United States Patent [19]

Sloan

[11] **3,867,070**

[45] **Feb. 18, 1975**

[54] **JET WATER PUMP APPARATUS**

[76] Inventor: **Albert H. Sloan,** 4201 Kean Rd., Ft. Lauderdale, Fla. 33314

[22] Filed: **June 28, 1973**

[21] Appl. No.: **374,343**

[52] **U.S. Cl.**..... **417/34,** 417/40, 417/200, 417/234, 418/98

[51] **Int. Cl.**..... **F04b 49/04,** F04d 9/00

[58] **Field of Search** 417/200, 40, 319, 429, 417/13, 34, 234; 418/98

[56] **References Cited**

UNITED STATES PATENTS

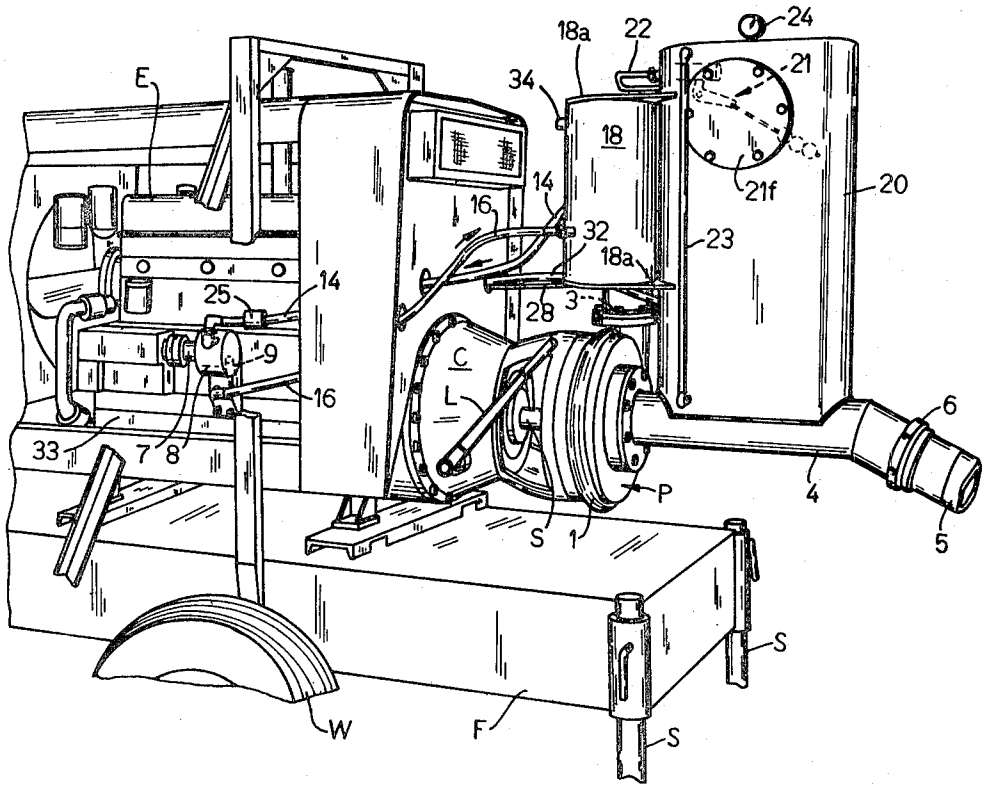
1,201,594	10/1916	King	417/429
1,784,205	12/1930	Seeger	417/200
1,910,775	5/1933	Saxe	417/200
2,071,703	2/1937	Nelson et al.	417/200
2,092,104	9/1937	Bowden	417/319
2,194,054	3/1940	Peterson	417/429
2,273,281	2/1942	McGrath	417/34
2,384,172	9/1945	Jauch et al.	417/200
2,535,583	12/1950	Kroll	417/200
3,385,218	5/1968	West	417/40
3,591,316	7/1971	Piccirilli	417/435
3,786,869	1/1974	McLoughlin	417/34

