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SAFETY APPARATUS FOR THE STORAGE AND DISTRIBUTION OF INFLAMMABLE AND OTHER LIQUIDS WITHIN TANKS AND PIPING OUT OF CONTACT WITH THE AIR.

APPLICATION FILED NOV. 15, 1920.

1,419,880. **Patented June 13, 1922.**

2 SHEETS—SHEET 1.

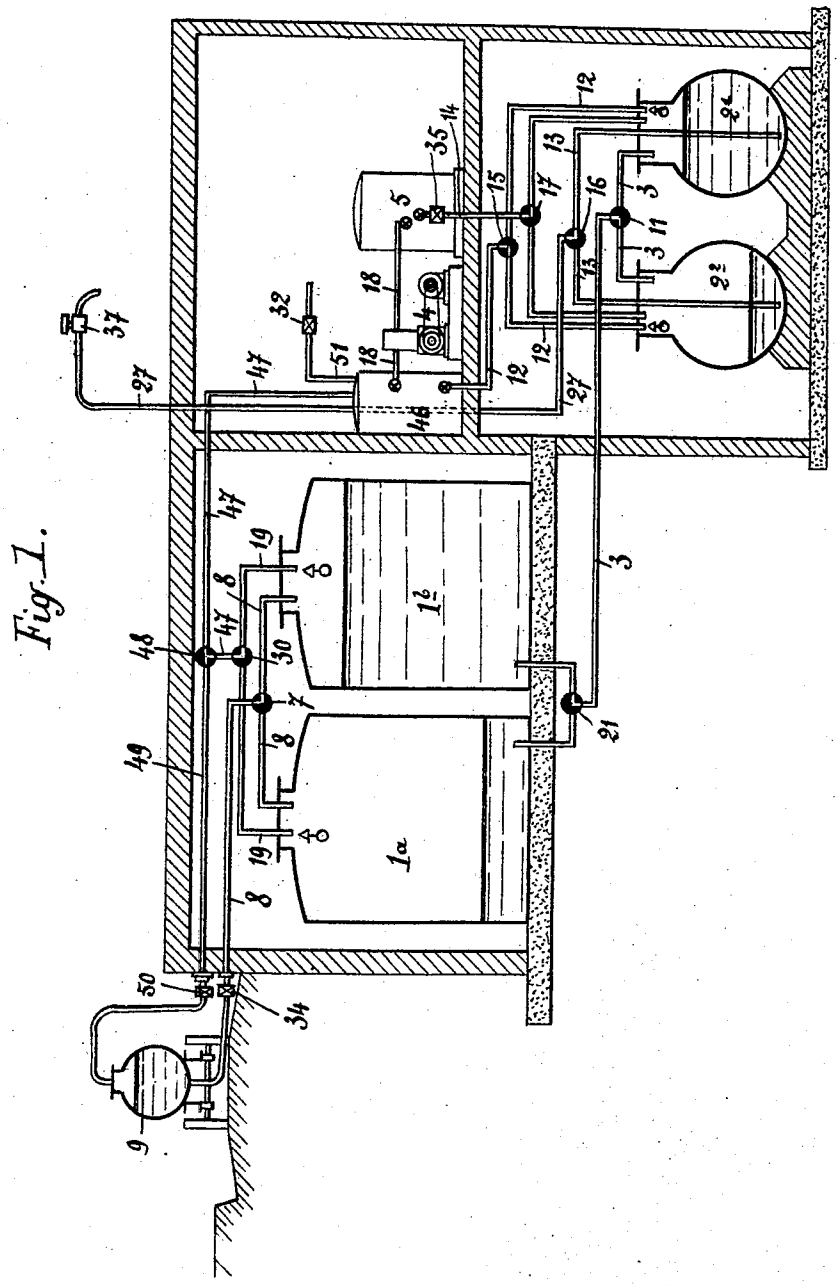


Fig. 1.

