June 30, 1942. W. J. CONERY ET AL 2,288,437

AIR CHARGER FOR STORAGE TANKS

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Fig. 1

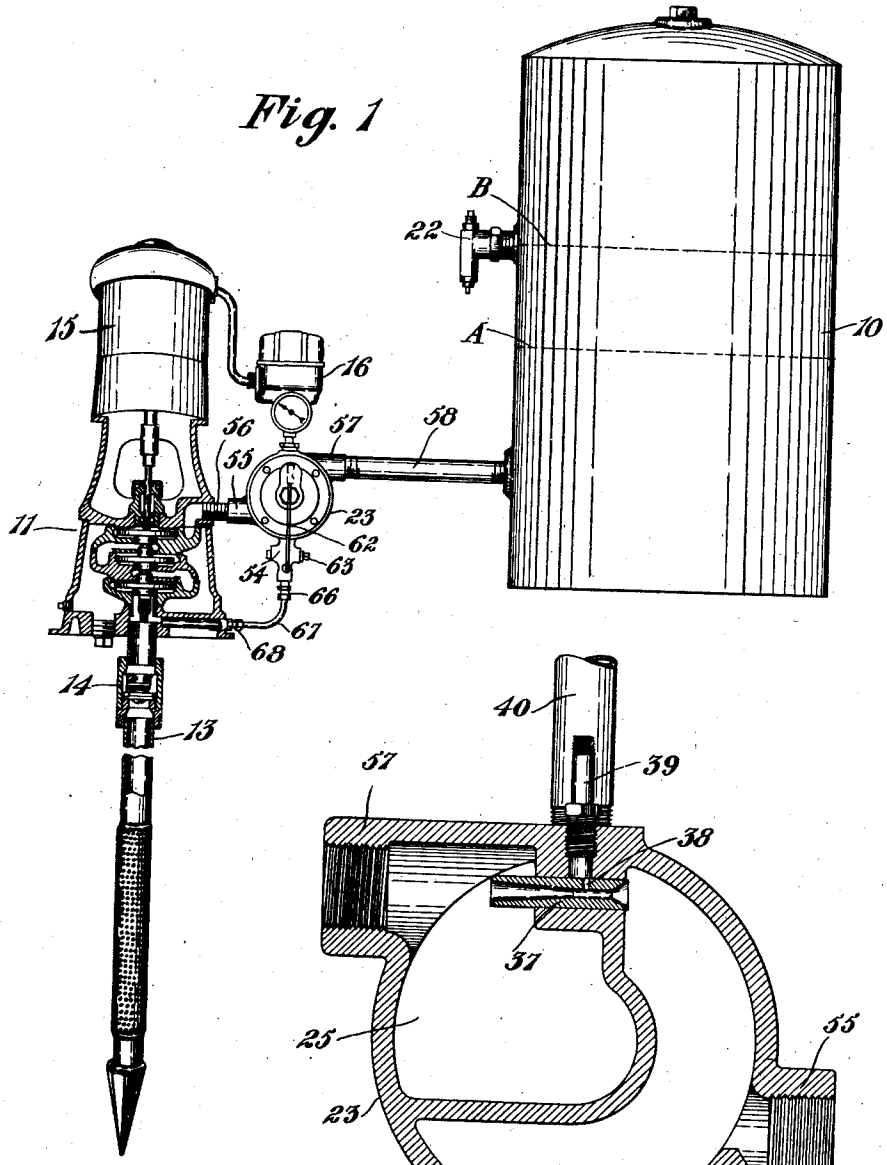






Fig. 6

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AIR CHARGER FOR STORAGE TANKS

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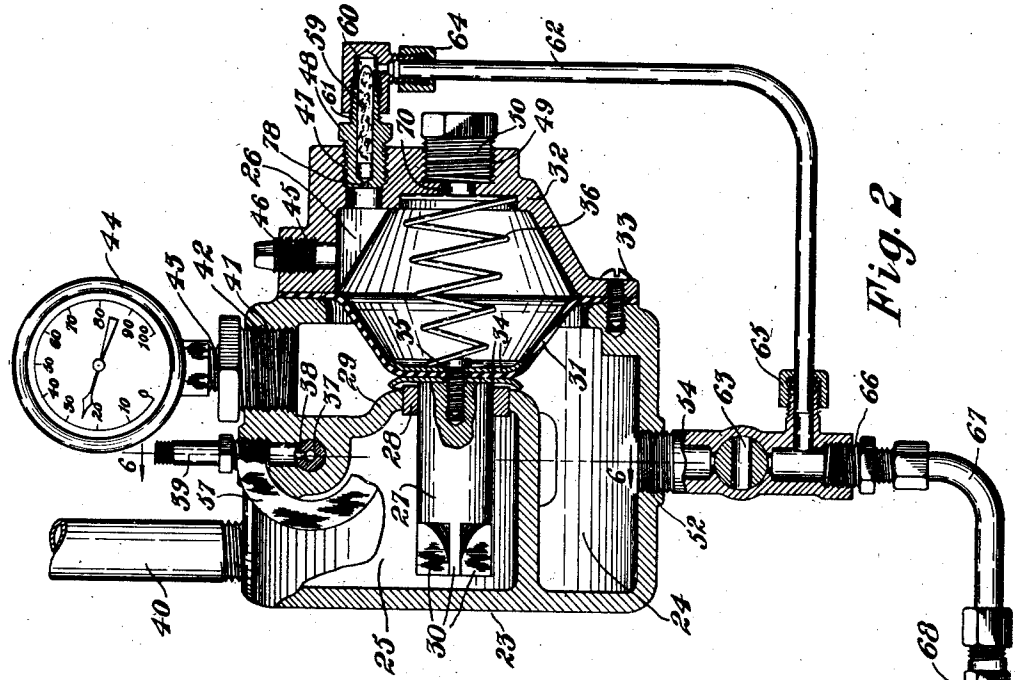


