J. J. TOKHEIM.

NAPHTHA STORING AND PUMPING SYSTEM.

APPLICATION FILED MAY 11, 1908.

1,040,463.

Patented Oct. 8, 1912

3 SHEETS—SHEET 1.

Fig. 8.

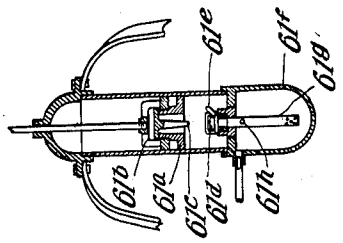

Fig. 1.

Fig. 9.

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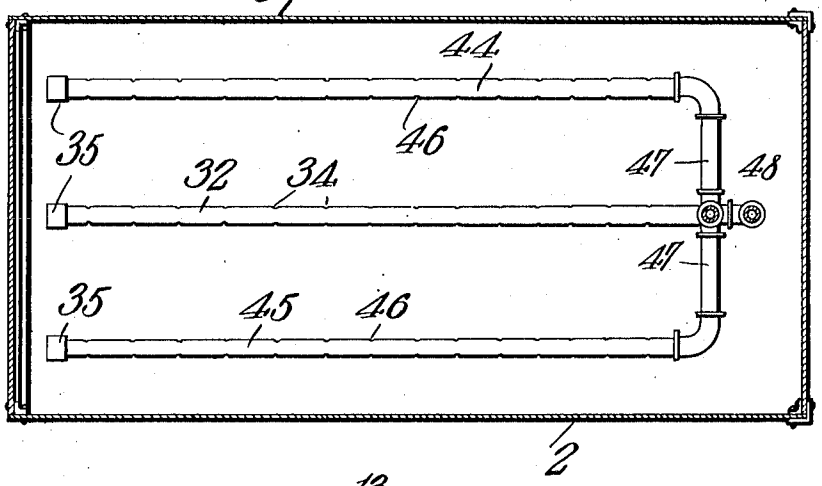
3 SHEETS—SHEET 2.

Fig. 2



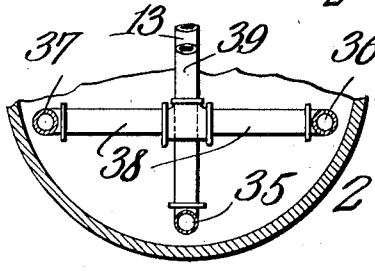
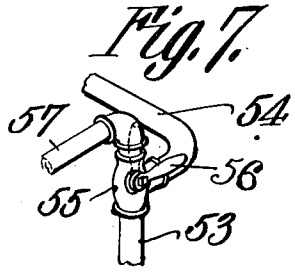


Fig. 3.

Fig. 7.



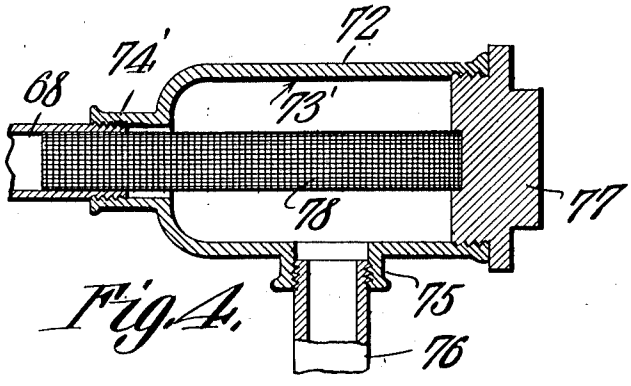


Fig. 4.

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3 SHEETS—SHEET 3.

Fig. 5.