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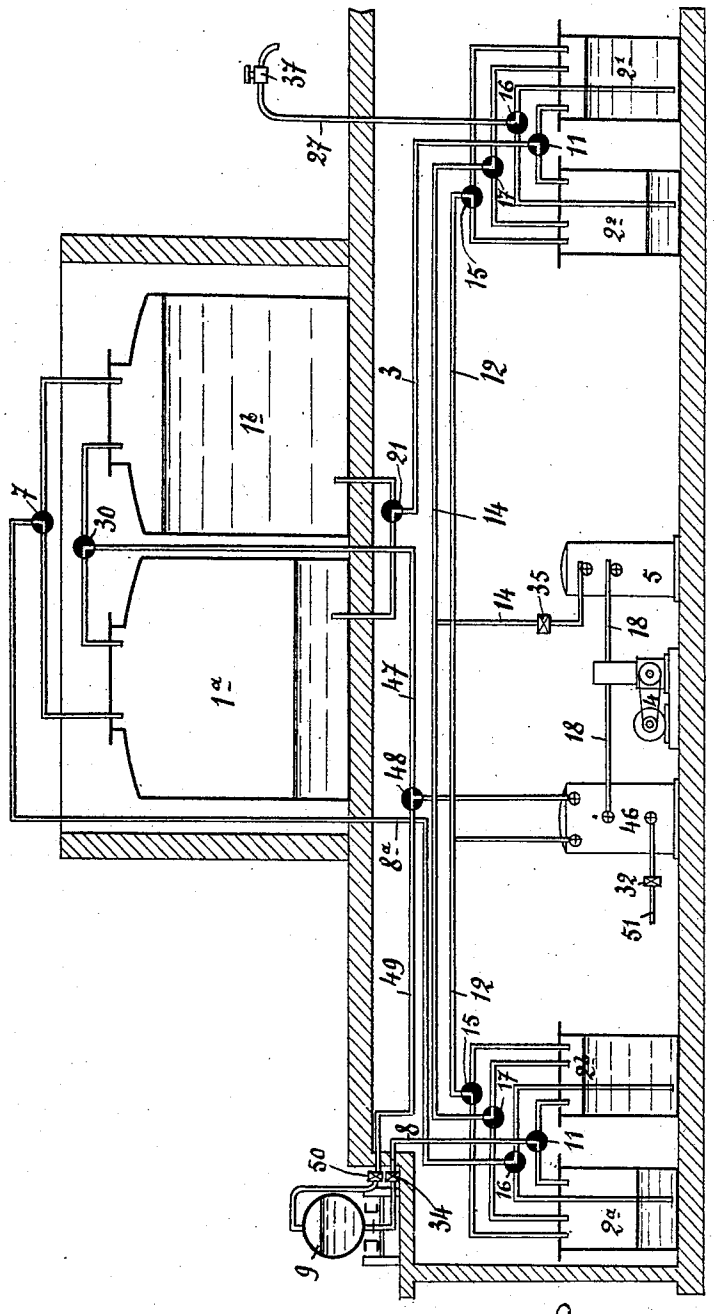
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2 SHEETS—SHEET 2.

Fig. 2.



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SAFETY APPARATUS FOR THE STORAGE AND DISTRIBUTION OF INFLAMMABLE AND OTHER LIQUIDS WITHIN TANKS AND PIPING OUT OF CONTACT WITH THE AIR.

1,419,880. Specification of Letters Patent. **Patented June 13, 1922.**

Application filed November 15, 1920. Serial No. 424,209.

To all whom it may concern:

Be it known that I, PIERRE ANDRÉ PAUL VICTOR MAUCLÈRE, citizen of the Republic of France, residing in Paris, France, and whose post-office address is 14 Rue de Evurnon, have invented certain new and useful Improvements in Safety Apparatus for the Storage and Distribution of Inflammable and Other Liquids Within Tanks and Piping Out of Contact with the Air; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

This invention relates to apparatus for the safe storage and distribution of inflammable and other liquids within tanks and piping out of contact with the air, the liquid in the storage tanks is in all cases maintained exactly at atmospheric pressure under the protection of a suitable gas which is employed in a closed cycle.

The invention according to this present application for improvements in the same is characterized by various modifications of the disposition of the apparatus and piping and by the use of a battery of combined gauging devices disposed at a lower level than the said storage tanks and employed to carry out the operations of withdrawal and distribution of the liquid, which operations may in fact be effected at the same time that liquid at atmospheric pressure is admitted into said storage tanks, either by direct gravity feed or through the medium of a special battery of combined gauging devices.

This invention also relates to a simplified method of carrying out the installation wherein a special expansion receptacle for the gas constituting a barometric regulator is provided, thus obviating all direct action of the compressor upon said storage tanks, and in this case the movements of the inner volume of gas are effected directly by the displacements of the liquid, the compressor being solely employed to ensure the compensation between said expansion receptacle and a pressure receptacle used for feeding the gauging devices. This latter disposition also affords the advantage of obviating all loss of vapors of the liquid in the atmosphere during the operations of storage, withdrawal and distribution of the liquid.

