March 7, 1961 F. E. MORRIS 2,974,071

LINE CLEANING PROCESS

Filed Dec. 21, 1953 3 Sheets-Sheet 1

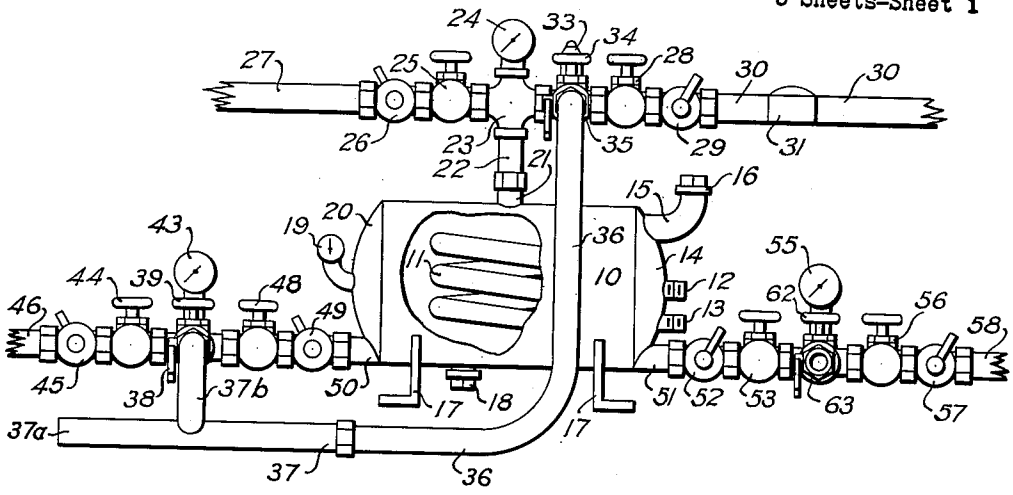


FIG. 1

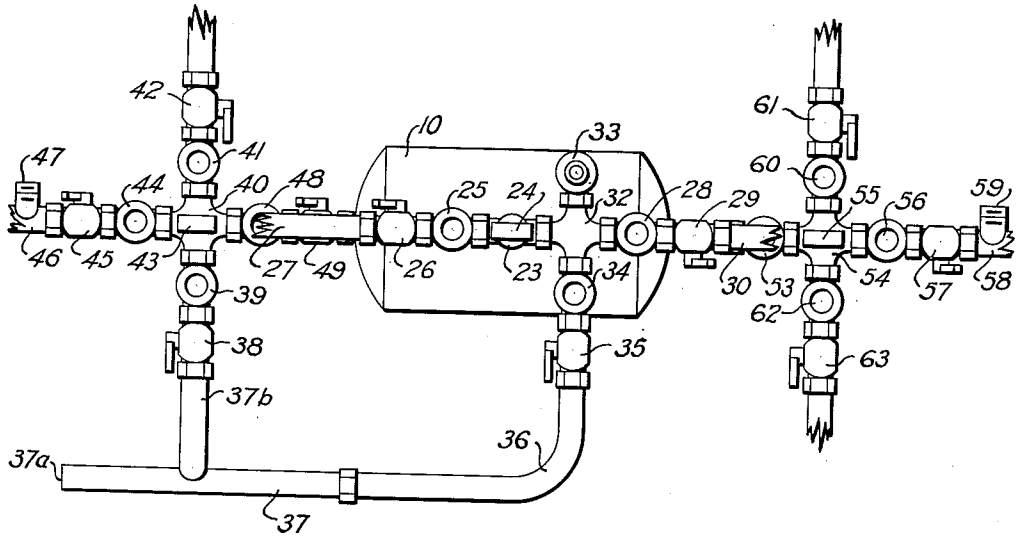


FIG. 2

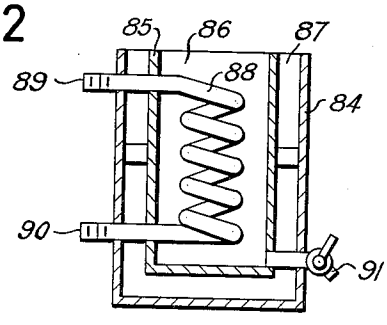


FIG. 7

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LINE CLEANING PROCESS

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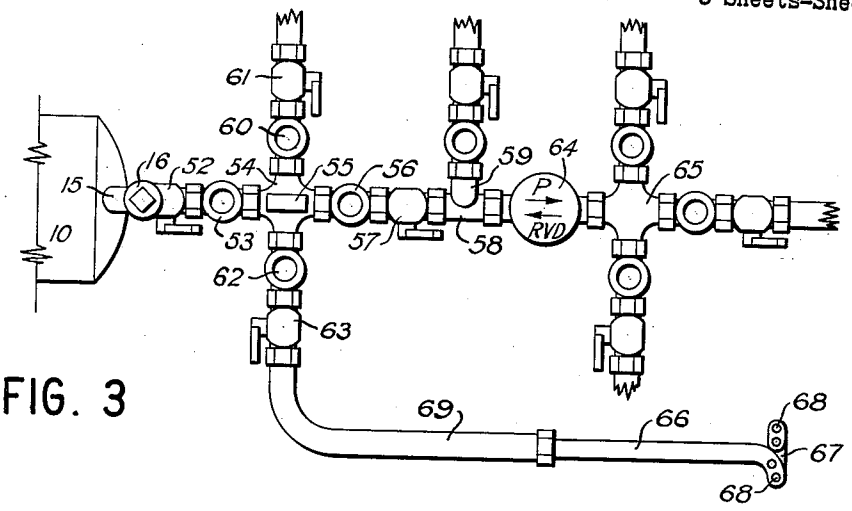


