Aug. 8, 1933. P. TAURISANO 1,921,895

FUEL MIXING APPARATUS

Filed July 15, 1931 3 Sheets-Sheet 1

Fig. 1.

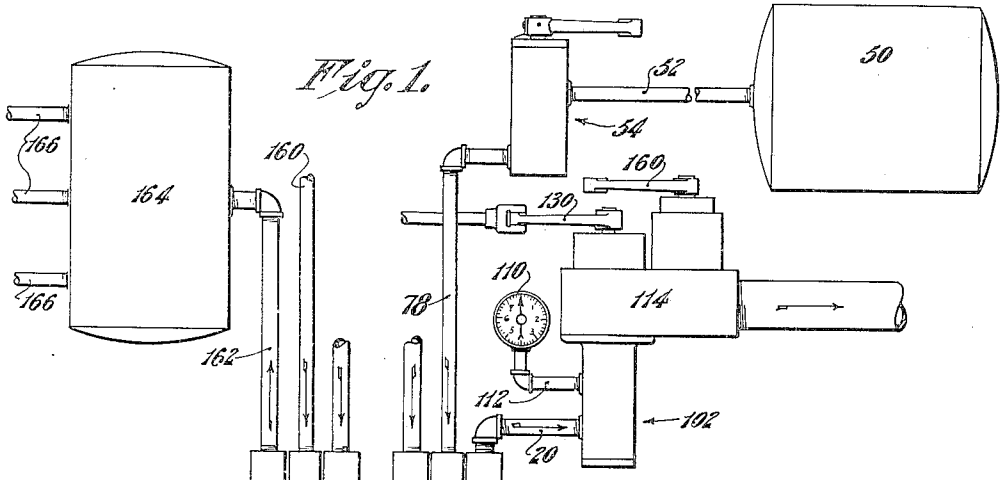


Fig. 2.

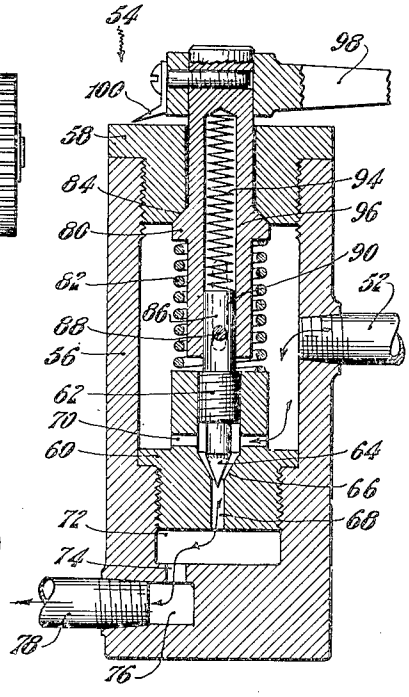
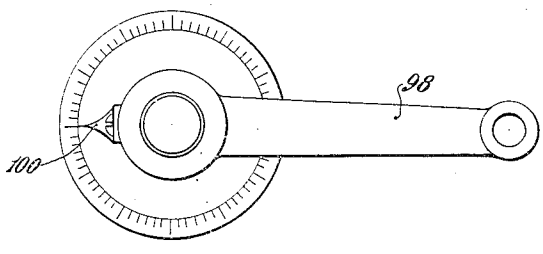


Fig. 3.



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FUEL MIXING APPARATUS

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Fig. 4.

