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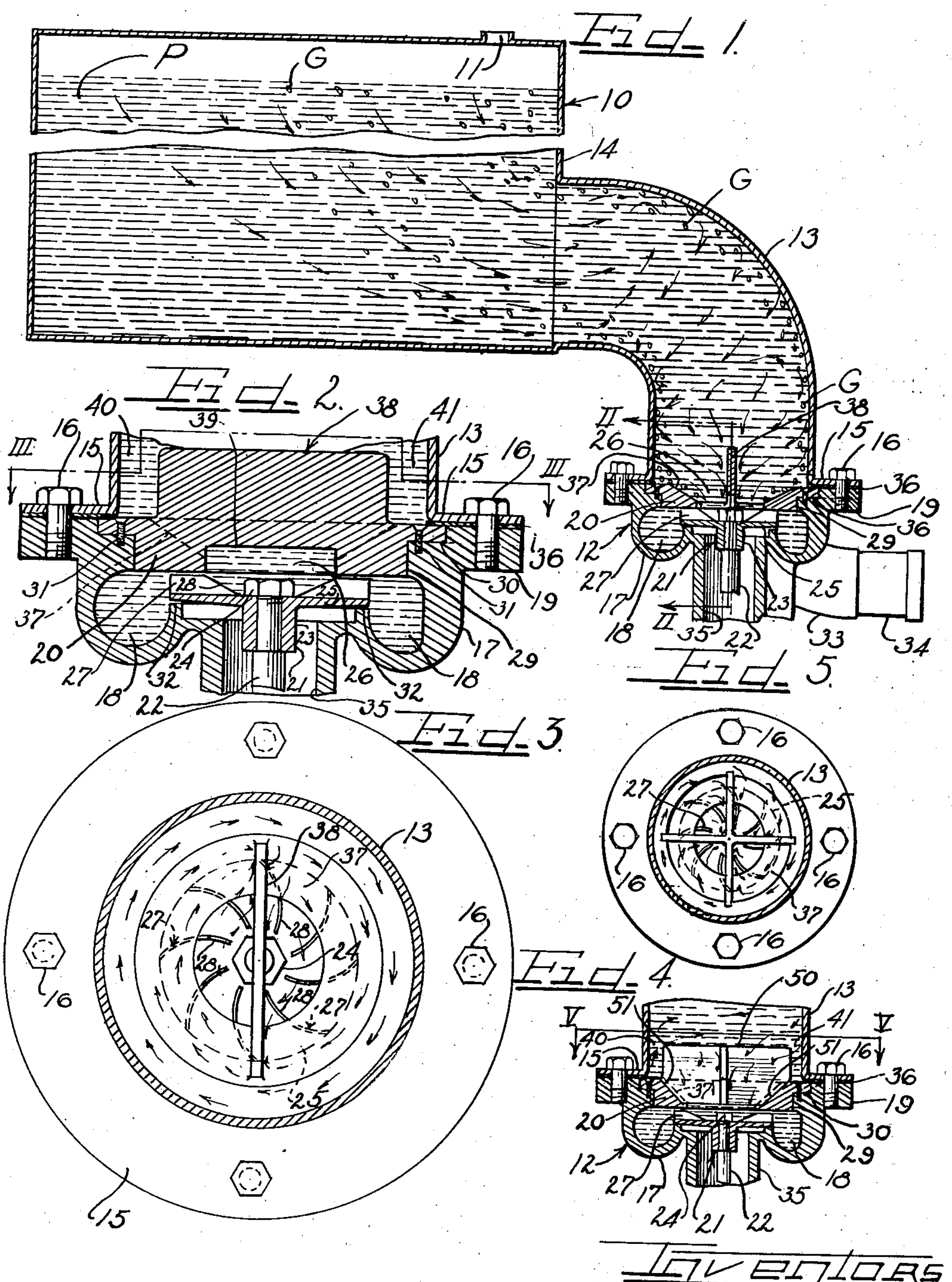

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BOOSTER PUMP ENTRY VANE CONSTRUCTION

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The present invention relates to a booster pump construction adapted for use in a fuel system for pressuring liquid fuel therein while at the same time separating gases and vapors from the fuel as it is being pressured.

