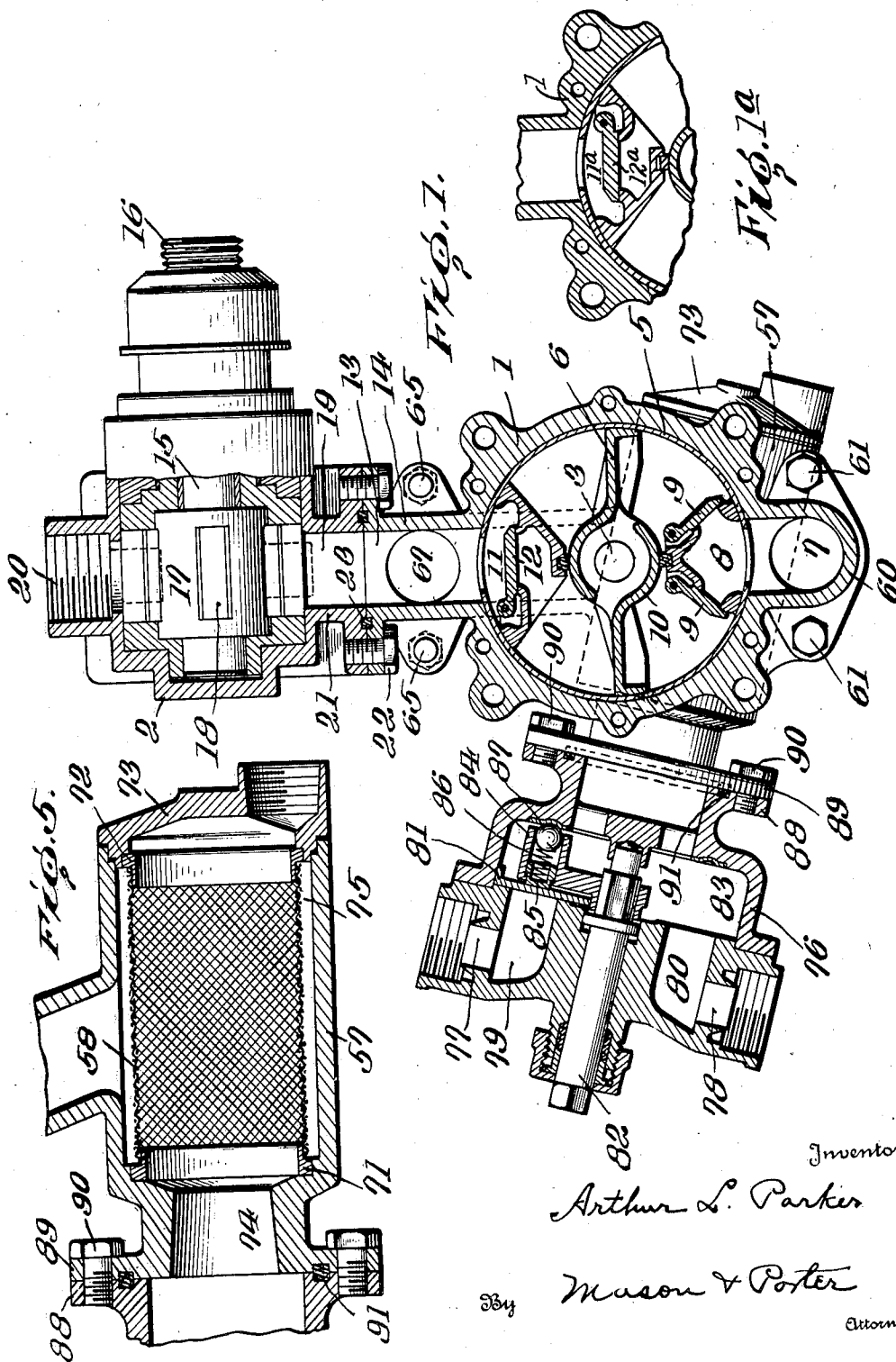


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A. L. PARKER
FUEL DISTRIBUTING UNIT
Filed June 15, 1936

