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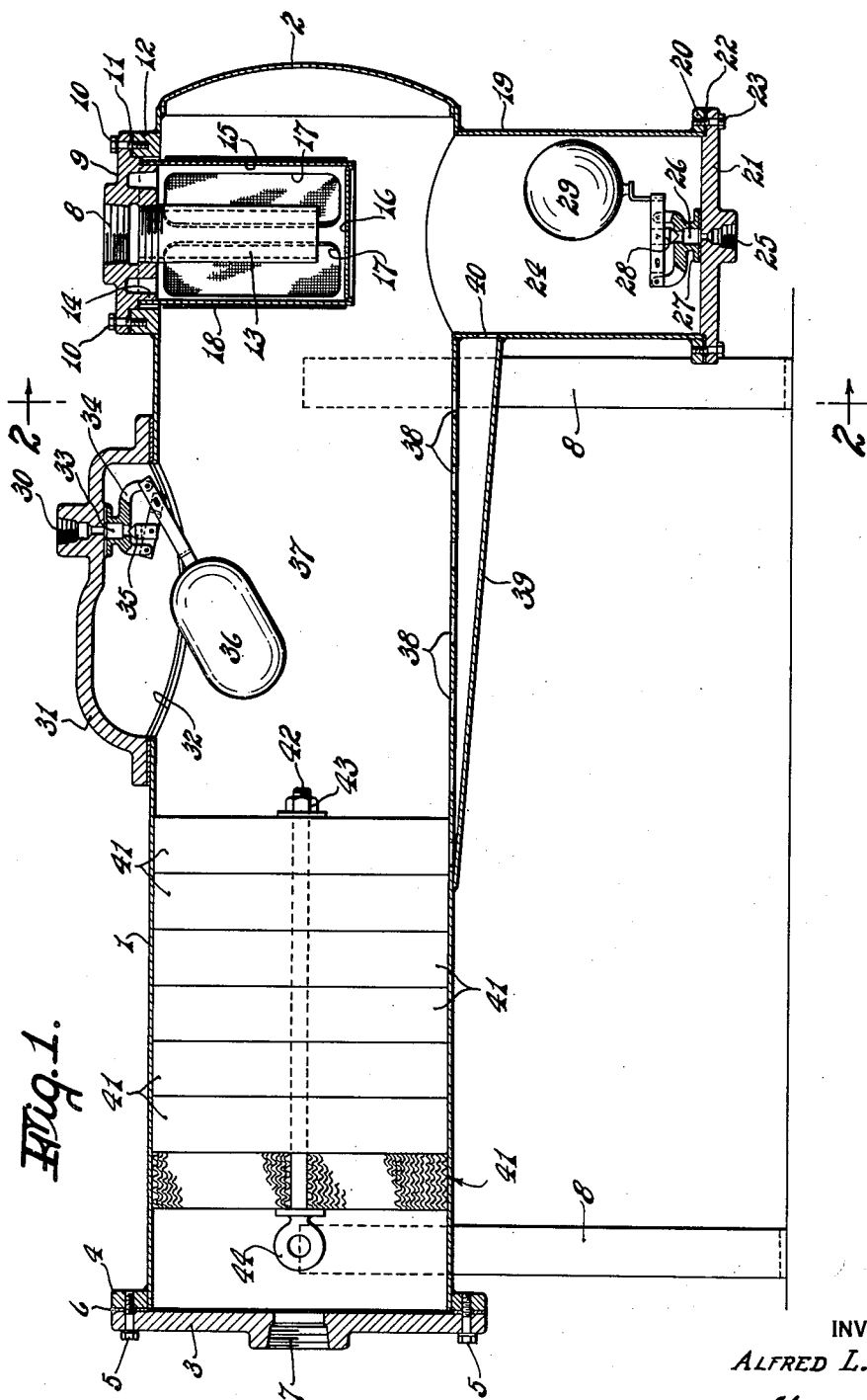
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SEPARATOR FOR REMOVING WATER FROM GASOLINE