More specifically, this invention relates to an entry baffle at the throat inlet of a centrifugal type of booster pump for breaking up a vortex of whirling liquid fuel caused by rotation of an agitating impeller as the fuel enters the pump inlet throat whereby a more efficient separation of gases and vapors from the fuel is effected.

While the invention will be specifically described in connection with aircraft fuel systems, it should be understood that the invention is not limited to such use but is broadly applicable to any system wherein it is desired to deliver only fully liquid material from a source containing the liquid admixed with gases and vapors or having highly volatile ingredients therein. The invention is particularly applicable for use in fuel systems for the prevention of vapor-lock therein.

It has been found possible to actually beat out air, gases and vapors from a pond of fuel by agitating the fuel below the hydraulic gradient of the pond. By using a centrifugal booster pump having a flared inlet throat, the fuel is subjected to a whirlpool action by the impeller thereof as the fuel flows from the pond into the pump inlet, whereby the lighter gaseous bubbles are thrown upwardly and outwardly, where they eventually rise through the pond, while fully liquid fuel is delivered under pressure to a delivery line of the fuel system.

In other words, gases and vapors dispersed throughout the liquid being subjected to agitation are beaten out of the liquid by forming the same into bubbles which rise through the liquid and eventually burst into the atmosphere at the top surface thereof. This beating of the liquid not only creates bubbles from the occluded gases and vapors therein but also induces the liberation of such gases and vapors still held in dissolved form in the liquid. The volatiles dissolved in the liquid, which are about to separate from the liquid as gases or vapors, are caused to separate in the form of newly created bubbles produced by the beating action. As a result, the liquid is not only freed of the occluded gases and vapors but is stabilized against the generation of additional occluded gases or vapors.

In the operation of aircraft with gasoline or other volatile liquid as a fuel, it is well known that, as the atmospheric pressure drops with increase in altitude, a point is finally reached where the air and fixed gases in solution start to evolve, and the lighter constituents in the fuel to vaporize, until the engine fuel pump is no longer capable of delivering fuel in a fully liquid form to the engine carburetor. This condition frequently gives rise to what is known in the art as "vapor-lock." The agitation of the fuel by the usual engine pump serves to aggravate the difficulties that may be experienced, by accelerating the separation of air or other fixed gases or vapors from the liquid fuel. In accordance with the operation of a booster pump construction of the type illustrated and to be described herein, these gases and vapors are liberated from the fuel before they reach the engine fuel pump and the gas and vapor-freed fuel is maintained under pressure as it is fed to the engine fuel pump, so that the vapor-lock condition cannot occur. The engine fuel pump thus not only receives a more stable liquid fuel, but receives this fuel under pressure.

The centrifugal type of booster pump usually employed for such gas and vapor separation includes an impeller having curved vanes partially overlapped by an inlet throat defining member.

For the proper operation of such a booster pump construction, it is necessary that the pump be positioned below the hydraulic gradient of the pond containing the liquid admixed with the gases and vapors. The usual practice is to connect such a booster pump construction directly to a fuel tank, either at the bottom or at one of the sides thereof adjacent the bottom so that the pump inlet throat opens directly into the liquid pond. In aircraft, this relative positioning of the elements of a fuel system is possible only when sufficient room is available below or at the side of a fuel tank mounted either in the wings or the fuselage.

In some aircraft constructions, however, there is no space immediately adjacent the fuel supply tank whereby a booster pump may be mounted on a wall thereof. In such cases, it is necessary to connect the fuel tank and booster pump by a fuel delivery line whose inside diameter should be at least as large as the largest diameter of the pump inlet throat. In those installations where the pump cannot be directly attached to the fuel tank, it has been found most expedient to connect a fuel line to the side of the fuel tank and often this requires that the fuel line be shaped as an enlarged elbow in order to maintain the booster pump below the hydraulic gradient of the fuel tank. The shape of the fuel line along its longitudinal axis and the length thereof will depend entirely upon the distance from the fuel tank and the position of available space for mounting the booster pump. In the present invention, the fuel line connecting the fuel tank and booster pump extends outwardly from a side wall thereof adjacent its bottom wall and then downwardly into connection with the inlet of the pump.

