

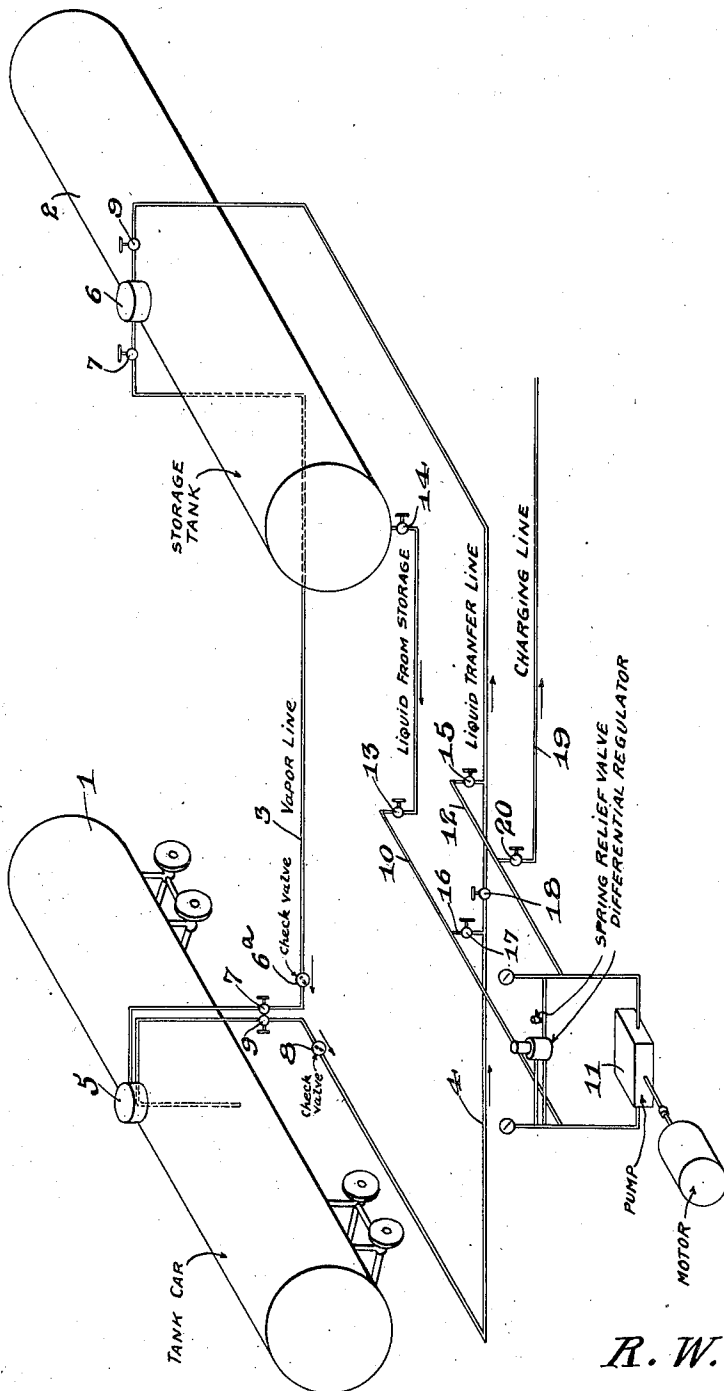
Aug. 27, 1935.

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2,012,362

APPARATUS FOR TRANSFERRING VOLATILE LIQUIDS

Filed July 6, 1933



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2,012,362

APPARATUS FOR TRANSFERRING VOLATILE LIQUIDS

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Application July 6, 1933, Serial No. 679,263

3 Claims. (Cl. 137-78)

This invention relates to an improved means for transferring volatile fluids from one receptacle to another, and the primary purpose of the invention is to furnish a system for transferring liquefied petroleum gas or the like from a tank car to a storage tank by taking advantage of differences in temperature conditions existing within the two tanks.