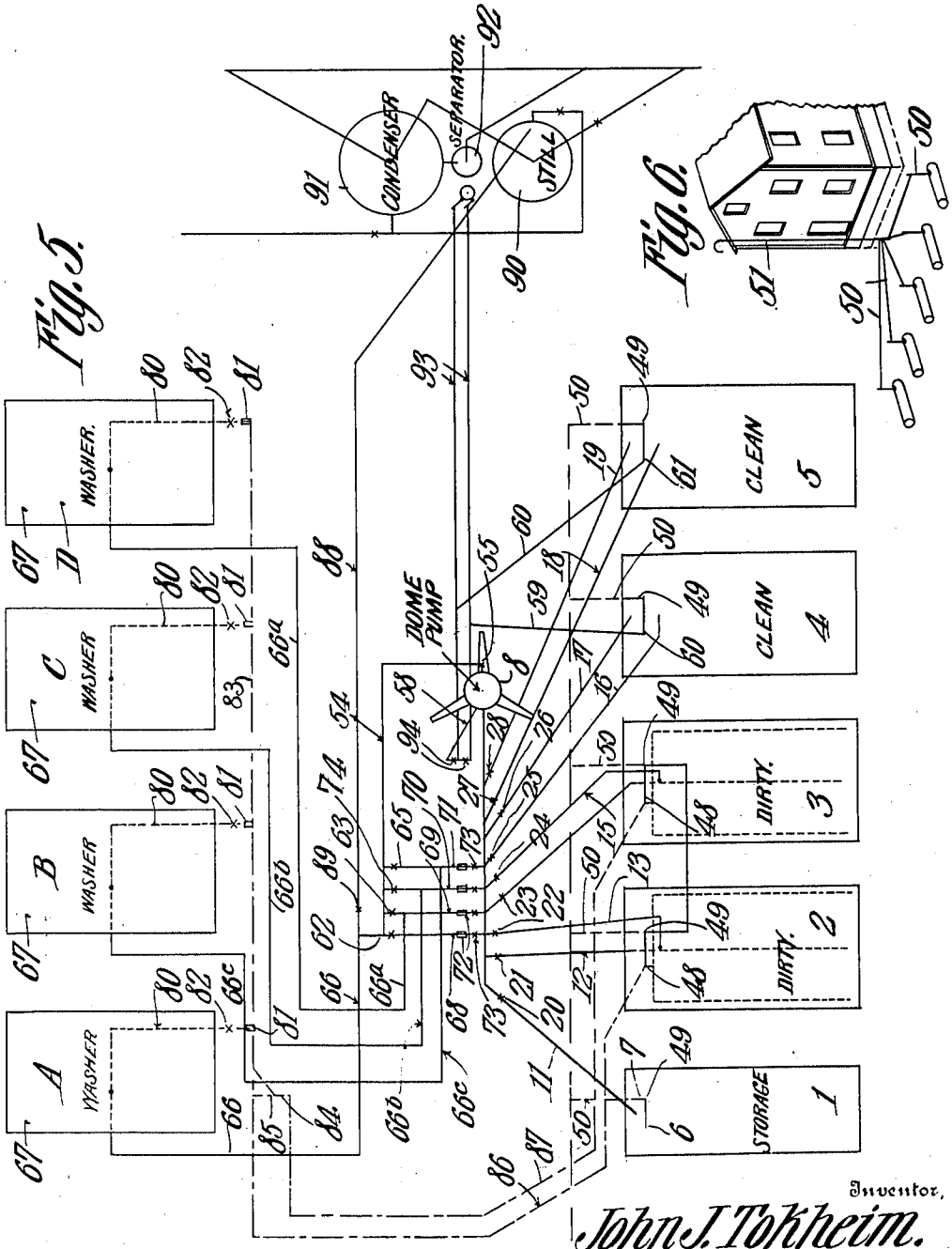

Fig. 6.

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UNITED STATES PATENT OFFICE.

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NAPHTHA STORING AND PUMPING SYSTEM.

1,040,463. Specification of Letters Patent. Patented Oct. 8, 1912.

Application filed May 11, 1908. Serial No. 432,140.