In the accompanying drawings,

Fig. 1 is a diagrammatic view showing the arrangement of an entire plant wherein two gas tanks are employed, one of said tanks being disposed on the intake side of the compressor and the second on the delivery side thereof, and the withdrawal and distribution of liquid are here effected by a battery of gauging devices. Fig. 2 is a similar view of a modified form of this disposition, wherein the separate sets of gauging devices are employed, one set for the storage and the second for the withdrawal and distribution.

In the construction shown in Fig. 1, the installation comprises one or more storage tanks 1^a 1^b, two combined gauging devices 2^1 2^2, the piping 3 for the gravity filling of said gauging devices by the liquid from the storage tanks, a compressor 4, the piping 8 for emptying the portable supply casks 9, the connecting piping 13, and the offtake piping 27 provided with the cock 37. The taps 7, 30, 21 for the storage tanks and the taps 11, 15, 16, 17 for the gauging devices are used to effect the desired connections between the various parts of the plant.

On either side of the compressor 4 are disposed the expansion tank 46 and a pressure tank 5 which are connected to said compressor by the piping 18. The expansion tank 46 containing gas at atmospheric pressure is connected by the piping 47 with the taps 30 whereby it is connected through the piping 19 with either one of the storage tanks 1^a 1^b. The piping 47 is also provided with a valve 48 for making connection through piping 49 between the storage tanks and the upper part of the supply casks 9. The valves 34 and 50 are disposed respectively upon the piping 8 and 49 at the connecting points of the flexible hose leading to the casks 9. The expansion tank 46 is also connected by the piping 12 with the tap 15 and by means of this latter with either one of the gauging devices 2^1 2^2.

The expansion tank 46 is provided with an offtake piping 51 having disposed thereon an expansion device 32 and adapted for connection where required with a source of gas under pressure.

The pressure tank 5 is connected by the expansion device 35 to the tap 17 and by this latter to the gauging devices.

The operation of the apparatus is as follows:—

Storage.—The cask 9 to be emptied is connected to the taps 34 and 50. These two taps are opened and the taps 7, 30 and 48 are disposed in the position shown. The liquid contained in the receptacle 9 flows freely by gravity into the tank 1^b while the inert gas in said tank which is thereby displaced is caused to pass into the upper part of the cask 9. The connection afforded through 48 with the tank 46 acts to maintain the upper portions of the receptacles at the atmospheric pressure.

The same conditions prevail for the operation of filling the storage tank 1^a, the taps 7 and 30 being in this case disposed in the opposite direction.

Withdrawal of liquid.—With the tap 21 in the position indicated, the liquid in the storage tank 1^b flows freely by gravity into the gauging device 2^2, the tap 11 being turned in the position shown in Fig. 7.

Delivery and supply.—With the gauging device 2^2 in process of filling as above indicated and the taps 11, 16, 17, 15 in the positions represented, the pressure of the gas from the reservoir 5, which is expanded to the delivery pressure by the expansion device 35, is exerted through the piping 14 upon the liquid in the gauging device 2^1. The said liquid is thus delivered through the piping 13 and 27 to the offtake cock 37.

At the same time, the gas which previously served to deliver the liquid from the gauging device 2^2 escapes through the piping 12 into the tank 46 in which it expands at the same time that the action of the compressor 4 brings it to atmospheric pressure.

When the gauging device 2^1 is entirely emptied, the gauging device 2^2 being now filled, the operation commences in the contrary sense by the simple inversion of the taps 15, 17, 16 and 11.

It should be observed that the storage tanks can be filled and emptied in a simultaneous manner.

It will be understood that the present disposition provides for the recovery of the vapors of the liquid which may be carried away by the gas, and especially as concerns the receptacles to be emptied. In fact, inasmuch as the atmosphere of gas which is substituted for the liquid in the receptacles to be emptied is previously saturated with vapors of the liquid at atmospheric pressure, there will occur no additional evaporation of the volume of liquid in the receptacle during the operation of emptying the latter. This arrangement therefore affords the minimum loss of the vapors of the liquid as well as the maximum safety.

