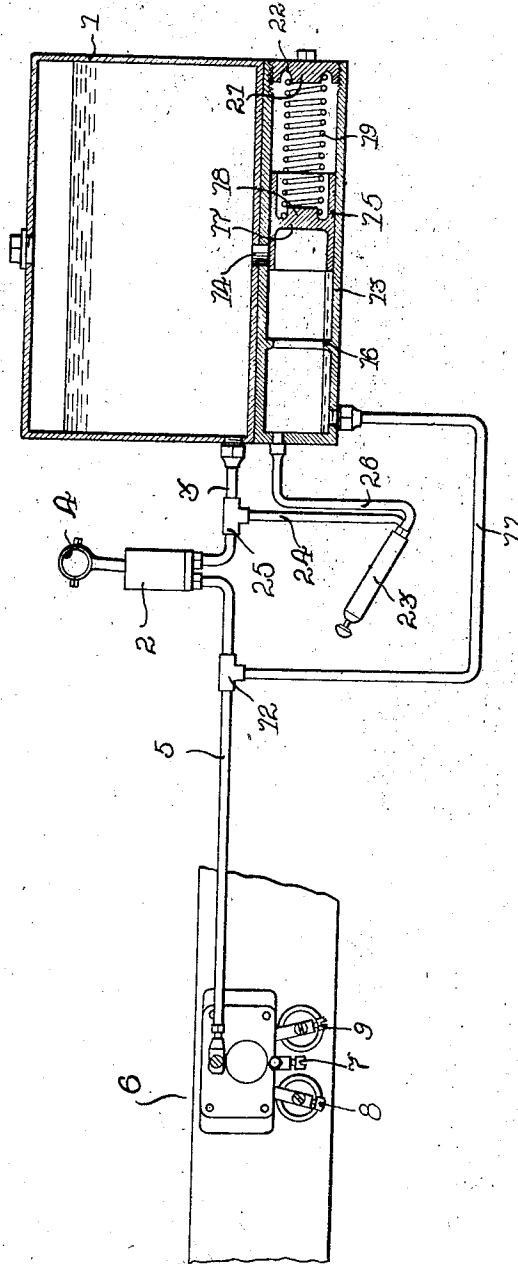


W. H. WINSLOW.
FUEL FEED SYSTEM.
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1,348,916.

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FUEL-FEED SYSTEM.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, WILLIAM H. WINSLOW, a citizen of the United States, residing at River Forest, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Fuel-Feed Systems, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to fuel feed systems.

My invention is primarily intended for supplying liquid fuel to the type of vaporizing burner generally employed in connection with the boiler of a steam driven vehicle or the like. It will be apparent, however, from the following detailed description, that my invention is characterized by certain features which make it admirably adaptable to other liquid feed systems as well, such as for supplying gasoline to the carburetor of an automobile internal combustion engine or for feeding lubricating oil to a number of bearings or the like.

In supplying liquid fuel to the vaporizing burner of a steam boiler, it is necessary that the fuel be fed under considerable pressure so that there will be a minimum tendency for the fuel to clog and carbonize in the preheating tubes. It is also necessary that the feed of the fuel be at a uniform pressure, as a pulsating pressure will produce a surging flame at the burner.

The prior systems of force feeding fuel to the burners of steam automobiles have in general utilized air under pressure to obtain the required uniformity of fuel pressure, this air being usually contained in either the main supply tank or in an auxiliary tank connected to the main tank through a check valve. These systems have necessitated both manually operated and engine-driven air pumps and, where the air is contained in the main tank, are particularly objectionable due to the entire loss of pressure in refilling the tank. Systems employing an auxiliary tank have a further disadvantage in that they require an additional engine driven fuel pump for pumping the fuel from the main tank to the auxiliary tank.

I have provided an improved fuel feed system dispensing with air pressure in the system and with all of the auxiliary devices

necessary to the maintenance thereof. According to my invention, I provide an engine driven fuel pump which draws fuel from the supply tank and delivers it under pressure to the vaporizing burner. A uniformity of pressure is maintained through the provision of a spring reservoir having connection with the fuel delivery pipe, which absorbs the pulsations of the fuel pump. This spring reservoir stores a reserve quantity of fuel which is fed under pressure to the system when the fuel pump ceases operating, as during periods when the engine is inert. This spring reservoir also functions to automatically by-pass the pump when a predetermined pressure in the delivery pipe is obtained, and to thereafter shunt a portion of the fuel back into the supply tank without lowering the pressure or creating pulsations in the pressure in the delivery pipe.

