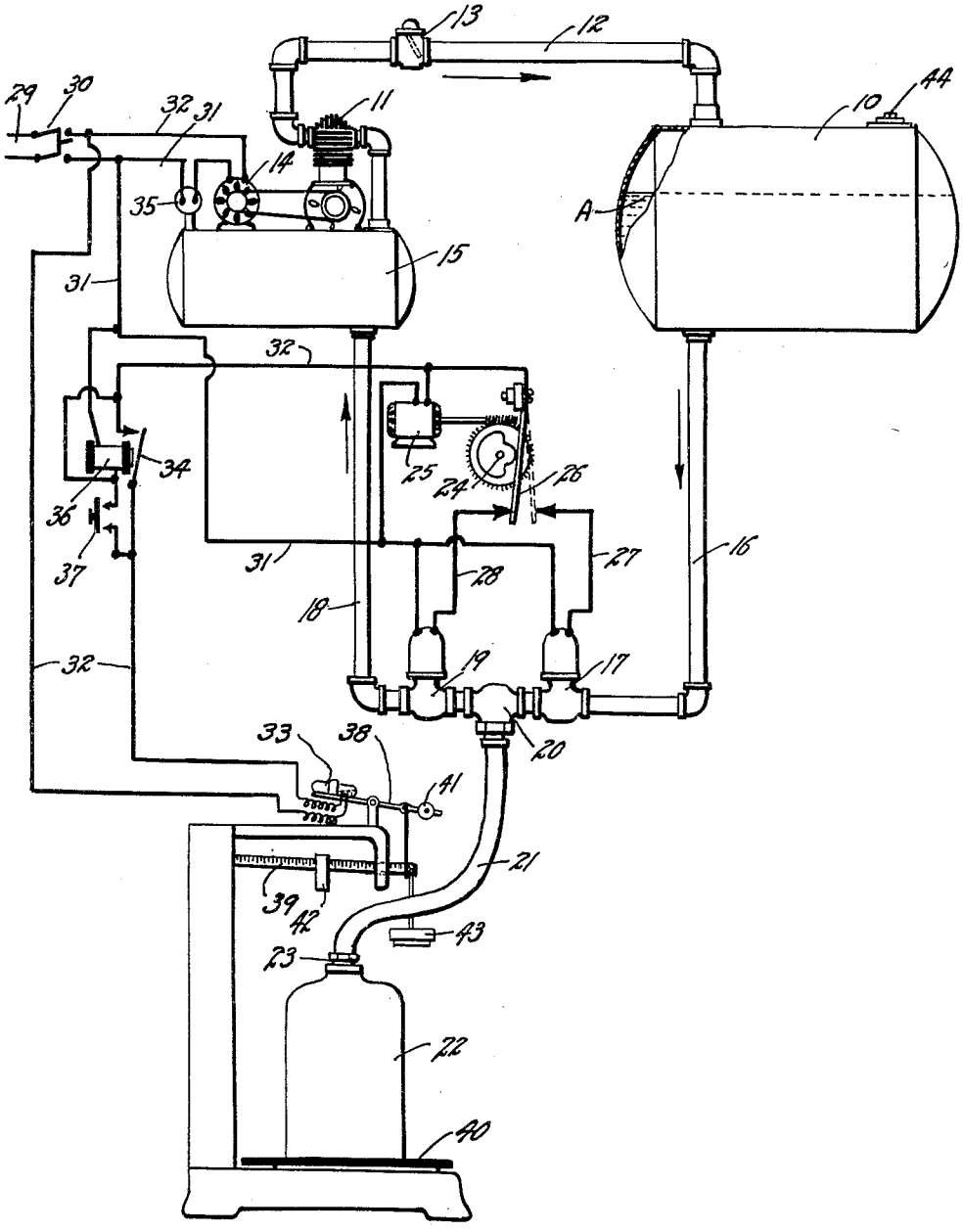
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MEANS FOR FILLING LIQUID GAS BOTTLES

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MEANS FOR FILLING LIQUID GAS BOTTLES

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This invention relates to mechanism for filling liquid gas bottles or cylinders such as used for butane, methane and propane gas plants. It is exceedingly difficult to fill liquid gas bottles without loss of gas due to the fact that vapors are formed which must be allowed to escape to allow the incoming liquid gas to enter. If allowed to escape to the atmosphere they are, of course, lost, and if only atmospheric pressure or less is maintained on the bottle an excessive amount of vapor is formed.

