

UNITED STATES PATENT OFFICE.

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VAPOR CONSERVATION SYSTEM.

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To all whom it may concern:

Be it known that I, CHARLES P. BUCK, a citizen of the United States, and resident of Topeka, county of Shawnee, State of Kansas, have invented a certain new and useful Improvement in Vapor Conservation Systems, of which the following is a complete specification.

This invention relates to oil-vapor conservation systems, and more especially to the conservation of vapor in receiving and stock tanks in oil fields, it being recognized that vapor to the value of millions of dollars is annually lost through evaporation in every large oil field employing the customary battery of open receiving and stock tanks, or closed tanks equipped with the usual relief valves.

Broadly, my object is to provide a system whereby crude oil can be handled without appreciable loss of any gas or vapor susceptible of conservation and use.

More specifically, my object is to produce a system providing for the recovery of the higher volatiles impossible of retention in the oil during the handling thereof in the field, by employing a closed receiving tank having a pipe line for withdrawing the "rich" vapor adjacent the level of the liquid in the tank, and closed stock tanks so connected that the pressure of vapor generated by evaporation shall be equalized in all of the tanks, and the "rich" gas generated in the stock tanks flow into the receiving tank and descend to the intake end of the draw-off pipe therein, and into any other tank or tanks where there is an unbalanced pressure.

With the objects mentioned in view, the invention consists in certain novel and useful features of construction and organization as hereinafter described and claimed; and in order that it may be fully understood, reference is to be had to the accompanying drawing, in which:—

Figure 1 is a top plan view of a vapor conservation system embodying the invention;

Figure 2 is a side elevation of the same; and,

Figure 3 is an enlarged central vertical section showing a controlling means for vapor-withdrawing pipe connected to the receiving tank of the system.

In the said drawing, 1 indicates an oil-receiving tank for use in oil fields, and 2 a pipe for discharging crude oil from the

wells into the tank. 3 indicates a series of stock or holding tanks of lesser height than the receiving tank, and 4 a pipe leading from the receiving tank in the plane to which the same should stand charged with oil, provided with branch pipes 5 communicating with the upper part of the stock tanks, said branch pipes having controlling valves 6.

A vapor pipe 7 communicates with the upper part of the receiving tank and is provided with branch pipes 8 communicating with the upper ends of the stock tanks, and said branch pipes are controlled by valves 9.

The receiving tank is preferably provided with a relief valve 10 at its top; all of the tanks being closed at the top as shown with a gas-tight relation, so that gas or vapor cannot escape from the tanks nor air enter the same except by circulating from one tank to another.

A vapor-withdrawing pipe leads from an ordinary vacuum pump, not shown, and comprises a pipe member 11, a double-walled pipe member 12, and a depending pipe member 13, which communicates at its lower end with the interior of the receiving tank close to but above the level of the oil therein. The inner wall of the member 12 of said pipe is perforated as at 14, and in conjunction with an opening 15 in the top of the tank establishes communication between the members 12 and 13 of said vapor-withdrawing pipe. In detail, the upper end of the member 13 is secured to a flanged tubular socket 16 which, with the member 12 which is also flanged, is riveted or secured as at 17 to the top of the tank around the opening 15 thereof.

A regulating mechanism or means for partially or wholly closing the vapor-withdrawing pipe, is constructed as follows: 18 is a casing preferably cast with member 12 of the said pipe and communicating with the passage formed by the inner wall of said member. 19 is a lever suitably mounted within said casing, and 20 is a weight or its equivalent for normally holding the lever in the position shown by Figure 3, that is, so that the rod 21 pivotally depending from the lever and pivoted to a piston-valve 22 operating within the pipe member 12, shall normally hold said piston-valve elevated and communication between pipe members 11 and 13 unobstructed.

A diaphragm 23 closing the upper end of

chamber 18, is provided with a depending pin 24 extending through a portion of lever 19, and provided with enlargements 25 and 26 so that movement of the diaphragm upward or downward, shall impart rocking movement to the lever and thereby shift the valve 22.

A cap 27 is employed for protecting and securing the diaphragm upon the casing and is provided with an upturned central portion 28 communicating with the atmosphere. A hood or guard 29 is secured over the upturned portion 28 to prevent rain and snow entering the casing and obtaining access to the diaphragm, the lower margin of the hood or guard having openings 30 to provide for the free passage of air. In this connection it should be stated that no claim to the specific construction of this regulator mechanism or means is made in this application except broadly in combination with other features, as the said regulator is claimed per se in a copending application.

In operation, the crude oil passes into the receiving tank through pipe 2 and upon attaining the level of pipe 4, flows through the same and the various branch pipes 5 until the stock tanks are charged, each stock tank when filled to the required degree being cut off by the manual closure of its valve 6, it being obvious that air standing in the tanks and vapor produced in the latter by evaporation, will be equalized in pressure in all of the tanks through the vapor line 7. It will also be apparent that as the vapor is heavier than the air, the latter will stand chiefly in the receiving tank, and that the vapor in the latter will graduate as to richness from the bottom strata adjacent the oil level to the top or leanest strata immediately underlying the relatively pure air. It will also be understood that under changes of temperature, the pressure due to evaporation, will vary, and hence permit of the recovery of the maximum volume of rich gas at a certain period of the day, through the vapor-withdrawing pipe, which gas might otherwise be lost in the further handling of the oil, as, for example, when discharging oil from the stock tanks and when recharging the same.

It will be apparent that under the withdrawal of vapor from the receiving tank, the pressure therein will be reduced and that when this reduction attains a certain degree,

the valve 22 will automatically close the withdrawal pipe, and will reopen it automatically to permit of withdrawal of additional rich vapor, when the proper pressure is re-attained through further evaporation of oil in the tank.

By this system, it will be clear that a relatively heavy loss of gasoline through evaporation is prevented, especially during the hot season, as at that time the specific gravity of oil in the tanks may be reduced several degrees in a comparatively short time, it being understood, however, that where gas-tight tanks are employed, they must be sufficient strength to withstand the pressure developed, any excess pressure due to the presence of "wild" gas being permitted to escape by the relief valve of the receiving tank.

I claim:

1. A vapor conservation system, comprising oil-receiving and stock tanks, valve-controlled pipes connecting the tanks, one of the pipes being arranged to convey oil from the receiving tank at an intermediate point thereof to the stock tank, and the other to convey vapor from the stock tank to the receiving tank above the level of the oil therein, a vapor-withdrawing pipe communicating with the receiving tank near but above the level of the oil therein, and means actuated by an increase in the vacuous condition of the receiving tank, to partially or wholly close the said vapor-withdrawing pipe.

2. A vapor conservation system, comprising an oil-receiving tank and a stock tank of less height than the receiving tank, a valve-controlled pipe leading from the receiving tank at an intermediate point of its height and communicating with the upper part of the stock tank, a valve-controlled pipe leading from the upper part of the stock tank to the upper part of the receiving tank, a vapor withdrawing pipe, a pipe depending within the oil-receiving tank to a plane slightly above the level of the oil therein, and means actuated by sufficient increase or decrease in the vacuous condition of the receiving tank, to close or open communication between the said depending pipe and said vapor-withdrawing pipe.

In witness whereof I hereunto affix my signature.

CHARLES P. BUCK.