In such an installation, the liquid fuel in the fuel line is subjected to agitation by the impeller of the fuel pump which sets up a vortex or whirling motion in the mass of fluid therein. As gases and vapors are liberated from the fuel at the inlet throat of the pump, they may be trapped by the downwardly flowing fuel and tend to build up a layer immediately above the throat inlet faster than they can rise through the liquid in the fuel line and pond. This layer of gas and vapor bubbles builds up until the impeller vanes are agitating gases or vapors only and not liquid fuel. As the gas or vapor layer offers very little resistance, the impeller speed immediately increases over its normal speed when operating in the liquid fuel. The resulting increased agitation or churning tends to rapidly disperse the gases and vapors upwardly through the fuel line and the dispersement thereof permits the liquid fuel to again flow into the inlet pump throat into contact with the impeller vanes whereby the impeller speed is immediately reduced in overcoming the inertia of the heavier liquid. Thus slugs of liquid and pockets of gas or vapor are alternately acted on by the impeller and pulsations occur in the speed of the pump with resulting pulsations of the liquid fuel into the delivery line of the fuel system. This alternate pumping of gases and vapors and liquid fuel causes an early failure in operation of the vehicle engine which is extremely dangerous when the vehicle is an aircraft as it usually results in complete operational failure of the motive power or may be undesirable by restricting the altitude at which the aircraft can be flown.

The present invention seeks to overcome this hazard by the insertion of a baffle at the inlet of the pump for the purpose of breaking up the vortex or whirlpool flow of the fluid as it enters the pump thereby directing the flow of fully liquid fuel in an axial direction into the pump while simultaneously directing the separated bubbles of gas and vapor outwardly and upwardly around the inner periphery of the fuel line. This assures a constant and even separation of gases and vapors from the liquid fuel and the pumping of a constant volume of fully liquid fuel into the delivery line of the fuel system.

It is then an object of the invention to break up the whirlpool flow of liquid to a centrifugal pump.

An important object of this invention is to maintain a continuous separation of gases and vapors from a liquid fuel and the pumping of a continuous stream of fully liquid fuel by a booster pump receiving fuel flowing in a path whose direction of flow is changed between a source of fuel and the booster pump.

Another object of this invention is the provision of a booster pump having an impeller for agitating liquid fuel flowing thereto with a baffle in the inlet throat thereof for directing the flow of liquid fuel in an axial direction while simultaneously effecting the separation and release of gases and vapors from the liquid fuel.

A still further object of this invention is the provision of an inlet throat construction for a centrifugal type of pump having an agitating impeller and which throat construction directs flow of liquid to the impeller axially thereof in a path separate from a counter-path of released gas and vapor bubbles.

Another and still further object of this invention is the provision of an inlet throat construction, having a baffle therein, for a centrifugal type of pump which throat and baffle coacts with an agitating impeller to effect a separation of gases and vapors from a liquid fuel and to simultaneously pressure the gas and vapor-freed fuel without any pulsations in the discharge from the pump.

A still further object of this invention is the provision of a baffle that seats on the inlet throat of a centrifugal pump to extend thereabove into a path of liquid fuel and to coact with the throat for directing the fuel axially into the throat whereby a constant separation of gases and vapors from the liquid fuel is effected by an impeller which simultaneously pumps a constant volume of gas and vapor-freed fuel to the discharge outlet of the pump.

The novel features believed to be characteristic of the present invention are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and manner of construction, together with further objects and advantages thereof, may best be understood by reference to the following description taken in connection with the accompanying drawing, in which:

Figure 1 is a broken and fragmental vertical cross-sectional view, with parts in elevation, of a booster pump, a fuel tank and a flow connection therebetween, all constructed and arranged in accordance with this invention;

Figure 2 is a fragmental vertical cross-sectional view, with parts in elevation, of the booster pump construction illustrated in Figure 1 as seen in a plane taken along the line II—II thereof;

Figure 3 is a transverse cross-sectional view, with parts in elevation, as seen when taken in the plane indicated by the line III—III of Figure 2;

Figure 4 is a view similar to Figure 2 illustrating a modified form of construction of the booster pump and baffle arrangement shown in Figure 2; and,

Figure 5 is a view similar to Figure 3 illustrating the modified form of construction shown in Figure 4 as seen when taken in the plane substantially along the line V—V of Figure 4.

