Oct. 22, 1929. F. GARDNER 1,732,465

MEANS FOR DECOLORIZING HYDROCARBON OILS

Filed Jan. 10, 1927 2 Sheets-Sheet 1

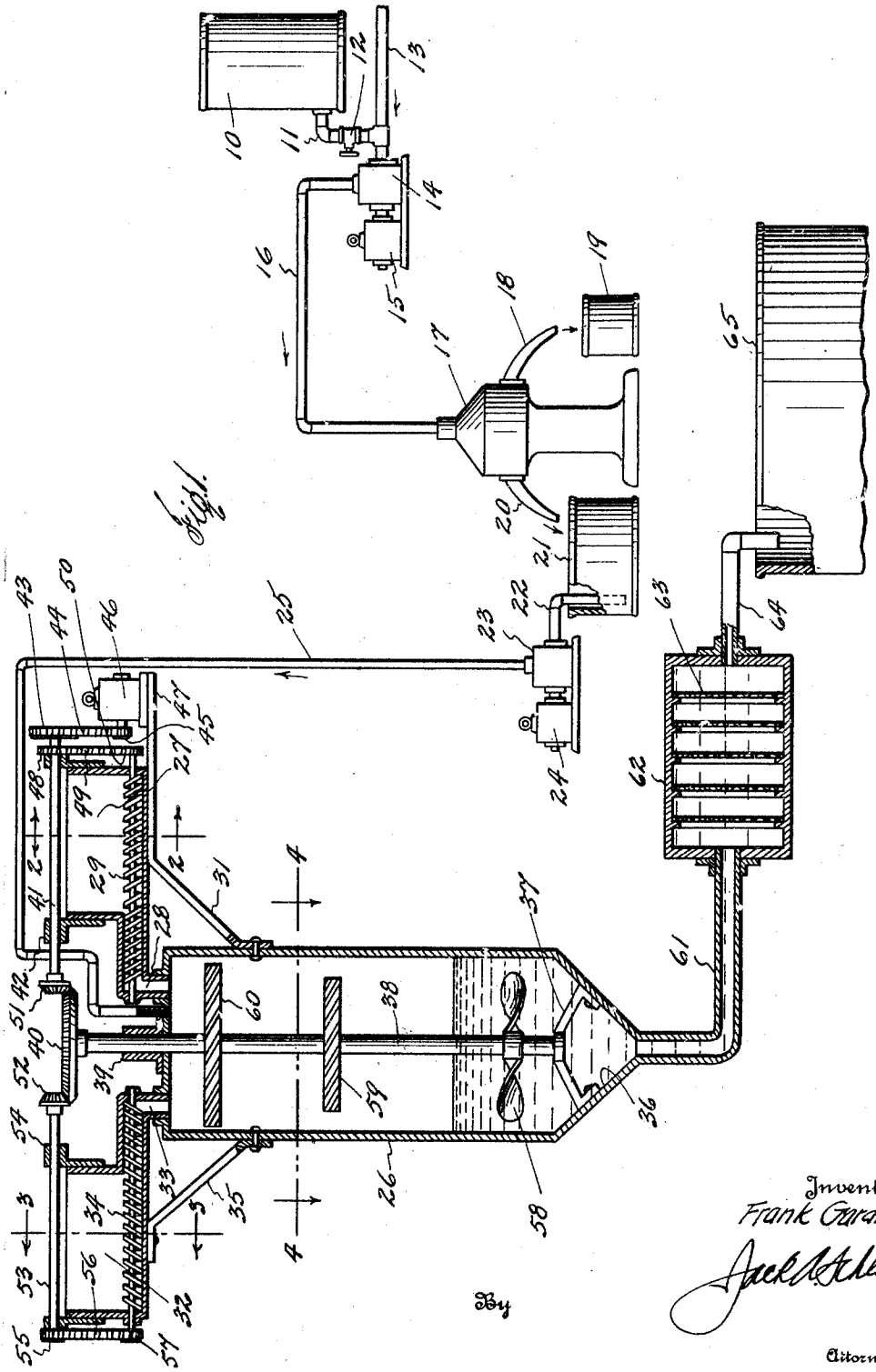


Fig. 1.

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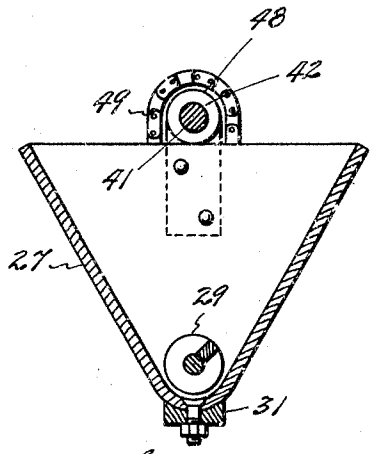


Fig. 2.

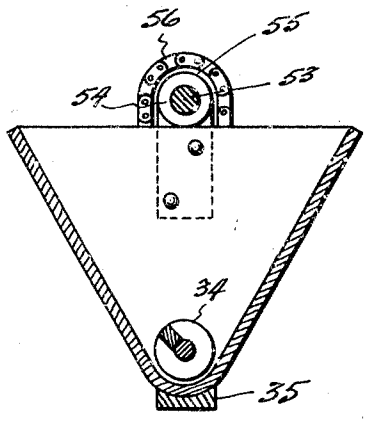


Fig. 3.