To all whom it may concern:

Be it known that I, JOHN J. TOKHEIM, a citizen of the United States, residing at Cedar Rapids, in the county of Linn and State of Iowa, have invented a new and useful Naphtha Storing and Pumping System, of which the following is a specification.

This invention relates to a naphtha storing and pumping system designed more especially for naphtha cleaning-establishments.

The object of the invention is, with the greatest element of safety, to enable the users of large quantities of naphtha, benzin, or gasolene, to handle the same with readiness and ease, and at the same time to avoid waste by conserving the foul or dirty hydrocarbon and subjecting it to a treatment that will purify or rectify it, and present it in condition for re-use, as often as may be desired.

With the above and other objects in view, as will appear as the nature of the invention is better understood, the same consists, generally stated, in a naphtha storing and pumping system embodying a source of supply, a receptacle for contaminated fluid, a receptacle for clean fluid, and means for forcing contaminated fluid from its receptacle to a point of rectification, and clean fluid to the point of utilization.

The invention consists further in a system for utilizing a cleansing fluid and rectifying it when contaminated, comprising a source of supply, a receptacle for contaminated fluid, a receptacle for clean fluid, and means for forcing the contaminated fluid from its receptacle to a point of rectification and for separating water from the clean fluid and forcing the latter to the point of utilization.

The invention consists further in a naphtha storing and pumping system comprising a series of naphtha containing tanks, a series of washers, a pump, and connections between the pump and the washers, including means whereby naphtha may be pumped from one washer to another without withdrawing naphtha from the tanks.

The invention consists further in the various novel details of construction and combination of parts of a naphtha storing and pumping system, as will be hereinafter fully described and claimed.

In the accompanying drawings forming a part of this specification, and in which like characters of reference indicate corresponding parts, Figure 1 is a view in perspective of a system displaying the naphtha receptacles or tanks, the pump, the connections between the parts, and, incidentally, for purposes of clearness, one of a series of washers that may be used in connection with the system. Fig. 2 is a horizontal section of one of the so-called dirty tanks. Fig. 3 is a view in transverse section of a portion of the above-named tank. Fig. 4 is a longitudinal sectional view through a strainer employed in connection with the system. Fig. 5 is a diagrammatic view showing the system connected up with a series of washers and with a rectifying plant embodying a still, a condenser, and a separator. Fig. 6 is a perspective fragmentary detail view, in the nature of a diagram, showing the manner in which the system is vented to prevent the accumulation of fumes within the tanks that might result in dangerous explosions. Fig. 7 is a fragmentary detail view in perspective of a portion of the pump. Fig. 8 is a fragmentary detail view of the lower portion of the pump. Fig. 9 is a similar view of the upper portion thereof.

While the term naphtha is herein referred to as the particular kind of hydrocarbon handled by this system, it is to be understood that it is equally well adapted for use in connection with the handling of gasolene, benzin, or other volatile oils used in dry cleaning, and, therefore, the term naphtha is to be construed to cover any character of volatile or inflammable oil capable of being used for cleaning fabrics, or to be handled for other purposes.

As shown in Fig. 1, there are five naphtha containing receptacles or tanks employed, designated, respectively, 1, 2, 3, 4 and 5, and in installing the system these tanks will be buried at a proper depth under the ground at any desired distance from the building employing the system, and preferably below the frost line, in order to prevent the freezing of any water contained in the naphtha. The tank 1 is a storage tank and receives the fresh naphtha through a pipe 6 from any suitable source of supply, such as an ordinary oil wagon, and has connected with it a vent pipe 7. The tanks 2 and 3 will be known to the trade as the "dirty tanks," as

they receive the used or foul naphtha from the washers, hereinafter described, while the tanks 4 and 5 will be known as the clean settling tanks, as they receive the purified or rectified naphtha. For ordinary purposes, five tanks will be all that will be necessary; but, if the requirements of a plant demand it, a sixth tank may be employed for containing naphtha used for rinsing purposes only, and this naphtha, after being used, will be drained back into the last-named tank and repeatedly utilized until it becomes too dirty for the purpose.