In Figure 1, the reference numeral 10 designates a gasoline tank having a bent 11 and which holds a pond P of gasoline or other volatile engine fuel. A booster pump assembly 12 is connected in flow communication with the tank 10 by means of a pipe member 13. This pipe member or flow communication 13 is formed as an elbow with one end being connected to a side wall 14 of the tank adjacent the bottom wall thereof and opening into the pond P of fuel. The other end of the pipe member 13 is connected to the booster pump assembly 12 in a manner to be more fully described hereinafter.

The elbow type flow connection between the tank 10 and booster pump assembly 12 illustrated in Figure 1 is made necessary in the present instance by lack of mounting space immediately adjacent the tank for the booster pump. In the usual assembly of elements, a booster pump, such as 12, is mounted directly on either the bottom wall or a side wall of the tank around an aperture therein whereby the pump inlet opens directly into the pond P of fuel. In such installations in which all of the available space is filled by the fuel tank 10, then a connection such as illustrated in Figure 1 may be provided. In this case, the flow communicating member between the fuel tank and booster pump extends outwardly from the tank and then downwardly into connection with the booster pump to position the latter below the hydraulic gradient of the pond P. Liquid fuel flowing from the fuel tank 10 to the inlet of the booster pump assembly 12 thereby changes direction by first flowing outwardly and then downwardly.

The lower end of the pipe elbow member 13 has a radially extending flange 15 thereon to which the booster pump assembly 12 is connected by means of studs 16.

The pump assembly 12 is composed of a casing 17 shaped to define a pump volute chamber 18 and an out-turned annular flange 19 receiving the studs 16 therethrough, a throat ring 20, and an impeller 21 driven by a shaft 22 from a source of motive power such as an electric motor (not shown). The impeller 21 is composed of a hub portion 23 keyed or otherwise secured on the shaft 22 and maintained thereon by a nut 24. The impeller also has a disk portion 25 spanning an inlet opening 26 defined by the throat ring 20. The disk 25 communicates around the periphery thereof with the volute chamber 18 and has upstanding curved pumping vanes 27 underlying th throat ring, as best shown in Figures 1, 2 and 3. It is preferred that the pumping vanes 27 have tapered inner end portions 28 disposed within the inlet opening 26, which, as will be explained hereinafter, serve as agitators or beaters for separating bubbles of gas and vapor flowing through the elbow member 13 to the inlet throat ring 20.

The pump casing 17, between the volute chamber 18 and the out-turned flange 19, is so shaped as to provide an annular shoulder 29 and a substantially horizontal seat 30. The throat ring 20 has its outer periphery shaped to complementally engage within and seat on the surfaces 29 and 30 of pump casing. Connection therebetween is effected by flathead screws 31.

The outer periphery of the impeller, defined by the ends of the vanes 27, is positioned between the throat ring 20 and an annular flange portion 32 (see Figure 2) on the inside of the pump casing 17 in order that the fuel be delivered under pressure through the volute chamber 18 into an outlet 33 which is connected through a pipe line or tube 34 to the inlet of an engine fuel pump (not shown). A pump casing portion 35 houses the driving shaft 22 which is connected to a source of motive power for driving the impeller, such as an electric motor (not shown).

If necessary or desirable, a gasket 36 may be interposed between the flange portion 19 of the pump casing and the radially extending flange 15 of the lower end of the elbow member 13 to seal the connection therebetween.

The throat ring 20 preferably flares outwardly from the inlet opening 26 in an axial direction to provide the angular extending annular surface 37. The outward flaring surface of the throat ring provides an enlarged mouth in direct communication with liquid flowing from the pond P through the elbow member 13 and the tapered surface 37 terminates in laterally spaced relation from the inner periphery of the elbow member 13. It is to be understood, however, that although it is preferred to form the inner periphery of the throat ring as described above, the broad aspects of this invention include a throat ring whose inner periphery may be formed of any flat or curved surfaces at different angles or described by various radii.

When the booster pump 12 is at rest, liquid fuel from the pond P can freely flow through the elbow member 13 and the pump inlet 26 along the open ended channels defined by the impeller disk 25 and the curved vanes 27 into the volute chamber 18 where it can be withdrawn through the outlet 33 and pipe line 34 into the fuel line for discharging the liquid fuel to the inlet side of a fuel pump. Thus, even though the booster pump 12 is at rest, the usual fuel pump in a fuel system can always receive fuel on its suction side from the pond P.

