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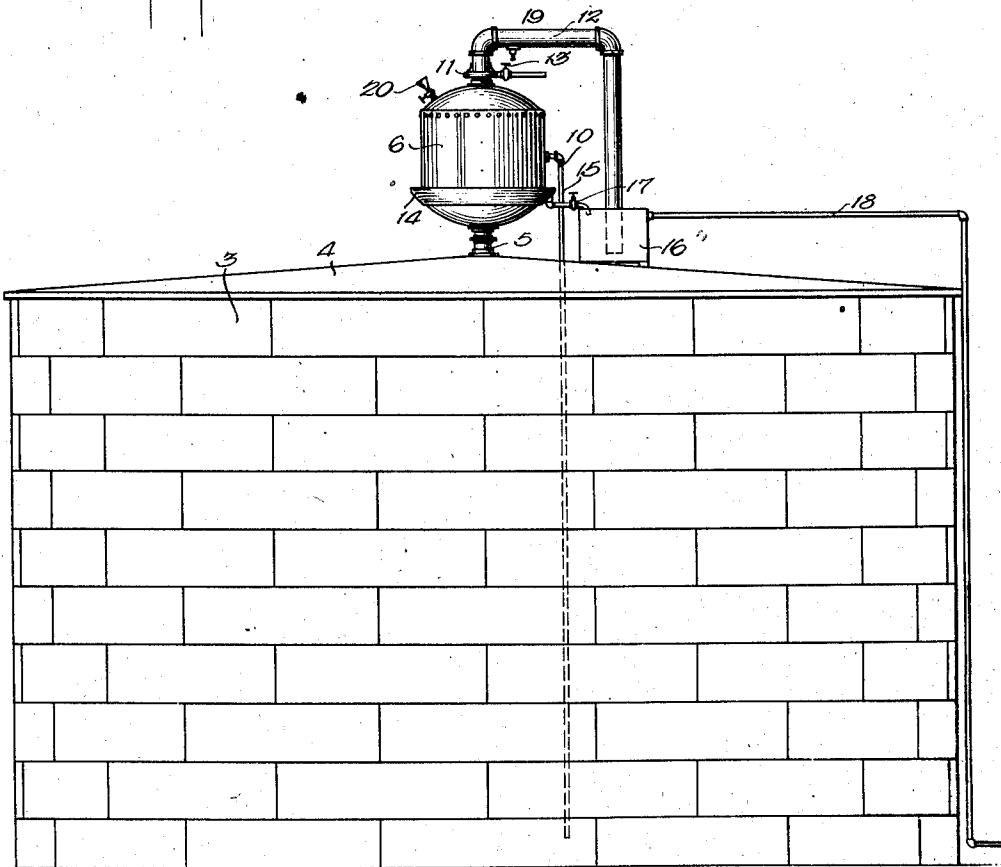
E. J. RODRIGUEZ

CONDENSER FOR LIQUID STORAGE TANKS

Filed Sept. 28, 1923

2 Sheets-Sheet 1

Fig. 1.