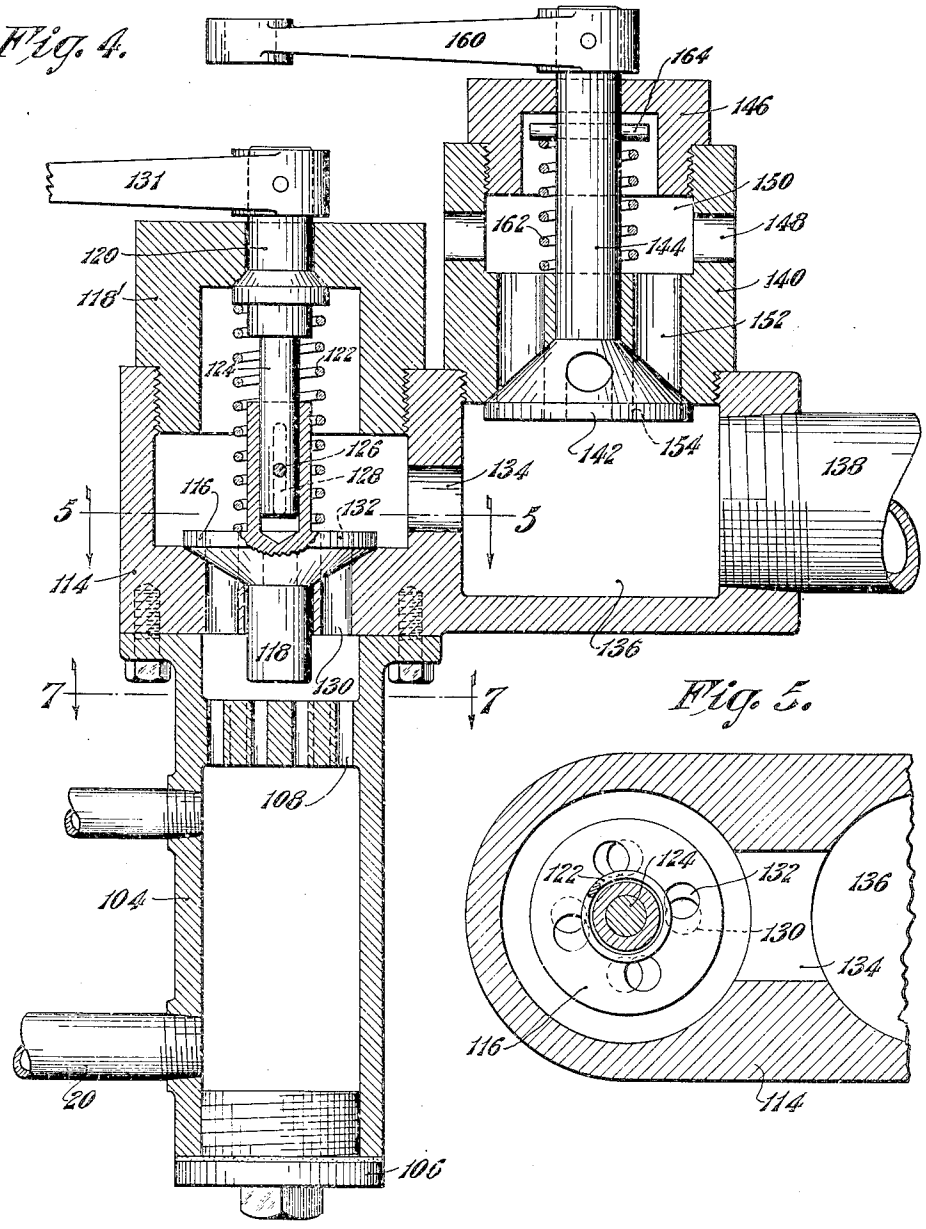

Fig. 5.

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Fig. 6.