Primary Examiner—William L. Freeh
Assistant Examiner—Gregory Paul LaPointe
Attorney, Agent, or Firm—James E. Nilles

[57] **ABSTRACT**

A mobile, jet type water pump apparatus which is self-priming and in which the water pump stays primed regardless of whether the water pump is running. The apparatus includes a self-priming tank which is primed by a vacuum pump directly driven by a mobile power source, such as an internal combustion engine, and the apparatus also includes a safety chamber which has a float switch that causes the engine to shut-down in the event that the float valve in the priming chamber fails, there being an electrical connection from the safety chamber float switch to a fuel solenoid valve of the engine and which can shut the engine down. The arrangement also provides that air is sucked in by the vacuum pump and is mixed with lubricating oil from the engine and functions to cool the vacuum pump. The oil-air mixture is returned to a separator tank which separates the oil from the air, the oil being returned to the engine block and the air is vented to the atmosphere.

10 Claims, 3 Drawing Figures



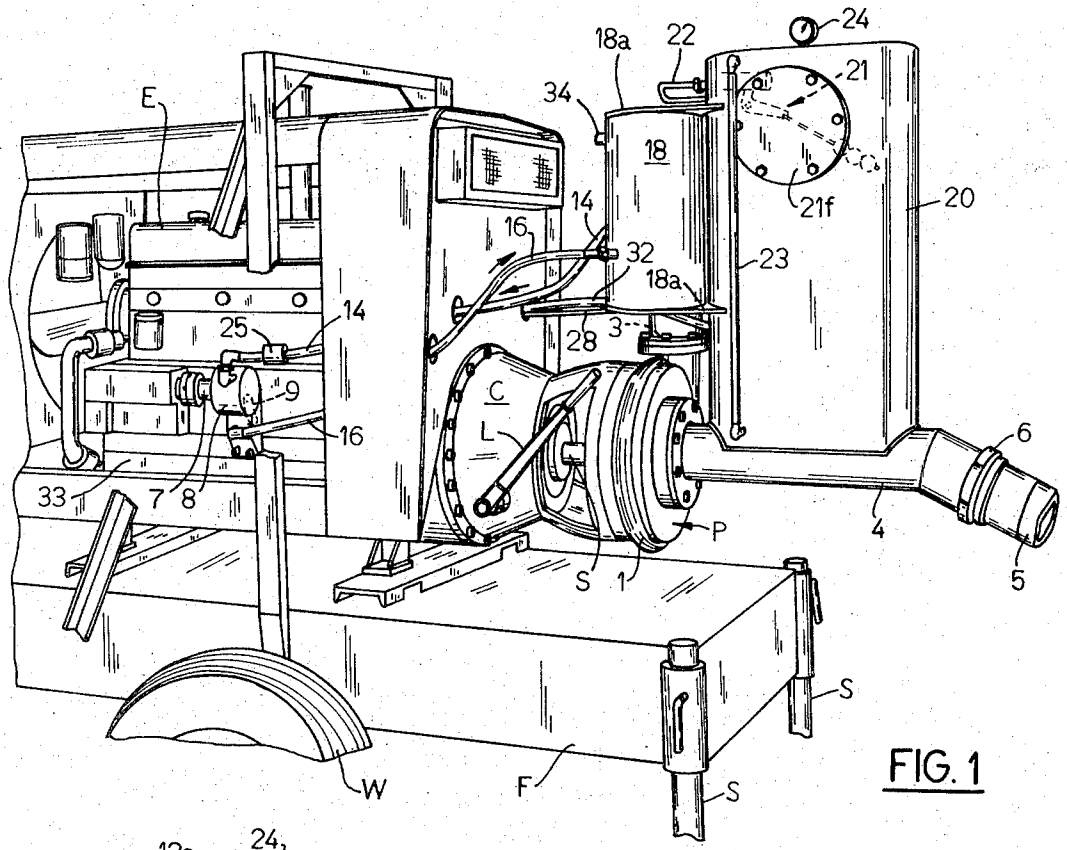

24
18a
22
21
34
E
18
14
16
32
21f
20
23
18a
14
25
28
3
9
C
L
16
6
33
7
8
P
4
S
1
5
S
W
F
S