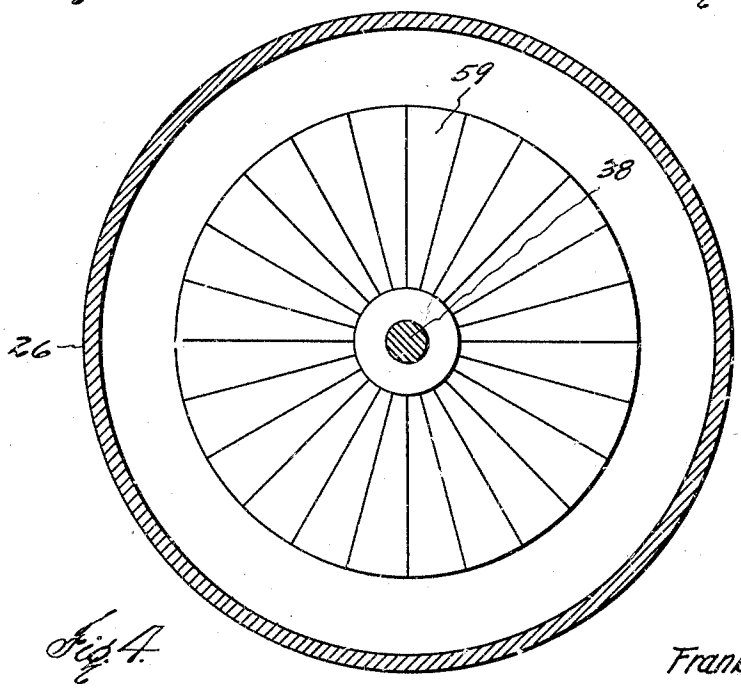


Fig. 4.

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UNITED STATES PATENT OFFICE

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MEANS FOR DECOLORIZING HYDROCARBON OILS

Application filed January 10, 1927. Serial No. 160,103.

This invention relates to new and useful improvements in means for decolorizing hydrocarbon oils.

In the treatment of hydrocarbon oils to produce gasoline or gasoline-like products certain impurities, such as sulphur compounds and acids, gums, resinous material, water and other deleterious matter, are encountered. In the effort to produce clean water-white liquid, various treatments have been resorted to and my invention has particularly to do with the removal of sulphur and colorizing compounds from the refined product.

The object of the invention is to provide means to treat gasoline with sulphuric acid, a highly absorbent compound and a neutralizing agent, whereby free acids and colorizing compounds are either neutralized or removed and a clean water-white gasoline is produced.

A further object of the invention is to provide means to subject caustic treated gasoline to an admixture of sulphuric acid and then to a separating action, whereby the acids and sludge are removed.

Another object of the invention is to provide means to mix the acid treated gasoline with a neutralizing agent and a highly absorbent compound to neutralize the acids and decolorize the liquid and then to filter said liquid to remove solids and deleterious matter.

A construction designed to carry out the invention will be hereinafter described together with other features of the invention.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawings in which an example of the invention is shown and wherein:

Fig. 1 is a diagrammatical view of an apparatus designed for practising the invention,

Fig. 2 is a transverse sectional view taken on the line 2—2 of Fig. 1,

Fig. 3 is a transverse sectional view taken on the line 3—3 of Fig. 1, and

Fig. 4 is an enlarged horizontal cross-sectional view taken on the line 4—4 of Fig. 1.

In the drawings the numeral 10 designates an elevated tank filled with sulphuric or equivalent acid and suitably supported at the proper elevation. A feed pipe 11, including a cut-off valve 12, leads downward from the bottom portion of said tank. The pipe 11 is connected in a gasoline supply pipe 13, which in turn enters the side of a suitable rotary pump 14, driven by an electric motor 15 or other suitable means. Gasoline, which has been "caustic-treated" or otherwise treated for deodorizing, is supplied through the pipe 13 and mixed with sulphuric acid fed through the pipe 11.

This admixture is pumped through a pipe 16 to a suitable centrifugal liquid separator 17. The surplus acid and sludge is thrown off through the spout 18 into the receptacle 19 and the liquid is thus freed therefrom. The mixing is closely followed by the separation so that the gasoline is quickly freed from the surplus acid.

The separated gasoline is delivered by the spout 20 into a vat 21 from which it is picked up by a suction pipe 22 extending down from the side of a centrifugal pump 23, driven by an electric motor 24. The gasoline is forced by the pump through the pipe 25 to the top of an upright mixing tank 26. At one side of the tank is a hopper 27 having a discharge spout 28. A screw conveyor 29 extends along the bottom of the hopper into the spout. The spout has a down-turned end entering the top of the tank 26. The hopper is supported by a bracket 31.