Fig. 2

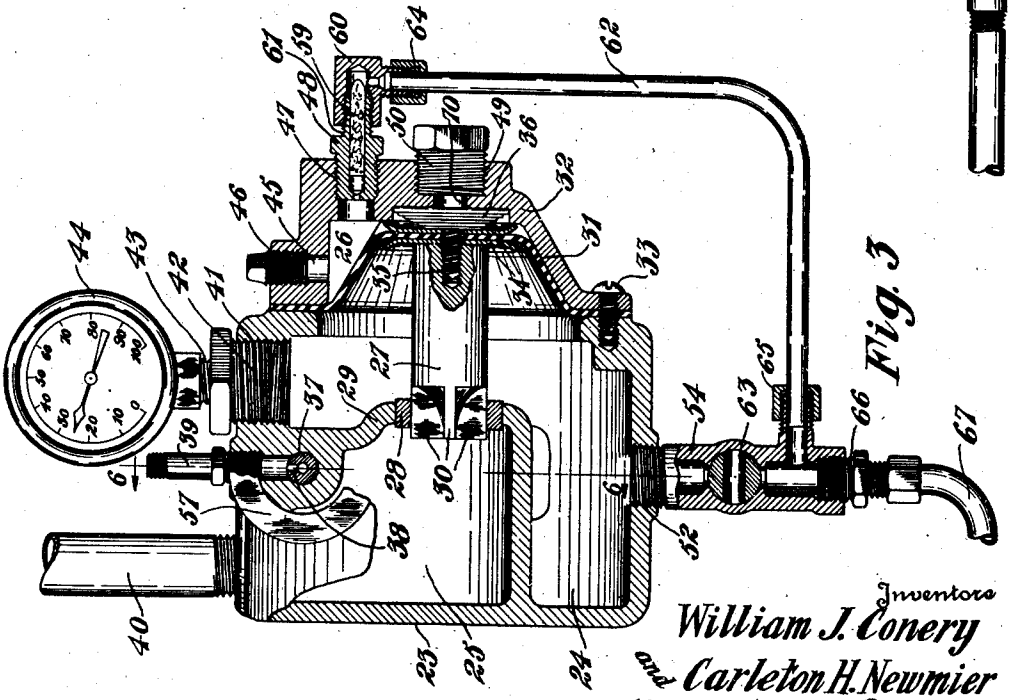


Fig. 3

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AIR CHARGER FOR STORAGE TANKS