In the event that the fuel pump becomes inoperative, the booster pump 12 can pressure the fuel to the inlet of the pump where it can be forced therethrough or by-passed therearound to feed fuel to an engine carburetor connected to the fuel line (not shown).

In accordance with the principles involved with the pump illustrated and described herein, the booster pump 12 is operated so as to beat out gases and vapors from the liquid fuel being sent to the fuel pump. The vane portions 28 of the impeller 21 agitate the fuel in the inlet 26 of the pump and actually beat out bubbles G of gas and vapor from the liquid fuel. The impeller vanes create a vortex or whirling mass of fluid in the elbow member 13, the particles of which rotate in the same direction as the impeller and move in a corkscrew fashion toward it.

The bubbles G are thrown by the vanes outwardly along the flared surface 37 of the throat ring and, being lighter than the liquid fuel, rise within the elbow member 13 adjacent the inner periphery thereof.

The light bubbles of gas and vapor, rising upwardly in the vertical leg of the elbow member 13, tend to flow into the path of liquid flowing through the horizontal leg of the member 13 and are thereby drawn downwardly towards the impeller with the liquid fuel. A layer or mass of bubbles then forms across the inlet throat cutting off the flow of liquid fuel into the throat. The vane blades then tend to race at full speed by reason of the low inertia of the gas and vapor bubbles. Increased agitation of the mass of bubbles or pockets of vapor tends to force bubbles outwardly along the tapered surface of the throat ring thereby breaking up the pocket. As soon as the mass of bubbles is dispersed, a slug of liquid fuel flows into the inlet throat and the speed of the impeller is immediately reduced by the inertia of the liquid fuel against rotation.

This alternate formation of vapor pockets and feeding of slugs of liquid, together with the alternate variations in impeller speeds, causes pulsations in the delivery of the fuel to the fuel line. The effect of this pulsating delivery is to effect early operational failure of the motive power which depends upon the constant delivery of fully liquid fuel thereto.

In order to overcome this pulsating delivery of fuel, a baffle member 38 is inserted in the inlet 26 of the booster pump in such a manner as to break the vortex of the whirling mass of liquid fuel in the elbow member 13 adjacent the pump inlet throat.

The baffle member 38 comprises a plate member having tapered corners for seating on the tapered surface 37 of the throat ring 20. A recess 39 is provided along the bottom edge of the baffle in order that there be sufficient clearance above the impeller nut 24 and the agitating portions 28 on the vanes. The length of the baffle 38 is substantially the same as the diametrical distance across the throat ring at its widest tapered portion. This provides spaces 40 and 41 between the ends of the baffle and the adjacent peripheral portion of the elbow member 13. The height of the baffle is such as to extend above the throat ring 20 and into the vertical leg of the elbow member 13.

The tapered corners of the baffle seated on the tapered surface 27 of the throat ring are connected to the throat ring by means of a bond such as brazing, welding or the like. It is to be understood, however, that the throat ring 20 and baffle 38 may be formed or cast as a single unitary member. Likewise, radial slots may be provided along the tapered surface 37 of the throat ring 20 within which the tapered corners of the baffle may be pressed or otherwise secured in place in a manner similar to that to be described more fully hereinafter.

As shown by the arrows in Figure 3, the whirling mass of liquid fuel in the vertical leg of the elbow member 13 strikes the sides of the baffle 38 where the liquid fuel is deflected axially downward towards the impeller 21. The baffle 38 does not restrict the separation of gas and vapor bubbles from the liquid fuel by agitation of the impeller vanes 27 and the bubbles are thrown outwardly along the tapered surface 37 of the throat ring where they rise upwardly around the inner periphery of the elbow member 13. The bubbles G continue to rise through the elbow member into the pond P and upwardly in the latter to the top thereof where they burst at the surface and liberate the entrapped gases and vapors to the atmosphere through the vent 11. Even though some of the bubbles G are again drawn downwardly towards the axis of rotation of the impeller, they are immediately thrown outwardly by the impeller vanes and the axially directed fully liquid fuel only flows into the open ended channels defined by the impeller, the pump casing and the throat ring for delivery through the volute chamber into the delivery line of the fuel system. By breaking the vortex or the whirling mass of liquid fuel adjacent the rotational axis of the impeller, the opportunity for the bubbles G forming in a mass or layer across the inlet throat is eliminated. Consequently, the separation of gas and vapor bubbles and the simultaneous pressuring of the liquid fuel continues at a constant rate and thereby eliminates pulsations in the delivery of the fuel.