FIG. 3

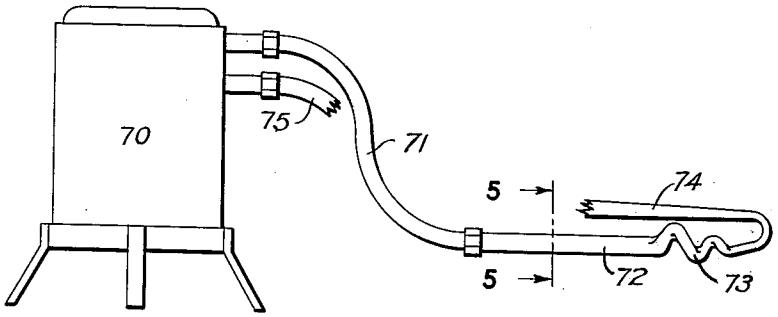


FIG. 4

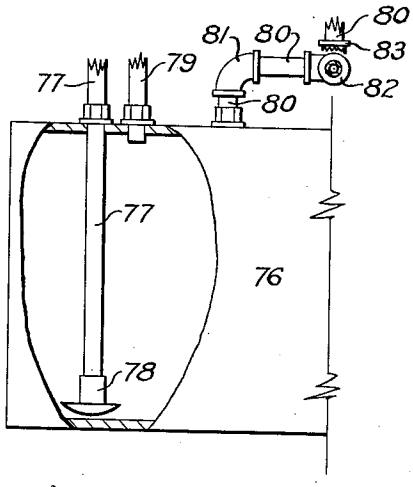


FIG. 6

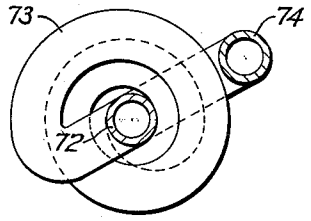


FIG. 5

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LINE CLEANING PROCESS

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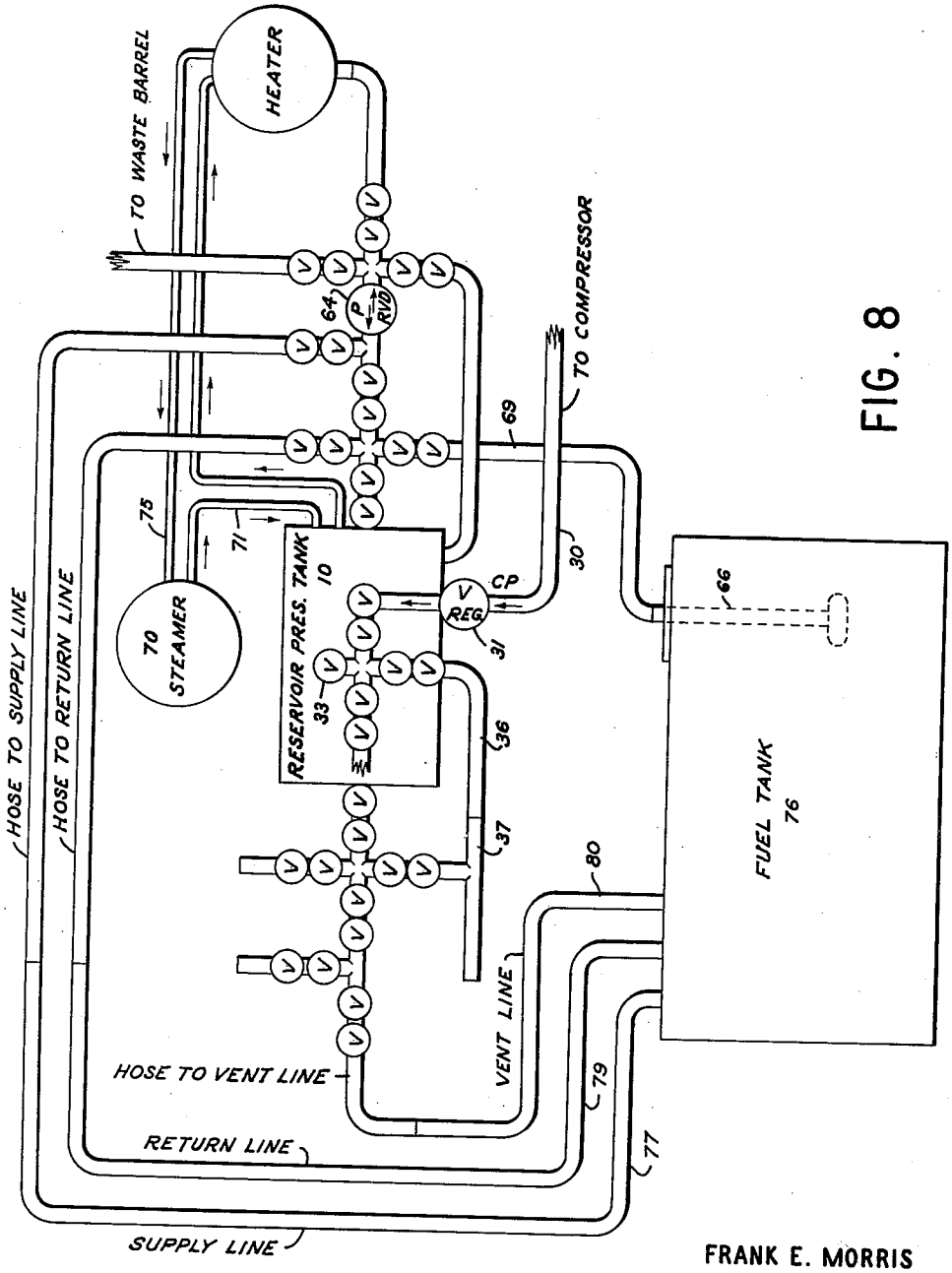


FIG. 8

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2,974,071

LINE CLEANING PROCESS

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Filed Dec. 21, 1953, Ser. No. 399,492
8 Claims. (Cl. 134—21)

My invention relates to providing improvements in line cleaning and freeing process for use in cleaning fuel oil supply, return and vent lines, plumbing waste lines and lines of all categories and uses which are subject to clogging by reason of the accumulation of residues formed from the intermingling of oil products, gasoline, water or vapor or condensation within said lines which gradually create a sludge formation resulting in a blocking and restriction of said lines.

One object of my invention is to provide a method of cleaning and freeing fuel oil supply, return and vent lines and plumbing waste lines which are ordinarily buried beneath earth, concrete or in other ways inaccessible without the necessity of uncovering said lines or opening the fuel supply tank in the case of fuel supply, vent, or return lines.

Another object of my invention is to use portable equipment that may be taken from location to location which is capable of cleaning and freeing more than one line at a time without the necessity of attaching the device to and removing it from each line as it is to be cleaned or to work on another line of a fuel oil system.

A further object of my invention is to use portable equipment and means for cleaning and freeing fuel oil supply, return and vent lines and plumbing waste lines in a relatively short period of time without necessity of taking the fuel oil supply system or waste lines out of service for a long period of time.

Referring to the drawings:

Fig. 1 is a side elevation of the pressure tank and oil and solvent heating receptacle with a portion of the side broken away, so as to show the steam heating coil therein. This view also shows three of the multiple heads in position, the air suction ejector attached for use, the air pressure line running into the upper multiple head, the fill pipe, temperature gauges, pressure gauges and operating valves, etc.