FIG. 1

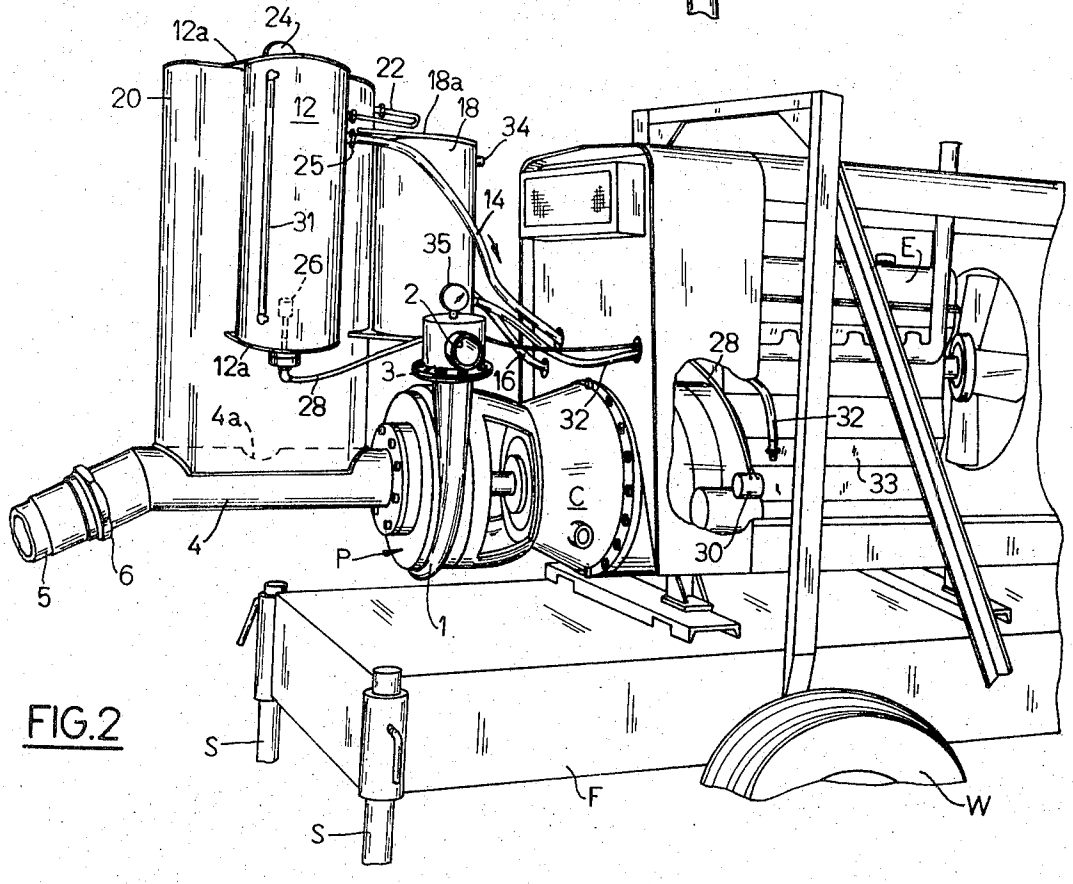
