May 8, 1928. 1,669,067

L. D. PASTORE

DEVICE FOR SAVING LIQUID FUELS AND THE LIKE

Filed March 25, 1926 2 Sheets-Sheet 1

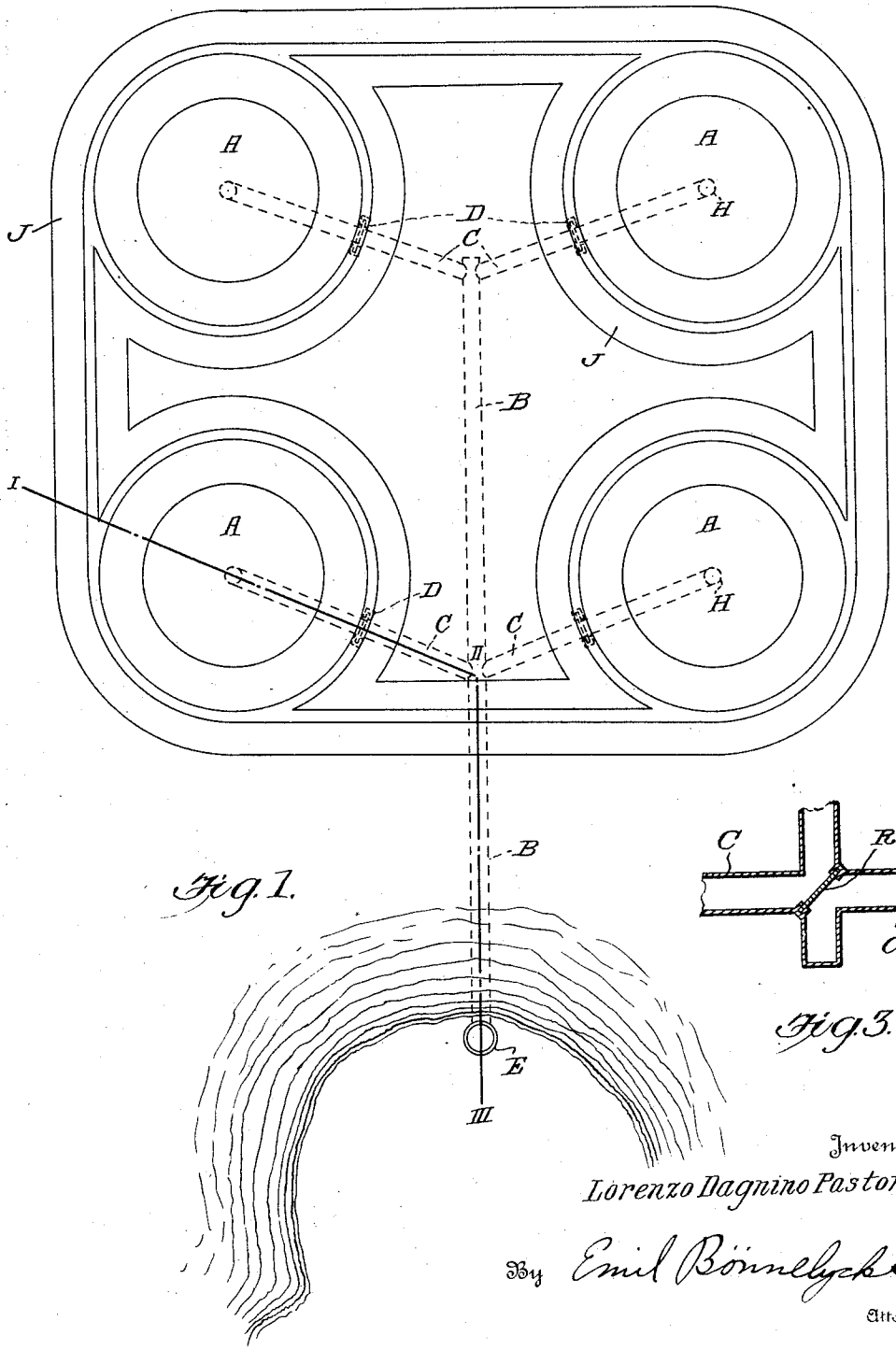


Fig. 1.

Fig 3.