Filed March 9, 1949

2 SHEETS—SHEET 1



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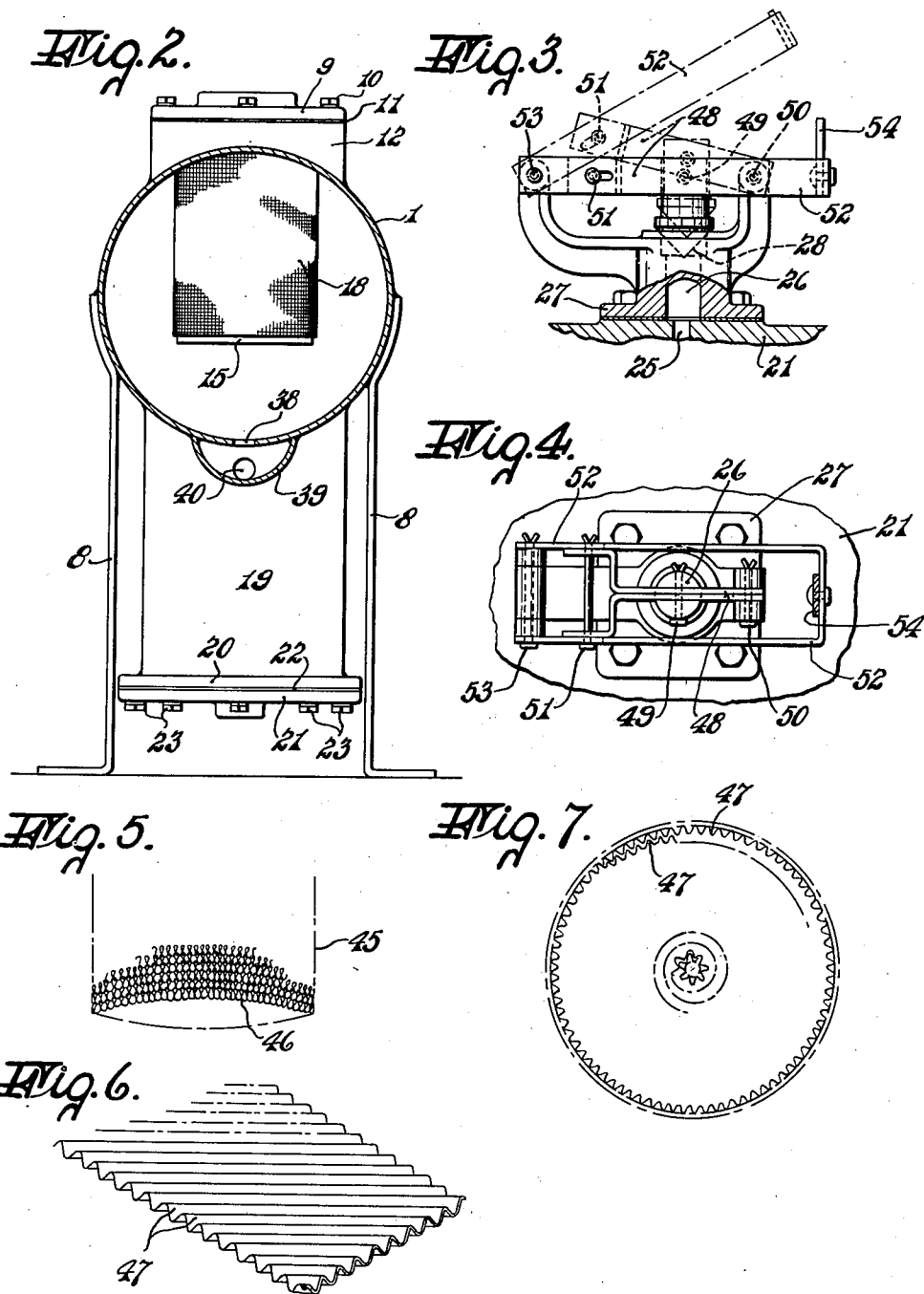
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SEPARATOR FOR REMOVING WATER FROM GASOLINE

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2 Claims. (Cl. 210-54)

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This invention relates to an improved separator for removing water and, also if desired, air from gasoline.