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Fig. 4

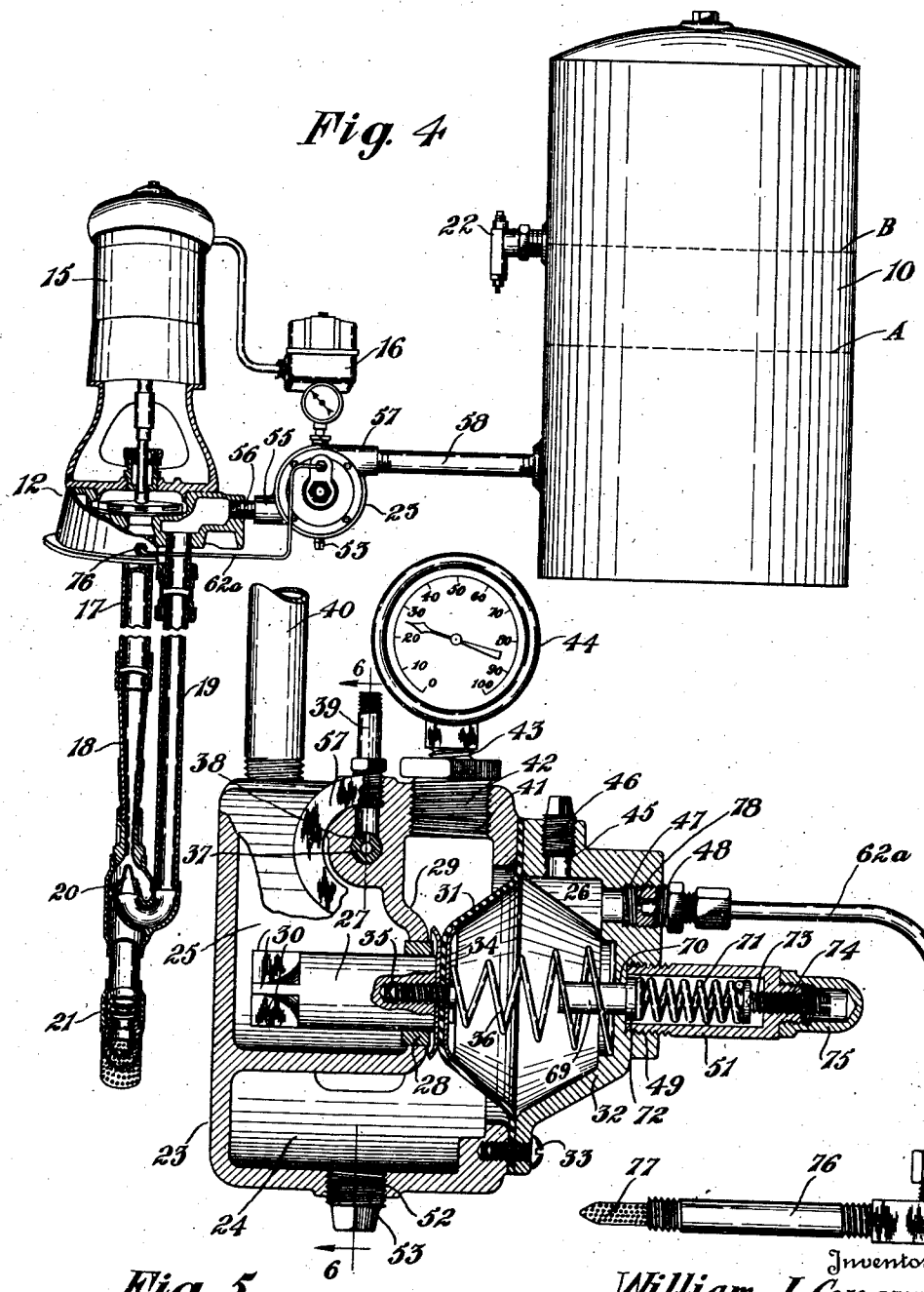



Fig. 5

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# UNITED STATES PATENT OFFICE

2,288,437

## AIR CHARGER FOR STORAGE TANKS

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Application July 22, 1941, Serial No. 403,508

15 Claims. (Cl. 103—6)

The invention relates to water pressure systems such as are associated with water pumps for supplying dwellings and the like, and more particularly to an air charger for use in connection with centrifugal shallow well pumps and centrifugal type deep well ejector pumps.

Such water pressure systems include a water tank which receives water from the pump and stores the water under pressure. An air cushion is maintained over the top of the water in the tank so as to force the water from the tank through the pipes of the system.

A considerable amount of water may be drawn from the tank before the pressure is lowered materially, and as the air pressure in the tank is lowered to a predetermined amount, the pump is automatically started and air and water are supplied to the tank until the water reaches a predetermined level and the air pressure is built up to a predetermined point.

It is common practice in such systems to provide for automatically starting the pump when the air pressure in the tank drops to 20 pounds, and for automatically stopping the pump when the air pressure reaches 40 pounds, although these extremes may be varied.

It will, thus, be evident that it is necessary to maintain the air pressure within some predetermined limits and to replenish air to the tank as it is absorbed or lost, in order to maintain this large cushion of air in the tank.

With most types of pumps air is supplied to the tank through the pump, but where a centrifugal type pump is used air cannot be carried through the pump with satisfactory results. For this reason, in a pressure system using a centrifugal type pump, it is necessary to provide means for supplying air to the tank without taking the air in through the suction of the pump.

It is therefore, an object of the invention to provide an air charger which will automatically supply air to the tank each time the pump is operated without drawing the air through the pump.

Another object is to provide an air charger which will work equally well with a shallow well centrifugal pump and with a centrifugal type ejector pump for deep wells.

A further object of the invention is to provide an air charger which will operate equally well with either pressure or vacuum on the suction of the pump.

A still further object is the combining of an air charger with a pressure regulating valve when used on a centrifugal type deep well ejector pump.

The above objects together with others which will be apparent from the drawings and following description or which will be later referred to, may be attained by constructing the improved air charger in the manner illustrated in the accompanying drawings in which

Figure 1 is a side elevation with parts broken in section showing a shallow well centrifugal pump and storage tank with the improved air charger connected thereto;

Fig. 2, a vertical longitudinal section through the air charger showing the same in operating position;

Fig. 3, a view similar to Fig. 2, showing the air charger in the non-operating position;

Fig. 4, a view similar to Fig. 1, showing the air charger applied to a centrifugal type deep well ejector pump;

Fig. 5, a vertical longitudinal section through the air charger as applied to the deep well pump; and

Fig. 6, a transverse sectional view through the air charger taken as on the line 6—6, Figs. 2, 3, and 5.

Similar numerals refer to similar parts throughout the several views.