Inventor

Lorenzo Dagnino Pastore,

By Emil Bönnelycke

Attorney

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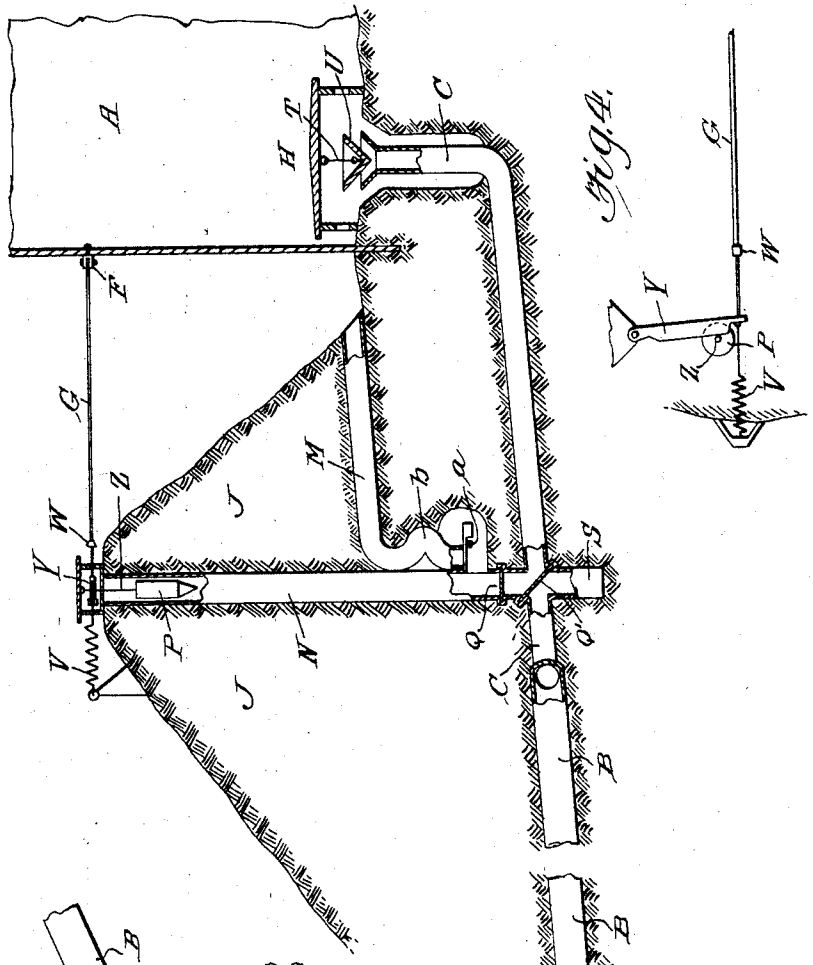


Fig. 2.

Fig. 4.

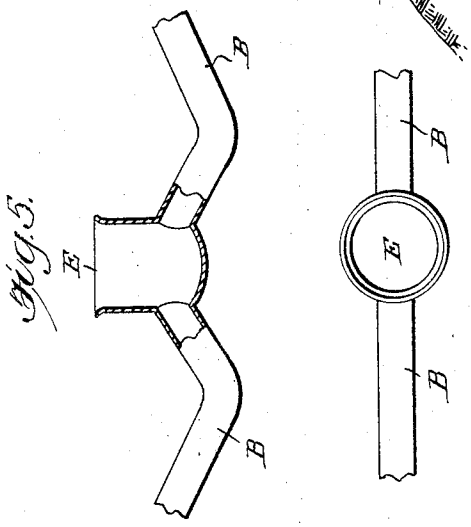


Fig. 5.

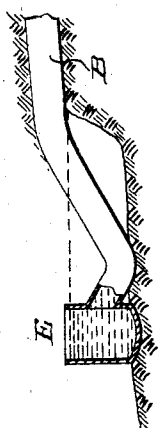


Fig. 6.

Inventor

Lorenzo Dagnino Pastore,

By Emil Bönnelycke

Attorney.

Patented May 8, 1928. 1,669,067

UNITED STATES PATENT OFFICE.

LORENZO DAGNINO FASTORE, OF BUENOS AIRES, ARGENTINA.

DEVICE FOR SAVING LIQUID FUELS AND THE LIKE.

Application filed March 25, 1926, Serial No. 97,454, and in Argentina January 19, 1926.