Another object is to join two tanks by a vapor line and a liquid line, each provided with a check valve so that vapor may flow from the second tank to the first tank but not vice versa, and liquid may flow from the first tank to the second tank but not in the opposite direction.

While the means which I have invented may be used in conjunction with pumps or the like, I purpose in most cases to use it without fluid forcing means, so as to simply take advantage of temperature conditions for transferring a volatile fluid from one receptacle to another.

With the foregoing objects outlined and with other objects in view which will appear as the description proceeds, the invention consists in the novel features hereinafter described in detail, illustrated in the accompanying drawing and more particularly pointed out in the appended claims.

The drawing shows a diagrammatic view of the apparatus.

Referring to the drawing 1 designates the first receptacle and 2, the second receptacle. Each must be made gas tight and capable of withstanding superatmospheric pressures. For the purpose of disclosing the invention, it will be assumed that 1 is the tank of a tank car insulated against heat transfer. 2, on the other hand is a stationary storage tank placed along side of a railway track and preferably uninsulated against heat transfer.

When a tank car containing liquefied petroleum gas, such as propane or butane, for example, is brought to rest on a spur or siding, it is connected to the storage tank by a vapor line 3 and a liquid transfer line 4. The ends of the vapor line or pipe are connected to the domes 5 and 6 of the respective tanks and it is provided with a check valve 6a that will permit vapor flow from the tank 2 to the tank 1 but will prevent flow in the reverse direction. The line 3 may also be provided with one or more hand-controlled valves 7.

One end of the liquid transfer line or pipe 4 preferably extends downwardly into the lower portion of the tank 1 and its other end is connected to the dome 6. This line has a check valve 8 which will allow liquid to flow from tank

1 to tank 2 but will prevent the flow of liquid in the opposite direction. This line may also be equipped with one or more hand-controlled valves 9.

At this point it may be noted that the lines 3 and 4 are preferably permanently connected to the tank 2 but are secured to the tank 1 by any suitable connecting means so that the lines may be rapidly connected to tank cars as they arrive on the siding.

Usually tank cars arrive on the siding in the early morning, as freight is generally moved during the night. When a tank car arrives it is connected to the storage tank by the pipes 3 and 4. The storage tank contents cools down over night due to the usual cycle of reduced atmospheric temperatures in the night. The tank car is not cooled down as much as the storage tank because the tank 1 of the car is insulated. The chances are, therefore, that the tank of the car will have more vapor pressure than the storage tank because its contents will be warmer than the contents of the storage tank. The pressure differential is therefore in the right direction and when the valves 7 and 9 are opened, the liquid will flow from the tank car to the storage tank until the pressures in the two tanks are equalized, at which time flow will stop. During the course of the day (which usually results in a warmer temperature than at night) the storage tank will heat up more rapidly than the tank of the car and consequently the liquid in tank 2 will become warmer and the vapor pressure will increase, until the pressure in the storage tank is higher than in the tank of the car, at which time the flow of vapor through line 3 from the storage tank back to tank 1 will take place. Liquid, however, won't flow back to the tank 1 because of the check valve 8. This operation reduces the temperature and pressure in the tank car so that the next time the temperature changes (when night comes on with cooler atmospheric temperatures) flow of liquid will again take place from the tank car into the storage tank though the line 4; the check valve 6a being closed against flow of vapor in the wrong direction. This cycle continues until the transfer is completed.

Actual use of the invention indicates that under favorable atmospheric conditions transfer can all be effected in one or two cycles but in other cases two or three days may elapse before the liquid is all automatically transferred into the storage tank. Obviously the success of this system depends entirely upon a reasonable cycle or fluctuation in atmospheric temperatures with