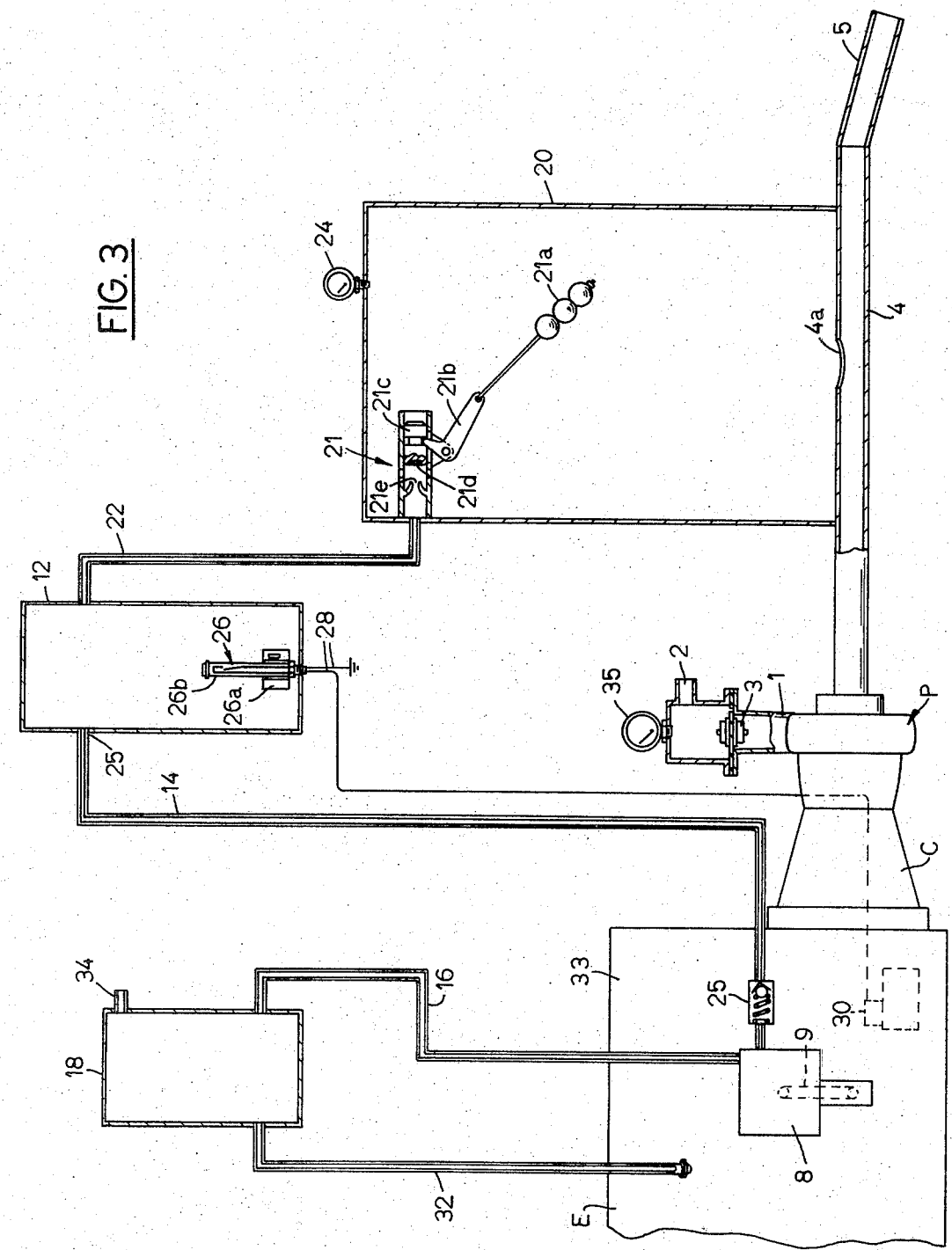