Fig. 2 is a top plan view of the heating and pressure reservoir tank, showing three of the multiple heads in position, the pressure gauges, the air suction ejector in position, the automatic safety valve, and the operating valves of the multiple heads.

Fig. 3 is a plan view of a portion of the heating and pressure reservoir tank, showing the tandem arrangement of two of the multiple heads set up with the attachment for shooting chemical into a fuel oil supply tank on one of the multiple head outlets and also the suction and return lines of a fuel supply system attached thereto, the reversible, variable speed pump and the second of the multiple heads showing parts of lines going to three separate sources of deposit for chemical, fuel oil and dissolved sludge withdrawn from the lines.

Fig. 4 is a side elevation view of a typical steamer with a preheating device coupled to the steam outlet thereof, said preheating device being designed for insertion through the fill pipe into a fuel oil tank.

Fig. 5 is a sectional view of the tank preheating device taken in the direction of the arrows along the line 5—5 of Fig. 4, showing the generally spiral design of the end of said preheating device. The steam return pipe is not shown in this view.

Fig. 6 is a side elevational view of a portion of a fuel supply tank with part of said tank broken away, so as to reveal the suction line and foot valve on the end thereof and the return line of a fuel supply tank. This view also shows a vent line with a portion thereof broken away.

Fig. 7 is a side elevational view in section of a preheating or reheating receptacle showing the water jacket, the oil compartment, the steam heated coil within the oil compartment and a drain outlet for the oil compartment.

Fig. 8 is a schematic or diagrammatic view showing the connection and relation of the pressure reservoir tank and manifolds shown in Figs. 1 to 3 inclusive, the steamer shown in Fig. 4, the supply tank shown in Fig. 6, the heater shown in Fig. 7 and the vent, supply and return lines of a fuel oil heating system. The various gauges have been omitted from this figure for reasons of clarity.

Referring further to the drawings:

The reservoir pressure tank **10** is equipped with a heat exchanging coil **11** whose inlet end **12** and outlet end **13** protrude from the end **14** of the said tank **10**. A fill pipe **15** is located on the end **14** of the said tank **10** and is equipped with a cap **16**. Legs **17** support the reservoir pressure tank **10**, and a drain plug **18** is located on the bottom side of said tank between the legs **17**. A temperature gauge **19** is connected to the end **20** of said tank **10**. An inlet pipe **21** is situated in the center of the upper side of said tank **10** to which is coupled a short length of pipe **22**. A conventional four-way plumbing cross **23** is threaded to the top of the pipe **22**. A pressure gauge **24** is threaded to the top of the cross **23**. Immediately adjacent to the cross **23** and on the left hand side thereof is coupled a screw type valve **25**. A lever operated butterfly type valve **26** is then coupled to the valve **25** at the end thereof opposite the cross **23**. A length of hose **27** is coupled to the butterfly type valve at the end thereof opposite the valve **25**. Immediately adjacent to the cross **23**, as shown in Fig. 1, is coupled a typical cross-head which is formed out of a conventional plumbing cross such as the cross **23**. Immediately adjacent to the cross-head and on the right hand side thereof opposite the cross **23** is coupled a screw type valve **28**. Immediately adjacent to this valve and opposite the end coupled to the typical plumbing cross is coupled a butterfly type valve **29**. The other end of the butterfly type valve **29** is coupled to a length of hose **30** in which is situated a constant pressure inlet valve **31**. The hose **30** is then attached to a source of compressed air. On one side of the typical cross-head **32** is coupled a safety valve **33**. On the opposite end of the crosshead **32** from the valve **33** is coupled a screw type valve **34** to which in turn is coupled a butterfly type valve **35**. A length of hose **36** is coupled to the opposite end of the valve **35**, said length of hose **36** in turn being coupled to an air operated ejector **37**. The end **37***a* of the air suction ejector deposits withdrawn oil, dissolved sludge, etc. in a waste barrel not shown in the drawings. The leg **37***b* of the air suction ejector is coupled to a butterfly valve **38** and a screw type valve **39** which is coupled to one outlet of a typical cross-head **40**. The opposite end of the four-way cross-head **40** is coupled to another screw type valve **41** which in turn is coupled to a butterfly type **42**, the valve **42** being then coupled to a supply line, a return line or a vent line, as the user may decide. In the center of the cross-head **40** and on the top thereof is located a pressure gauge **43** on the left hand side of the cross-head **40**, as shown in Fig. 2 of the drawings, a screw type valve **44** is coupled. In turn a butterfly type valve **45** is coupled to the screw type valve **44**. A stand-