Located in any preferred room, or on any floor of the building employing the system, is a pump 8 which constitutes a combined force and dome, or water separating, pump, and which handles the naphtha of all of the tanks.

Associated with this pump is a mechanism, to which no claim is here made, for returning all of the unused naphtha back to the storage tanks, the object of the employment of this feature being to eliminate, practically, every element of danger in handling the naphtha, and the result is secured by merely lifting the handle of the pump, whereupon all of the naphtha will be discharged back to the storage tank except a small quantity contained in the priming chamber of the pump. Communicating with the priming chamber 9 of the pump is a pipe 10 constituting a manifold, and with which connect the upper ends of nine pipes 11, 12, 13, 14, 15, 16, 17, 18 and 19. Of these, the pipe 11 connects with the storage tank 1, the pipes 12 and 13 with the dirty tank 2, the pipes 14 and 15 with the dirty tank 3, the pipes 16 and 17 with the clean tank 4, and the pipes 18 and 19 with the clean tank 5. Each of these pipes carries a valve designated, respectively, 20, 21, 22, 23, 24, 25, 26, 27, and 28 that control passage to the manifold 10 and thence to the pump. As shown in Fig. 1, each of the pipes 11—19 is constructed of a series of sections and elbows, but this arrangement is not obligatory, as it may be varied according to the requirements arising in installing the apparatus in a building.

It will be observed by reference to Fig. 1 that the branch 29 of the pipe 11 extends to within a short distance of the bottom of the storage tank 1 and this will insure the withdrawal of practically all of the naphtha within the receptacle. Inasmuch as in the best of naphtha there is always some sediment or foreign substance present, there will be a slight space left between the lower end of the branch 29 and the bottom of the tank 1, which will prevent the removal of such impurities. The branches 30 and 31 of the pipes 12 and 14 within the tanks 2 and 3 have extensions 32 and 33 at their lower ends that lie close to the bottoms of the tanks, and are perforated along their sides, as shown at 34 in Fig. 2, and have their outer ends closed by caps 35, as also shown in the same figure. The branch 36 of the pipe 16 in the tank 4 extends to within a short distance of the bottom of the tank, as does also the branch 37 of the pipe 18, the branches 36 and 37 having side perforations adjacent their lower ends but having their ends closed by caps 42 to prevent entry of water, as will be hereinafter described. The branch 38 of the pipe 17 and similar branch 39 of the pipe 19 extend to the bottoms of the tanks 4 and 5, and are open at their lower ends. The branches 40 and 41 of the pipes 13 and 15 extend into the tanks 2 and 3 to within a comparatively short distance of the bottom thereof, and in order that the greater portion of the contents of these tanks may be drawn, and without removing any of the foul matter which has settled to the bottom, these pipes are perforated at their lower ends along their sides and their ends are closed by caps 42 similar to those which are applied to the branches 36 and 37. The pipes 38 and 39 of the tanks 4 and 5 have their lower ends open, and these two pipes constitute water suction pipes for the tanks 4 and 5, while the pipes 36 and 37 constitute the naphtha suction pipes for the same.

In addition, the tanks 2 and 3 have arranged within them two pipes 44 and 45, which, like the pipes 32 and 33, are provided with caps 35 by which their ends are closed, the sides of the pipes 44 and 45 being provided with any desired number of orifices 46. These pipes 44 and 45 are connected by branches 47 with pipes 48 that extend upward from the tanks 2 and 3 any desired distance, and have their upper ends sealed. Connected with each of the tanks 2, 3, 4 and 5 and extending above the same, is a pipe 49 similar to the pipe 7 of the tank 1. These pipes merely enter the tanks and constitute vent pipes, the upper ends of which are sealed. With each of these pipes 49 connects a gas pipe 50 that communicates with a stand pipe 51 arranged exteriorly of the building utilizing the system, as clearly shown in Fig. 6.