12a
24
22
18a
20
12
18
34
25
14
31
35
26
E
2
28
12a
3
16
4a
28
32
32
33
C
4
P
30
5
6
1
S
F
W
S

FIG. 2

FIG. 3


5
20
24
21a
4a
4
21c
21b
21
21e
21d
22
12
26
28
26b
26a
25
14
35
2
3
1
P
C
34
16
33
25
30
9
18
8
32
E

JET WATER PUMP APPARATUS

BACKGROUND OF THE INVENTION

The present invention relates generally to jet type water pumps. Such prior art pumps have been used in the past for example, for pumping water out of excavations or the like and forcibly ejecting the water as a jet stream. Such devices have had several shortcomings, for example, one of the primary shortcomings of the prior art pumps is the difficulty in priming such pumps and furthermore the difficulty in maintaining the prime on such a pump. For example, it is sometimes necessary to shut down the pump for one reason or another, for instance, when the well points were being changed. Very often under those circumstances, the pump lost its prime and that involved considerable trouble and down time in again priming the system into operating condition. These prior art pumps often required numerous valves, levers or other adjustments to be manipulated in a certain sequence in order to eventually bring the pump to a primed condition.

SUMMARY OF THE INVENTION

The present invention provides a highly mobile jet water pump which is self-priming, and which can maintain itself primed even though the water pump is shut down for periods of time. The pump apparatus provided by the present invention includes a priming tank which is first filled with water before the water pump, such as a centrifugal volute type pump, is turned on. The priming tank is filled by means of a vacuum pump which is mounted directly on and directly driven by a power source, such as an internal combustion engine. The vacuum pump functions to pull a vacuum in the priming tank by sucking air out of the priming chamber through a float valve in the priming chamber and through a safety chamber and before it reaches the vacuum pump. The float valve shuts off air to the vacuum pump when the water reaches a predetermined level in the priming tank, thus cutting off the vacuum in the priming tank and thereby stopping flow of water into the priming tank. The safety chamber also acts to shut off the vacuum pump if the float valve in the priming tank fails. This is accomplished by a float switch in the safety chamber which shuts off the engine when water from the priming tank enters the safety chamber and rises sufficiently therein. Air enters the vacuum pump and is mixed with lubricating oil from the engine crankcase and acts to cool the vacuum pump. The mixture of oil and air is returned to a separator tank which functions to separate oil from the air, the oil being returned to the engine block while the air is dumped to the atmosphere.

Another aspect of the invention relates to providing such a water pump which is highly portable and self-contained, and which includes a clutch that is easily operable to prevent running the pump seal in a dry condition. A one-way valve functions to seal the water pump discharge end until the pump is primed, the discharge valve can open when the pump is operating to then permit normal operation of the pump.

The pumping apparatus provided by the present invention is automatically primed and stays primed even though the water pump may be declutched and thus shut down for periods of time.

These and other objects and advantages of the present invention will appear hereinafter as this disclosure progresses, reference being had to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a mobile, jet type water pump apparatus made in accordance with the present invention with certain parts being shown as broken away or removed for the sake of clarity;

FIG. 2 is another perspective view of the pump apparatus but taken generally from the opposite side of that shown in FIG. 11;

FIG. 3 is a schematic diagram of the apparatus shown in FIGS. 1 and 2;

DESCRIPTION OF A PREFERRED EMBODIMENT

The water jet pump apparatus provided by the present invention is highly mobile and compact for rapid transport to the work site and instantaneous use. A mobile frame F having ground wheels W and an elevationally and vertically adjustable leg stands S whereby the apparatus can be easily transported, moved about and quickly set up in proper operating position. The apparatus also includes a power source, such as an internal combustion engine E. A manually operated clutch C, is directly connected to the fly-wheel (not shown) of the engine and in axial alignment with the engine, and the clutch is manually engageable and disengageable by its lever L located at one side of the machine (FIG. 1). Directly connected to the output shaft 5 (FIG. 1) of the clutch is a centrifugal water pump P which is shown as being of the type having a volute housing 1 and a discharge outlet 2 (FIG. 2). The pump P also includes a one-way check valve in the form of a conventional one-way flap valve 3 (FIG. 6) located at the discharge side of the pump and which functions to seal the discharge side of the pump for example, when the pump P is not running and permits priming of the pump, as will appear later. The inlet of the pump P is in communication with water inlet means for the pump in the form of the water inlet pipe 4, which inlet pipe 4 can be quickly coupled to a long flexible hose 5 or the like by means of the coupling 6.