ard plumbing T 46 is then coupled to the butterfly type valve 45. The outlet 47 on the leg of the T 46 at the operator's option is coupled to a suction line, return line or vent line. On the right hand side of the cross-head 40 as shown in Fig. 2 of the drawings a screw type valve 48 is attached, to which in turn a butterfly type valve 49 is then attached, the valve 49 then being coupled to an outlet pipe 50 on the end 20 of the reservoir pressure and heating tank 10. The outlet 50 on the end 20 and the outlet 51 on the end 14 of the said tank 10 are located at the lowermost point of the diameter of said pressure and heating tank 10. A butterfly type valve 52 is coupled to the outlet pipe 51 on the end 14 of the reservoir pressure and heating tank 10. A screw type valve 53 is then coupled to the butterfly type valve 52. A typical plumbing cross head 54 is coupled to the valve 53; a pressure gauge 55 is screwed into the middle of the cross-head 54. On the opposite side of the cross-head 54 is coupled a screw type valve 56 to which is coupled a butterfly type valve 57. A conventional plumbing T 58 is then coupled to the valve 57; leg 59 of the T 58 may be attached to a suction line, a return line or a vent line at the operator's option. To another side of the cross-head 54 is coupled a screw type valve 60 which is coupled to a butterfly type valve 61 which is coupled to a vent, suction, or return line at the operator's option. On the opposite side of the cross-head 54 is coupled a screw type valve 62 which in turn is coupled to a butterfly type valve 63. The valve 63 is then coupled to a waste line, a return line, a vent line or a suction line at the operator's option. As shown in Fig. 3 of the drawings, a variable delivery reversible pump 64 is coupled to the T 58. To the reversible pump 64 on the side opposite the T 58 is coupled a standard cross-head 65. The remaining three outlets of the cross-head 65 are equipped with a typical screw valve and butterfly valve combination such as has been described in connection with cross-heads aforementioned in this specification. These outlets from the cross-heads 65 enable the operator at his option to withdraw hot oil and chemical and sludge from the line being cleaned and deposit it in a waste barrel, the pre-heating device, or the reservoir pressure and heating tank 10.

The combination of a cross-head coupled to a lower outlet of the pressure and heating tank 10, said cross-head being attached to a return line, a suction line and a vent line or a chemical spraying device 66 with a variable delivery reversible pump between said cross-head and an outer cross-head whose three outlets run to various places of deposit for the hot oil and chemical and sludge withdrawn from the lines is intended to be used on either end of the reservoir, pressure and heating tank 10. Hence said tank 10 may be equipped at either end or both ends simultaneously with a tandem cross-head set-up with a reversible variable delivery pump between said cross-heads. By means of the said reversible pump 64 the operator is also enabled to withdraw deposited chemical and oil from one of the places in which it has been deposited and run it back through the same or a different line from which it was withdrawn. Thus by means of the reversible pump 64 and the pressure gauges 55 the operator is enabled through his pressure readings to tell when he has hit a plug in a line and then to back the hot chemical and oils up by means of said pump 64 causing it to be deposited in one of the receptacles serviced by the cross-head 65. He can again reverse the pump 64 forcing the hot oil and chemical against the plugged spot in said line from which it was withdrawn, creating a ramming effect. By alternating the pumping direction as above described, the chemical and oil solution tends to have a wiping or scouring effect on the lines to be freed. If the operator so desires, in the use of the air ejector 37, a positively maintained predetermined pressure or suction can be attained in the withdrawing phase by setting the constant pressure valve 31 at the pressure reading desired. The air ejector 37 is useful only for the purpose of backing up or withdrawing the oil and chemical solution from the line or lines being freed. Thus, if it has been determined the lines are old or too weak to stand with safety more than a given amount of suction or pressure, that pressure may be established by means of the valve 31 or by controlling the speed or delivery of the pump 64, so that the operation can be carried out without the operator having to worry about rupturing, collapsing, or damaging lines.

