

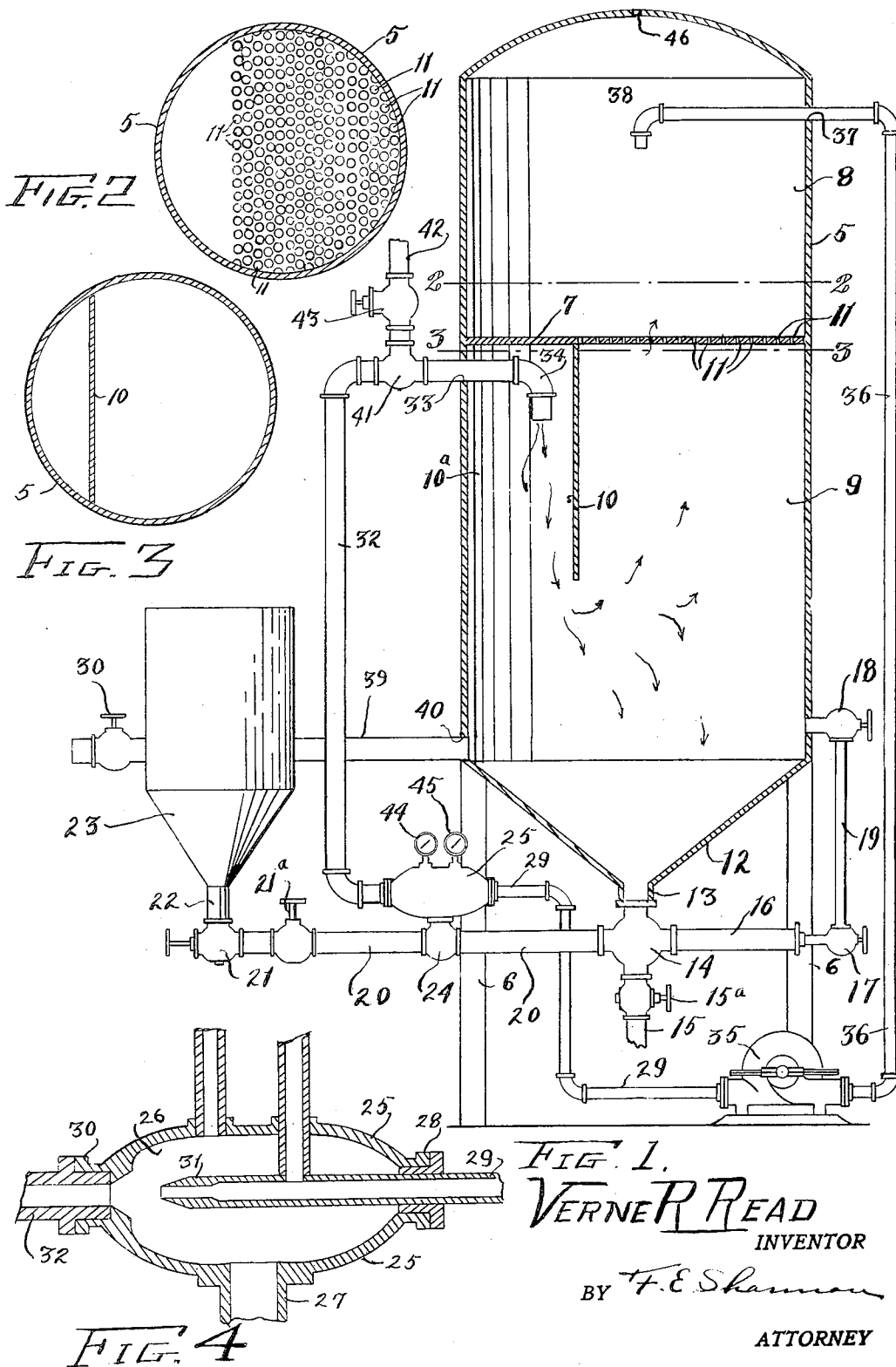
May 1, 1934.