In the modified form of construction shown in Fig. 2, the general disposition of the apparatus is the same except that in this case the storage reservoirs are disposed at a higher level and are supplied by a series of additional gauging devices 2^a and 2^b. These gauging devices are supplied by the piping 8 from the casks 9 and serve to deliver the liquid into the storage tanks 1^a, 1^b through the valve 16 and the piping 8^a. In all other respects the operation of the gauging devices and the general installation is similar to what has been described with reference to the preceding embodiment of the invention.

Having now described my said invention and the best means I know for carrying the same into effect, I declare that what I claim is:—

1. In an apparatus of the character described, the combination with a storage tank and means for connecting it with a source of supply, of a plurality of gauging devices, means to connect first one and then another of the gauging devices with the tank, a delivery conduit, means in the latter for connecting any one of the gauging devices therewith, an expansion tank, conduits leading from the gauging devices to the expansion tank, means in the last named conduits to connect anyone of the gauging devices with the expansion tank, a pressure reservoir, a conduit leading from the latter to the gauging devices, and means for connecting any one of the latter to the pressure reservoir.

2. In an apparatus of the character described, the combination with a supply cask, a storage tank, and conduits for connecting the cask and tank, of two gauging devices, a conduit between the latter and tank, a valve to alternately connect the gauging devices with the tank, a delivery conduit, a valve therein for alternately connecting the gauging devices with the delivery conduit, an expansion tank, a conduit leading from the gauging devices to the expansion tank, a valve in the last named conduit for alternately connecting the gauging devices with the expansion tank, a pressure reservoir, a conduit leading from the latter to the gauging devices, and a valve alternately connecting the latter to the pressure reservoir, whereby one gauging device is in filling connection with the storage tank and with the expansion tank and the other gauging device is in communication with the pressure reservoir and with the delivery conduit.

3. In an apparatus of the character described the combination with a supply cask, and a storage tank, of a conduit connecting the bottom of the cask with the top of the tank, a conduit connecting the top of the cask with the top of the tank, an expansion tank, a conduit connecting the latter with the top of the cask, two gauging devices, a conduit for supplying liquid from the storage tank to the gauging devices and connected with the tops of the latter and with

the bottom of the storage tank, a valve in the supply conduit for alternately connecting the gauging devices with the storage tank, a gas conduit connecting the gauging devices with the expansion tank, and a valve in the gas conduit for establishing communication between the expansion tank and the gauging device that is in communication with the storage tank.

4. In an apparatus of the character described, the combination with a supply cask, and a storage tank, of a conduit connecting the bottom of the cask with the top of the tank, a conduit connecting the top of the cask with the top of the tank, an expansion tank, a conduit connecting the latter with the top of the cask, two gauging devices, a conduit for supplying liquid from the storage tank to the gauging devices and connected with the tops of the latter and with the bottom of the storage tank, a valve in the supply conduit for alternately connecting the gauging devices with the storage tank, a gas conduit connecting the gauging devices with the expansion tank, and a valve in the gas conduit for establishing communication between the expansion tank and the gauging device that is in communication with the storage tank, a pressure reservoir, a conduit connecting the latter with the tops of the gauging devices, and a valve in the last named conduit for establishing communication between the pressure reservoir and the gauging device that is out of communication with the storage tank.

5. In an apparatus of the character described, the combination with a supply cask, of a closed storage tank, a conduit for supplying liquid from the cask to the tank, a gas conduit for connecting the tops of the cask and tank, means for equalizing the pressure in the cask and tank, and a plurality of gauging devices for distributing the liquid.

6. In an apparatus of the character described, the combination with a supply cask, of a closed storage tank, a conduit for supplying liquid from the cask to the tank, a gas conduit connecting the tops of the cask and tank, an expansion tank communicating with the gas conduit, a plurality of gauging devices, means to alternately connect the gauging devices with the storage tank, and means to alternately connect the gauging devices with the expansion tank.

7. In an apparatus of the character described, the combination with a supply cask, of a closed storage tank, a conduit for supplying liquid from the cask to the tank, a gas conduit connecting the tops of the cask and tank, an expansion tank communicating with the gas conduit, a plurality of gauging devices, means to alternately connect the gauging devices with the storage tank, means to alternately connect the gauging devices with the expansion tank, a pressure reservoir, and means for alternately connecting the latter with the gauging devices.

In testimony that I claim the foregoing as my invention, I have signed my name.

PIERRE ANDRÉ PAUL VICTOR MAUCLÈRE.