2,189,674

3 Sheets-Sheet 1



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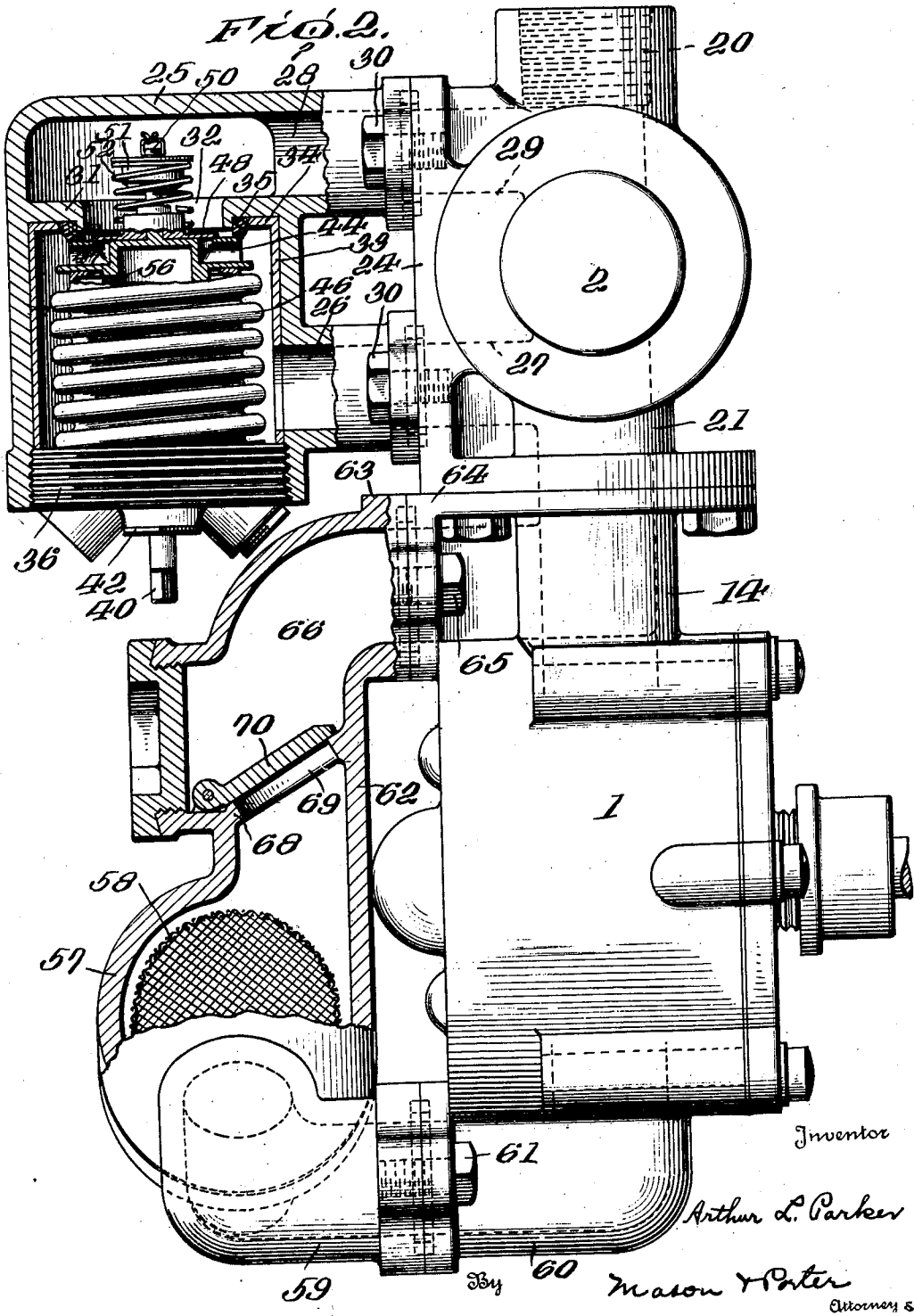
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