The pressure tank into which the water is pumped and stored under air pressure is indicated at 10 in Figs. 1 and 4. This tank is connected to the discharge side of the pump, which may be a centrifugal shallow well pump as indicated generally at 11 in Fig. 1, or a centrifugal type, deep well, ejector pump as indicated generally at 12 in Fig. 4.

The suction pipe 13 of the shallow well pump 11 may have a check valve 14 located therein as shown in Fig. 1 or, if desired, the usual foot valve may be located at the lower end of the suction pipe.

Each of the pumps 11 and 12 may be operated in accordance with usual pressure system operation by means of a motor indicated generally at 15 which is started by the usual automatic pressure switch 16 mounted in direct communication with the tank 10 and constructed and operating in usual manner so that when the water level in the tank drops to a predetermined low level the pressure switch automatically closes and starts the motor operating the pump to deliver water to the tank until the water level reaches a predetermined high level, at which time the air cushion above the water has been compressed sufficiently to build up pressure nec-

essary to open the pressure switch 16 stopping the operation of the motor and pump.

All of this is of usual and well-known construction and operation as is also the ejector mechanism of the pump 12 which includes the delivery pipe 17 having the Venturi tube 18 at its lower end and the pressure pipe 19 leading downward from the pump and having the upturned nozzle 20 at its lower end for creating high velocity at the Venturi throat.

The usual foot valve 21 is located at the lower end of the pipe, and as above mentioned this foot valve may be located at the lower end of the suction pipe 13 of the shallow well instead of the check valve shown in Fig. 1.

The usual air vent valve 22 may be provided upon the tank 10 at the maximum water level so as to vent off any excess air which may accumulate in the tank due to the operation of the air charging device to which the invention pertains.

This air charger is indicated generally at 23 and is in the form of a substantially cylindrical housing consisting of three chambers comprising the high pressure chamber 24, the tank chamber 25 and the diaphragm or low pressure chamber 26.

A plunger 27 is slidably mounted through the bushing 28 located in the partition wall 29 between the tank chamber 25 and the low pressure chamber 26, the end of said plunger being cut away to form a plurality of vanes 30 in substantially cross shape so as to provide communication through the same between the several chambers when the plunger is in the retracted position as shown in Fig. 3.

A flexible diaphragm 31 has its peripheral portion clamped between the housing 23 and the cap 32, as by the screws 33, the central portion of said diaphragm being clamped between the diaphragm holding plates or washers 34 and attached to the adjacent end of the plunger 27 as by the screw 35.

A coil spring 36 is interposed between the diaphragm and the outer end of the cap 32 for normally holding the diaphragm and plunger in position shown in Figs. 2 and 5 so that the opening through the bushing 28 is closed by the plunger.

A Venturi tube 37 connects the high pressure chamber 24 and the tank chamber 25 and communicates through the restricted opening 38 with an air valve 39 of the well-known type commonly used upon automobile tires. A pipe 40 communicates with the tank chamber 25 and with the automatic pressure switch 16.

An internally threaded priming opening 41 is formed through the top wall of the housing 23 communicating with the high pressure chamber 24 and receives the threaded bushing 42 in which is located the threaded tube 43 of the pressure gauge 44 which indicates the operation of the pump and the air pressure in the tank.

An internally threaded air vent 45 is formed in the cap 32 and normally closed by the screw plug 46. A threaded orifice 47 is formed in the end of the cap 32 for receiving an orifice fitting 48, the purpose of which will be later described.

A threaded opening 49 is also formed in the end of the cap, in axial alignment with the plunger 27 to receive a threaded plug 50 when the air charger is used upon a shallow well pump, or the regulator spring housing 51 when the air charger is used upon a deep well ejector type pump.

An internally threaded drain aperture 52 is provided in the bottom wall of the housing 23 communicating with the high pressure chamber 24 and adapted to be closed by the drain plug 53 when the air charger is used in connection with a deep well pump.

An internally threaded inlet neck 55 is formed upon the housing 23 communicating with the high pressure chamber 24 and adapted to be connected as by the pipe 56 with the discharge side of the pump.

A similar outlet neck 57 is formed upon the housing 23 and communicates with the tank chamber 25 and is adapted to be connected as by the pipe 58 with the tank 10.

In connecting the air charger to a shallow well pump as shown in Figs. 1, 2, and 3, a strainer screen 59 is placed in the orifice fitting 47 and an elbow compression fitting 60 is mounted upon the threaded neck 61 of the orifice fitting.

A copper tube 62 is connected to the elbow 60 and to the shut-off valve casing 64 below the valve 63 therein, as by the compression fittings 66 and 65, respectively.

A brass nipple 66 is connected to the lower end of the valve casing 64 and to one end of a copper tubing 67, the other end of which is connected as by the brass nipple 68 directly to the intake side of the pump.

The valve 63 is provided for the purpose of priming the pump. When this is necessary the valve 63 is opened, the pressure gauge 44 and bushing 42 are removed and the pump is filled with water through the opening 41.

The pump is then started and water is allowed to circulate until all air is carried out of the pump 11 and suction piping 13, after which the valve 63 is closed and the pump is operated in usual manner.