The particular separator shown is adapted to be interposed in a gasoline pipe line, such for example as the gasoline supply line for service installations at aviation fields, where it is essential to eliminate all water from the gasoline.

The invention has for an object the provision in a separator of a water-coalescing roll of metallic fabric, which roll serves to efficiently collect the water present in the gasoline and enable the same to be separated from the gasoline with a practically perfect recovery of the water.

The invention also has for an object to provide water coalescing rolls for the purpose described, which are not readily breakable or disintegratable, which may be easily removed, cleaned and replaced, and which may be used over and over again with a very long life of useful service.

The invention will be disclosed with reference to the accompanying drawings, in which:

Fig. 1 is a sectional elevational view of a separator embodying the invention;

Fig. 2 is a cross sectional view taken on the line 2-2 of Fig. 1;

Fig. 3 is a side elevational view, partly in section, of the water release valve;

Fig. 4 is a top plan view of such valve;

Fig. 5 is a fragmentary plan view of the tubular knitted metal fabric from which the water-coalescing rolls are made;

Fig. 6 is a fragmentary perspective view showing how the fabric of Fig. 5 is crimped prior to winding it up into roll form; and

Fig. 7 is an end view of one of the water-coalescing rolls.

Referring to these drawings: the separator includes a horizontally-disposed cylindrical tank 1, having a fixed head 2 at one end and a removable head 3 at the other end suitably fastened to a flange 4 on the tank, as by the cap screws 5, which clamp the marginal portions of head 3 against a gasket 6 and the latter against flange 4. An inlet 7 is provided centrally of head 3. This tank is supported in any suitable way as by the pairs of legs 8, welded or otherwise fixed to the tank.

An outlet for gasoline is provided in the top of tank 1 near the head 2. This outlet consists of a passage 8 in a cap 9, fixed as by screws 10 with an interposed gasket 11 to a ring 12 welded to the tank. The cap 9 has fixed thereto a vertically depending pipe 13, the upper end of which is in constant communication with passage 8

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and the lower end of which is open. The cap also has a depending annular flange 14, to the exterior periphery of which is fixed the upper end of a depending cylindrical cage 15, which has a closed lower head 16 and a plurality of openings 17 in its periphery. Fixed to this cage is a thin gauge cylindrical screen 18 of fine mesh, say 65 to the inch, and preferably of Monel metal. Gasoline leaves the separator by passing through the screen, thence into pipe 13 and through the latter to outlet 8.

An outlet for separated water is provided in the bottom of tank 1, near the head 2. A depending hollow cylinder 19 is secured to tank 1 and extends downwardly therefrom, terminating with a flange 20 to which a head 21 with an interposed gasket 22 is fixed by screws 23. The hollow cylinder 19 forms within it a trap chamber 24. In the head 21 is an outlet passage 25 which communicates with a passage 26 in a member 27 fixed to the inner face of head 21. The passage 26 is controlled by a valve 28, which is operated through a linkage to be later described from a float 29, which sinks in gasoline and rises in water. The valve 28 will thus be closed until water accumulates in trap chamber 24 to a predetermined level, when the float will rise and open valve 28, allowing water to drain out through passages 26 and 25 until the water in such chamber drops to the predetermined level, when valve 28 will close.

The tank 1 has an outlet 30 in its upper end for the escape of air or other gases which become separated from the liquid. This outlet is formed in a cap 31 fixed to tank 1 and covering an opening 32 formed in the tank. The passage 30 communicates with a passage 33 formed in a member 34 fixed to the inner face of cap 31. A valve 35 operable by a float 36 through a linkage to be described, controls passage 33, opening the latter to release air or gases when the liquid falls to a predetermined level and closing the valve when the liquid rises to another predetermined level.