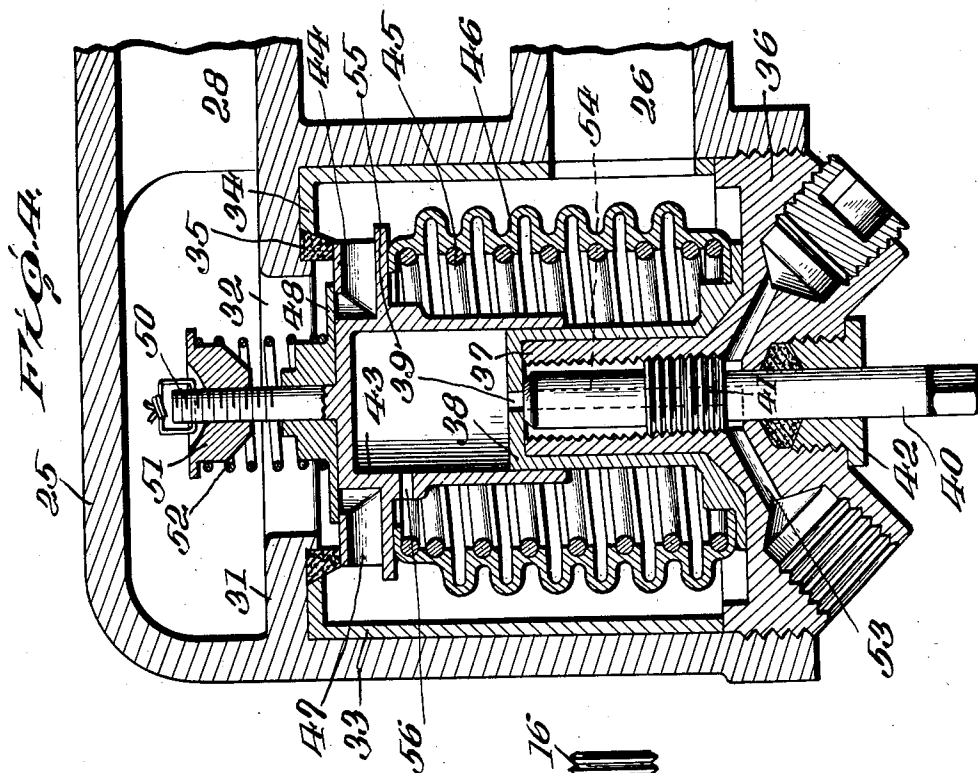
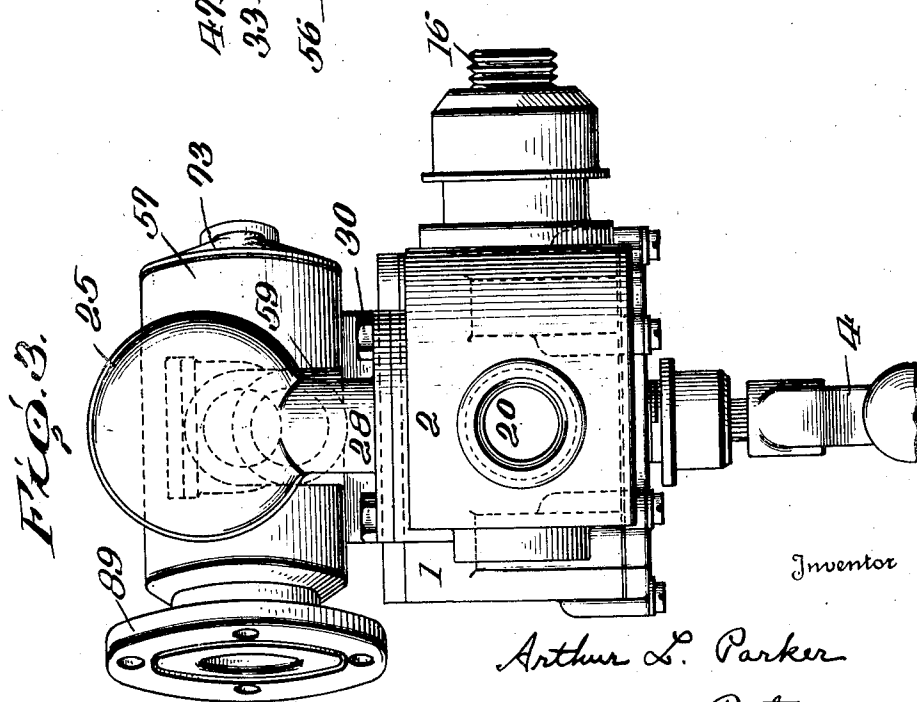
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FUEL DISTRIBUTING UNIT