The same air charger is used in connection with deep well pump as shown in Figs. 4 and 5, the connections being slightly different as shown.

When used on centrifugal type deep well ejector pumps the air charging principle is exactly the same as for the shallow well operation excepting that a pressure regulating attachment is used with the air charger.

In a deep well ejector pressure system as illustrated in Fig. 4 a given pressure at the ejector nozzle 20 is required at all times to keep the pump operating. If the pressure is allowed to drop off water will not be raised up to the centrifugal pump 12 and the flow will cease.

The object of the pressure regulating device is, therefore, to maintain a set pressure on the ejector nozzle 20 at all times regardless of the tank pressure.

This pressure regulator is mounted in the housing 51 and comprises a plunger 69 slidably located through the bore 70 in the outer end of the cap 32 and projected into the chamber 26.

A coil spring 71 is interposed between the head 72 of this plunger and the adjusting screw 73 which is adjustably mounted in the threaded bore 74 in the outer end of the housing 51, and arranged to be normally enclosed by the screw cap 75.

In this arrangement of the invention a copper tubing $62_a$ leads from the orifice fitting 48 to the suction nipple 76 which is connected to the intake side of the pump 12 and is preferably provided with a screen 77 to prevent the restricted

aperture 78 in the orifice fitting 48 from becoming clogged.

As in usual and well-known practice in pressure system operation both the shallow well and deep well systems are arranged to be operated by the motor 15 being started by the automatic pressure switch 16 when the water level in the tank drops to the predetermined minimum level indicated by the line A, the motor operating the pump 11 or 12, as the case may be, delivering water to the tank 10 until the water reaches the maximum level indicated by the line B at which time sufficient air has been compressed in the tank above the water to build up the pressure necessary to open the switch 16 stopping the motor and pump.

When the pump starts to operate, pressure is immediately built up in the chamber 24 of the air charger, since the only passage open for flow of water to the pressure tank 10 is through the Venturi tube 37, and the opening through this tube being small automatically causes the centrifugal pump to operate at a high pressure.

The characteristics of the centrifugal type pump are such that as the pressure increases the flow decreases until a point of equilibrium is reached and water flows through the Venturi tube 37 at a constant rate.

Simultaneously with the high pressure created in the chamber 24 by the pump, low pressure occurs in the chamber 26 by reason of the water in the chamber 26 being released through the aperture 78 in the orifice fitting 48 and through tubing 62 and 67 to the intake side of the pump.

This differential pressure between the chambers 24 and 26 causes the diaphragm 31 to move in the direction of the lowest pressure, that is, toward the right as viewed in the drawings, compressing the spring 36 until the diaphragm 31 and plunger 27 assume the position shown in Fig. 3.

The speed at which the diaphragm moves is governed by the size of the orifice 78 in the fitting 48. The plunger 27 being directly connected to the diaphragm moves at the same rate of speed as the diaphragm.

The pressure in the chamber 24 being considerably higher than that in the chamber 25 causes the water to flow through the Venturi tube 37 at a high velocity creating a vacuum at the throat of the venturi and causing atmospheric air to be taken in through the air valve 39.

This air is mixed with the water and discharged directly into the pressure tank through the discharge outlet 57 and pipe 58. This flow of water and air through the venturi continues until the diaphragm 31 and plunger 27 are moved to the position shown in Fig. 3 permitting water to go directly from the chamber 24, and between the vanes 30 of the plunger to the chamber 25.

The pressure is then immediately equalized in the chambers 24 and 25 reducing the flow through the venturi 37 which ceases to draw air in through the valve 39.

The greater pressure in chamber 24 over chamber 26 causes the diaphragm 31 to remain in the open position as shown in Fig. 3 during the time the pump is operating.

As soon as the pump stops pressure is completely equalized throughout the system by reason of the foot valve 21 or check valve 14 and water then flows back through the tube 62 or 62a to the chamber 26 equalizing the pressure on both sides of the diaphragm 31 and permitting the spring 36 to push the diaphragm and plunger back to the normal or closed position.

This cycle is repeated each time the pump operates supplying the necessary amount of air to the pressure tank 10. The operation above described is the same in both the shallow well and deep well pumps. However, when used in connection with the deep well pump the pressure regulator mounted in the housing 51 functions as follows:

When the pump starts the diaphragm 31 and plunger 27 move to the right as above described. As the head of the screw 35 upon the plunger comes in contact with the spring plunger 69 of the pressure regulator the spring 71 is compressed, the amount of compression being regulated by adjusting the screw 73.

With this arrangement pressure in the chamber 24 can be exactly maintained at any set point. The chamber 24 being in direct communication with the nozzle 20 this pressure is directed positively to said nozzle.

As the tank pressure builds up a greater force is exerted on the diaphragm 31 causing the spring 71 to be further compressed allowing the port opening 30 to become larger reducing the friction loss through the valve at high pressure.

This is very important in an ejector type pump since any unnecessary friction results in reducing capacity.