The principal object of this invention is to provide an automatic device which will collect and retain all vapor and yet which will maintain a greater than atmospheric pressure in the bottle, and system to retard vaporization.

Another object of the invention is to provide a device of this character which will automatically stop the feeding of the liquid gas when a predetermined amount has been placed in the bottle.

Other objects and advantages reside in the detail construction of the invention, which is designed for simplicity, economy, and efficiency. These will become more apparent from the following description.

In the following detailed description of the invention, reference is had to the accompanying drawing which forms a part hereof. Like numerals refer to like parts in the drawing and throughout the description.

In the drawing a typical liquid gas bottle, to the filling of which this invention relates, is indicated at 22.

The drawing illustrates diagrammatically the improved mechanism for filling liquid gas bottles or cylinders. The improved device employes a sealed high pressure liquid gas tank 10 for storage of the liquid gas. The tank 10 may be the tank of a tank car or truck in which the gas is received or may be a separate storage tank, as desired. A vapor receiver 15 is also employed from which vapor is returned to the tank 10 by means of a suitable compressor 11 through a vapor return pipe 12, in which a non-return check valve 13 is incorporated. The compressor is driven from a suitable electric motor 14. The liquid gas flows from the tank 10 through a feed pipe 16, controlled by means of a first solenoid valve 17. The vapor is supplied to the vapor tank through a vapor pipe 18, which is controlled by means of a second solenoid valve 19.

The two valves 17 and 19 are both connected to a common T-fitting 20, from which a filling pipe or hose 21 depends. The hose is arranged for gas-tight connection to the threaded neck opening of the bottle by means of a suitable coupling 23.

The solenoid valves 17 and 19 are electrically controlled by means of a rotating cam 24, which is driven from a cam motor 25. The cam 24 operates a single-pole, double-throw switch blade 26, between a conductor 27, leading to the solenoid of the valve 17, and a condutcor 28, leading to the solenoid of the valve 19.

The current for operating the various devices is obtained from supply mains 29 through a main switch 30. One of these mains, which will be herein designated the ground circuit 31, leads to both valves 17 and 19. The other main, which will be herein designated the live circuit 32, leads through a mercury switch 33, and a relay switch blade 34, to the cam switch blade 26. The cam motor 25 is connected between the ground circuit 31 and the live circuit 32 in parallel with the solenoid valves 17 and 19. Thus when the circuit 32 is closed the cam 24 will rotate and current will be alternately fed to the valves 17 and 19, causing them to alternately open the feed pipe 16 and the vapor pipe 18.

The circuit to the compressor motor 14 is controlled by means of a pressurestat 35 so that whenever the pressure in the vapor tank 15 increases to a predetermined point the compressor will start operation to reduce this pressure by returning vapor to the gas tank 10.

The relay switch blade 34 is controlled by means of a relay magnet 36, which can be placed in the live circuit 32 by means of a suitable starting button 37. The circuit to the magnet 36 is bridged across the relay switch blade 34 so that, after the starting button 37 is operated to close the switch blade 34, the latter will remain closed until the circuit 32 is broken.

The breaking of the circuit 32 is accomplished through means of a mercury switch 33. The mercury switch is mounted on a tilting arm 38, which is connected to a scale beam 39. The beam 39 indicates the load resting on a scale platform 40, upon which the bottle 22 rests. Thus, whenever a predetermined amount of liquid gas is placed in the bottle 22, the scale beam 39 will tilt the mercury switch 33 to break the circuit 32.

Let us assume that a supply of liquid gas is contained within the tank 10; that an empty bottle 22 is in place upon the platform 40 and connected to the T-fitting 20; and that the main switch 30 is closed. Let us also assume that there is no pressure in the vapor receiver 15 at this time so that the pressurestat 35 is open, and the compressor is idle. Since the bottle is empty the scale

beam 39 will be lowered so that the mercury switch will be closed and the relay blade 34 will be open. The operator now presses the starting button 37. This immediately snaps the switch blade 34 closed and starts the motor 25. The rotating cam 24 now energizes the valve 17, allowing liquid gas to flow into the bottle 22 for a predetermined time interval. At the termination of this interval the blade 26 moves to the conductor 28 closing valve 17 and opening valve 19. This allows the vapor which has been placed under pressure by the incoming gas to escape to the receiver 15 for a second time interval, after which, the cam 24 will close the valve 19 and again open the valve 17.

