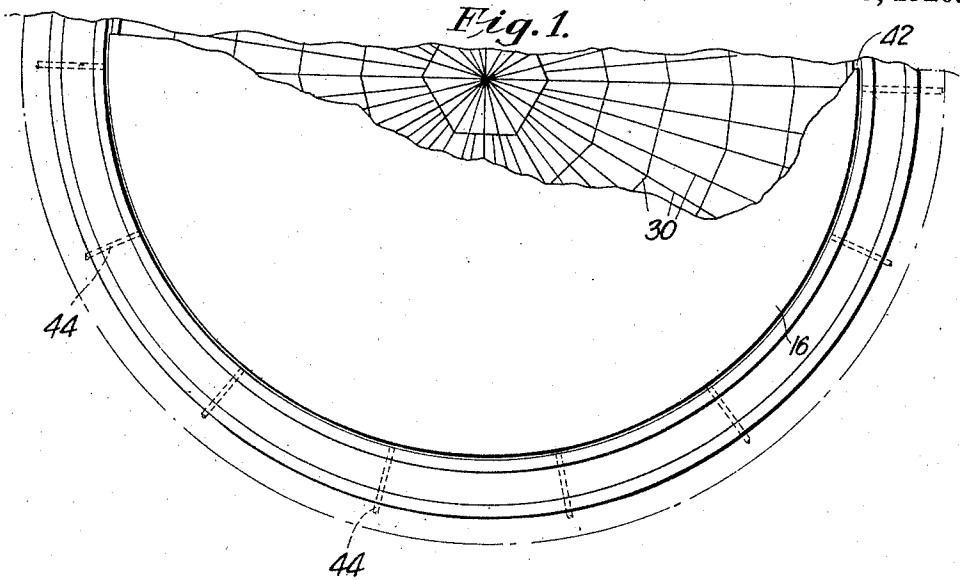
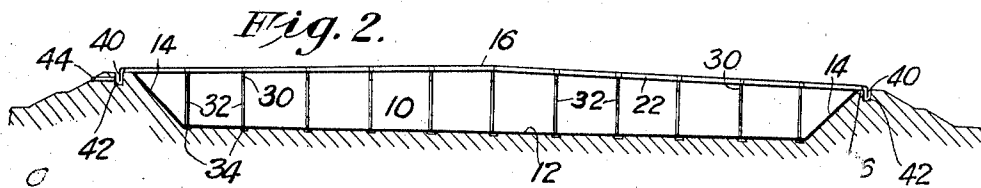
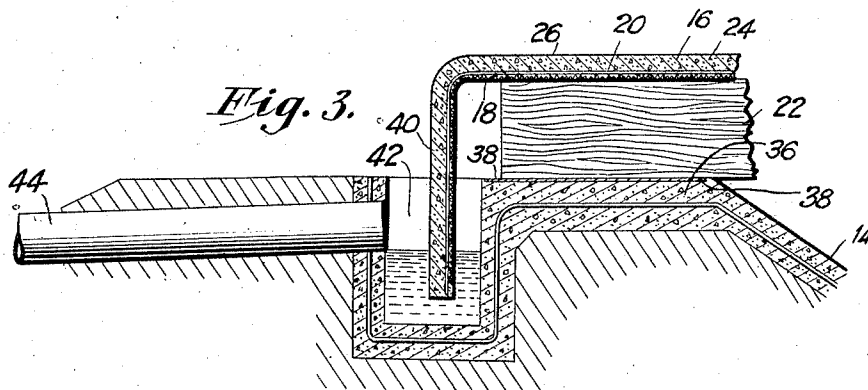
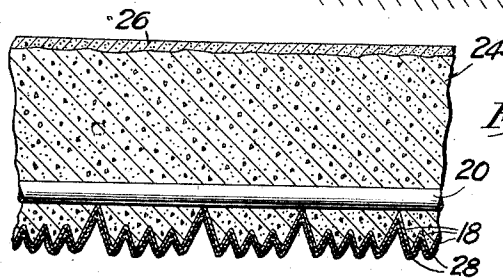


J. J. ALLINSON.
STORAGE RESERVOIR.
APPLICATION FILED AUG. 12, 1918.

1,360,170.

