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TRANSPORTING OIL AND APPARATUS USEFUL THEREFOR.
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Fig. 1.

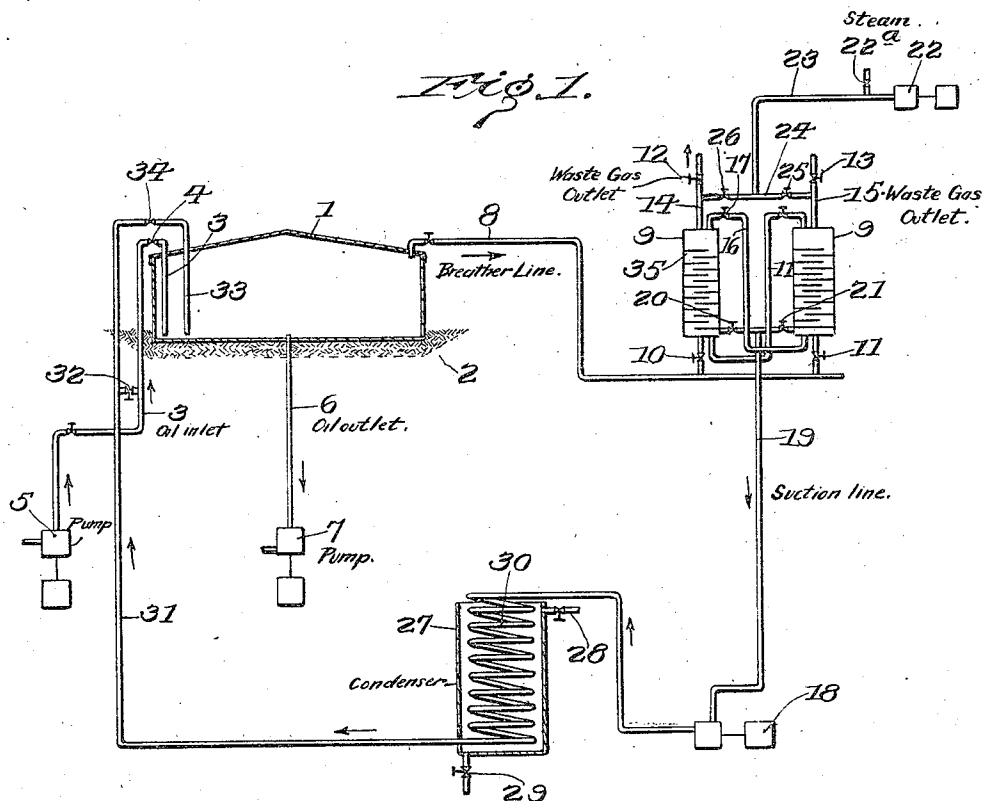
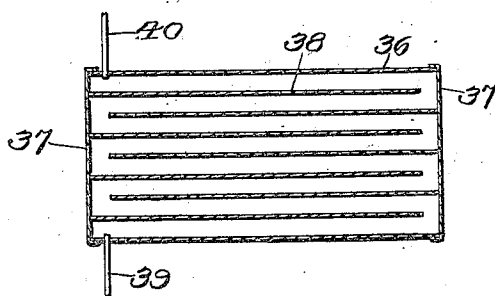


Fig. 2.



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UNITED STATES PATENT OFFICE.

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TRANSPORTING OIL AND APPARATUS USEFUL THEREFOR.

Application filed December 17, 1919. Serial No. 345,568.

To all whom it may concern:

Be it known that we, FRANK M. SEIBERT and EDWARD T. GREGG, citizens of the United States, and residing at Houston, in the county of Harris and State of Texas, have invented certain new and useful Improvements in Transporting Oils and Apparatus Useful Therefor, of which the following is a specification.