From the above it will be obvious that the improved air charger works automatically in connection with centrifugal pumps of either shallow well or deep well type, to take in atmospheric air between the pump and the tank and charge the air into the water from the pump so that the desired air pressure may be supplied to the tank at all times, without in any manner interfering with the operation of the pump.

According to the provisions of the patent statutes, we have explained the principle of our invention and described an embodiment thereof, but we desire to have it understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically illustrated and described, as modifications may be made by those skilled in the art without departing from the spirit of the invention, which resides in the provision of an air charger for admitting air to the water line between the discharge side of the pump and the pressure tank regardless of the detail structure by which this may be accomplished.

We claim:

1. In a fluid pressure system having a water pressure pump, an actuating means for the pump, a pressure water and air tank, and a pressure controlled means for starting and stopping said pump, a pipe leading from the discharge side of the pump to said tank, an air charger located in said pipe between the pump and the tank, said air charger having an open passageway and a normally closed passageway and means in said air charger for drawing atmospheric air into the water stream from the pump when the pump starts to operate, and discharging the air mixed with the water into the tank, through the open passageway, a pipe connected to the air charger and to the intake side of the pump, and valve means in the air charger under the influence of the pump suction and subjected to the higher pressure on the pump discharge side of said valve means so that said valve means is operated by the difference of pressures for equalizing the pressure on opposite sides of said open passage-

way for rendering said air entrainment ineffective and for opening the closed passageway to provide a main pump discharge some time after the pump starts to operate.

2. In a fluid pressure system having a water pressure pump, an actuating means for the pump, a pressure water and air tank, and a pressure controlled means for starting and stopping said pump, a pipe leading from the discharge side of the pump to said tank, an air charger located in said pipe between the pump and the tank, said air charger having an open auxiliary passageway and a normally closed main passageway, means in said air charger for drawing atmospheric air into the water stream from the pump when the pump starts to operate, and discharging the air mixed with the water into the tank through the auxiliary passageway, a pipe connected to the air charger and to the intake side of the pump, and valve means in the air charger under the influence of the pump suction and subjected to the higher pressure on the pump discharge side of said valve means so that said valve means is operated by the difference of pressures for equalizing the pressure on opposite sides of said auxiliary passageway for rendering said air entrainment ineffective and for opening the main passageway to provide a main pump discharge some time after the pump starts to operate.

3. In a fluid pressure system having a water pressure pump, an actuating means for the pump, a pressure water and air tank, and a pressure controlled means for starting and stopping said pump, a pipe leading from the discharge side of the pump to said tank, an air charger located in said pipe between the pump and the tank, said air charger having a normally closed passageway and means including a Venturi tube and an air valve in said air charger for drawing atmospheric air into the water stream from the pump when the pump starts to operate, and discharging the air mixed with the water into the tank, through said Venturi tube, a pipe connected to the air charger and to the intake side of the pump and valve means in the air charger under the influence of the pump suction and subjected to the higher pressure on the pump discharge side of said valve means so that said valve means is operated by the difference of pressures for equalizing pressure on opposite sides of the Venturi tube for rendering said air entrainment ineffective and for opening the closed passageway to provide a main pump discharge some time after the pump starts to operate.

4. In a fluid pressure system having a water pressure pump, an actuating means for the pump, a pressure water and air tank, and a pressure controlled means for starting and stopping said pump, a pipe leading from the discharge side of the pump to said tank, an air charger located in said pipe between the pump and the tank, said air charger having a normally closed passageway and means including a Venturi tube and an air valve in said air charger for drawing atmospheric air into the water stream from the pump when the pump starts to operate, and discharging the air mixed with the water into the tank through the Venturi tube, a pipe connected to the air charger and connected to the intake side of the pump and valve means in the air charger under the influence of the pump suction and subjected to the higher pressure on the pump discharge side of said valve means so that said valve means is operated by the difference of pressures for equalizing the pressure on opposite sides of said Venturi tube for rendering said air entrainment ineffective and for opening said normally closed passageway to provide a main pump discharge sometime after the pump starts to operate.

5. In a fluid pressure system having a water pressure pump, an actuating means for the pump, a pressure water and air tank, and a pressure controlled means for starting and stopping said pump, a pipe leading from the discharge side of the pump to said tank, an air charger located in said pipe between the pump and the tank, there being a high pressure chamber in the air charger connected to the discharge side of the pump and a tank chamber connected to the tank, and a normally closed port between said chambers, plunger means normally closing said port, a Venturi tube normally forming the only communication between the high pressure chamber and the tank chamber of the air charger and an air valve communicating with the Venturi tube for drawing atmospheric air into the water stream from the pump when the pump starts to operate and discharging the air mixed with the water into the tank, a pipe connected to the air charger and connected to the intake side of the pump so that said plunger means is under the influence of the pump suction and subjected to the higher pressure on the pump discharge side of said plunger means and so that said plunger means is moved by the difference of pressures for equalizing the pressure in said chambers for rendering said air entrainment ineffective and for operating said plunger means to provide a main pump discharge some time after the pump starts to operate.