The space in tank 1 beneath the air release valve constitutes a settling or separating chamber 37. In the bottom of tank 1 immediately beneath this chamber is a series of longitudinally spaced openings 38, leading into an underlying trough 39 which is fixed to tank 1 and slopes downwardly toward the water trap chamber 24, communicating with the latter by means of a hole 40.

Between the inlet 7 and the settling chamber 37 are arranged a plurality (seven as shown) of

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foraminous water-coalescing rolls 41, through the manifold interstices of which the liquid must flow in order to reach chamber 37 and any of the outlets described. Conveniently, these rolls may be held together by the bolt 42 and nut 43 so that they may be placed in or removed from the tank as a unit, when the head 3 is removed. The head of bolt 42 is preferably formed with an eye 44 to facilitate removal of the group of the rolls. While a single roll equal in length to the combined lengths of the seven rolls shown might be used, the plurality of rolls is preferable as tending to stagger the passages in adjacent rolls.

Each roll is made up of a suitable length of fabric made up of fine metal wire. In the preferred form shown, a tubular knitted metal fabric is used. A portion of the fabric strip is shown at 45 in Fig. 5. Very fine wire, of non-corrosive metal, such as example as Monel metal, is knitted as indicated at 46, into a tubular fabric. This fabric is then flattened down, forming a two-ply strip. Then this two-ply strip is crimped in a manner shown at 47 in Fig. 6. The crimping lines are preferably disposed at an acute angle to the sides of the strip. To avoid confusion of lines, the knitting is shown separately in Fig. 5 and the crimping in Fig. 6. The strip, formed as described, is wound up, as indicated in Fig. 7, into roll form. The roll is tightly wound and the ridges of one convolution fit into the hollows of an adjacent convolution. A thick roll of a large number of convolutions is thus formed and it presents a compact mass of interfitting and intertangled wires, providing a very great number of very small interstices. The exceedingly small passages through this wire mass are necessarily exceedingly tortuous.

The roll, thus constructed, is a standard commercial article, which has been used before to prevent the passage of entrained gases in liquids. As heretofore used, so far as I am aware, the liquid, by gravity flow, passes through one of these rolls and any vapor or gas entrained in the liquid will be prevented from passing by the roll.

In the present application, these rolls act to coalesce the water particles, contained in emulsion, in gasoline. Gasoline with a small percentage of water, seldom over 3% by volume, is fed into the inlet 7 of tank 1 under substantial pressure, say for example, 20 pounds per square inch, and forced through the several rolls 41. The velocity of the liquid in the feed pipe will be around 125 gallons per minute and such velocity is substantially reduced in tank 1, say to 3.5 gallons per minute. However, the liquid is under substantial pressure and any air and any water entrained in the gasoline passes through the rolls. These rolls, as used herein, function to cause the exceedingly small droplets of water contained in emulsion in the gasoline to coalesce. Tiny droplets merge one with another, forming larger ones, which in turn merge with others and so on until drops of water are formed, which are large enough to drop by their weight to the bottom of the tank. Separation of fluids will take place by gravity in chamber 37. Air or gases rise to the top of chamber 37 to be released from time to time by float-operated valve 35 through the outlet 30. The large drops of water, formed by coalescing small droplets, sink to the bottom of chamber 37 and are conducted to trap chamber 24, to be released from time to time by float-actuated valve 28. The gasoline passes through the screen 18 and thence out through outlet 8.

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The screen 18 serves to hold back any last traces of water contained in the gasoline as a very fine mist which clings to the surface of the screen and rolls down the latter into the tank. Separation of water from gasoline in tests of this separator have shown that 99.9996 per cent of the water in the gasoline has been removed.