WITNESSES

Frederick Diehl.
E. J. Mueller

INVENTOR

E. J. RODRIGUEZ

BY

Mumford

ATTORNEYS

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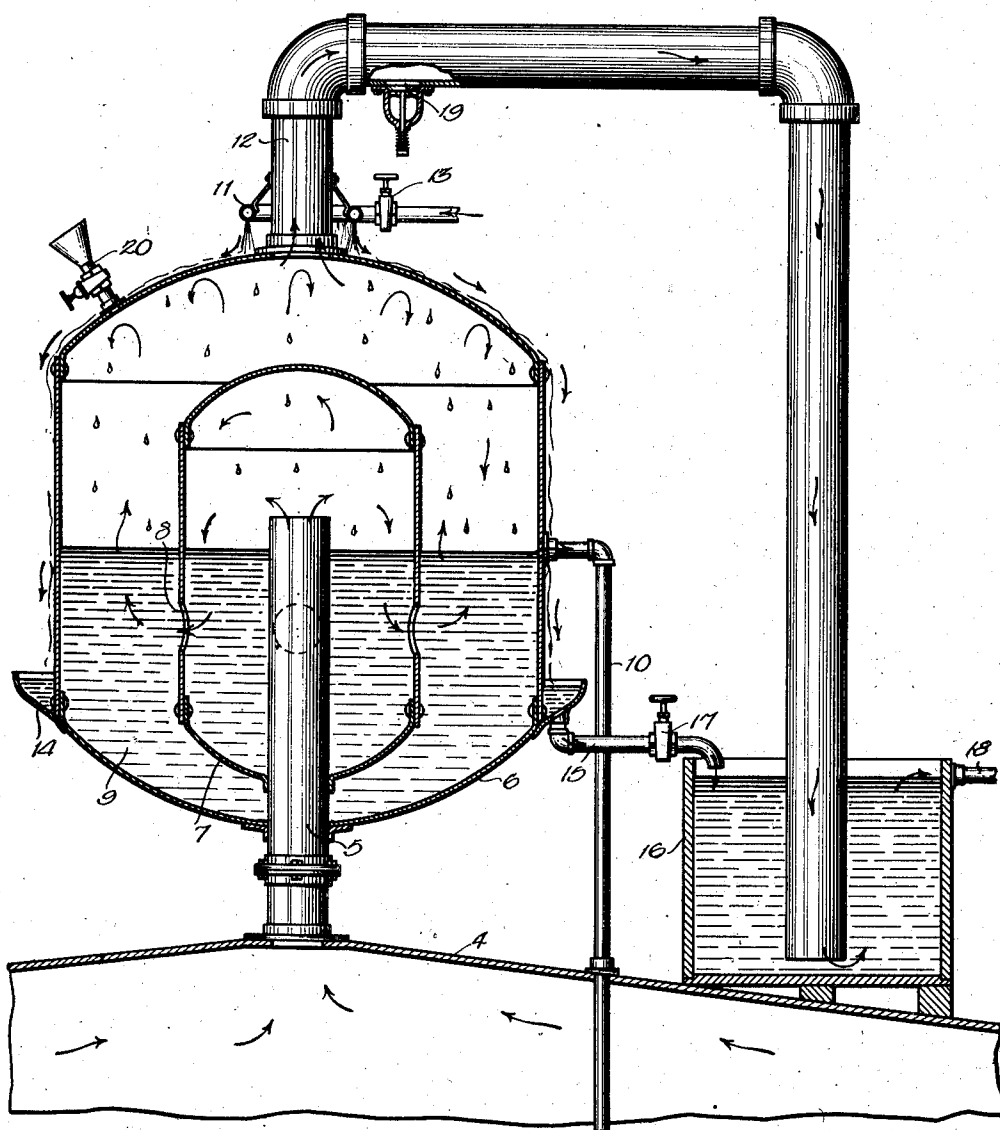
E. J. RODRIGUEZ

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2 Sheets-Sheet 2

Fig. 2.



WITNESSES

Frederick Diehl.
C. A. Mueller

INVENTOR
E. J. RODRIGUEZ

BY

Munroe

ATTORNEYS

UNITED STATES PATENT OFFICE.

EDWIN JOSEPH RODRIGUEZ, OF NEW ORLEANS, LOUISIANA.

CONDENSER FOR LIQUID-STORAGE TANKS.

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To all whom it may concern:

Be it known that I, EDWIN J. RODRIGUEZ, a citizen of the United States, and a resident of New Orleans, in the parish of Orleans and State of Louisiana, have invented a new and Improved Condenser for Liquid-Storage Tanks, of which the following is a full, clear, and exact description.

This invention relates to improvements in liquid storing apparatus, and has particular reference to a condenser therefor.

In the storage of gasoline and other volatile oils, it is the common practice to provide the storage tank with a vent pipe to compensate for expansion within the tank and permit of the escape of the vapors from the tank into the atmosphere. It is well known that this method of storage results in a considerable loss in volume, due to evaporation, aside from the fact that tanks having vent pipes have been known to be struck by lightning causing great damage and loss by fire.

An object of the present invention is to eliminate the use of vent pipes on storage tanks and to provide an improved apparatus capable of absorbing and condensing the vapors emanating from volatile oils, such as gasoline, crude oil, kerosene and the like, stored in said tanks.

Another object is to cause the return to the tank of all but a very small percentage of the condensed vapors and to convey such portion of the unreturned fluid from the immediate vicinity of the tank in such manner that the danger of loss from ignition of said unreturned portion will be reduced to a minimum.

The above and other objects will appear more clearly from the following detail description when taken in connection with the accompanying drawings, which illustrate a preferred embodiment of the inventive idea.