Arthur L. Parker, Cleveland, Ohio

Application June 15, 1936, Serial No. 85,358

5 Claims. (Cl. 103-5)

The invention relates to new and useful improvements in a fuel distributing unit which is particularly adapted for use in aircraft.

An object of the invention is to provide a fuel distributing unit which includes a self-contained, hand-operated fuel pump and a self-contained, power-operated fuel pump, which pumps are detachably and directly connected to each other so that the pumps may be separately manufactured and assembled in a unit without the use of intervening connecting pipes and the like.

A further object of the invention is to provide a fuel distributing unit of the above type wherein a strainer unit is detachably connected to the pumps and constructed so as to supply fuel directly to either of the pumps when in operation.

A still further object of the invention is to provide a fuel distributing unit of the above type wherein a relief valve is detachably and directly connected to the power-operated pump and disposed so as to bypass fuel from the delivery to the receiving side of the pump when pressure on the system reaches a predetermined degree.

A still further object of the invention is to provide a fuel distributing unit of the above type wherein the relief valve is so constructed that fuel may be passed through the relief valve from the hand-operated pump and around the power-operated pump to the delivery side thereof.

A still further object of the invention is to provide a fuel distributing unit of the above type wherein a distribution valve is detachably and directly connected to the strainer so that fuel may be supplied to the system selectively from separate storage tanks.

These and other objects will in part be obvious and will in part be hereinafter more fully disclosed.

In the drawings—

Figure 1 is a view partly in section and partly in side elevation showing a fuel distributing unit embodying the improvements;

Fig. 1a is a sectional view through the rear valve at the delivery side of the pump;

Fig. 2 is a view partly in side elevation and partly in section in a plane at right angles to the rotary shaft of the power-operated pump;

Fig. 3 is a top plan view of the fuel distributing unit as shown in Fig. 1;

Fig. 4 is an enlarged detail section through the relief valve, and

Fig. 5 is a sectional view through the strainer unit.

In a fuel distributing system for aircraft, it is

particularly desirable to use a power-operated pump and a hand-operated pump, and that these pumps shall be brought together in a single unit placed at a low point in the system. It has been a common practice to construct a single housing which contains the power-operated pump and the hand-operated pump. While this brings the pumps into close compact relation to each other, there are many objections to the assembling of the pumps in a single housing. Applicant has conceived of a fuel distributing unit wherein the power-operated pump is self-contained and can be manufactured as a separate unit. The hand-operated pump is also self-contained and may be manufactured as a separate unit. These two pumps are detachably and directly connected to each other. The power-operated pump is preferably placed at the delivery side of the hand-operated pump. Associated with the power-operated pump and detachably connected thereto is a housing for a relief valve. This relief valve housing is connected to the power-operated pump both at the receiving side and the delivery side. The relief valve is so constructed that when the pressure on the system reaches a predetermined degree, the fuel will pass through the relief valve from the delivery side to the receiving side of the pump. This relief valve is also so constructed that fuel from the hand-operated pump may pass through ports in the relief valve to the delivery side of the power-operated pump. These ports are controlled by a valve which prevents any fuel from flowing back through the relief valve unless the pressure is sufficient to open the relief valve. Connected to the hand-operated pump is a housing for a strainer. This strainer housing is connected both to the receiving side and the delivery side of the hand-operated pump, and there is a check valve in the passage leading to the delivery side so as to prevent fuel from flowing back into the strainer from the delivery side of the hand-operated pump when said pump is being operated. Connected to this strainer housing is a distribution unit including a valve so that fuel may be selectively obtained from separate tanks.