Eventually a pressure will build up in the vapor receiver 15, depending upon the setting of the pressurestat 35, normally about fifteen p. s. i. When this occurs the compressor 11 starts operation, and withdraws vapor from the receiver 15, returning it at high pressure to the tank 10 until a predetermined pressure has been restored to the vapor receiver. All of the pressure is never exhausted from the vapor tank so that there is no possibility of outside air being drawn into this system and the entire gas circuit at all times is under internal pressure.

When the desired amount of liquid gas has entered the bottle 22 the weight thereof will depress the platform 40, causing the scale beam 39 to operate the tilting arm 33 so as to tilt the mercury switch 33 and break the circuit 32. This stops the motor 25; de-energizes both conductors 27 and 29 so as to close both valves; and de-energizes the relay magnet 36 to open the switch 34 so as to bring the entire system to rest, with all valves closed. The filled bottle 22 can now be removed and replaced with an empty bottle for another cycle of operation.

A counterweight 41 is employed in the arm 33 which is adjustable for exactly counterbalancing the weight of the mercury switch 33 so as not to affect the accuracy of the weighing operation. A slidable balance weight 42 is provided on the scale beam 39 which can be set to exactly counterbalance the empty weight of the bottle 22. The amount of liquid gas is determined by the weight of a weight disc 43 which is hung on the beam after the weight of the bottle has been balanced.

The upper portion of the tank 10 contains gas vapor and the lower portion liquid gas as indicated at A in the drawing. The tank 10 is provided with any suitable filling plug 44.

While a specific form of the improvement has been described and illustrated herein, it is desired to be understood that the same may be varied, within the scope of the appended claims, without departing from the spirit of the invention.

Having thus described the invention, what is claimed and desired secured by Letters Patent is:

1. Means for filling a liquid gas bottle comprising: a supply tank; a vapor receiver; a motor driven compressor; a pressure conduit from said compressor to said tank; an intake conduit from said receiver to said compressor; means for starting said compressor when the pressure in said receiver has risen to a predetermined point; a discharge pipe from said tank; a vapor pipe communicating with said receiver, both pipes leading to a common bottle-filling outlet; a solenoid valve controlling each of said pipes; and means for alternately opening and closing said solenoid valves.

2. Means for filling a liquid gas bottle comprising: a supply tank; a vapor receiver; a motor driven compressor; a pressure conduit from said compressor to said tank; an intake conduit from said receiver to said compressor; means for starting said compressor when the pressure in said receiver has risen to a predetermined point; a discharge pipe from said tank; a vapor pipe communicating with said receiver, both pipes leading to a common bottle-filling outlet; a solenoid valve controlling each of said pipes; a motor driven cam; and a circuit closer operated by said cam to alternately energize said solenoid valves.

3. Means for filling a liquid gas bottle comprising: a supply tank; a vapor receiver; a motor driven compressor; a pressure conduit from said compressor to said tank; an intake conduit from said receiver to said compressor; means for starting said compressor when the pressure in said receiver has risen to a predetermined point; a discharge pipe from said tank; a vapor pipe communicating with said receiver, both pipes leading to a common bottle-filling outlet; a solenoid valve controlling each of said pipes; means for alternately opening and closing said solenoid valves; a flexible filling conduit extending from said outlet to said gas bottle; a depressible supporting platform for said bottle; and circuit closing means operable in consequence of the depression of said platform to open the circuit to said valves.

4. Means for dispensing liquid gas from a tank to a receiving bottle comprising: a discharge conduit from said tank; a vapor receiver; mechanical means for drawing vapor from said receiver and forcing it into said tank; a vapor conduit communicating with said vapor tank; a filling tube communicating with both said conduits and said bottle; a valve in each of said conduits; and means for closing each valve as the other valve is opened.

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