By the provision of the strainer pipes, danger of clogging the system by the intake of foul matter contained in the tanks 2 and 3 will practically be precluded, but, in order to guard against any such contingency which might result should the tanks 2 and 3 contain an excessive amount of foul matter, each of the tanks 2 and 3 is provided with a man-head 52 by which access may be had to their interior.

Connecting with the discharge pipe 53 of the pump 8 is one end of a pipe 54 which constitutes a manifold, and the pipe 53 carries a three-way valve 55 which is of such

construction that, when turned so that its operating handle 56 is in a vertical position, the discharge from the pump will be into its transparent dome 56′, and when turned to a horizontal position, the discharge will be diverted to the pipes leading to the washer valves. The spout 57 of the pump is for the discharge of water from the tanks 4 and 5 which is drawn into the pump through the pipes 17, 19, 38 and 39, the water thus raised being discharged in any suitable manner. Communicating with the base of the pump is a pipe 58, and coupled with this pipe are two pipes 59 and 60 which constitutes overflow pipes from the dome, the former of which communicates with a pipe 60′ that enters the top of the tank 4, and the latter with a pipe 61 that enters the top of the tank 5. After the desired amount of naphtha has been drawn or at any time when the system is not in use, and especially at night, the system can be drained by raising the pump handle. To effect this result the cylinder plunger 61^a is provided with a puppet 61^b having an extension 61^c that projects below the plunger, and the lower valve has a puppet 61^d provided with an arm 61^e. When the pump handle is raised, and the plunger descends, the latter will first contact with the arm 61^e and trip the puppet 61^d, and upon further movement the puppet 61^d trips the puppet 61^b so that all of the naphtha in the pump will be allowed to flow out except about a quart that is retained in the priming chamber 61^f, this priming liquid being retained by providing the pipe 61^g that connects with the lower valve with a vent 61^h disposed adjacent to the said valve.

As stated, it is one of the objects of the present invention to adapt the system for pumping used naphtha from one washer to another without withdrawing any from the tanks. The general practice in cleaning establishments is to use the naphtha after it has been mixed with soap as often as possible without purifying, as the latter step removes the soap and thus occasions loss. The naphtha is generally used twice, and the dirty naphtha may then be used on dark fabrics. After garments have been washed, or cleaned, they must be rinsed with clean naphtha, and the rinsing is done in the same washer as that in which they were cleansed, in order to prevent loss of time that would result in removing the garments. In order to remove the naphtha from one washer to another, thus to obviate the necessity of running it back into one of the tanks, there is provided a special arrangement of pipes and fittings, shown in Fig. 1, that connect the manifold 54 and the manifold 10 with the washers. This arrangement comprises four pipes 62, 63, 64, and 65, the upper ends of which are connected with the manifold 54 and the lower ends of which have connected with them four branch pipes 66, 66^a, 66^b and 66^c that connect, one with each of the washers 67, of which four are shown in this instance, and as they may be of the usual or any preferred construction, and form no portion *per se* of the present invention, detailed description thereof is omitted. With each of the pipes 66, 66^a, 66^b, and 66^c are coupled the inner ends of branch pipes 68, 69, 70 and 71, the outer ends of which carry strainers 72, and these strainers are connected by branches 76 with the manifold 10, each of the branches 76 having connected with it a valve 73 of any preferred construction. Each of the pipes 62, 63, 64 65 carries a valve 74 by which passage through the pipes is controlled.

One of the strainers 72, to which reference has been made, is shown in detail in Fig. 4, and comprises a casing 73′ of any preferred size, and having at one end a constricted internally threaded neck 74′ with which one of the pipes 68—71 is connected, and is provided at one side with a threaded extension 75 with which one of the pipes or branches 76 carrying the valves 73, is connected. The end of the casing opposite the neck 74 is internally threaded and is engaged by a plug 77 in which is firmly seated one end of a tubular strainer 78, the other end of which fits within the pipe 68, or other of the pipes 66—71 in connection with which the strainer is used. It will be observed that by this arrangement the naphtha withdrawn from one washer and passed to another is strained, and any foreign matter, such as ravelings, buttons, or the like, is caught and retained by the strainer 78 and may be removed at stated intervals, or otherwise, by removing the plugs 77 and freeing the casing of the strainer from the accumulated material.