Referring more in detail to the drawings, the improved fuel distributing unit includes a hand-operated pump indicated at 1 and a power-operated pump indicated at 2. The hand-operated pump 1 includes a casing in which is mounted a shaft 3 which can be oscillated by means of a crank arm 4. Within the housing is a liner 5 and mounted on the shaft 3 is a vane 6 which extends diametrically across the housing

and makes contact with the liner 5. Fuel is directed to the hand-operated pump through the passage 7. The fuel passes into the chamber 8 controlled by valves 9, 9 which allow the fuel to pass freely through into the pump, but prevents any backward movement of the fuel into the supply passage 7. The wall of the chamber 8 has a packed connection with the sleeve 10 of the vane 6. In the upper part of the pump there is a chamber 11 and valves 12 and 12a (see Figures 1 and 1a) which prevents the fluid from passing back into the pump when it has been forcibly delivered therefrom. The wall of this chamber has a packed connection with the sleeve of the vane. The fuel can pass through the vane sleeve from one side thereof to the other. It is thought that the operation of this pump will be obvious. When the vane is oscillated in one direction, fuel will be drawn into the pump chamber, and when oscillated in the other direction, it will be forced out of the chamber into the delivery passage 13. The casing of the hand-operated pump has an extension 14 containing the passage 13.

The power-operated pump 2 includes a shaft 15 which is mounted in suitable bearings in the casing of the pump. This shaft may be operated in any suitable way from the power plant of the aircraft. A flexible shaft is indicated at 16 which may be used for this purpose. Mounted on this shaft 15 is a drum 17 carrying radial vanes 18 which are of the usual construction. The pump is rotated continuously and will take fuel from the passage 19 and deliver the same into the passage 20 which is connected through suitable piping with the carbureter.

The casing of the pump 2 is provided with an extension 21 containing the receiving passage 19 for the power-operated pump. The extensions 14 and 21 are both provided with flanges which are secured together by suitable bolts 22. Located in recesses in the flanges is a packing gasket 23 which makes a fluidtight connection between the two pumps. Through this means the two pumps are detachably and directly connected to each other.

The casing of the power-operated pump has a lateral extension 24 (see Fig. 2). Detachably connected to this lateral extension is a housing 25 containing a relief valve. The housing 25 is provided with a passage 26 connected to a passage 27 leading to the intake side of the power-operated pump. The housing is also provided with a passage 28 which is connected to a passage 29 leading to the delivery side of the power-operated pump. This relief valve housing is detachably secured to the casing of the power-operated pump by suitable bolts 30. Packing gaskets are used similar to the gasket 23 for making a fluidtight joint between the housing for the relief valve and the casing of the power-operated pump.

The housing 25 for the relief valve is provided with a cross-partition 31 having an opening 32 therethrough. A sleeve 33 is inserted in the housing 25 and this sleeve has an inwardly projecting flange 34 at its upper end which clamps a packing gasket 35 against the under face of the partition 31. A cap 36 is threaded into the lower end of the housing and holds this sleeve in place. This cap 36 has a central stem 37 on which is mounted an abutment sleeve 38. This abutment sleeve extends the full length of the stem and normally rests against the cap 36. The stem 38 has a port 39 therethrough. Threaded into the stem 37 is a rod 40 carrying a sleeve 41 which has a threaded

engagement with the inner wall of the stem 37. This rod extends above the threaded portion 41 and bears against the upper end of the abutment sleeve 38. The rod extends through a packing nut 42 which forms a fluidtight connection for the rod. By turning the rod in one direction, it can be threaded into the stem and thus raised so as to lift the abutment sleeve 38 to a different set position. When it is turned in the opposite direction, then it will lower the abutment sleeve until it reaches a limit where it rests on the cap 36.