10 This invention relates to transporting oils and apparatus useful therefor; and it comprises as an improvement in the art of transporting petroleum oils through pipe lines a method wherein gases and vapors 15 escaping from oils in transit are vented through or past porous and pervious material adapted to take up and retain the vapors of condensible hydrocarbons carried by such gases, said material from time to time being 20 stripped of condensed hydrocarbons which may then be returned to the line; and it further comprises a method in which casing head gasoline and other volatile liquids are mixed with crude oil so transported, loss 25 of such volatile liquids in transit being avoided by the described expedient; and it still further comprises an improvement in pipe line apparatus comprising providing the gas vents of the line with filters or like 30 devices of pervious absorbent material, such devices being so connected with the line and with a stripping apparatus as to permit the device being cut out of circuit, stripped of condensed matter and once more 35 placed in circuit; all as more fully hereinafter set forth and as claimed.

Pipe lines for transporting crude oil are usually provided with receiving and measuring tanks at intervals of forty miles or so; 40 there being a pair of these tanks at each station for alternately receiving and discharging oil. As the tank fills with oil, the air therein must find exit, while as it is emptied again, air must find entrance. In 45 addition it is necessary to provide for a more or less irregular evolution of gases and vapors from the oil itself. Crude petroleum oil, in addition to the readily volatile oils or hydrocarbons of the nature of gasoline which it contains, usually contains dis-

solved gases; and these gases tend to separate more or less in transportation, taking with them more or less gasoline. It is usual to provide the receiving and measuring tanks with breather pipes or bleeders; vent 55 pipes connected to the top of the tank and extending some distance away. Through these breather pipes air escapes in filling the tank and air enters in emptying the tank, while they also take care of evolved gases 60 and vapors. The function of these breather pipes is, of course, to maintain normal pressure in the receiving and measuring tanks. The evolution of gas and vapor from the oil itself is more or less irregular and much of 65 it takes place in the tank itself. It is more copious when the tank is warmed by the sun than at other times. The use of these vent pipes is responsible for the loss of considerable quantities of gasoline from 70 the oil in transit; and it is one of the objects of this invention to avoid this loss.

In the present invention in order to prevent loss of valuable volatile oils with escaping air and gases, the vent pipe is provided with a filter or chamber charged with 75 granular adsorbent material which while offering no great frictional resistance to the back and forth passage of gases, is nevertheless adapted to abstract from it and hold 80 any condensible hydrocarbons present. As such a material may be used the "activated" charcoals and coals employed in gas masks for military use, decolorizing carbons, porous silica, such as that produced by drying 85 silica gels, dried aluminum hydroxide, porous "zeolites" of the nature of those used in softening water, and many other minutely pervious materials. It is convenient to use such devices in pairs, so that one can 90 be functioning in removing hydrocarbons from gases while another is being stripped of condensed hydrocarbons and made ready to serve anew. While other methods of stripping may be employed such as the use 95 of air, steam or gases, heating, etc., it is simple and advantageous to employ vacuum or suction, the vapors removed by the suction being afterwards condensed by pressure and cooling or in any of the other usual 100

ways. Since the movement of gases through these breathing pipes is irregular and fluctuates, air enters from time to time and in employing charcoals and coals it is advantageous, to avoid risk of fire, to provide the device with means for wetting down the carbon in the event of the development of heat. With the mineral powders there is not the same tendency for catalytic oxidation and development of heat to set in.

In a way the present device may be said to operate as a differential check valve on the line; a valve permitting free escape of air and gas while holding back gasoline. The gasoline collected is simply returned to the body of oil in transit; and even crude oils high in gasoline may be transported without material loss of the gasoline. It is, further, possible to add more gasoline to the oil and utilize the present system in the pipe line transportation of gasoline, gasoline being added to the crude oil at the receiving end and regained from it in the distillation of the oil at the other end; such distillation giving not only the gasoline naturally present but also that added. This gives opportunity for an important economy in transportation charges, pipe line transport being much cheaper than other ways of carrying oils. Because of the efficiency with which gasoline can be kept in the system by the use of the present invention, it is possible to utilize pipe lines for the transport of what is known as casing head gasoline; a highly volatile material regained from natural gas by various methods and difficult of transportation by any other method. Its volatility is so great as to render it unsafe to transport it in tank cars or the like unless blended with heavy oil at the point of shipment. Under the present invention it is simply mixed with the crude oil and the two sent through the pipe line together, being subsequently separated by distillation. In so transporting it, it is incidentally "weathered"; that is freed from dissolved gases; its contained gases being vented off with the gases of the crude oil. As casing head gasoline is recovered from natural gas it is full of dissolved gas and it is necessary to "weather" it to free it of this gas.