A vacuum pump 8 (FIG. 1) for example, of the vane type, is mounted on the engine and is driven by the engine through a coupling 7 (FIG. 1) directly by the engine. The inlet of the vacuum pump is connected to a safety chamber 12 (FIGS. 2 & 3) by means of a flexible air intake conduit 14. The outlet of the vacuum pump is connected by a flexible conduit 16 to a separator tank 18. Oil is picked up by the vacuum pump 8 directly through a passage 9 in its housing from the main oil gallery of the engine at the rate of about one quart per minute, and this oil acts to cool the vacuum pump.

The apparatus also includes a larger priming tank 20 which is secured directly, as by welding its open bottom directly to the pump intake pipe 4. The interior of the upper end of the priming tank communicates through an air line 11 with the interior of the upper end of the safety chamber 12. The tank 20 is also in direct fluid communication with the water intake pipe 4 by means of opening 4*a* in the upper side of the pipe 4. The priming tank 20 has a float valve 21 in its upper end which includes a float 21*a* (FIG. 4) that is pivoted on arm 21*b* to shift valve element 21*c*. Element 21*c* has a rubber seat 21*d* that can abut against orifice 21*e*, to thereby close air line 22 leading to the safety tank 12, when the priming tank 20 is full of water. Closing the air line

thereby shuts off the air to the vacuum pump and prevents water from overflowing from tank **20** into the air line **22,** flooding the safety chamber **12** and then going into the vacuum pump **8.** As will later appear, the safety chamber **12** also acts as a secondary means to prevent water from entering the vacuum pump.

The float valve **21** is accessible via a removable plate **21***f* (FIG. **1**) detachably secured to the side of tank **20.**

The vacuum produced in tank **20** by pump **8** thus holds the water in the tank **20;** if there is no vacuum in tank **20,** then there is no water in tank **20.**

It will also be noted that the separator tank **18** and the safety chamber **12** are connected directly, as by welding the connecting plates **18***a* and **12***a*, respectively, to the priming tank **20,** thus forming a compact unit.

The lower end of safety chamber **12** has a float switch **26** therein, which is electrically connected via wires **28** (FIG. **2**) to a conventional electric solenoid fuel valve **30** (FIG. **2**) of the engine. The switch **26** is conventional and of the normally open type, that is, it is open when its float member **26***a*, which is slideable on the rod **26***b*, is in the lowest position. The safety chamber **12** functions, when its float **26***a* rises, to shut off the engine. In this manner, if the float valve **21** in the priming tank **20** fails, the water then enters the safety chamber via air line **22** and rises sufficiently in chamber **12** to raise the float member **26***a*, thereby shutting the engine off. Thus, the chamber **12** and float valve **21** act as a secondary means to prevent water from entering the vacuum pump **8.**

The safety chamber also has a water level indicating transparent sight tube **31.**

The tank **20** also has a water level indicating, sight gauge tube **23.** A vacuum gauge **24** is provided at the top of tank **20** for reading the vacuum pulled by the vacuum pump **8.**

The above arrangement is such that before the water pump P is engaged by operating the clutch lever L, the priming tank **20** is filled with water from the water intake pipe **4** through opening **4***a* as follows. The vacuum pump **8,** driven directly by the engine, acts to pull air from the safety chamber **12,** through air line **22,** and consequently from the priming tank **20,** thereby causing water to be sucked up from pipe **4** and into the priming tank **20.** Thus the air that is sucked from the priming tank by the vacuum pump first passes through the air line **22** and into the safety chamber **12** and the air then passes through orifice **21***e* and from the safety chamber **12** via conduit **14** to the vacuum pump **8.** As previously mentioned, the vacuum holds water in the tank **20.**

The air that enters the vacuum pump **8** is mixed with oil which functions to cool the vacuum pump, and the mixture is then discharged from the vacuum pump **8** via conduit **16** and into the separator tank **18.** The separator tank functions to separate the oil from the air, the oil being returned via flexible conduit **32** to the engine block **33** as shown in FIG. **2,** and the air in turn is vented into the atmosphere through the open nipple **34** extending from the inside of the top of tank **18.**

The air that comes out of the safety chamber via conduit **14** passes through a check valve **25** at the intake side of the vacuum pump, where check valve **25** keeps the air from returning to the safety chamber **12** when the engine is shut off.