In the accompanying drawing I have diagrammatically illustrated one preferred embodiment of my improved system to acquaint those skilled in the art how to practise the same.

The supply tank 1 is connected to the inlet port of a fuel pump 2 through a pipe 3 which opens into the bottom of the tank 1. The fuel pump 2 is preferably a reciprocating plunger pump driven from an eccentric 4, which has any suitable connection with one of the operating shafts of the engine or vehicle. The pump 2 is provided with the usual inlet and outlet ports which are governed by suitable check valves. The outlet port has communication with a delivery pipe 5, extending to the vaporizing burner 6.

This burner may be of any preferred type, comprising the customary preheating tube or tubes, the pilot burner and the main burner. In the fragmentary illustration of the burner, 7 indicates the spud or nozzle for the pilot burner and 8 and 9 designate the nozzles for the main burner.

The present invention is not concerned with the principle of operation nor the mechanical details of this burner and I shall therefore make no detailed description of the same.

A reservoir pipe 11 branches off of the delivery pipe 5, by way of the T connection 12 and extends down and taps into the bottom, and at one end of, the reservoir cylinder

der 13. The reservoir cylinder is preferably mounted beneath the supply tank 1 so as to have direct communication therewith through the port 14, which is formed by the registration of holes cut in the bottom of the tank and in the top of the cylinder. This port is approximately midway of the length of the cylinder 13. A sleeve type of piston 15 is disposed in the reservoir cylinder and is arranged to reciprocate to admit and discharge fuel to and from the cylinder and to control the port 14. An internal flange 16, formed integral in the cylinder 13, serves to limit the motion of the piston 15 to the left, so that the piston will not uncover the port 14 in its travel in this direction.

The sleeve piston 15 is closed off at its center by a web 17 which has an annular boss 18 projecting from the rear side thereof. One end of a compression spring 19 encircles this boss and the other end encircles a similar boss 21 formed on an adjustable cap member 22, which closes off the other end of the cylinder 13. A hand pump 23, mounted on the dash of the machine or in some location readily accessible to the driver, has inlet communication with the supply tank 1 for drawing fuel therefrom through a pipe 24 which branches off of a T connection 25 interposed in the pipe line 3. The outlet port of this pump has communication through the pipe 26 with the left hand end of the reservoir cylinder 13.

The operation of the system is as follows:

The fuel pump 2 is so designed that when the engine is running at an average speed the volumetric displacement of the pump will be slightly greater than the maximum rate of consumption at the burner 6, i. e., greater than the volume consumed by both the main and pilot burners when working at their maximum rates. Thus, a surplus quantity of fuel will gradually accumulate in the reservoir cylinder 13 and will force back the spring pressed piston 15 until the by-pass port 14 is uncovered. Thereafter, all of the surplus fuel will be shunted or by-passed back into the main tank 1, an idle circulation of surplus fuel occurring through the fuel pump 2, the pipe 11, the spring reservoir 13, the supply tank 1 and back into the fuel pump 2, as long as the engine continues to run at an average speed or higher. During this phase of the operation, the pulsations of the fuel pump 2 are entirely absorbed in the spring reservoir 13. The spring pressed piston exerts a constant uniform pressure against the body of fuel contained in the cylinder 13, even when the fuel is being by-passed through the port 14 and thus the column of fuel in the delivery pipe 5 is always at a constant uniform pressure. It will be apparent that this pressure may be varied to meet the requirements of different types of burners by merely adjust-

ing the end cap 22 or by substituting a stronger or weaker spring for the spring 19.

During periods when the engine is not operating, the spring reservoir will function to continue the pressure feed to the burner 6. At such times the main burner is usually burning low or is entirely extinguished and, as the pilot burner consumes but a very small amount of fuel, the quantity of fuel required from the spring reservoir is relatively small. I contemplate making this reservoir of such size that the fuel stored therein will be ample to keep the pilot burning over night or even for a longer period.

When the reservoir is exhausted to the point where it exerts no more pressure upon the fuel in the delivery pipe and it is desired to start up the burner 6, pressure in the system can be quickly built up by operation of the hand pump 23. This draws fuel from the supply tank 1 and discharges it into the spring reservoir 13, forcing back the piston 15 and thereby generating a pressure in the system. Obviously, for greater ease of operation, the hand pump 23 may have no connection with the supply tank 1 but may be simply an air pump for creating an air pressure in the reservoir 13. Such air as might be necessary for creating the requisite pressure in the system would be exhausted through the port 14 as soon as the system resumed normal operation.