In the drawings—

Figure 1 is a complete side elevation of a storage tank showing the condensing apparatus of the present invention applied thereto; and

Figure 2 is a fragmentary enlarged sectional view of the condensing apparatus.

Referring more particularly to the accompanying drawings, the numeral 3 indicates generally a storage tank, which may be constructed in any well known manner, and which is provided with the usual cover or top 4.

In lieu of the usual vent pipe, the present invention provides an outlet pipe 5 extending upwardly from the top 4 and having communication with the interior of the tank to permit of the escape from the tank of the vapor therein. The condenser, which comprises the essential features of the invention, includes outer and inner chambers 6 and 7 supported upon the pipe 5 in spaced relation to each other and in concentric relation with respect to said pipe, the inner chamber 7 enclosing the outer end of the pipe 5. The inner chamber 7 is provided in the side wall thereof and intermediate its ends with a plurality of ports 8 for affording communication between said chambers. In practice, it is desirable though not absolutely necessary, to partially fill the chambers 6 and 7 with a low gravity gasoline or other absorbing oil, indicated by the numeral 9, the level of said oil being above the ports 8 and below the upper or outlet end of the pipe 5, so that as the vapor passes out of the pipe 5 into the portion of the chamber 7 above the level of the liquid 9, a portion of said vapor will be condensed by contact with the upper end of the chamber 7 and the pressure from within the tank will cause the remaining vapor to be forced through the liquid in the chamber 7 and from thence through the ports 8 and upwardly into the portion of the chamber 6 above the liquid 9, as clearly indicated by the arrows in Figure 2. During the passage of the vapor through the liquid 9, a portion of the vapor is condensed into liquid form and mixes with the absorbing or condensing medium 9. In order that the condensed vapor may be returned to the tank 3, an overflow pipe 10 is provided, the upper end of which communicates with the interior of the chamber 6 at a point below the upper end of the pipe 5, so that as said chamber gradually fills and the level of the liquid reaches that of the upper end of the connection or pipe 10, the liquid will flow through said pipe and from thence downwardly into the tank.

The portion of the vapor which remains uncondensed after passage through the medium 9 rises in the chamber 6 and impinges against the upper end thereof. To facilitate the condensation of this vapor, the invention provides a spraying device, in the form of a circular pipe 11, having a plurality of perforations in the lower portion thereof, said pipe surrounding and being supported

centrally above the upper end of the chamber 6 by an outlet pipe 12 extending upwardly from said chamber. The spraying device is connected to a suitable source of water supply (not shown) and the flow of water through the perforations in the pipe 11 is controlled by a suitable valve 13. It will thus be seen that by means of the spraying device a continuous stream of water may be caused to flow over the top and down the side wall of the outer chamber 6 which will facilitate the condensation of vapor impinging against the interior surface of the upper end of said outer chamber. The condensed vapor will then fall on to the surface of the medium 9 and eventually pass downwardly into the tank 3.

Means are further provided for utilizing the water from the spraying device 11 for effecting the condensation of any vapor which might not be condensed by contact with the walls of the inner or outer chambers or passage through the medium 9, which vapor will escape through the pipe 12. To this end, there is secured to the outer chamber 6 adjacent the lower end thereof an outwardly directed annular flange 14 combining with the side wall of said outer chamber to form a troughlike structure for receiving the water as the same flows down the side wall of the outer chamber. An outlet pipe 15 has one end connected to said trough and its discharge end positioned over a reservoir 16, preferably mounted upon the top 4 of the tank. The outlet pipe 15 is provided with a valve 17 which may be opened to permit the water to flow into the reservoir 16, or which may be closed so as to stop the flow into said reservoir. In the latter event, the water in the trough will overflow on to the top 4 of the tank 3 and down the sides thereof to cool the tank should this be deemed necessary. While the valve 17 is open and the spraying device is in operation, a constant stream of water is flowing into the reservoir 16 and from thence outwardly through an overflow pipe 18, which is extended to any desired point at a considerable distance from the tank away from the fire limits thereof. The end of the outlet pipe 12 opposite that connected to the top of the outer chamber 6 is extended into the reservoir 16 to a point adjacent the bottom thereof so that the residual vapor from the chamber 6 will be forced to pass through said pipe and from thence upwardly through the water in the reservoir 16. Said vapor is thus condensed and will flow out of the reservoir through the overflow pipe 18. The quantity of vapor thus condensed is so negligible that should the liquid in the reservoir become ignited it would quickly burn itself out without danger of igniting the main supply in the tank 3.