The water pump P is capable, for example, of developing a pressure of 180 p.s.i., which is indicated on gauge **35,** and a pumping volume of about 680 gallons per minute.

With the present invention, the pump is first primed automatically, when the engine is turned on, by means of the vacuum pump **8** and before the water pump P itself is driven by the engine by engagement of the clutch C. After the water pump is primed and has been engaged and in operation, it is often necessary to cease operating the water pump by declutching it, for example, to change well points or to change the location of the intake end of the water inlet hose **5.** The present invention insures that the water pump remains primed even though it is shut down, and this is accomplished because of the water in the priming tank **20.**

During operation, the float valve in tank **20** functions to prevent water from rising above a predetermined height in tank **20** by closing the air line **22** and thus cutting off air to the vacuum pump. If however, the float valve in tank **20** fails to operate for some reason or another, the safety chamber **12** and more specifically, the float switch **26** therein, acts as a secondary means to prevent water from flowing into the vacuum pump. In other words, when the water from tank **20** flows into the safety chamber **12** in sufficient quantity to raise the float member **26***a*, the float switch **26** functions to shutdown the engine, thus prevent damage.

The apparatus provided by the present invention is highly mobile and compact, the three tanks **12, 18** and **20** all being rigidly secured together and directly on the water intake pipe **4** which in turn is rigidly connected to the pump itself. The apparatus is automatic in its functioning and failproof in its operation.

I claim:

1. Self-priming jet type water pump apparatus comprising a power source, a water pump connected to and driven by said power source, water inlet means for said pump, a priming tank in fluid receiving communication with said water inlet water means, a safety chamber, an air line placing said priming tank in communication with said safety chamber; a vacuum pump driven by said power source and having an air inlet conduit connected to said safety chamber whereby said vacuum pump can draw a vacuum from said safety chamber, said airline and consequently from said priming tank to thereby create a vacuum in said priming tank which causes water to be drawn up into said priming tank from said water inlet means; a float type valve mounted in said priming tank and actuated by water level of a predetermined height in said priming tank to close said air line to said safety chamber and consequently shut off the vacuum in said priming tank, a float switch in said safety chamber and having a connection to said power source for shutting off said power source when water enters said safety chamber from said priming tank and rises in said safety chamber to a predetermined level, a separator tank, a conduit connecting said vacuum pump with said separator tank whereby said vacuum pump can deliver a mixture of air and oil to said separator tank for separating air from said oil.

2. A self-priming jet type water pump apparatus comprising a mobile power source, a disengagable clutch connected to the output of said power source and a water pump connected to said clutch for being driven by said power source through said clutch, water inlet means for said pump, a priming tank in fluid receiving

connection with said water inlet water means, a safety chamber, an air line between the upper end of said priming tank and said safety chamber, a vacuum pump driven by said power source and having an air inlet conduit connected to said safety chamber whereby said vacuum pump draws air from said safety chamber through said air line and consequently from said priming tank to thereby create a vacuum in said priming tank and causes water to be sucked up into said priming tank, a float type valve mounted in the upper portion of said priming tank and actuated by water level of a predetermined height in said priming tank to close said air line to said safety chamber and consequently shut off the vacuum pump and vacuum in said priming tank, a float switch in said safety chamber and having a connection to said power source for shutting off said source when water enters said chamber from said priming tank and rises in said chamber to a predetermined level, said clutch being disengageable to thereby stop said water pump while vacuum maintains water in said priming tank for subsequent priming of said water pump when said clutch is engaged, a separator tank, said vacuum pump having an outlet, a conduit connection between said outlet of said vacuum pump and said separator tank for delivering a mixture of air and oil to said separator tank.