Referring to Fig. 1, in which only one of the washers is shown, the pipe 66 leading thereto enters the washer from the under side through a coupling 79 with which connects one end of a pipe 80, the other end of which enters a strainer 81 constructed in the same manner as the strainer 72 shown in detail in Fig. 4, a valve 82 on the pipe 80 serving to control passage therethrough. Arranged below the pipe 80 is a pipe 83 which is connected near one end with the strainer 81, and this pipe is adapted to constitute a discharge pipe common to the series of washers, each of which will be connected thereto through the medium of a pipe corresponding to the pipe 80 and a strainer 81, as shown in Fig. 1.

Connecting with the outer end of the pipe 83 is a branch pipe 84 that carries a valve 85, and connected with the terminals of the branch pipe 84 are two pipes 86 and 87 that connect with the pipes 48 of the tanks 2 and

3 to return the foul naphtha from the washers thereto, the discharge to the tanks being controlled by the valve 85. Under the arrangement above described, and when it is desired to pump dirty napththa from washer A to washer B, (the four washers being indicated for the purpose of identification by the letters A, B, C, D) the valve 73 on the branch pipe 68 and the valve 74 on the pipe 63 are open and the other valves of the system are closed, and upon the pump being operated, the naphtha from washer A will be drawn through the strainer on the branch 68 through the valve 73 below the same, thence to the pump cylinder, thence through the manifold 54 to the pipe 63, and thence to washer B.

Connecting with the manifold 54 is one end of a pipe 88 carrying a valve 89, the other end of which communicates with a steam still, designated generally 90 in Fig. 5 that forms one element of a rectifying or purifying system, the other elements of which consist of a condenser 91 and a separator 92. As these parts form no part of the present invention, *per se*, detailed illustration thereof is deemed unnecessary, and it will suffice to say that the foul naphtha is pumped to the still, which is steam heated, where the naphtha is vaporized, and passes over to the condenser 91 which may be of the ordinary worm type, and the condensed hydrocarbon passes to a separator 92 and is returned to the clean tanks 4 and 5 through pipes 93. It may be stated, in this connection, that while the system is shown as connected with a series of washers, and with a rectifying or purifying system, it is to be understood that the invention is not to be limited to this combination, as, in effect, the naphtha storing and pumping system, which includes the series of receptacles or tanks, the pump, and the pipes and fittings necessary for connecting up the system with the washers and the rectifying system, may be furnished alone and installed in a building already equipped with the washers and the rectifying system.

In the use of the apparatus, the naphtha that is rectified or distilled, for instance, on Monday, will be returned to tank 4, and that rectified on Tuesday will be returned to tank 5. The naphtha in tank 4 will be allowed to settle until Tuesday, and the water is then pumped into the dome pump by opening the valve 26, and the naphtha in the tank 5 will be allowed to settle until Wednesday, and the water is then pumped into the dome pump by opening the valve 28. The water, of course, settles to the bottom of the tanks, owing to its greater specific gravity, and it is a very easy matter to remove it, and by attaching a hose to the faucet or spout 57 of the pump, the water may be conducted to a sewer. As soon as all the water is pumped out of the tanks, the naphtha appears in the transparent dome 56′, and the difference is at once noticeable. As the naphtha in the two tanks will be used on alternate days, a clean supply is always obtainable.