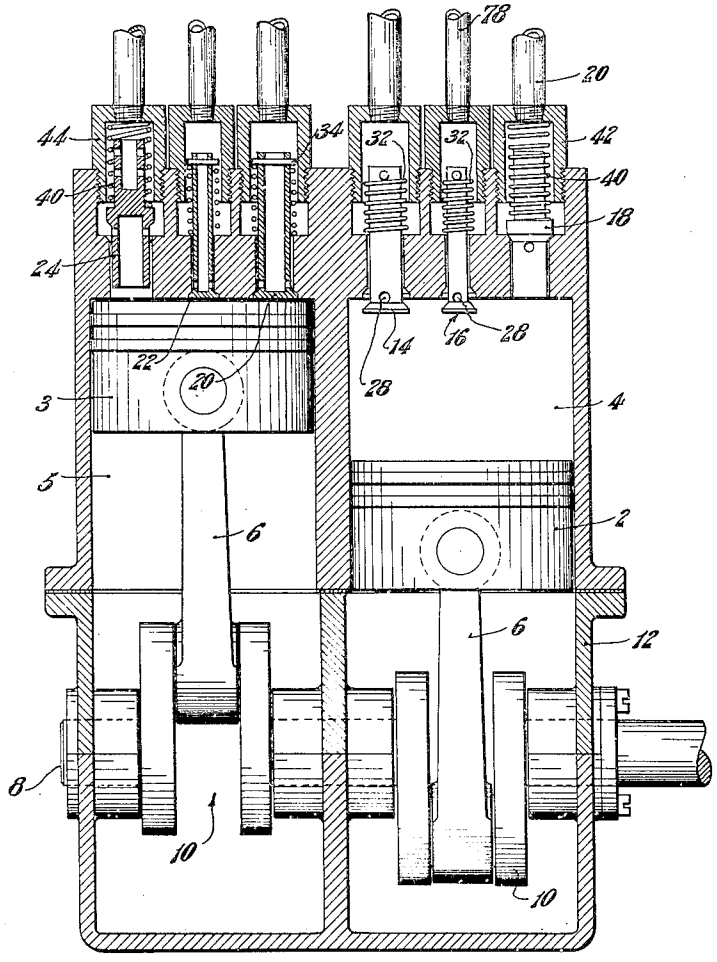
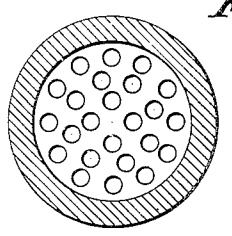


Fig. 7.



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Patented Aug. 8, 1933

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UNITED STATES PATENT OFFICE

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FUEL MIXING APPARATUS

Peter Taurisano, Springfield, Mass.

Application July 15, 1931. Serial No. 550,823

4 Claims. (Cl. 261—28)

This invention relates to apparatus for delivering hydrocarbon liquid mixed with air to internal combustion engines and the like.

The principal object of the invention is the provision of an apparatus of novel form and arrangement which is adapted and arranged to mix hydrocarbon oils, combustible fuels, air and the like and to deliver the same to an internal combustion engine or other apparatus.

According to special features of the invention the apparatus is so constructed and arranged as to be capable of producing mixtures of such a character as will bring about the most efficient and economical operation of an internal combustion engine or the like.

Various and numerous novel features and advantages of the invention will be hereinafter more fully referred to in connection with the accompanying description of the preferred form of the invention which for purposes of disclosure is shown in the accompanying drawings wherein:

Fig. 1 is a small scale elevational view showing the novel apparatus of the invention.

Fig. 2 is a sectional elevational view through the fuel supply valve of the apparatus of the invention.

Fig. 3 is a plan view of the valve shown in Fig. 2.

Fig. 4 is a sectional elevational view through certain of the delivery valve apparatus.

Fig. 5 is a sectional plan view on the line 5—5 of Fig. 4.

Fig. 6 is a sectional elevational view through the mixing cylinders of the apparatus, and

Fig. 7 is a sectional plan view on the line 7—7 of Fig. 4.

Referring now to the drawings in detail the invention will be fully described.

Referring more particularly to Figs. 1 and 6, there is shown a block 1 in which are reciprocable a pair of pistons 2 and 3. The piston 2 at the right is reciprocable in a cylinder bore 4 of the block and the piston 3 at the left is reciprocable in the bore 5 of said block.

For purposes of illustration and disclosure the piston 2 will be referred to as a gasoline piston, while the other piston will be referred to as an oil piston.