I do not intend to be limited to the particular details and arrangement herein shown and described.

I claim:

1. In a fuel feed system, a supply tank, a delivery pipe, pumping means for pumping fuel from said supply tank to said delivery pipe, an elastic reservoir having connection with said pumping means, said elastic reservoir comprising a movable member having positions corresponding to the maximum and minimum capacities of said reservoir, and means actuated by said movable member only when in its position of maximum capacity for by-passing the fuel from said reservoir to said tank.

2. In a fuel feed system, a supply tank, a delivery pipe, pumping means for feeding fuel from said supply tank to said delivery pipe, an elastic reservoir connected to the outlet port of said pumping means, said elastic reservoir having a relatively large degree of expansion, and means for by-passing the fuel from said pumping means back into said supply tank when said elastic reservoir has received fuel to a predetermined capacity, said elastic reservoir operating to maintain pressure upon the fuel in said delivery pipe for a considerable time interval after said pumping means ceases operating.

3. In a fuel feed system, a supply tank, a delivery pipe, pumping means for feeding fuel from said supply tank to said delivery

pipe, an elastic reservoir connected to the outlet port of said pumping means, said elastic reservoir comprising a movable member having positions corresponding to the maximum and minimum capacities of said reservoir, and by-pass means for by-passing the fuel from said pumping means back into said supply tank, said by-pass means being operable by said movable member and having a lost motion relation therewith to by-pass the fuel only when said movable member is substantially in the position of its maximum capacity.

4. In a fuel feed system, a supply tank, a delivery pipe, pumping means for pumping fuel from said supply tank to said delivery pipe, an elastic reservoir connected to said pumping means, said elastic reservoir comprising a movable wall having a relatively large range of expansion movement and a by-pass valve for by-passing the fuel from said reservoir to said supply tank, said by-pass valve being opened by said movable wall only at the outer limit of its expansion movement.

5. In a fuel feed system, a supply tank, a delivery pipe, pumping means for feeding fuel from said supply tank to said delivery pipe, and means for maintaining a substantially constant pressure in said delivery pipe for a relatively long time interval after said pumping means ceases operating, said means being operative to relieve pressures above a predetermined maximum.

6. In a fuel feed system, a supply tank, a delivery pipe, a pump for pumping fuel from said supply tank to said delivery pipe, an expansion chamber connected to the outlet port of said pump, said expansion chamber comprising a movable piston, and a by-pass port adapted to be uncovered by said piston at the outer limit of its expansion movement for by-passing the fuel from said expansion chamber back to said supply tank.

7. In a fuel feed system, a supply tank, a

delivery pipe, pumping means for feeding fuel from said supply tank to said delivery pipe, an elastic reservoir connected to the outlet port of said pumping means, and a manually operated pump for creating a pressure in said elastic reservoir.

8. In a fuel feed system, a supply tank, a delivery pipe, an engine driven pump for feeding fuel from said supply tank to said delivery pipe, a reservoir connected to said delivery pipe, a spring actuated piston in said reservoir, and a by-pass port in said reservoir adapted to be over-run by said piston, said by-pass port having communication with said supply tank.

9. In a fuel feed system, a supply tank, a burner, an engine driven pump for pumping fuel from said supply tank to said burner, a reservoir connected to the outlet port of said pump, a spring-actuated piston in said reservoir controlling a by-pass therein communicating with said supply tank, and a manually operated pump for pumping fuel from said supply tank into said reservoir.

10. In a steam automobile, a burner, a liquid fuel supply tank, an engine driven pump for pumping fuel from said supply tank to said burner, an expansion reservoir connected to the outlet port of said engine driven pump, said reservoir adapted to maintain pressure upon the fuel at said burner for a considerable time interval after said engine driven pump has ceased operating, said expansion reservoir comprising a resilient piston having a wide range of expansion movement, a by-pass port in said reservoir connecting with said supply tank, said by-pass port adapted to be opened by said piston at the outer limit of its expansion movement, and means independent of said engine driven pump for generating a pressure in said expansion reservoir.

In witness whereof, I hereunto subscribe my name this 10th day of July, A. D. 1919.

WILLIAM H. WINSLOW.