It will be observed from the foregoing that a counter-current circulation of fuel and bubbles is thus created in the elbow member 13, with the bubbles rising through the fuel along the inner periphery of the elbow member and with the fully liquid fuel being fed axially towards the impeller through the inlet throat. The fully liquid fuel is then subjected to centrifugal action between the vanes 27 on the impeller and the throat member to effect a constant delivery of pressured fuel to the delivery line of the fuel system.

The spaces 40 and 41 between the baffle 38 and the inner periphery of the elbow member 13 permit the bubbles to flow upwardly along the tapered surface 37 of the throat ring and to then rise along the inner periphery of the elbow member without any interference by the baffle. Thus, the agitating action of the impeller vanes on the fuel induces bubble formation and stabilizes the liquid through separation therefrom of volatiles about to become vapors or gases and the extending baffle breaks up the whirling motion of the mass of fluid whereby fully liquid fuel only flows into the volute chamber 18.

While the fuel system as described is used in aircraft which fly to high altitudes, the booster pump 12 can be started before the fuel starts breaking up in the pond or the flow communication elbow so that the fuel will be maintained stabilized at practically any atmospheric pressures encountered. As a result, the aircraft can be flown to much higher altitudes, and even though the fuel breaks up at these high altitudes, the booster pump will insure delivery of only fully liquid fuel from the pond to the fuel delivery line.

A modified form of construction is illustrated in Figures 4 and 5 of the drawing. Like numerals refer to like parts throughout all of the figures of the drawing.

The booster pump construction illustrated in Figures 4 and 5 is exactly the same as that shown in the previous figures of the drawing. The only change is in the construction of the baffle means.

In the modified form of baffle construction, a cross-shaped baffle member 50 is formed by right angularly extending plate members whose lower outer corners are beveled at the same angle as the tapered surface 37 on the throat ring 20. In this form of construction, it is preferred that diametrically opposed slots 51 be provided along the tapered surface 37 of the throat ring for receiving therein the beveled corners of the baffle 50. The baffle member is press-fitted within these slots 51 for ease in removal or may be positively connected by means of brazing, welding or the like. Likewise, it is within the purview of this invention to form the throat ring 20 and the baffle 50 as an integral member.

The lower edge of the baffle member 50 is spaced upwardly from the vanes 27 and the impeller nut to eliminate any interference in the separation of gas and vapor bubbles within the inlet throat 26.

The length of the plates forming the baffle member 50 is such that they terminate in spaced relation from the inner periphery of the elbow member 13 to provide the spaces 40 and 41 for the same purpose as hereinbefore described. Also, the baffle member 50 extends above the throat ring 20 into the vertical leg of the elbow member 13 in order to break the vortex or the whirling mass of liquid fuel adjacent the inlet throat 26.

The baffle member 50 coacts with the booster construction 12 in exactly the same manner as the baffle 38 which was described in detail above. The baffle member 38 diametrically extends across the inlet opening 26 to provide adjacent inlet openings for directing the liquid fuel axially to the impeller. The provision of the baffle member 50 further divides the inlet opening into four axial channels through which the liquid fuel is directed toward the impeller.

From the foregoing description, it will be apparent that the booster pump described has three functions; the first, to separate out bubbles of gas or vapor which form at the inlet, due to the agitation of the liquid, and elsewhere in the pond or flow connection between the pond and booster pump; the second, to break the vortex or whirling mass of liquid fuel to direct the liquid axially toward the impeller; and the third, to pressure the fully liquid fuel through a fuel line.

The booster pump construction of this invention having a baffle as described effects a full separation of gases and vapors from the liquid fuel and maintains a constant flow of fuel under pressure to a fuel line thereby eliminating any pulsations in the fuel delivery.

While particular embodiments of this invention have been illustrated, it will, of course, be understood that the invention should not be limited thereto since many other modifications may be made, and, therefore, it is contemplated by the appended claims to cover all such modifications as fall within the true spirit and scope of the present invention.