These pistons are connected by suitable connecting rods 6 to a crank shaft 8 having offset crank portions 10, and this crank shaft is journalled in a base 12 suitably secured to the under side of block 1.

As the crank shaft is rotated the pistons are, as usual, reciprocated up and down in their respective bores and when the apparatus is used in connection with an internal combustion engine, such as an automobile engine, the crank shaft may be driven from said engine in any suitable manner as by gears, chains, belts or the like.

An intake valve 14 is movable up and down in the head of the cylinder bore 4 and in this case will be referred to as an air inlet valve. A second inlet valve 16 is likewise reciprocable in the head of the cylinder bore 4 and will be referred to as a gas inlet valve. An outlet valve 18 is also reciprocable in the head to permit the piston 2 in its upward movement to expel a mixture of air and gas therepast so that the mixture may be conveyed through a pipe 20 for the purpose later to be described.

An air inlet valve 20 is reciprocable in the head above the cylinder bore 5 and an oil inlet valve 22 is similarly reciprocable while a discharge valve 24 is located in the head above the cylinder bore 5 to permit the piston 3 to force a mixture of air and oil therepast. The valves 14, 16, 20 and 22, as shown in Fig. 6, are preferably hollow and have openings 28 just above the head portion. Compression springs 32 are associated with each of the inlet valves and are disposed beneath pins 34 so as to urge the valves upwardly whereby their tapering seat portions will seat on suitable tapering seats in the head of the block.

These valves 14, 16, 20 and 22 are moved away from their seats by the suction action of the pistons as gasoline and oil is drawn into the cylinders as will be observed from the construction shown in Fig. 6.

The valves 18 and 24 are likewise hollow in their lower ends as shown in Fig. 6, so that when moved upwardly away from their seats by upward movements of the pistons, mixed air and gas or air and oil may be forced upwardly therepast and outwardly through outlet pipes thereabove. Springs 40 between the upper sides of the valves 18 and 24 and caps 42 and 44 tend to urge the valves 18 and 24 towards their respective seats.

It will be here stated that the springs in all cases may be varied so that they will offer the desired resistance and in that way will function to control the pressure at which mixtures may be discharged from the cylinders. A supply tank 50 is shown in Fig. 1 and this may be called for descriptive purposes a gasoline tank. This is connected by a pipe 52 to a valve 54 shown more clearly in Fig. 2.

This valve 54 includes a shell 56 and a cap 58 in threaded engagement therewith. A member 60 in the lower side of the valve 56 has in screw threaded engagement therewith a needle valve 62 the pointed lower end 64 of which is adapted as the valve is turned in one direction or the other to move towards and away from a seat 66 at the upper side of a passageway 68. Openings 70 in the sides of member 60 allow gasoline to be drawn from pipe 62 downwardly past the lower end of needle valve 64 into a chamber 72 below the member 60. A passageway 74 communicates with chamber 72 and another chamber 76 and a pipe 78 extends from the latter chamber 76 to the valve 16 of the gasoline cylinder. The piston 2 reciprocates up and down to create suction to draw gasoline from the tank 60 past the needle valve and into the cylinder.

A gland like element 80 rotatable in the cap 58 is urged upwardly by means of a spring 82 so that the tapered seat portion 84 thereof cooperates with a suitable tapering surface on the cap to provide a tight joint. The member 80 is hollow so as to receive the upper end 86 of the needle valve and a pin 88 in the needle valve works in a slot 90. As the member 80 is turned in one direction or the other the valve therebelow is likewise turned and by reason of the screw-threaded portion 62 the valve is raised and lowered to control the amount of fuel flowing therepast.

A spring 94 is disposed in a bore 96 of a member 80 and is arranged to urge the needle valve downwardly and take up any lost motion in connection with the threaded portion thereof.

A lever 98 is carried by the upper end of the member 80 and is provided with a pointer 100 which may register with graduations on top of member 56 as is indicated in Fig. 3. This lever 98 may be connected by any suitable means to an operating means in the driving compartments of the vehicle with which the apparatus may be used.