The relief valve 43 has a telescoping engagement with the abutment sleeve 38. The relief valve has a projecting head 44 at its upper end, which when raised, contacts with the gasket 35 for closing the opening 32 in the partition 31. A coiled spring 45 operates to hold the relief valve in raised position in contact with the gasket 35. Surrounding this coiled spring is a rubber syphon bellows 46. The spring is housed within the syphon bellows and is nested in grooves formed in the bellows. The spring bears against the upper end of the bellows and presses the same against the head of the relief valve. It also bears against the lower portion of the bellows and presses the same against the abutment sleeve 38. This syphon bellows forms an airtight chamber, the purpose of which will be described later. By adjusting the rod 40, the abutment sleeve is raised or lowered, and thus the tension of the spring holding the relief valve closed can be varied.

When the system is filled with fuel through the operation of the power-operated pump, it will bear against the head of the relief valve, and when the system reaches a predetermined degree so that the pressure overcomes the tension of the spring closing the relief valve, it will open and let the fuel pass back through the opening 32 in the partition to the passage 26, and thus to the receiving side of the power-operated pump.

The relief valve is provided with radial ports 47 the inner ends of which lead upwardly to the upper face of the head of the relief valve. A check valve 48 slides on a stem 50. A nut 51 is threaded on to this stem and provides an abutment for a spring 52 which bears on the check valve 48 and normally holds the same against the head of the relief valve, thus closing the ports 47. The fuel which is being delivered by the power-operated pump creates a pressure against the upper face of this check valve and seats the same so that it does not function when the power-operated pump is in action. The relief valve operates solely as a means for establishing a connection from the delivery side of the power-operated pump to the receiving side thereof, when the pressure reaches a predetermined degree. When the power-operated pump is not in operation and it is desired to supply fuel to the carbureter by the use of the hand-operated pump, then the fuel will pass from the delivery passage 13 through the receiving passage 19 and into the passage 26. The sleeve 33 has an opening therethrough so that the fuel will pass into the sleeve and into the ports 47, lifting the check valve 48 so that the fuel can pass through the opening 32 into the passage 29 and then out through the passage 20 to the carbureter. Thus it is that the fuel may be supplied by the hand-operated pump to the system when the power-operated pump is idle.

The cap 36 is provided with a port 53 which leads to a port 54 in the rod 40, and this port 54 is in register with the port 39 in the abutment sleeve. When air is supplied to the port 53, it

will pass into the chamber 55 in the relief valve and out through radial ports 56 into the bellows. The port 53 is connected through suitable piping with the air supply system for the carbureter, so that when a supercharger is used, the pressure on the relief valve will be varied to correspond to the pressure on the fuel line so that the pressure under which the system operates will be practically uniform.

Attached to the casing for the hand-operated pump is a housing 57 for a strainer 58. This housing 57 is provided with an extension 59 which is connected to an extension 60 on the casing of the hand-operated pump, which extension 60 contains the supply passage 7. The extensions 59 and 60 are provided with flanges, and these flanges are connected by suitable bolts 61, 61. The housing 57 has an extension 62 which is flanged at 63 and this flange 63 is connected to a flange 64 carried by the extension 14. The two flanges 63 and 64 are detachably connected by suitable bolts 65, 65. The extension 62 has a passage 66 which leads to the passage 67. The extension 62 has a partition 68 with an opening 69 therethrough. A valve 70 closes this opening and prevents fuel from passing back into the strainer housing, but permits the free flow of fuel through the valve and directly to the power-operated pump. Fuel may flow from the strainer housing also directly to the supply passage 7 and thus to the hand-operated pump. The strainer 58 is of the usual construction. It is cylindrical in shape and is connected at the receiving end to a ring 71. It is also connected at its other end to a ring 72 which is seated in a cap 73 which closes the housing for the strainer. The fuel is directed into the passage 74, thence into the strainer, and through the strainer into the chamber 75 surrounding the same, and from this chamber 75 the fuel may pass to the hand-operated pump or to the power-operated pump in the manner above described.