In the accompanying illustration I have shown, more or less diagrammatically, certain apparatus within the purview of this invention and adapted for use in the performance of the described process.

Figure 1 is a diagrammatic showing, not made to scale, of a pipe line with a tank and adsorbers in circuit and Figure 2 is a longitudinal section on a somewhat enlarged scale of a modified form of adsorber.

For convenience of illustration, the various elements are shown out of plane; that is, the earth level is disregarded.

Referring to the drawings, element 1 indi-

cates a storage and measuring tank having the surrounding levee 2. For convenience of illustration but one of the usual pair of tanks is shown. The tank receives oil through pipe 3 extending inside the tank and ending at a point near the bottom thereof, and having the check valve 4 for the purpose of preventing back flow or syphoning of oil in event of a break in the line or when the pump is stopped. The line 3 may lead from a pump 5 which receives the oil either from a previous station or from the wells. Tank 1 is further provided with exit pipe line 6 leading to a pump 7 which delivers the oil from tank 1 to the next station along the route of the oil through the pipe line.

The construction previously outlined is substantially that usually employed at oil pumping stations by pipe lines and forms no part of my present invention except in so far as it operates in combination with the parts hereinafter described.

Leading from the storage and measuring tank 1 is a valved bleeder line 8 which is adapted to deliver vapors and gases to one or more of a plurality of adsorbers 9. With the various valves open, a breather line open to the atmosphere is offered by the bleeder pipe through the adsorber, taking care of and obviating changes of pressure in the storage tank in filling and discharging or by atmospheric pressure changes. In event it is desired to pass escaping gases and vapors through the adsorbers in parallel, the valves 10 and 11 on line 8 are opened and the valves 12 and 13 on the lines 14 and 15, respectively, are opened, the waste gases escaping to the air or being used as fuel as the case may be, while the vapors are held back by the adsorbers. Should it be desired to run the adsorbers in series, the valve 11 on the line leading to the second adsorber is closed and the valve 10 leading to the first adsorber is opened whereupon the vapors and gases pass through the first adsorber 9 and thence through the line 16, valve 17 thereon being opened, and thence upwardly through the second adsorber 9, waste gases escaping through 15.

When it is desired to run one adsorber at a time, which is advantageous when a charged adsorber is to be stripped as will hereinafter be pointed out, the first adsorber 9 may be in direct communication with line 8, valves 10 and 12 being opened, while the second adsorber may be in communication with apparatus for stripping it.

When any adsorber, or all of them, are charged or when evolution of gases and vapors from the oil in tank 1 temporarily ceases and it is desired to recover the adsorbed gases and vapors, suction pump 18 may be used. This pump is in communication with the adsorbers through line 19 and it may draw vapors and gases from the first

adsorber 9 alone when valve 20 is opened or from the second adsorber alone when valve 21 is opened and valve 20 is closed, or it may withdraw gases and vapors from both adsorbers simultaneously when valves 20 and 21 are opened.

Should it be desired to use an agent for stripping the adsorbers of adsorbed vapors and gases, this may be done by means of a pump 22 adapted to supply air or gas to the line 23 and thence to the adsorber. The stripping agent may be sent through line 24 to either, or simultaneously to both, of the adsorbers as the case may be, the valves 25 and 26 being suitably adjusted as will readily appear. The diagrammatically shown pump 22 may indicate a source of stripping agent and the suction pump 18 may be relied upon for the purpose of drawing the stripping agent from the adsorbers as described. Steam may be used, being admitted through valved pipe 22^a. In case of ignition in the adsorbers this steam may be used for quenching.