V. R. READ

1,956,997

APPARATUS FOR TREATING CLEANING SOLVENTS

Filed Jan. 8, 1931



## UNITED STATES PATENT OFFICE

1,956,997

## APPARATUS FOR TREATING CLEANING SOLVENTS

Verne R. Read, Akron, Ohio

Application January 8, 1931, Serial No. 507,373

4 Claims. (Cl. 196—46)

This invention relates to apparatus for purifying, clarifying or otherwise treating liquids.

While intended for use wherever it may be advantageously applied, the invention is particularly intended for use in dry cleaning establishments for cleansing and clarifying dry cleaning liquids in which connection it will be illustrated in the drawings and hereinafter described.

It is well known that economical operation of a dry cleaning plant requires the cleansing and clarifying of the dry cleaning solution whereby the same solution may be repeatedly used. As one of the steps of the process ordinarily employed, the cleansing fluid is treated with sulphuric acid and considerable trouble is experienced in following this ordinary method because the acid erodes and destroys the working parts of the pump to an extent which soon renders it inoperable, causing delay and considerable expense.

Objects of this invention are to provide means for treating a hydrocarbon or other liquid with sulphuric acid or other purifying element by repeatedly forcing the acid through the liquid to be cleansed by a pumping action without permitting the acid to come into contact with the pump or any of the working parts thereof.

Other objects are to provide apparatus of the character indicated which will be of simple, durable construction, which may be manufactured at a low cost and which will be conveniently operable and very efficient in operation.

The above objects are accomplished and additional ends are attained by the new and improved method, the novel construction and arrangement of parts hereinafter described and illustrated in the accompanying drawing, wherein I have shown a preferred form of the invention, it being understood that the invention is capable of various adaptations and that changes and modifications may be made which come within the scope of the appended claims.

In the drawing like characters of reference are employed to designate like parts as the same appear in any of the several views and in which:—

Figure 1 is a side elevational view of apparatus constructed in accordance with this invention, the same being somewhat diagrammatic in character and showing the tank employed in central, vertical, section.

Figure 2 is a cross sectional view taken as indicated by the lines 2—2 of Figure 1,

Figure 3 is a cross sectional view taken as indicated by the lines 3—3 of Figure 1,

Figure 4 is a central, longitudinal view of one

form of eductor which may be employed in carrying out the invention,

Figure 5 is a diagrammatic view showing parts in elevation and parts in cross section and illustrating a modified form of the invention.

Proceeding now to a detailed description of the invention with reference to the particular adaptation thereof disclosed in the drawing, the numeral 5 is used to denote a tank which may be of any suitable construction. The tank 5 is supported on suitable legs 6 which are welded or otherwise secured thereto.

The numeral 7 denotes a horizontal partition which divides the tank into an upper chamber 8 and a lower chamber 9. The numeral 10 denotes a vertical partition which extends downwardly from the partition 7 to a horizontal plane disposed intermediate the height of the chamber 9. The partition 10 is preferably located closer to one side of the tank 9 forming a relatively small entrance chamber 10a. The partition 10 is welded or otherwise secured to the partition 7 and to the side wall of the tank and the portion of the partition 7 over the entrance chamber 10a is solid. The remaining portion of the partition 7 is provided over the entire area thereof with closely spaced openings 11.

The tank is provided with a conical bottom wall 12 which terminates in a downwardly depending nipple 13. A four-way pipe coupling 14 is secured in the nipple 13 and a drain pipe 15 is secured in the downwardly presented nipple of the coupling 14. A horizontal pipe 16 is secured in one of the nipples of the coupling 14 so as to project outwardly to the vertical plane of the side wall of the tank. A gauge nipple 17 is secured in the outwardly projecting end of the pipe 16. A similar nipple 18 is secured in the side wall of the tank and a glass tube 19 is operatively positioned in said nipple.