On the opposite side of the tank a similar hopper 32 having a spout 33 and conveyor

34 is supported by a bracket 35. The spout enters the top of the tank. The tank 26 has a hopper bottom 36 and a bearing bracket 37 is secured therein. A vertical shaft 38 having its lower end stepped in the bracket, extends axially of the tank. This shaft projects through a bearing collar 39 on the top of the tank and has a beveled gear 40 fastened on its upper end.

A drive shaft 41 supported in hangers 42 mounted on the hopper 27 has a sprocket wheel 43 on its outer end. This wheel 43 is driven by a chain 44 from a sprocket wheel 45 mounted on the armature shaft of an electric motor 46 which is secured on a shelf 47 extending from the bracket 31. A second sprocket wheel 48 is also fastened on the shaft 41 and drives a chain 49 which operates a sprocket 50 on the outer end of the conveyor 29.

A beveled pinion 51 on the inner end of the shaft 41 drives the gear 40 which not only rotates the shaft 38, but drives a pinion 52 on the inner end of a counter shaft 53 mounted in hangers 54 on top of the hopper 32. A sprocket chain 56 carried by a wheel 55 on the outer end of the shaft 53, drives a wheel 57 on the outer end of the conveyor 34. The conveyor 29 has a right hand spiral, while the conveyor 34 has a left hand spiral, whereby said conveyors will both feed to their spouts.

A liquid level is maintained in the lower portion of the tank 26 and a double blade agitator 58 is fastened on the shaft 38 just above the bracket 37 so as to be immersed in the liquid and to agitate the latter when the shaft is rotated. At the central and upper portions of the tank, horizontal paddle wheels 59 and 60, respectively, having radial flat blades, are mounted on the shaft 38. The wheel 60 is larger in diameter than the wheel 59 and its blades extend under the spouts 28 and 33 so as to receive the materials discharged therefrom.

In the hopper 27 a powdered material is deposited and I will designate this material by the generic term, clay. This material may consist of any highly absorbent compound such as finely divided fuller's earth or argillaceous composition. In the hopper 32 is deposited a neutralizing agent in powdered form, such as calcium hydroxide (common lime), or any other substance suitable for the purpose. The gasoline which has been treated by sulphuric acid and pumped through the pipe 25 is discharged into the tank 26 through its closed top, and passed down through the wheels 59 and 60 to the bottom of the tank. The clay and neutralizing agent are fed into the tank through the spouts 28 and 33, respectively, and these materials falling upon the paddles of the wheel 60 are mixed and fall in the tank and are again mixed and agitated by the wheel 59.

The materials, together with the gasoline, are accumulated in the bottom of the tank and thoroughly mixed and agitated by the agitator 58. By introducing the clay and neutralizing agent into the gasoline, the sulphur and colorizing compounds are absorbed and free acids are neutralized. In the methods heretofore practised, instead of neutralizing the free acids, silicious acid was formed. The neutralizing agent is very important because it not only neutralizes the free acids but certain other colorizing compounds or agents in the gasoline, and it also co-acts with the clay in decolorizing and producing water-white gasoline. The mixed and agitated liquid is conducted from the hopper 36 by a discharge pipe 61 and enters a filter 62 having spaced transverse and upright filtering partitions 63 formed of canvas or other suitable material. In this filter, the solids and foreign matter are removed from the gasoline and the latter flows from the filter through a pipe 64 into a receiving tank 65.

The particular advantage and important feature of the invention resides in the quick operation and expeditious steps by which it is carried out. The apparatus is comparatively simple and it is obvious that by use of the pumps 14 and 23, the gasoline is caused to travel rapidly. It will be seen that as the gasoline enters the tank 26 it will tend to saturate the clay and neutralizing agent and will be admixed therewith by the rotating paddle wheels 59 and 60.

Various changes in the size and shape of the different parts, as well as modifications and alteration, may be made within the scope of the appended claims.

What I claim, is:

1. In an apparatus for decolorizing hydrocarbon liquids, a mixing tank having a liquid supply pipe, mechanical means for introducing a solid material into the tank, separate mechanical means for simultaneously introducing a second solid material into the tank, a rotary mixer at the upper portion of the tank having spaced supporting blades upon which the liquid and solid materials are fed before delivery to the liquid in the lower portion of the tank, means for agitating the liquid at the lower portion of the tank, and means for conducting liquid from the tank.

2. In an apparatus for decolorizing hydrocarbon liquids, a mixing tank having a liquid supply pipe at its upper portion, mechanical means for feeding a solid agent into the upper portion of the tank, a rotating wheel within the tank disposed beneath the liquid and solid feeds and having a continuous series of spaced overlapping supporting blades intermediate of which the materials are fed and mixed before delivery to the liquid at the lower portion of the tank, and means for conducting liquid from the tank.

3. In an apparatus for decolorizing hydro-

carbon liquids, a mixing tank having a liquid supply pipe discharging downward into the tank, separate mechanical means for feeding solid agents into the top of the tank at different points, a rotating mixer comprising a continuous series of spaced overlapping radial blades disposed in substantially parallel planes beneath both the liquid and solid feeds to support the solid agents and mix the materials fed intermediate said blades before delivery to the liquid in the lower portion of the tank, and means for conducting the liquid from the tank.

In testimony whereof I affix my signature.

FRANK GARDNER.