This invention relates to an improved process for saving the larger part of liquid fuel contained in tanks or similar reservoirs, located either above or below the ground, when a fire has broken out therein. I have found that it is unnecessary to construct special tight tanks or reservoirs for the storage of liquid fuels and the like and in case of fire to be compelled to extinguish it by systems based on the principles governing combustion. In view of my studies and experiments, I find that in case of burning liquid fuels it will be sufficient to cause the fuel to pass through a duct or pipe which should be entirely filled with the fluid. The requirement that the liquid shall occupy the entire cross section of the outlet duct or pipe, is unnecessary when the pipe has a considerable length since then its rather long travel in the pipe will cause the free space therein to be filled with its own vapors which will prevent the presence of the necessary amount of air for allowing the combustion to continue. Thus the liquid which enters the pipe in a flaming condition, will issue completely extinguished at the outlet. In case of the storage of a considerable quantity of liquid, the fire will continue to burn on its surface but the quantity below the surface will be saved by draining the fluid away by means of open or closed channels.

In fact, any fluid, no matter what may be its degree of inflammability and the magnitude of the fire, can only burn on its surface where it is in contact with the air. Therefore, when a large or small quantity of liquid fuel or other combustible liquid has caught on fire, it will be possible, while its surface is burning, to drain off or lead away all the liquid located beneath said superficial zone of fire by simply causing the same to pass through a duct or pipe which will be completely filled, or if not, then provided said duct is of a sufficient length the liquid will appear at the other end of the duct completely and absolutely extinguished.

I desire it to be particularly understood that one of the essential features of my invention consists in the fact that there is always interposed between the surface of the burning liquid and the surface of the liquid which is saved, a quantity of the same liquid in a completely extinguished condition, such quantity of liquid acting as a separating stop or seal between the burning surface and the surface of the liquid which has been saved.

It will be evident that in this way, the complete extinction of the fire is also readily accomplished, since within a short time no fuel will remain in the burning zone within the reservoir.

The speed with which the fire may be extinguished can readily be regulated by determining the cross-sectional area of the outlet orifice of the reservoir.

A convenient form of construction of my invention has been shown, by way of example, on the accompanying drawings, wherein like reference characters indicate similar parts in all the different views.

Figure 1 is a diagrammatic view of a fire protecting system for four reservoirs containing oil, naphtha, kerosene or the like;

Fig. 2 is a vertical sectional view of one of the reservoirs, taken on line I—II—III of Fig. 1, on an enlarged scale;

Fig. 3 is a sectional view of a detailed valve construction;

Fig. 4 is a top view of a modified automatic valve operator;

Fig. 5 is a sectional view of a pipe construction; and

Fig. 6 is a top view of the pipe construction of Fig. 5.

A indicates the reservoirs located on elevated position, the series of reservoirs being surrounded by the usual embankment J which forms a confinement and prevents the flaming liquid from flowing out in case of fire and bursting of one of the reservoirs. In accordance with this invention, an embankment J is provided for each reservoir in order to form a supplementary reservoir or safety container, of funnel shape within which is situated a reservoir. Each of said reservoirs or tanks is provided with a duct or pipe C, opening into a main duct or pipe B, of sufficient length to allow the liquid to be conveyed in an entirely extinguished condition to a location sufficiently distant and free from the dangers of the fire. The collecting duct B may be omitted in plants of minor importance.

It will be evident that instead of the four reservoirs shown in the drawings, any con-

venient or desired number of tanks may be protected by the above described means arranged with their respective embankments and provided with the collector pipes B.

At a point intermediate its length, each duct or pipe C is provided with a stop valve D, arranged to open automatically as soon as fire breaks out in the reservoir A to which it is connected.

Figure 2 clearly illustrates the manner of operating said valve. On the outbreak of a fire in the tank A, the fastening device F which may be located on the top of the reservoir or as shown in Fig. 2 and may be constructed of any suitable material, melts or is destroyed by heat or direct fire. The rope G is thereby detached and the spring V released. Instead of a spring, the descent of a weight might also be used for operating a severing device or knife Y for cutting the rope Z and to thus cause the descent of the part or weight P. The weight of this latter piece is so determined that its fall will produce the necessary energy for breaking the diaphragms Q and Q′, of glass, clay or other fragile material which in their normal or inoperative position establish a tight seal to prevent the tank or reservoir A from communicating with the collector B. When the part P falls and the diaphragms Q and Q′ are thereby broken, said part P and the fragments of glass fall into the ditch or channel S and the liquid commences to discharge from the burning reservoir A through the ducts or pipes C and B which as already stated, will lead the liquid to a safe place. The two diaphragms not only prevent the liquid from reaching the collecting duct B, but also prevent it from entering the tube N within which descends the part P.