Attached to the strainer unit is a distribution unit which includes a housing 76 having ports 77 and 78 which are independently connected to supply tanks. There may be more than two parts in this distribution valve when it is desired to connect the system to more than two tanks. The port 77 leads to a port 79 and the port 78 leads to a port 80. A valve disk 81 actuated by a valve stem 82 is moved so as to cover all but one of the ports so that fuel will flow from the tank through the uncovered port into the chamber 83. The valve stem has an arm 84 carrying a member 85 which contacts with the valve disk and presses the same tightly against the valve seat. A spring 86 bears against this member and against the ball 87 moving on a hardened collar formed with depressions which yieldingly stops the valve in a set position. This valve mechanism forms no part of the present invention.

The housing 76 for the distribution unit is provided with a flange 88 which contacts with a flange 89 on the strainer housing, and the two flanges are detachably connected by bolts 90, 90. A packing gasket 91 is provided for making a fluidtight connection.

From the above it will be apparent that a fuel distributing unit has been provided wherein all of the essential features of the unit are self-contained in separate housings or casings which are detachably and directly connected to form the unit. Each one of these auxiliary units

making up the fuel distributing unit may be separately manufactured and when assembled will produce a rigid unit structure, free from any interconnecting pipes and wherein the fuel flows directly from one auxiliary unit into another. When these auxiliary units are self-contained, they cannot only be separately manufactured, but can be readily replaced without necessitating the replacement of the entire unit. It will be noted that the fuel from the strainer chamber passes directly to the hand-operated pump and thence around the power-operated pump when the latter is idle and the hand-operated pump is in action. Likewise, when the power-operated pump is in action, the fuel passes around the hand-operated pump and not through the same. This provides a very simple supply system which can be very readily serviced.

It is obvious that minor changes in the details of construction may be made without departing from the spirit of the invention as set forth in the appended claims.

Having thus described the invention, what I claim as new and desire to secure by Letters Patent, is:

1. A fuel system comprising a power-operated self-contained pump including a casing having an intake port and a delivery port, a self-contained hand-operated pump including a casing having an intake port and a delivery port, the casing of the power-operated pump at the intake side thereof having a flange, and said casing of the hand-operated pump at the outlet side thereof having a similar flange, and means for securing said flanges together whereby the power-operated pump and the hand-operated pump may be separated as units, means for connecting the intake port of the casing for the power-operated pump to the outlet port thereof including a valve for permitting fuel to by-pass the power-operated pump when said pump is inoperative and fuel is delivered by the hand-operated pump, a housing directly and detachably connected to the casing of the hand-operated pump, said housing being connected to the intake port of the power-operated pump and to the intake port of the hand-operated pump whereby fuel may be supplied directly to the power-operated pump when the hand-operated pump is inoperative, and may be supplied to the hand-operated pump when the power-operated pump is inoperative, and a valve in said last-named housing for preventing the return flow of fuel from the outlet to the intake of the hand-operated pump when in operation.