In the operation of the apparatus as the piston 2 moves downwardly, air is drawn into the cylinder through valve 14 and fuel such as gasoline is drawn into the cylinder through valve 16. In upward movements of the piston fuel and air are forced past outlet valve 18 and into the outlet pipe 20.

The needle valve may be adjusted to control the amount of fuel being drawn into the cylinder and as has been stated the tension of the springs may be varied so as to more or less control the pressure at which the mixed fuel and air is forced through the pipe 20.

When more than one gasoline cylinder is used there may be other pipes such as 78 which are in communication with the valve 54, and each of said cylinders may be directly connected either to the chamber 72 or to the pipe 78, all as may be desired.

A mixing unit 102 is provided which as shown in Fig. 4 consists of a shell 104 to which pipe 20 is connected. This chamber is sealed by a suitable cap 106 at its lower end and near its upper end is provided with a baffle plate or perforated partition wall 108. A gauge 110 is connected by a suitable pipe 112 to the chamber 104 for indicating the pressure in the system.

A valve block 114 is disposed above the member 104 and a control valve 116 has a cylindrical portion 118 reciprocable and rotatable therein. A cap 118' in screw threaded relation with the member 114 has a gland member 120 rotatable therein and a spring 122 between the lower side of the member 120 and the upper side of the valve 116 urges the members 116 and 120 downwardly and upwardly so that their angularly shaped seat portions are held in contact with suitable seats in the members 114 and 118 respectively. A stem 124 of the member 120 is slidable in a suitable bore of the valve 116 and a pin 126 of the stem 124 is slidable in a slot 128 of the valve. In this way the valve may move up or down relative to the member 120 and its stem while at the same time as the member 120 is rotated the valve 116 will be rotated thereby.

Ports 130 in the member 114 are provided to register with other ports 132 through the valve. As this valve 116 is turned the ports thereof are brought into and out of register with the ports in the member 114 and will control the flow of mixed fuel and air therepast.

During the first reciprocating movements of the piston 2 the air and the fuel are forced outwardly through the pipes 20 into the chamber 104 and past the perforated member 108 and through the openings 130 and 132 accordingly as the openings are in register with one another. As pressure in the system is built up by continued reciprocating movements, the spring 122 may allow the valve 116 to be elevated off of its seat. In this way the fuel and air may flow not only through the ports 130 and 132, but past the valve 116 so that a greater amount of mixed gas and oil is delivered by the piston.

A lever 131 fixed to the upper side of the lever 120 may be connected to any suitable control mechanism in the driving compartment of the vehicle with which the apparatus may be used or it may well be adjusted in any other suitable manner.

A passageway 134 in the member 114 permits air and gasoline to flow therethrough into a chamber 136 and outwardly therefrom through a pipe 138. The pipe 138 may be connected to the manifold of an internal combustion engine or any apparatus with which this apparatus is to be used.

A cap 140 is secured to the member 114 above the chamber 136 and has a valve 142 the stem 144 of which is rotatable therein and in a nut 146. Air inlets 148 in the member 140 are in communication with a chamber 150 and ports 152 in the member 140 communicate with ports 154 in the valve. As these ports are brought into register with one another more or less air may be allowed to enter the chamber for mixing with the previously mixed air and gas.

A lever 160 fixed to the valve stem 144 may like the lever 131 be connected to any suitable control device located in the driving compartment or elsewhere. A spring 162 around the stem 44 acts on a pin 164 to urge the valve upwardly in seating engagement with the member 140.

It will here be stated that the tapering surfaces of the members 80 and 120 provide nonleakable joints so that mixed air and gasoline are not likely to be expelled therepast.