Fig. 3 illustrates a modified form of the valve D which opens automatically. In this form of construction, by means of one single breakable seal or diaphragm R, the interruption of communication between the reservoir A and the tube N for the descent of the weight P, and the end of the pipe C leading to pipe B, is obtained.

It will be evident that the valve D, above described, may be substituted by a cock of usual or known type, in which case the descent of the weight P may operate a suitable device for opening the cock, in order to cause the liquid to pass from A to B.

As the level of the flaming liquid descends in the reservoir A, the fire also descends and at a given moment the combustible support or fuse T of the heavy lid U will be destroyed and as said lid or cap is made of refractory material, it will descend by its own weight and thus obturate the inlet end of the pipe C, thereby automatically intercepting the communication between the reservoirs and the collecting duct B which leads the liquid out of the range of the fire and zone of danger.

Fig. 4 represents a diagrammatic plan view of the severing device or knife above referred to. As the fastening device F is destroyed by the fire or the action of heat and the spring V acts, the speed of the rope will increase until the stop W abuts against the end of the knife Y which is thus forced with a considerable force against the rope Z supporting the part or weight P. The rope is thus severed and the part P falls. However, it may happen that the liquid may flow over, passing from the interior of A to the space confined within the surrounding embankment J and in order to save such overflowing liquid, I provide a supplementary duct M, having a balanced valve *a* which will open when a sufficient amount of fuel enters into the tube M or in the space surrounding the embankment J. I thus prevent the fire from passing from the reservoir A to the collecting pipe B. The sinuous shape at *b* of the duct M has the purpose of preventing a smaller amount of flaming liquid from opening by its sudden descent and direct blow the valve *a* and thereby allow the fire to reach the collector pipe B.

An important feature of the plant is the device E, situated at the end of the collector pipe or pipes B. Said device consists of a container of cylindrical or other suitable shape (as shown in Fig. 5), without any cover at its top and into which discharge the lower ends of the ducts B. Before reaching the container E, the ducts B are curved, so as to form a siphon which serves to establish, by means of a height *h* of liquid (which before the fire may be water, being afterwards replaced by an equal volume of the liquid which is being saved) a perfectly tight seal between the space destined to receive the extinguished liquid and the collecting pipes B. In the drawing, two collecting ducts B converge to the container E.

It should be noted that these siphons connected to the device E, constitute a supplementary safety device, since as I have before explained and according to the basis of my theory, it will be sufficient to arrange the ducts B or C so that they will always discharge at the lowest part of the space, tank or reservoir which is to receive the liquid, as by this means a portion of the extinguished liquid will always be interposed between the surface of said reservoir or the like which contains the salvaged liquid, and the surface of the burning liquid.

Special attention has also been paid to the arrangement of the discharge outlet of each reservoir A. Around the inlet funnel, a type of well or ditch *d* is provided for the purpose of preventing any solid or dense material contained in the mass of liquid or coming from the bottom of the reservoir,

from gaining access to the inlet funnel and thence, to the pipe C. Such solid or dense lumps of material will therefore first descend to the bottom of the reservoir A and will then be dragged slowly towards and remain in said ditch or well formed around the inlet mouth of the duct C, thus avoiding the obstruction or clogging of this latter.

Finally, I desire to state that instead of forming a reservoir within embankments or in a depression at a distance from the location of danger or fire, if it should be desired to store the saved liquid in closed containers, I provide these latter with a suitable duct or outlet for the discharge of the gases or vapors carried along or produced by the salvaged liquid which, though completely extinguished, may be at a high temperature. Such outlet or discharging device may conveniently lead to a gasometer placed at a suitable distance in order to prevent, in case of escapement of the gases, the same from coming into contact with the flaming matter of the fire zone.

It will be evident that an alarm circuit of any known or suitable type may be provided, so that when a fire breaks out or threatens to do so, a set of alarm bells arranged at convenient places will be operated and the persons in charge may proceed to open or close the valves, without necessity of waiting for their automatic operation.