The float-actuated release valves, above briefly described as to their function, are shown in full detail in Figs. 3 and 4. While these valves may be made in various ways and their particular construction is not an essential part of this invention, the construction shown has been found very effective and will be briefly described as an illustrative example of one suitable type. Both release valves are alike and one only will be described. The release valve 28 has the upper end of its stem slotted to receive the intermediate portion of a lever 48 and the latter is pivotally connected at 49 to the stem. Lever 48 is fulcrumed at one end on a pin 50 in bracket 27. The other end of the lever is forked and the two arms of the fork are connected by a pin 51, one to each of two levers 52, which are fulcrumed at one end on a pin 53 in bracket 27. The other end of the lever 52 is connected as by the member 54 to float 29. The air release valve is constructed in the same way, differing only in the shape of its float and the manner in which it is fixed to lever 52.

The use of water-coalescing rolls, constructed as described, of fine wire of metal, such as Monel metal, which is non-corrosive in gasoline and water, is the characteristic feature of this invention. A large mass of fine metal wires, closely packed and interwoven and intertwined, provides a multiplicity of very fine tortuous passages through which the liquid must pass. There will be no straight channels such as would permit relatively free flow of liquid at particular points through the wire mass. Uniformity of flow is effected. In the example shown, the seven rolls present a combined length of nearly sixteen inches of closely-packed, tangled, wire mass, through which the liquid must pass and the emulsion is subjected to intimate contact with this mass and a very effective coalescing of the water contained in the emulsion effected. This is effected with only a small drop in pressure, about three pounds, in the present example. The rolls have long life. Particles of the wire do not break off to be carried by the liquid and cause trouble. The rolls can be removed, unwound and cleaned, whenever necessary, then re-wound and replaced in the separator tank. The rolls should last indefinitely.

Thus, a very efficient separator has been provided having water-coalescing rolls of a construction combining convenient removal and cleaning and replacement with long life and very effective water-coalescing action.

I claim:

1. A water separator, adapted to be inserted in a gasoline pipe line and comprising, a tank having a hollow cylindrical member with its axis horizontally disposed and having heads closing opposite ends of said member, one of said heads being easily removable, said tank having an inlet and an outlet near opposite ends thereof for connection to said line, said cylindrical member having a portion of substantial length and uniform diameter, and a series comprising a plurality of cylindrical rolls of fabric formed of fine metal wires and mounted in said portion one after another with the adjacent end faces of successive

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rolls in abutment and their peripheries closely fitting the peripheral wall of said portion, each roll composed of a fabric strip of a width equal to the length of the roll, such strip being rolled up to a diameter such as to closely fit said portion and having adjacent convolutions interlocked and intertangled and presenting a compacted mass of metal with manifold tortuous interstices, said tank having in its bottom at a location beyond the last roll of said series in the direction of flow through said tank an outlet for water, the portion of said tank between the removable head and the first roll of the series having a diameter at least as great as that of the rolls and being unobstructed to enable facile removal of the rolls.

2. A water separator, adapted to be inserted in a gasoline pipe line and comprising, a tank having a hollow cylindrical member with its axis horizontally disposed and having heads closing opposite ends of said member, one of said heads being easily removable, said tank having an inlet and an outlet near opposite ends thereof for connection to said line, said cylindrical member having a portion of substantial length and uniform diameter, a series comprising a plurality of cylindrical rolls of fabric formed of fine metal wires and mounted in said portion one after another with the adjacent end faces of successive rolls in abutment and their peripheries closely fitting the peripheral wall of said portion, each roll composed of a fabric strip of a width equal to the length of the roll, such strip being rolled up to a diameter such as to closely fit said portion and having adjacent convolutions inter-

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locked and intertangled and presenting a compacted mass of metal with manifold tortuous interstices, said tank having in its bottom at a location beyond the last roll of said series in the direction of flow through said tank an outlet for water, a member extending longitudinally through all rolls of said series, and means on said last-named member for clamping said rolls together in end to end abutment, said last-named member having a part which is located in the space between the first roll of the series and the removable head and which may be conveniently grasped to pull the rolls as an assembled unit out of one end of the tank after the last-named head has been removed, the portion of said tank between the removable head the first roll of the series having a diameter at least as great as that of the rolls and being unobstructed to enable facile removal of the rolls.

ALFRED L. GRISE.

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