The pump is provided with an overflow pipe 93ª, clearly shown in Fig. 9, and this pipe is absolutely necessary for the operation of the pump as it returns to the tanks 4 and 5 all excess naphtha pumped into the dome over and above the top of the overflow pipe. In order to take care of this excess naphtha, the return pipes 59 and 60 are provided, and as already stated the return pipe 59 is connected with the tank 4 and the return pipe 60 with the tank 5, and when the pump is used to separate water from the naphtha the operator will open either one of the valves 94 carried by the pipes 59 and 60 according to the requirements of the case. Thus if the tank 4 is being used on the day in question to receive the distilled naphtha from the still the valve on the pipe 59 will be opened to allow the excess from the dome to return to the tank 4, whereas if the tank 5 was being used the valve 94 on the pipe 60 would be opened for the return of the excess naphtha to the tank 5, the object of this arrangement of course being not to disturb the contents of the tank from which the water has been pumped out. In the same manner, the tanks 2 and 3 may be alternately operated so as to give the naphtha in one ample time to settle while that from the other is being withdrawn.

As will be obvious by reference to Fig. 1 the naphtha that passes through the strainer 81 will be freed of all ravelings, pieces of fabric, buttons, or the like, and in passing down the pipes 86 or 87 to the tanks 2 or 3, the naphtha will have sufficient head in discharging from the orifices 46 to cause the sediment or dirt thoroughly to be stirred up and thus prevent it from caking along the sides of the tank.

It will be seen from the foregoing description that by the use of this system, a pronounced saving can be effected in the use of the naphtha, and, further, that an element of danger always present in the use of highly volatile hydrocarbon is eliminated by employing the closed strainers 81, the vents 50, and the means for returning the naphtha in the pump back to the tanks at the conclusion of the pumping operation.

I claim:—

1. In a cleaning system, a washer, a pump, a liquid receiving tank, an outlet pipe extending within said tank and terminating above the bottom thereof, said pipe being provided with side perforations, pipe connection between said outlet pipe and the inlet of said pump, an inlet pipe located adjacent the wall of said tank, said inlet pipe

being formed with perforations facing said wall whereby said wall is washed by the liquid entering the tank, pipe connection between said inlet pipe and said washer, and pipe connection between said washer and the outlet of said pump.

2. In a cleaning system, a washer, a pump, a liquid receiving tank, an outlet pipe extending within said tank and terminating above the bottom thereof, said pipe being provided with side perforations, pipe connection between said outlet pipe and the inlet of said pump, an inlet pipe located adjacent the wall of said tank, said inlet pipe being formed with perforations facing said wall whereby said wall is washed by the liquid entering the tank, pipe connection between said inlet pipe and said washer, a second liquid receiving tank having an outlet and an inlet pipe similar to those of said first-mentioned tank, pipe connections for said second-mentioned tank similar to those for said first-mentioned tank, pipe connection between said washer and the outlet of said pump, and valves in said pipe connections, whereby the liquid in one tank may be utilized while the liquid in the other pipe is being allowed to settle.

3. In a cleaning system, a washer, a pump, a liquid receiving tank, an outlet pipe extending within said tank and terminating above the bottom thereof, said pipe being provided with side perforations, pipe connection between said outlet pipe and the inlet of said pump, an inlet pipe located adjacent the wall of said tank, said inlet pipe being formed with perforations facing said wall whereby said wall is washed by the liquid entering the tank, pipe connection between said inlet pipe and said washer, a second outlet pipe in said tank for the withdrawal of dirty liquid and sediment, pipe connection between said second outlet pipe and the inlet of said pump, and pipe connection between said washer and the outlet of said pump.

4. In a cleaning system, a washer, a pump, a liquid receiving tank, an outlet pipe extending within said tank and terminating above the bottom thereof, said pipe being provided with side perforations, pipe connection between said outlet pipe and the inlet of said pump, an inlet pipe located adjacent the wall of said tank, said inlet pipe being formed with perforations facing said wall whereby said wall is washed by the liquid entering the tank, pipe connection between said inlet pipe and said washer, a second liquid receiving tank having an outlet and an inlet pipe similar to those of said first-mentioned tank, pipe connections for said second-mentioned tank similar to those for said first-mentioned tank, pipe connection between said washer and the outlet of said pump, valves in said pipe connections, whereby the liquid in one tank may be utilized while the liquid in the other tank is being allowed to settle, a rectifier connected with said pump, and another outlet pipe in each of said tanks for the withdrawal of dirty liquid and sediment, said outlet pipes being connected to said pump.