We claim as our invention:

1. In a booster pump construction having a tapered inlet throat, a source of liquid fuel having gas and vapor dispersed therethrough from which said liquid is supplied to said inlet throat, and an impeller underlying said throat for agitating the liquid in a whirling motion as it flows to said throat, the improvements comprising flow communicating means connecting said source of liquid and said throat, and a baffle member extending across and axially outward from the mouth of said throat into said communicating means in spaced relation thereto for breaking the whirling motion of said agitated liquid whereby the liquid flows axially to the impeller inside of a path of gas and vapor bubbles separated from the fuel by agitation by said impeller.

2. In a booster pump construction having a tapered inlet throat, a source of liquid fuel having gas and vapor dispersed therethrough from which said liquid is supplied to said inlet throat, and an impeller underlying said throat for agitating the liquid in a whirling motion as it flows to said throat, the improvements comprising a hollow elbow member interposed between said source of liquid and said throat for positioning the throat below the hydraulic gradient of said source, and a baffle member extending across the mouth of said throat into said elbow member and terminating in spaced relation from the inner periphery of said elbow member, said baffle member extending axially outward from the throat into the whirling path of movement of the liquid in said elbow member whereby the liquid is directed axially to the impeller inside of a path of gas and vapor bubbles separated from the fuel by agitation of said impeller and flowing outwardly and upwardly along said throat between said baffle and the inner periphery of the elbow member and along said inner periphery.

3. In a booster pump construction having an inlet throat, an agitating impeller at one side of said throat, and a source of liquid fuel having gas and vapor dispersed therethrough, the improvements which comprise a flow communication member connecting said source of liquid fuel and the other side of said inlet throat, and baffle means within and spaced from said communication member for directing the flow of fuel from said source to said impeller in a path counter to and within a path of gas and vapor bubbles separated from the fuel by agitation by said impeller.

4. In a booster pump construction having a tapered throat, an agitating impeller on one side of said throat, and a source of liquid fuel having gas and vapor dispersed therethrough, the improvements which comprise a flow connecting member between said source and said tapered throat on the other side thereof for changing the direction of flow of the liquid therebetween, said impeller agitating said liquid fuel in a whirling motion as it flows through said throat for separating gas and vapor bubbles from the fuel and for throwing said bubbles outwardly away from the axis of rotation of the impeller, and means extending across said throat within and in spaced relation to said flow connecting member for breaking the whirling motion of the liquid adjacent the throat at the rotational axis thereof whereby gas and vapor-freed fuel flows through the throat.

5. In a centrifugal pump having an inlet and an agitating impeller, the improvements which comprise a removable throat ring in said inlet overlapping said impeller in closely spaced relation, said throat ring having a tapered mouth on the side thereof opposite the side adjacent said impeller, and a baffle member extending diametrically across said mouth with one edge overlying the portion of said impeller not overlapped by said throat ring and in spaced relation therefrom with its opposite edge being spaced outwardly from said mouth.

6. In a pump construction having an inlet throat, an impeller having pumping vanes underlapping said throat to centrifugally whirl and pump fluids received from the throat, and uncovered agitating vanes on said impeller exposed to the throat opening for acting on fluids flowing to the pumping vanes and effective for ejecting bubbles of gas and vapor from the fluids before the fluids reach the pumping vanes, the improvement of a baffle extending completely across the throat opening and having side faces effective for breaking up the whirling of fluid flowing to the pumping vanes while directing the fluids substantially axially of the throat opening.

7. In a fuel system having a tank for a pond of fuel, a pump having an inlet throat below the top of the tank for receiving fuel by gravity flow from the tank, a fuel conduit connecting the inlet throat and the tank, a centrifugal impeller in said pump adjacent said inlet throat for centrifugally whirling and pumping fuel received from the throat, and a baffle extending completely across the throat projecting into the conduit in spaced relation therefrom effective for breaking up whirling of fuel in the conduit to direct the fuel axially of the throat opening and toward the impeller.

8. In a fuel system, means for containing fuel, a pump having an inlet throat receiving fuel by gravity flow from said means, a centrifugal impeller in said pump adjacent said inlet throat, agitating means on said impeller exposed to the throat opening and effective for circulating bubbles of gas and vapor in said means away from the pump, a baffle extending completely across the throat opening and projecting into said means in spaced relation from the means for impeding the whirling of fuel flowing to the pump while permitting free flow of ejected bubbles of gas and vapor in the means.

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