6. In a fluid pressure system having a water pressure pump, an actuating means for the pump, a pressure water and air tank, and a pressure controlled means for starting and stopping said pump, a pipe leading from the discharge side of the pump to said tank, an air charger located in said pipe between the pump and the tank, there being a high pressure chamber in the air charger connected to the discharge side of the pump and a tank chamber connected to the tank and a normally closed port between said chambers, a Venturi tube normally forming the only communication between the high pressure chamber and the tank chamber of the air charger and an air valve communicating with the Venturi tube for drawing atmospheric air into the water stream from the pump when the pump starts to operate and discharging the air mixed with the water into the tank, and means including diaphragm and plunger means controlling said port and a pipe connected to the air charger and to intake side of the pump so that said diaphragm and plunger means is under the influence of the pump suction and subjected to the higher pressure on the pump discharge side of said diaphragm and plunger means and so that said diaphragm and plunger means is moved by the difference of pressures for equalizing the pressure in said chambers to provide a main pump discharge some time after the pump starts to operate.

7. In a fluid pressure system having a tank, a centrifugal type deep well ejector pump for supplying liquid to the tank, a pipe leading from the discharge side of the pump to the tank, an air charger located in said pipe between the pump and the tank, said air charger having an open passageway and a normally closed pas-

sageway, means in said air charger for drawing atmospheric air into the water stream from the pump when the pump starts to operate and discharging the air mixed with the water into the tank, diaphragm and plunger means in the air charger controlling the normally closed passageway and a pipe communicating with the air charger and with the intake side of the pump so that said diaphragm and plunger means is under the influence of the pump suction and subjected to the higher pressure on the pump discharge side of said diaphragm and plunger means and so that said diaphragm and plunger means is moved by the difference of pressures for equalizing pressure on opposite sides of the open passageway and operating the diaphragm and plunger means to open the closed passageway and provide a main pump discharge some time after the pump starts to operate, and a pressure regulator for controlling the operation of the diaphragm and plunger means.

8. In a fluid pressure system having a tank, a centrifugal type deep well ejector pump for supplying liquid to the tank, a pipe leading from the discharge side of the pump to the tank, an air charger located in said pipe between the pump and the tank, said air charger having an open passageway and a normally closed passageway, means in said air charger for drawing atmospheric air into the water stream from the pump when the pump starts to operate and discharging the air mixed with the water into the tank, diaphragm and plunger means in the air charger controlling the normally closed passageway and a pipe communicating with the air charger and with the intake side of the pump so that said diaphragm and plunger means is under the influence of the pump suction and subjected to the higher pressure on the pump discharge side of said diaphragm and plunger means and so that said diaphragm and plunger means is moved by the difference of pressures for equalizing pressure on opposite sides of the open passageway and operating the diaphragm and plunger means to open the closed passageway and provide a main pump discharge some time after the pump starts to operate, a pressure regulator for controlling the operation of the diaphragm and plunger means, and means for adjusting the pressure regulator.

9. In a fluid pressure system having a tank, a centrifugal type deep well ejector pump for supplying liquid to the tank, a pipe leading from the discharge side of the pump to the tank, an air charger located in said pipe between the pump and the tank, said air charger having an open passageway and a normally closed passageway, means in said air charger for drawing atmospheric air into the water stream from the pump when the pump starts to operate and discharging the air mixed with the water into the tank, diaphragm and plunger means in the air charger controlling the normally closed passageway and a pipe communicating with the air charger and with the intake side of the pump so that said diaphragm and plunger means is under the influence of the pump suction and subjected to the higher pressure on the pump discharge side of said diaphragm and plunger means and so that said diaphragm and plunger means is moved by the difference of pressures for equalizing pressure on opposite sides of the open passageway and operating the diaphragm and plunger means to open the closed passageway and provide a main pump discharge some time after the pump starts to operate, and a pressure regulator for controlling the operation of the diaphragm and plunger means, said pressure regulator including a spring pressed plunger.

10. In a fluid pressure system having a tank, a pump for supplying liquid to the tank, a pipe leading from the discharge side of the pump to the tank, an air charger located in said pipe between the pump and the tank, means dividing said air charger into a high pressure chamber communicating with the discharge side of the pump, a tank chamber communicating with the tank and a low pressure chamber, a pipe from the low pressure chamber communicating with the intake side of the pump, a Venturi tube forming communication between the high pressure chamber and the tank chamber, an air valve communicating with the Venturi tube for admitting atmospheric air thereto, there being a port between the high pressure chamber and the tank chamber, a plunger for normally closing the port, a diaphragm in the low pressure chamber and connected to said plunger, and spring means for holding the plunger in closed position when the pump is not operating, so that when the pump starts to operate water under pressure from the high pressure chamber will pass through the Venturi tube to the tank chamber drawing in air from the air valve, after which the diaphragm will be moved withdrawing the plunger and opening the port.

