operable in said casing to and from its seat therein, a diaphragm closing said chamber, and upwardly urged by pressures transmitted from said exhaust manifold, actuating connections between said diaphragm and valve including a bar element pivotally connected to said valve, resilient elements downwardly urging said bar, and a yieldable element connected between said diaphragm and said bar element operative to urge said bar upwardly in response to movements of said diaphragm.

4. The combination with a frame member providing a chamber having a pipe connection to an engine exhaust manifold, of a pressure responsive element exposed to pressures in said chamber and movable in response to changes of such pressure, a valve casing mounted on said member and provided with inlet and outlet ports and an intermediate valve seat, a valve movable to and from said seat and provided with a stem reciprocably projecting from said casing, a bar extending across said element and connected with said stem, spring means urging the ends of said bar toward said element, and means providing a motion transmitting connection between said element and bar whereby the movement of said element in response to increased pressures in said chamber is adapted to transmit motion to said bar in a valve opening direction.

5. In a device of the character described, the combination with a frame member providing a pressure chamber and provided with an exhaust pipe connection, of a diaphragm applied across said chamber and movable in response to pressures therein, a valve casing mounted on said frame member and provided with a vapor inlet port, an intake manifold vapor outlet connection, and an intermediate seat, a valve reciprocable to and from said seat and provided with a stem projecting from said casing, the movement of the valve from its seat being in the same direction as the movement of said diaphragm element in response to a pressure increase in said chamber, a bar extending trans-

versely across said diaphragm element in spaced relation thereto, spring means connecting the ends of said bar with said frame member, means connecting said bar with said valve stem, a link loosely connecting said bar with said diaphragm element, and spring means encircling said link and interposed between said element and bar whereby to provide motion transmitting connections for opening said valve in accordance with pressure increases in said chamber.

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