The pipe 12 is provided therein with an air inlet valve 19, which will automatically open should a vacuum be created in the tank, due to changes in atmosphere, thus permitting air to flow into the outer chamber 6 and destroy the vacuum. The outer chamber 6 may be provided with a valve controlled inlet 20 through which a low gravity oil, comprising the absorbing medium 9, may be poured into said chamber whenever desired.

What is claimed is:

1. The combination with a storage tank having a pipe projecting from its top, of inner and outer chambers mounted on said pipe with the end of the pipe terminating short of the top of the inner chamber, the inner chamber being provided with openings intermediate of its ends establishing communication between said chambers.
2. In combination, a storage tank for containing volatile oils, inner and outer vapor receiving chambers arranged above the tank and having communication with each other and with the inner one of which the tank communicates, a condensing medium in said chambers, an overflow connection between said outer chamber and said tank for conveying condensed vapor from said chamber to said tank, means for spraying a liquid over said outer chamber to condense the vapor therein, and means on the tank, whereby the water flowing over the condenser may be conducted away or delivered onto the tank to cool the same.
3. The combination with a storage tank provided with a pipe extending from its top, of inner and outer concentric chambers mounted on the pipe with its end terminating short of the top of the inner chamber, the inner chamber having openings in its ends, an overflow pipe leading from the outer chamber below the upper end of the pipe extending from the tank into the outer chamber, and means for spraying water on the outer chamber.
4. In combination, a storage tank for containing volatile oils, a chamber having communication with said tank and in which vapor from said tank is condensed, an overflow connection between said chamber and tank through which the condensed vapor flows from said chamber to said tank, means for spraying a liquid over said chamber to produce condensation of the vapor therein, a reservoir for receiving the liquid sprayed over said chamber, and a connection between said chamber and reservoir for passing uncondensed vapor from said chamber through the liquid in said reservoir.
5. In combination, a storage tank for containing volatile oils, a vapor outlet pipe extending from said tank, inner and outer condensing chambers supported by said outlet pipe and arranged concentrically with re-

spect thereto, said inner chamber having ports for establishing communication between said chambers, a condensing medium in said chambers, an overflow connection between the outer chamber and the interior of said tank, said connection communicating with the interior of said outer chamber at a point below the outlet end of said vapor outlet pipe, a reservoir supported upon said tank, a second outlet pipe extending from said outer chamber into said reservoir for conveying vapor from said outer chamber to said reservoir, a trough supported by said outer chamber, a spraying device for spraying a liquid over said outer chamber and into said trough, and a valve controlled connection between said trough and reservoir for permitting the liquid from said trough to flow into said reservoir.

6. The combination with a storage tank having a pipe extending from its top, of outer and inner condensing chambers communicating with each other and supported upon said pipe one within the other, and in spaced relation to one another, with the pipe extending into the inner chamber and terminating short of the upper end thereof, and a pipe leading from one side of the outer chamber at a point below the upper end of the pipe within the inner chamber into the tank to convey the condensed vapor from said chamber into the tank.

7. The combination with a storage tank having a pipe projecting from its top, of outer and inner chambers supported upon said pipe one within the other and in spaced relation to one another, with the said pipe

extending into the inner chamber and terminating short of the top thereof, the inner chamber being provided with openings intermediate of its ends, a condensing medium in said chambers, the level of said medium being above the openings of said chamber and below the top of said pipe, and a pipe leading from one side of the outer chamber at a point below the upper end of the pipe within the inner chamber to the tank to convey the condensed vapor from said chamber to said tank.

8. The combination with a storage tank, of a condenser supported above the tank, a pipe for leading the condensed vapor from the condenser into the tank, means for delivering water upon the condenser, and a trough carried by the condenser at the lower end thereof for receiving the water flowing over the condenser, and a valved discharge pipe leading from the trough, whereby by closing the valve the overflow of the trough will be delivered onto the tank to cool the same.

9. A condenser of the character described comprising two chambers one within the other and in spaced relation to each other, the inner chamber having openings therein, a pipe upon which the chambers are mounted in concentric relation thereto the upper end of the pipe terminating short of the top of the inner chamber and above the openings thereof and the lower end of the said pipe extending through the outer chamber and adapted to be secured to a tank, and a vapor outlet in the top of the outer chamber.

EDWIN JOSEPH RODRIGUEZ