2. A fuel system comprising a power-operated self-contained pump including a casing having an intake port and a delivery port, a self-contained hand-operated pump including a casing having an intake port and a delivery port, said casings being directly and detachably connected so that the outlet port of the hand-operated pump is connected to the intake port of the power-operated pump, means for connecting the intake port of the casing for the power-operated pump to the outlet port thereof including a valve for permitting fuel to by-pass the power-operated pump when said pump is inoperative and fuel is delivered by the hand-operated pump, and means connected to the casing for the hand-operated pump for supplying fuel to the intake port thereof and to the casing at the outlet side thereof including a valve for permitting fuel to flow directly to the outlet port of the casing for the hand-operated pump when

said hand-operated pump is inoperative and for preventing the return flow of fuel from the outlet to the intake of the hand-operated pump when in operation.

3. A fuel system comprising a power-operated self-contained pump including a casing having an intake port and a delivery port, a self-contained hand-operated pump including a casing having an intake port and a delivery port, said casings being directly and detachably connected so that the outlet port of the hand-operated pump is connected to the intake port of the power-operated pump, and means for connecting the intake port of the casing for the power-operated pump to the outlet port thereof including a valve for permitting fuel to by-pass the power-operated pump when said pump is inoperative and fuel is delivered by the hand-operated pump, a housing directly and detachably connected to the casing of the hand-operated pump, said housing being connected to the intake port of the pump and to the outlet port thereof whereby fuel may be supplied directly to the power-operated pump when the hand-operated pump is inoperative and may be supplied to the hand-operated pump when the power-operated pump is inoperative, and a valve in said last-named housing for preventing the return flow of fuel from the outlet to the intake of the hand-operated pump when in operation.

4. A fuel system comprising a power-operated, self-contained pump including a casing having an intake port and a delivery port, a self-contained, hand-operated pump having an outlet port connected to the intake port of the power-operated pump, a housing directly and detachably connected to the casing of the power-operated pump, said casing for the power-operated pump and said housing having ports connecting the intake port and the delivery port of the power-operated pump, a valve mechanism located in said housing including a valve through which fuel from the hand-operated pump is bypassed about the power-operated pump when said power-operated pump is inoperative, and a valve through which fuel is bypassed from the delivery end of the power-operated pump to the intake end thereof when the power-operated pump is in action and the fuel reaches a predetermined pressure, a housing directly and detachably connected to the casing of the hand-operated pump, said housing being connected to the intake port of the power-operated pump and to the intake

port of the hand-operated pump whereby fuel may be supplied directly to the power-operated pump when the hand-operated pump is inoperative, and may be supplied to the hand-operated pump when the power-operated pump is inoperative, and a valve in said last-named housing for preventing the return flow of fuel from the outlet to the intake of the hand-operated pump when in operation.

5. A fuel system comprising a power-operated, self-contained pump including a casing having an intake port and a delivery port, a self-contained, hand-operated pump having an outlet port connected to the intake port of the power-operated pump, a housing directly and detachably connected to the casing of the power-operated pump, said casing for the power-operated pump and said housing having ports connecting the intake port and the delivery port of the power-operated pump, said housing having a partition dividing the same into two chambers, one of which is connected with the delivery port of the power-operated pump and the other of which is connected with the intake port of the power-operated pump, a port through said partition, a valve seat carried by said partition, a spring-pressed valve adapted to contact with said seat for closing said port against the passage of fuel from the delivery port of said power-operated pump to the intake side thereof until said fuel reaches a predetermined pressure, said valve having a port therethrough, a valve for closing said port, said last-named valve being disposed so as to prevent fuel from passing from the delivery port to the intake port, and yielding means for holding said valve closed so that fuel may pass from the intake port of the power-operated pump to the delivery port thereof when said power-operated pump is inoperative and the hand pump is in operation, a housing directly and detachably connected to the casing of the hand-operated pump, said housing being connected to the intake port of the power-operated pump and to the intake port of the hand-operated pump whereby fuel may be supplied directly to the power-operated pump when the hand-operated pump is inoperative, and may be supplied to the hand-operated pump when the power-operated pump is inoperative, and a valve in said last-named housing for preventing the return flow of fuel from the outlet to the intake of the hand-operated pump when in operation.

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