Patented Nov. 23, 1920.



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STORAGE-RESERVOIR.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, JOHN JOSEPH ALLINSON, a citizen of the United States, residing at Bartlesville, in the county of Washington, State of Oklahoma, have invented certain new and useful Improvements in Storage-Reservoirs; 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.

This invention relates to storage reservoirs and more particularly to reservoirs for storing crude petroleum oil.

Heretofore it has been the practice to store oil as it is pumped from a well in steel storage tanks. These steel tanks generally rest upon the ground so that all portions of the tank except the bottom are exposed to the heat of the sun. The heat evaporates the oil in the tanks and although the tanks may have tight covers, the evaporation loss is very high because the tanks have to be vented to prevent an excess gas pressure in the tanks and to avoid explosions.

In the California oil fields, oil has been stored in concrete lined reservoirs. These reservoirs are located below the surface of the ground so that the sun's heat acts only upon the surface of the oil in the reservoir. The reservoirs are provided with covers, but owing to the large dimensions of the reservoirs, the covers were not made gas-tight and are not sealed at the junction of the covers with the reservoir. With this type of reservoir, the loss by evaporation is less than the evaporation in steel tanks but the character of the reservoir cover has been such that the loss from evaporation is very high.

The object of the present invention is to provide a reservoir in which oil or volatile liquids may be effectively stored and which will overcome the objections above noted.

With this and other objects in view, the invention consists in the improved oil storage reservoir hereinafter described and claimed.

The various features of the invention are illustrated in the accompanying drawings, in which—

Figure 1 is a partial plan view with parts

broken away of a storage reservoir embodying the preferred form of the invention.

Fig. 2 is a vertical sectional view of the reservoir shown in Fig. 1;

Fig. 3 is a detail view in vertical section showing the liquid seal between the reservoir basin and cover; and

Fig. 4 is a detail vertical sectional view of the concrete cover.

In the preferred form of the invention, the storage reservoir consists of a concrete lined reservoir having a gas-tight concrete cover and a gas-tight seal between the cover and the reservoir basin. This reservoir is of that type of concrete lined reservoirs having a depth of from 30 to 40 feet, a diameter of 300 to 400 feet or more, and is capable of holding from 300,000 to 800,000 barrels of oil. In the preferred construction of the reservoir, the reservoir basin is located below the surface of the ground and the banks of the reservoir are formed with the earth which is excavated to form the basin. The basin is preferably circular in shape having a reinforced concrete floor and a reinforced concrete sloping side wall or embankment. The floor and side wall are made of relatively coarse concrete and the upper surface is finished with a waterproofing material such as gunite to prevent leakage of the oil or volatile liquid to be held in the reservoir.

The reservoir cover consists of a sheet of reinforced concrete which is supported above the reservoir on a wooden structure. The cover and supporting structure for the cover may be made entirely of concrete or may be made of steel, but it is preferred that the cover be made of concrete since the concrete has a low heat conductivity, is fire-proof, and is very resistant to the corrosive action of the oil vapors. The cover consists of a continuous slab of concrete which is reinforced with a sheet metal lath and iron or steel rods (see Figs. 3 and 4). The metal lath, known in the trade as hyrib, rests upon rafters and the ribs of the metal lath are arranged circumferentially of the reservoir. The reinforcing rods rest on top of the ribs of the lath and are arranged substantially at right angles to the ribs of the lath or radially of the reservoir.

In making the cover, the lath 18 and reinforcing rods 20 are secured in position and a concrete filling 24 poured over the lath 18 and rods 20 to embed them in the reservoir cover. To make the cover vapor or gas-tight and water-tight, a layer of cement mortar 26 is spread over the upper surface of the concrete 24. To protect the under face of the metal lath 18 and to securely embed the lath in the concrete slab, the lower face of the lath is coated with a layer of gunite 28 by means of a concrete gun. The rafters 22 for supporting the cover rest upon girders 30 which are supported upon posts 32 mounted on piers 34 formed in the reservoir floor 12.