correspondingly more rapid fluctuations in the temperatures and vapor pressures in the uninsulated storage tank than in the insulated tank of the car. Therefore I prefer to employ the system in conjunction with some positive forcing means to be used at times when atmospheric temperatures are not favorable. Any suitable positive forcing means may be employed. For example, a pipe 10 may lead from the bottom of the tank 2 to a motor-driven pump 11 which will force the liquid through a pipe 12 which leads into the liquid transfer line 4. The pipe 10 may be provided with hand-controlled valves 13 and 14 and the pipe 12 may have hand-controlled valve 15. A branch pipe 16 may connect the pipe 10 to the pipe 4 and this branch may have a hand-controlled valve 17. Another valve 18 will be interposed in the pipe 4 between branch 16 and pipe 12, and when the valve 18 is closed the liquid may be positively transferred by means of the pump 11. In this case the pump may draw liquid from the pipe 4 anterior to the valve 18 and force it back into the line 4 posterior to the latter.

A charging line 19 having a valve 20 may lead from the pipe 12.

Whether or not positive pumping means is employed, the tank 1 may be insulated or uninsulated. In the latter case the tank-2 would be shaded by a shed or insulated so as to effect a variation in temperature between the two tanks at certain times.

My improved system has proved very advantageous and practical as its operation is entirely automatic with no opportunities for errors to occur or for the system to be contaminated with water, air, lubricating oil, etc. For small undiluted propane gas plants or the like where only a few cars per year of fuel may be used, it avoids a capital investment in air compressors and motor, liquid pump and primary mover, necessity of electric power wiring or service, complicated control devices, back pressure valves, pipe manifolds, etc. and is in general an economic and money-saving proposition.

From the foregoing it is believed the invention and the advantages thereof may be readily understood by those skilled in the art and I am aware that changes may be made in the details disclosed without departing from the spirit of the invention as expressed in the claims.

What I claim and desire to secure by Letters Patent is:

1. Means for utilizing the differential pressures existing in a plurality of pressure tanks, due to varying temperature conditions, for transferring volatile liquids from one tank to the other, comprising a liquid line leading from the first tank below the liquid level therein, to the second tank and provided with a valve to permit the flow of

fluid from the first tank to the second tank, but preventing the flow of liquid from the second tank to the first tank, a gas line connecting said tanks above the liquid levels therein and provided with a valve to permit the passage of gas from the second tank to the first tank, but preventing reverse flow of gas from the first tank to the second tank, said lines being so arranged that liquid will flow through the liquid line whenever the pressure in the first tank exceeds the pressure in the second tank, and gas will flow from the second tank to the first tank whenever the pressure in the second tank exceeds the pressure in the first tank.

2. Means for utilizing the differential pressures existing in a plurality of pressure tanks, due to varying temperature conditions, for transferring volatile liquids from one tank to the other, comprising a liquid line leading from the first tank, below the liquid level therein, to the second tank and provided with a valve to permit the flow of liquid from the first tank to the second tank, but preventing the flow of liquid from the second tank to the first tank, a gas line connecting said tanks above the liquid levels therein, and provided with a valve to permit the passage of gas from the second tank to the first tank, but preventing reverse flow of gas from the first tank to the second tank, said lines being so arranged that liquid will flow through the liquid line whenever the pressure in the first tank exceeds the pressure in the second tank, and gas will flow from the second tank to the first tank whenever the pressure in the second tank exceeds the pressure in the first tank, one of said tanks being insulated and the other uninsulated.

3. Means for utilizing the differential pressures existing in a plurality of pressure tanks, due to varying temperature conditions, for transferring volatile liquids from one tank to the other, comprising a liquid line leading from the first tank, below the liquid level therein, to the second tank, and provided with an automatically operating check valve to permit the flow of fluid from the first tank to the second tank, but preventing the flow of liquid from the second tank to the first tank, a gas line connecting said tanks above the liquid levels therein, and provided with an automatically operating check valve to permit the passage of gas from the second tank to the first tank, but preventing reverse flow of gas from the first tank to the second tank, said lines being so arranged that liquid will flow through the liquid line whenever the pressure in the first tank exceeds the pressure in the second tank, and gas will flow from the second tank to the first tank whenever the pressure in the second tank exceeds the pressure in the first tank.

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