5. In a cleaning system, a tank for receiving dirty liquid, and an inlet pipe for said tank, said pipe being provided with a portion extending longitudinally of the tank adjacent a wall thereof and being provided with a plurality of orifices facing said wall, whereby said wall is washed when liquid is admitted to the tank.

6. In a cleaning system, a tank for receiving dirty liquid, an inlet pipe for said tank, said pipe being provided with a portion extending longitudinally of the tank adjacent a wall thereof and being provided with a plurality of orifices facing said wall, whereby said wall is washed when liquid is admitted to the tank, and an outlet pipe for said tank extending within the same and terminating above the bottom thereof, said outlet pipe being formed with side orifices to enable liquid to be withdrawn from the tank without disturbing any sediment therein.

7. In a cleaning system, a tank for receiving dirty liquid, an inlet pipe for said tank, said pipe being provided with a portion extending longitudinally of the tank adjacent a wall thereof and being provided with a plurality of orifices facing said wall, whereby said wall is washed when liquid is admitted to the tank, an outlet pipe for said tank extending within the same and terminating above the bottom thereof, said outlet pipe being formed with side orifices to enable liquid to be withdrawn from the tank without disturbing any sediment therein, and a second outlet pipe for dirty liquid and sediment, said second outlet pipe extending longitudinally along the tank adjacent the bottom thereof and being provided with orifices for admitting the liquid and sediment.

8. In a cleaning system, a tank for receiving a mixture of rectified liquid and water, an inlet pipe for said tank, an outlet pipe extending within said tank and terminating adjacent the bottom thereof, a pump, pipe connection between the inlet of said pump and said outlet pipe, a second tank for receiving rectified liquid mixed with water, inlet and outlet pipes for said second-mentioned tank similar to those of said first-mentioned tank, pipe connection between the outlet pipe of said second-mentioned tank and the inlet of said pump, valve means in said pipe connections for enabling liquid to be admitted to or withdrawn from either one of said tanks without disturbing the contents of the other, whereby one tank may

be used while the water is settling in the other, and means associated with said pump for enabling the nature of the liquid pumped to be determined.

9. In a cleaning system, a washer, a pump, pipe connection between said pump and said washer, a tank for receiving dirty liquid from said washer, pipe connection between the inlet of said pump and said tank, an outlet pipe for enabling dirty liquid and sediment to be withdrawn from said tank, pipe connection between said outlet pipe and the inlet of said pump, a rectifier, pipe connection between said rectifier and said pump, a tank for receiving a mixture of liquid and water from said rectifier, an outlet pipe extending within said second-mentioned tank and terminating adjacent the bottom thereof, pipe connection between said outlet pipe and the inlet of said pump, and a by-pass associated with said pump for permitting the water to be removed before liquid from said last-mentioned tank is pumped to the washer.

10. In a cleaning system, a washer, a pump, pipe connection between said pump and said washer, a tank for receiving dirty liquid from said washer, pipe connection between the inlet of said pump and said tank, an outlet pipe for enabling dirty liquid and sediment to be withdrawn from said tank, pipe connection between said outlet pipe and the inlet of said pump, a rectifier, pipe connection between said rectifier and said pump, a tank for receiving a mixture of liquid and water from said rectifier, an outlet pipe extending within said second-mentioned tank and terminating adjacent the bottom thereof, pipe connection between said outlet pipe and the inlet of said pump, means for enabling the nature of the liquid pumped to be determined, and a by-pass associated with said pump for permitting the water to be removed before liquid from said last-mentioned tank is pumped to the washer.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

JOHN J. TOKHEIM.

Witnesses:

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