The reservoir cover is a continuous integral sheet of reinforced concrete having only a valved exhaust outlet and one or more openings for a winch and to permit access to the interior of the reservoir. There are no expansion joints in the cover and the reinforcing material keeps the concrete sheet from cracking as it undergoes expansion and contraction. With a reservoir having a diameter of 300 to 400 feet, the lineal expansion at the mud-sill of the reservoir basin for changes in temperature of 100° F. will be approximately 2 inches so that it is impossible to have a fixed joint between the reservoir basin and the cover. The cover is loosely mounted on the rim or mud-sill 36 of the reservoir basin to allow the cover to be freely movable under contraction and expansion. To avoid wear on the bottom of the rafters 22 due to movement of the cover, a metal plate 38 is mounted in the mud-sill 36 below each of the rafters.

To provide an effective gas-tight seal between the reservoir basin and the movable cover 16, the reinforced concrete cover slab is provided with a downwardly projecting flange 40 which is positioned in a gutter 42 surrounding the mud-sill 36. The flange 40 is made with a form to have substantially the same construction as the cover 16 and is united integrally with the cover to give a vapor-tight structure. The gutter is formed of reinforced concrete and made waterproof to hold water for making a liquid seal between the cover and reservoir. The water seal between the cover and the reservoir basin effectively provide for the expansion and contraction of the cover. A series of drains 44 are placed at intervals in the gutter to keep the water of the gutter at a predetermined level and to conduct away water which may run into the gutter from the cover 16.

The reinforced concrete cover will support a comparatively heavy load so that it may be covered with earth or other suitable heat insulating material to prevent the oil in the reservoir from becoming heated suf-

ficiently to cause evaporation. This form of construction further is very effective in preventing evaporation in that the heat of the sun will act only on the cover and the cover may be insulated sufficiently to prevent the oil in the reservoir from becoming heated high enough to cause an evaporation that will form a vapor pressure under the reservoir cover. For this reason the cover does not necessarily have to be capable of resisting a high pressure but only needs to be sufficiently gas-tight to hold a vapor pressure which will prevent evaporation. The cover, further, does not require the usual explosive doors because an excessive pressure will break the water seal and allow the gas to escape around the water seal flange 40.

To recapitulate, the invention provides a reservoir which has a liquid-tight basin and a gas-tight cover having a vapor-tight seal with the basin, thus avoiding losses due to volatilization or evaporation. The structure, further, is effectively insulated from heat and therefore holds evaporation to a minimum so that the cover does not have to be constructed to withstand losses due to high gas pressures.

The preferred form of the invention having been thus described, what is claimed as new is:

1. An oil storage reservoir having in combination, a reinforced concrete basin, a heat-insulating cover for said basin relatively very large and having wide limits of expansion and contraction, said cover being made of a continuous, jointless sheet of reinforced concrete, and a vapor-tight seal between said basin and cover comprising a fluid-tight concrete gutter secured to the edge of said basin and having a reinforcement therein connected with the concrete of the basin and a reinforced concrete flange integral with said continuous cover extending into said gutter.

2. An oil storage reservoir having in combination, a reinforced concrete basin, a heat-insulating cover supported for free expansive movement over said basin made of a continuous, jointless sheet of reinforced concrete having a downwardly extending integral flange built on reinforcement integral with said sheet reinforcement, and a vapor-seal between said cover and basin comprising a liquid-tight concrete gutter formed integral with the peripheral edge of said basin and arranged to receive said downwardly extending flange, said gutter being relatively large to permit said flange to move freely therein under expansion and contraction of said cover.

3. An oil storage reservoir having in combination, a reinforced concrete basin, a heat-insulating cover supported for free expansive movement over said basin, a supporting

frame mounted in said basin and arranged for expansive movement relatively thereto, a continuous, jointless body of reinforced concrete supported on said frame and arranged for free expansive movement relatively to said frame, and a vapor-seal between said basin and cover comprising a comparatively wide concrete gutter formed integrally with the peripheral edge of said basin and a reinforced concrete flange integrally formed with the peripheral edge of said cover and normally extending down into the central portion of said gutter. 10

In testimony whereof I affix my signature.

J. J. ALLINSON.