A pipe 20 is threaded in the remaining horizontal nipple of the coupling 14. The pipe 20 is provided at the outer end thereof with a valve elbow 21 and a vertical pipe 22 is secured in said elbow. The numeral 23 denotes a container for sulphuric acid or other purifying element which is operatively positioned on the pipe 22 with the bore of said pipe in communication with the cavity thereof. The pipe 20 is also provided with a valve 21a which may be used as hereinafter set forth. The pipe 20 is provided intermediate its length with a T coupling 24 and an eductor 25 is operatively secured to one of the nipples of the coupling 24.

The eductor 25 may be of any suitable construction

tion. In the drawing I have shown an eductor which comprises an elongated casing having a cavity 26. The casing is provided with a downwardly protruding nipple 27 which is threaded on the coupling 24. The casing 25 is provided at one end thereof with a nipple 28 in which is threaded or otherwise suitably secured the pipe 29. The casing is provided with an outlet nipple 30 which is in axial alinement with the inlet nipple 28.

The pipe 29 terminates in a nozzle 31 which is directed into the nipple 30. An outlet pipe 32 is secured in the nipple 30. The outlet pipe 32 projects upwardly then horizontally and is entered in a suitable bore 33 in the side wall of the casing and terminates in a downwardly turned elbow 34 which is positioned in the upper portion of the chamber 10a.

The pipe 29 is operatively connected to the outlet opening of the pump 35 and the pipe 36 is connected to the inlet end of said pump. The pipe 36 extends upwardly and is entered through a suitable bore 37 which is formed in the side wall of the tank at a point adjacent the upper end thereof. The pipe 36 projects inwardly and terminates in a downwardly turned elbow 38 which is positioned approximately at the axis of the tank. The tank 5 is provided with an outlet pipe 39 which is threaded in a suitable opening 40 which is formed in the side wall thereof at a point immediately above the conical bottom wall 12. The outlet pipe 39 is provided with a valve 30 which may be operated to discharge the contents of the tank. The pipe 32 is provided with a T coupling 41 in which is threaded an inlet pipe 42.

The pipe 42 is provided with a suitable valve 43. The tank is provided in the upper wall thereof with a suitable vent 46 which will permit air to escape while filling the tank and prevent a retarding suction when the contents of the tank is being withdrawn.

The eductor 25 is provided with a pressure gauge 44 which is operatively connected thereto in communication with the chamber 26. The eductor is also provided with a similar gauge 45 which is operatively connected to the pipe line 27 as shown in Figure 4. As soon as the tank is filled the valve 43 is closed.

In use, the valve 43 is opened and cleaning fluid, preferably cleaning fluid which has been used and which must be cleansed, is pumped or otherwise forced through the pipe 42 and delivered to the tank 5 through the pipe 32. The tank is filled with the cleaning fluid to a level above the pipe 38. The desired amount of sulphuric acid or other purifying element is placed in the container 23. The valves 21a are opened and the pump 35 is operated.

The operation of the pump 35 draws the cleaning fluid from the upper portion of the chamber 8 and delivers the same through the pipe 29 in a forced stream through the nozzle 31 to the eductor 25. As the nozzle 31 is directed into the pipe 32 and as the stream delivered is relatively small in volume, a suction is provided in the chamber 26. This suction is communicated to the pipe 20 thus drawing acid from the container 23 and mixing the same with the stream delivered by the nozzle 31. The force of this stream is sufficient to carry the mixture upwardly through the pipe 32 and deliver the same to the upper portion of the entrance chamber 10a. The sulphuric acid, being of greater specific gravity than the cleaning fluid, passes downwardly through the entrance

chamber 10a and the chamber 9 to the bottom of said chamber. As soon as the contents of the container 23 is drawn therefrom the valve 21a is closed. As the acid falls to the bottom of the tank 9, it is drawn through the nipple 13 and the pipe 20 into the eductor and is continually delivered to the upper portion of the entrance chamber 10.

The process is repeated until all of the impurities and foreign matter in the cleaning fluid has been destroyed by the action of the purifying element. As the cleaning fluid is thus cleansed it rises through the openings 11 in the partition 7 to replace the amount drawn from the chamber 8 by the action of the pump 35.