In the operation of the apparatus air and gas or other combustible fuel are drawn into the cylinder as the piston 2 reciprocates up and down and is forced past the valve 18 into and through the chamber 104 and past valve 116. The tension of the springs and the position of the valve

116 will control more or less the pressure at which the mixed gas and air are delivered into chamber 136 and more or less air may be admitted into the chamber by adjusting the valve 142. In this way a mixture of gas and air may be delivered to the manifold of an internal combustion engine or the like and in such amounts as may be required. At the same time the relative proportions thereof may be varied within wide limits. When the apparatus is operated from the engine to which is supplied the mixture of air and gas the amount supplied will vary accordingly as the speed of the engine and the apparatus driven thereby varies. In this way it is possible to provide a definite or required amount of mixture for the most efficient and economical operation.

As has been previously described the piston 3 and cylinder 5 may be employed to deliver oil or lubricating fluid to the engine and in this case as the piston 3 reciprocates air is drawn into the cylinder and past valve 20 while lubricating fluid is drawn into the cylinder through a pipe 160 from a suitable source of supply. The air and lubricant are mixed and is expelled past the valve 24 into a pipe 162 in communication with a tank 164. Other pipes 166 may connect this tank 164 to different mechanisms or parts to be lubricated and in the operation of the apparatus the lubricant is delivered under pressure to various points requiring lubrication.

It will be observed that the apparatus is simple in form so as to be economical to manufacture and easy to operate. This is all to the end that the apparatus may be efficient in its operation for the purpose intended and to bring about efficient and economical operation of internal combustion engines and other apparatus with which the apparatus of this invention may be used.

Having described the invention in the form at present preferred, what I desire to claim and secure by Letters Patent of the United States is:

1. An apparatus comprising in combination, a piston and cylinder, the latter having fuel and air inlets and an outlet associated therewith, a mixing unit connected to said outlet and a valve block connected to said unit, the said unit including a chamber having a perforated wall therein, the said valve block including a perforated seat and a perforated valve movable towards and away from said seat, a rotatable member, connections between said member and valve to permit relative reciprocating movements thereof and keying the same together for simultaneous rotation and a spring between said member and valve to yieldingly urge the valve against its seat.

2. An apparatus comprising in combination, a piston and cylinder, the latter having fuel and air inlets and an outlet associated therewith, a mixing unit connected to said outlet and a valve block connected to said unit, the said unit including a chamber having a perforated wall above its connection with said cylinder, the said valve block including a perforated wall above the chamber of the mixing unit, a perforated valve having a stem guided in said last mentioned perforated wall for closing said perforations, a rotatable member in said valve block in relative sliding non-rotative connection with said valve and a spring disposed between said member and valve to urge the latter into seating position.

3. An apparatus comprising in combination, a piston and cylinder, the latter having fuel and air inlets and an outlet associated therewith, a mixing unit connected to said outlet and a valve block connected to said unit, the said unit including a chamber having a perforated wall above its connection with said cylinder, the said valve block having a perforated wall above the mixing chamber and a cap thereabove, a perforated valve guided in said last mentioned wall normally closing the perforations therein, a stem extending from said valve, a rotatable member in said cap above said valve having an enlarged part bearing against said cap and a part slidable and non-rotatably engaging the stem of the valve, and a spring disposed between said enlarged part and said valve yieldingly urging the valve into seating position and the enlarged part against the cap.

4. An apparatus of the class described comprising in combination, a cylinder having a piston reciprocable therein, a mixing chamber and a valve block connected thereto, the said mixing chamber including a chamber connected to the outlet which is provided with a perforated wall above the connection, the said valve block having a perforated wall closing said chamber, a perforated valve having a lower part guided for reciprocation in the last mentioned wall and adapted to overlie said perforations of said wall, a hollow stem on the upper side of said valve provided with a slot, a cap above said valve, a rotatable member slidable in said valve stem, a pin in said member slidable in said slot, the said cap being provided with a seat and an enlarged part on the rotatable member bearing thereagainst and a spring between said enlarged part and valve tending to urge the said part and valve into seating engagement.

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