3. A self-priming jet type water pump apparatus comprising a mobile power source, a volute type water pump connected with and driven by said power source, a water inlet pipe extending rigidly from said pump and for conducting water to said pump, said pump having a discharge end and a one-way vlve in said discharge end for sealing the latter against entry of air when said pump is inoperative, a priming tank in fluid communication with said water inlet pipe, a safety chamber adjacent said priming tank, an air line between the upper end of said priming tank and said safety chamber, a vacuum pump driven by said power source and having an air inlet conduit connected to said safety chamber whereby said vacuum pump draws a vacuum in said safety chamber through said air line and consequently in said priming tank to thereby create a vacuum in said priming tank which causes water to be sucked up into said priming tank from said inlet pipe, a float type valve mounted in said priming tank and actuated by water level of a predetermined height in said priming tank to close said air line to said safety chamber and consequently shut off the vacuum in said priming tank, a float switch in said safety chamber and having a connection to said power source for shutting off said source when water enters said safety chamber from said priming tank and rises in said safety chamber to a predetermined level, a separator tank, said vacuum pump having a conduit connection with said separator tank for delivering a mixture of air and oil to said separator tank.

4. The apparatus set forth in claim **3** including a disengagable clutch between said power source and said water pump, said clutch being disengagable to thereby stop said water pump while vacuum maintains water in said priming tank for subsequent and immediate priming of said water pump when said clutch is engaged.

5. The pump apparatus set forth in claim **1** further characterized in that said power source has a fuel valve, said connection of said float switch to said power source is an electrical connection, and said electrical connection is to said fuel valve of said power source.

6. The apparatus set forth in claim **2** further characterized in that said power source has a fuel valve, said connection of said float switch to said power source is an electrical connection, and said electrical connection is to said fuel valve of said power source.

7. The apparatus set forth in claim **3** further characterized in that said power source has a fuel valve, said connection of said float switch to said power source is an electrical connection, and said electrical connection is to said fuel valve of said power source.

8. A mobile self-priming jet type water pump apparatus comprising a mobile frame having ground wheels for transporting said apparatus, an internal combustion engine, said engine having a fuel valve, a disengagable clutch connected directly to said engine, said clutch having an output shaft, a water pump connected directly to and driven by said clutch outtput shaft, a water inlet pipe extending rigidly from said pump and for conducting water to said pump, said pump having a discharge end and a check valve in said discharge end for sealing the latter against entry of air when said pump is inoperative, a priming tank rigidly mounted on and in fluid communication with said water inlet pipe, a safety chamber rigidly mounted on said priming tank, an air line between and in communication with the upper end of said priming tank and the upper end of said safety chamber, a vacuum pump mounted on and driven directly by said engine and having an air inlet conduit connected to and in communication with the upper end of said safety chamber whereby said vacuum pump draws a vacuum in said safety chamber through said air line and consequently in said priming tank to thereby create a vacuum in said priming tank which causes water to be sucked up into said priming tank from said inlet pipe, a float type valve mounted in the upper portion of said priming tank and actuated by water level of a predetermined height in said priming tank to close said air line to said safety chamber and consequently shut off the vacuum in said priming tank, a float switch in said safety chamber and having an electrical connection to said fuel valve for shutting off said fuel valve and consequently said engine when water enters said safety chamber from said priming tank and rises in said safety chamber to a predetermined level, a separator tank, said vacuum pump having an outlet, a conduit connection between said outlet of said vacuum pump and separator tank for delivering a mixture of air and oil to said separator tank, said separator tank being mounted on said priming tank.

9. The apparatus set forth in claim **8** further characterized in that said separator tank is rigidly connected to said priming tank.

10. The apparatus set forth in claim **8** further characterized in that said fuel valve is an electric solenoid operated valve, said clutch is in axial alignment with said engine, said water pump is a volute type pump and said water inlet pipe is in axial alignment with said volute type water pump.

* * * * *