It will be seen that the perforated partition 11 forms a screen which will permit the liquid in the chamber 8 from being disturbed by the forced delivery of acid and cleaning fluid by the pipe 32.

As soon as the device has been operated a sufficient length of time to destroy the foreign matter therein the pump 35 is stopped and the contents of the tank is permitted to settle. The valve 15a is then opened and the waste matter and acid at the bottom of the tank is allowed to drain therefrom. As soon as the gauge 19 shows that the level of the acid is below the upper edge of the conical bottom 12, the valve 15a is closed. The valve 30 may then be opened and the purified cleaning element may be drawn from the tank through the pipe 39.

While I have shown the pump 35 positioned below the tank 12, in actual practice the pump is preferably positioned a sufficient distance above the bottom of the tank to avoid the danger of acid entering the pump through the pipe 29.

It will be seen that the only liquid which passes through the pump 35 is drawn from the upper portion of the chamber 8. As the specific gravity of the sulphuric acid is so much greater than that of the cleaning fluid, it will be confined to the lower chamber 9. The perforated partition 7 maintains the liquid in the upper chamber in a calm condition even when the contents of the lower chamber 9 is thoroughly agitated, by the forced delivery of fluid from the pipe 32. Sulphuric acid thus pumped into and thoroughly agitated with the liquid without any of the acid coming in contact with the pump.

Having thus illustrated my invention and described the same in detail, what I claim as new and desire to secure by Letters Patent is:—

1. In apparatus of the character described, a tank, a perforated partition dividing the tank into upper and lower chambers, said tank also provided with an inlet chamber, said inlet chamber having an open lower end communicating with said lower chamber, a pipe leading from the upper end of said upper chamber to said inlet chamber, means to convey liquid through said pipe in a forced stream and deliver the same to said inlet chamber; an eductor in said pipe and means to feed a purifying element to said eductor for delivery with said forced stream.

2. In apparatus of the character described, a tank, a perforated partition dividing the tank into upper and lower chambers, said tank also provided with an inlet chamber, said inlet chamber having an open lower end communicating with said lower chamber, a pipe leading from the upper end of said upper chamber to said inlet chamber, means to convey liquid through said pipe in a forced stream and deliver the same to said inlet chamber, an eductor in said pipe, means

to feed a purifying element to said eductor for delivery with said forced stream and a tube leading from the lower portion of said lower chamber to said eductor.

ing from the lower portion of said lower chamber to said eductor.

4. In apparatus of the character described, a tank having an upper chamber, a lower chamber and an inlet chamber, said inlet chamber having an open lower end communicating with said lower chamber, a perforated partition between said upper chamber to said inlet chamber, an eductor from the upper portion of said upper chamber to said inlet chamber, a pump operatively interposed in said line for delivering a liquid from said upper chamber to said inlet chamber, an eductor operatively interposed in said line between said pump and said inlet chamber; means to feed a purifying element to said eductor and means to feed liquid from the lower portion of said tank to said eductor.

VERNE R. READ,

5 3. In apparatus of the character described, a  
10 tank having an upper chamber, a lower chamber  
and an inlet chamber, said inlet chamber having  
an open lower end communicating with said lower  
chamber, a perforated partition between said  
15 upper and lower chambers, a pipe line leading  
from the upper portion of said upper chamber  
to said inlet chamber; a pump operatively inter-  
posed in said line for delivering a liquid from  
said upper chamber to said inlet chamber, an  
20 eductor operatively interposed in said line be-  
tween said pump and said inlet chamber, a con-  
tainer for sulphuric acid, a tube leading from  
said container to said eductor and a tube lead-

|    |     |
|----|-----|
| 20 | 95  |
| 25 | 100 |
| 30 | 105 |
| 35 | 110 |
| 40 | 115 |
| 45 | 120 |
| 50 | 125 |
| 55 | 130 |
| 60 | 135 |
| 65 | 140 |
| 70 | 145 |
| 75 | 150 |