The vapors and gases stripped from the adsorbers may be compressed in any known device or they may be sent under the pressure of pump 18 to the condenser 27 which is the ordinary condenser tub having inlet 28 and outlet 29 for cold water and having therein the coiled cooling pipe 30. Condensed liquid is then sent through pipe 31 to join the main supply of crude oil through connection 32 if desired or it may be separately sent to the tank 1 through line 33 provided with the check valve 34 to prevent back flow and syphoning in event of breakage of the line or stoppage of the pump 18. The adsorbers 9 are provided with any desired means for holding the adsorbing material in such position that the gases passing and vapors from the tank 1 may pass in efficient contact with it without too much friction. Any substantial degree of frictional resistance to passage of gases interferes with the breather function of the apparatus. I have shown a plurality of staggered shelves 35 for holding granular adsorbent materials.

Referring to Figure 2, it illustrates more or less diagrammatically a modified form of adsorber which I may use. This adsorber comprises a casing 36 having removable heads 37 and a plurality of staggered partitions 38 arranged in the casing so that the gases and vapors which pass there-through shall take a circuitous course. The gases and vapors may be admitted through inlet 39 and removed through outlet 40. I may use a plurality of such modified adsorbers as shown in Figure 2 in the place of adsorber 9 diagrammatically shown in Figure 1.

It is to be understood that the drawing accompanying this application is purely diagrammatic. The tank 1 may readily be a

still in which event I should take from the condenser in communication with such still the vapors and gases not condensed by that particular condenser and treat them in the manner described. The material thus recovered may be supplied to the still or reserved for use itself or be blended with other materials.

The operation of the system is obvious from the foregoing description. When I use air or gas as my stripping agent I advantageously heat the same; but the utilization of air or gas as a stripping agent is not necessary for the proper operation of my process. Simple suction with a relatively low vacuum in the adsorbers is usually sufficient.

What I claim is:—

1. In the transportation and storage of petroleum oils the process of preventing loss of volatile oils while maintaining normal atmospheric pressure and permitting escape of gases and vapors which comprises venting off said gases and vapors through a chamber containing adsorbent pervious material, stripping adsorbed volatile oils from the pervious material from time to time and returning the volatile oils to the oil whence they came.

2. In the transportation and storage of petroleum oils the process of preventing loss of volatile oils while maintaining normal atmospheric pressure and permitting escape of gases and vapors which comprises venting off said gases and vapors through a chamber containing adsorbent pervious material, and stripping said material of adsorbed oils from time to time by exposure to suction.

3. In the transportation and storage of petroleum oils the process of transporting volatile oils of the nature of gasoline through pipe lines which comprises mixing said gasoline with crude oil and passing the mixture through a pipe line provided with gas vents carrying adsorbent porous material.

4. An oil pipe line system provided with breathing devices for venting off gases; the breathing devices being in communication with the atmosphere and provided with chambers charged with adsorbent material adapted to abstract and retain volatile oils while allowing gases to go on.

5. An oil pipe line system provided with breathing devices for venting off gases, the breathing devices being in communication with the atmosphere and provided with chambers charged with adsorbent material adapted to abstract and retain volatile oils while allowing gases to go on in combination with means for stripping the adsorbent material of adsorbed oils.

6. An oil pipe line system comprising receiving and measuring tanks provided with

breathing devices for equalizing pressure
therein, said breathing devices being in com-
munication with the atmosphere and pro-
vided with chambers charged with adsorbent
5 material adapted to abstract and retain va-
pors of volatile oils by allowing the gases
to go on, means for stripping the adsorbent

materials of adsorbed oils, and means for
returning the oils so stripped to the tanks.

In testimony whereof, we hereunto affix 10
our signatures.

FRANK M. SEIBERT.
EDWARD T. GREGG.