It will also be understood that by means of my invention, liquids contained in reservoirs not provided with the particular devices represented in the drawings, may be saved by simply boring by suitable means, in case of fire, a duct through the surrounding embankment and then lead the liquid to another reservoir. This clearly demonstrates the convenience of my system, as it does not require the use of special extinguishing means. On the other hand, the system in accordance with this invention has been devised with a view of eliminating, when desired, all complicated constructions; however, any suitable or desired devices may be adopted within the scope of the invention to obtain the purposes set forth, that is, the conduction of the liquid by means of pipes or ducts completely occupied by the liquid led therethrough, or the extraction by means of channels or ducts of the extinguished liquid situated beneath the burning surface. Thus the extinguished liquid might simply be pumped to a common reservoir at a high level, distant from the tanks A to be emptied, a suitable pumping plant being provided with motors to be operated according to well known methods and ready to start operating at the outbreak of fire or other danger with regard to any one of the tanks A, the pumps then performing the passage of the liquid in danger from the tanks A to the common reservoir.

The pumps may be arranged to start operating automatically or may be in charge of special watchmen.

I claim as my invention:—

1. Apparatus for saving liquid fuel from a dangerous zone comprising a storage tank for the fuel; a duct connected to the bottom of the tank through which the fuel is adapted to flow to a distant location; means in said tank permitting the flow of fuel to be stopped when the level of the fuel in the tank decreases within close proximity to the bottom; and an embankment surrounding said tank and provided with a duct for the passage of fuel.

2. Apparatus for saving liquid fuel from a dangerous zone comprising a storage tank for the fuel; a duct connected to the bottom of the tank through which the fuel is adapted to flow to a distant location; a normally open valve in said duct at the bottom of a tank; a breakable seal for closing the duct; an embankment surrounding said tank and provided with a duct for the passage of fuel which may overflow the tank; and means in said embankment for breaking said seal controlled by heat at the top of the tank so that the fuel may flow out of the tank and to the distant location, said valve closing automatically under the action of heat when the level of the fuel in the tank reaches within close proximity thereto.

3. Apparatus for saving liquid fuel from a dangerous zone comprising a storage tank for the fuel; a duct connected to the bottom of the tank through which the fuel is adapted to flow to a distant location; a normally open valve in said duct at the bottom of the tank; a breakable seal for closing the duct; an embankment surrounding said tank and provided with a duct for the passage of fuel which may overflow the tank and also provided with a vertical passage therethrough; and a weight held in a suspended state in said passage for breaking said seal when heat at the top of the tank releases it so that the fuel may flow out of the tank through the duct and to the distant location, said valve closing automatically when released under the action of heat when the level of the fuel in the tank reaches within close proximity thereto.

4. An installation for saving inflammable liquids stored in tanks, comprising means constituting an evacuating orifice in the lower part of the tank for the liquid to be saved; a weighted valve suspended by a fusible support over said evacuating orifice, said valve being adapted to fall and close the orifice when the liquid level has fallen sufficiently to permit the heat of the burning liquid to melt the support; a conduit for leading the liquid away; and a weighted valve for said conduit, which automatically opens when the liquid is submitted to dan-

gerous temperatures, said valve comprising membranes of breakable or tearable material which is broken by the falling of a suspended weight, said weight falling when the liquid is heated to said dangerous temperature.

5. An installation for saving inflammable liquids stored in tanks comprising means constituting an evacuating orifice and a collecting cavity for heavy materials surrounding the evacuation conduit in the lower part of the tank; a conical weighted valve over the evacuation orifice; a fusible support for said valve; a weighted valve in said evacuation conduit, said valve being constituted by a membrane of breakable material; a weight suspended over said membrane; a knife device for cutting the suspension cable of the weight; and a knife in said device which is actuated by a spring which is freed when the tank temperature becomes dangerous.

6. An installation for saving inflammable liquids stored in tanks comprising means constituting an evacuating orifice and a collecting cavity for heavy materials surrounding the evacuation conduit in the lower part of the tank; a conical weighted valve over the evacuation orifice; a fusible support for said valve; a weighted valve in said evacuation conduit, said valve being constituted by a membrane of breakable material; a weight suspended over said membrane; a knife device for cutting the suspension cable of the weight; a knife in said device which is actuated by a spring which is freed when the tank temperature becomes dangerous; a chamber beneath the breakable valve; a terrace about the tank to be protected; and secondary conduits from within the terrace to the breakable valve aforesaid, said secondary conduits being sinuous along their length and having counterweighted valves at their lower ends, to prevent said conduits from passing burning liquid before their transverse sections are filled.

In testimony whereof I affix my signature.

LORENZO DAGNINO PASTORE.