11. In a fluid pressure system having a tank, a centrifugal type deep well ejector pump for supplying liquid to the tank, a pipe leading from the discharge side of the pump to the tank, an air charger located in said pipe between the pump and the tank, means dividing said air charger into a high pressure chamber communicating with the discharge side of the pump, a tank chamber communicating with the tank and a low pressure chamber, a pipe from the low pressure chamber communicating with the intake side of the pump, a Venturi tube forming communication between the high pressure chamber and the tank chamber, an air valve communicating with the Venturi tube for admitting atmospheric air thereto, there being a port between the high pressure chamber and the tank chamber, a plunger for normally closing the port, a diaphragm in the low pressure chamber and connected to said plunger, and spring means for holding the plunger in closed position when the pump is not operating, so that when the pump starts to operate water under pressure from the high pressure chamber will pass through the Venturi tube to the tank chamber drawing in air through the air valve, after which the diaphragm will be moved withdrawing the plunger and opening the port, and a pressure regulator for controlling the operation of the diaphragm and plunger.

12. In a fluid pressure system having a tank, a centrifugal type deep well ejector pump for supplying liquid to the tank, a pipe leading from the discharge side of the pump to the tank, an air charger located in said pipe between the pump and the tank, means dividing said air charger into a high pressure chamber communicating with the discharge side of the pump, a tank chamber communicating with the tank and a low pressure chamber, a pipe from the low pressure chamber communicating with the intake side of the pump, a Venturi tube forming communication between the high pressure chamber and the tank chamber, an air valve com-

municating with the Venturi tube for admitting atmospheric air thereto, there being a port between the high pressure chamber and the tank chamber, a plunger for normally closing the port, a diaphragm in the low pressure chamber and connected to said plunger, and spring means for holding the plunger in closed position when the pump is not operating, so that when the pump starts to operate, water under pressure from the high pressure chamber will pass through the Venturi tube to the tank chamber drawing in air from the air valve, after which the diaphragm will be moved withdrawing the plunger and opening the port, and a pressure regulator for controlling the operation of the diaphragm and plunger, said pressure regulator including a spring pressed plunger.

13. In a fluid pressure system having a tank, a pump for supplying liquid to the tank, a pipe leading from the discharge side of the pump to the tank, an air charger located in said pipe between the pump and the tank, means dividing said air charger into a high pressure chamber communicating with the discharge side of the pump, a tank chamber communicating with the tank and a low pressure chamber, a pipe from the low pressure chamber communicating with the intake side of the pump, a normally closed valve for providing communication between the high pressure chamber and said pipe, a Venturi tube forming communication between the high pressure chamber and the tank chamber, an air valve communicating with the Venturi tube for admitting atmospheric air thereto, there being a port between the high pressure chamber and the tank chamber, a plunger for normally closing the port, a diaphragm in the low pressure chamber and connected to said plunger, and spring means for holding the plunger in closed position when the pump is not operating so that when the pump starts to operate water under pressure from the high pressure chamber will pass through the Venturi tube to the tank chamber drawing in air from the air valve, after which the diaphragm will be moved withdrawing the plunger and opening the port.

14. In a fluid pressure system having a tank, a pump for supplying liquid to the tank, a pipe leading from the discharge side of the pump to the tank, an air charger located in said pipe between the pump and the tank, means dividing said air charger into a high pressure chamber communicating with the discharge side of the pump, a tank chamber communicating with the tank and a low pressure chamber, a pipe from the low pressure chamber communicating with the intake side of the pump, a Venturi tube forming communication between the high pressure chamber and the tank chamber, an air valve communicating with the Venturi tube for admitting atmospheric air thereto, there being a port between the high pressure chamber and the tank chamber, a plunger for normally closing the port, a diaphragm in the low pressure chamber and connected to said plunger, and spring means for holding the plunger in closed position when the pump is not operating, so that when the pump starts to operate water under pressure from the high pressure chamber will pass through the Venturi tube to the tank chamber drawing in air from the air valve, after which the diaphragm will be moved withdrawing the plunger and opening the port, there being an orifice in the pipe leading from the low pressure chamber to the intake side of the pump, the size of said orifice controlling the speed of movement of the plunger.

15. In a fluid pressure system having a water pressure pump, an actuating means for the pump, a pressure water and air tank, and a pressure controlled means for starting and stopping said pump, a pipe leading from the discharge side of the pump to said tank, an air charger located in said pipe between the pump and the tank, there being a high pressure chamber in the air charger connected to the discharge side of the pump and a tank chamber connected to the tank and a normally closed passageway between said chambers, valve means normally closing said passageway, a Venturi tube normally forming the only communication between the high pressure chamber and the tank chamber of the air charger, an air valve communicating with the Venturi tube for drawing atmospheric air into the water stream from the pump when the pump starts to operate and discharging the air mixed with the water into the tank through the Venturi tube after which said valve means will be moved opening said normally closed passageway, a pipe leading from the high pressure chamber to the inlet side of the pump and a valve in the pipe between the high pressure chamber and the pump inlet so that the pump will be self-priming when said valve is opened by reason of re-circulation of water from the discharge side of the pump through the high pressure chamber of the air charger to the intake side of the pump.

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