A tank spraying device 66 for shooting the inside of a fuel storage tank at various levels with a hot chemical cleaning and desludging solution is provided at its end 67, which is generally circular in shape, with a plurality of holes 68 in the circular portion thereof. The terminology "shooting the inside of a fuel storage tank" as used in this specification is employed in the sense of disbursing hot oil, hot chemical and/or hot oil and chemical through and upon the interior of the fuel storage and supply tank. By coupling the tank operating device 66 to one of the three outlets on one of the inner cross-heads, such as cross-head 54, by means of a hose 69, the inside of a fuel tank can be shot at various levels with the hot chemical desludging solution at a predetermined pressure which is controlled by the setting on the constant pressure inlet valve 31. The tank spraying device 66 may be inserted through the fill pipe or the manhole opening of the fuel tank.

A portable steamer 70 of any standard make or design, such as is shown in Fig. 4, is connected by means of a hose 71 to the inlet end 12 of the heat exchanger coil 11 in the reservoir, pressure and heating tank 10. The steamer 70 provides and generates the necessary heat which is transferred through the heat exchanger coil 11 to the hot chemical and oil solution in the reservoir pressure and heating tank 10. When the desired temperature, as shown by the thermometer 19 on the end 20 of the reservoir pressure and heating tank 10, has been obtained, the line gauge 31 is set at a predetermined pressure, and compressed air is introduced through the hose 30, the valve 29, the valve 28, the cross-head 32, the vertical cross 23, the pipe 22 and the inlet opening 21 into the reservoir pressure and heating tank 10. The operator by opening and closing the proper valves is ready to start freeing one of the lines connected to an outlet of an inner cross-head. As soon as the first line has been freed, which will be indicated by the change in pressure registered on the pressure gauges 43 or 55, the operator is then immediately able to work on another line by merely opening and closing the proper valves on the cross-head to make the desired outlet accessible to the hot chemical and oil solution in the reservoir, pressure and heating tank 10. Thus after the equipment has been set up and attached to the lines, which are in need of cleaning and freeing, the operator can carry on the whole operation by merely changing the openings on valves and without the necessity of any further couplings or uncouplings until the job has been completed.

A tank preheater 72, as shown in Fig. 4, is coupled by lengths of hose to the steamer 70 and then inserted through the manhole of the fuel oil supply tank. The end 73 of the tank preheater 72 is generally spiral in design for the purpose of obtaining a greater heating area within the fuel oil supply tank. The spiral 73 emerges into the return pipe 74 of the tank preheater 72. The return pipe 74 is coupled by means of a hose 75 to the return connection of the steamer 70. The whole tank preheater 72 is constructed preferably of copper tubing.

A portion of a typical fuel oil supply tank 76 with a part thereof broken away is shown in Fig. 6. A suction line 77 with a foot valve 78 at the bottom thereof is shown in place in the tank 76. Also, a return line 79 and vent line 80 are shown in place on the tank 76.

Oftentimes the source of trouble in a blocked fuel oil supply system resides in the foot valve 78 which becomes lodged open by means of sludge formations or particles

of carbon. By attaching the end of the suction line 77, which fastens to the burner of the heating unit, to one of the outlets on one of the inner cross-heads of the tandem cross-head set-up, such as the cross-head 54, pressure and hot oil and chemical solution may be applied to the line and rammed back and forth, as described above, until the line has been completely freed and scoured out, including the foot valve 78. This is accomplished without the necessity of entering, opening or excavating the fuel oil supply tank or of excavating or uncovering the suction line, return line or vent line of the heating system, as the case may be.

A typical vent line 80 has three 90° elbows 81, 82 and 83 inserted in such a manner as to allow for the settling of the fuel oil tank 76 into any direction without breaking the vent line 80. Oftentimes when a tank settles the resulting angles created by the shifting of the vent line through the 90° elbows 81, 82 and 83 creates a low section in the vent line which becomes blocked by fuel oil when the tank is filled to the capacity it is supposed to hold. This results eventually in a sludge formation and a blocking of the vent line 80 so that the tank 76 is unable to breathe properly, resulting in the burner unit not functioning as it should. The vent line 80 may also be coupled to one of the outlets of one of the inner cross-heads such as cross-head 40 and freed in the same manner as a suction line or return line without the necessity of excavating said vent line 80.

The same process using the reservoir pressure tank 10, the air pressure line 30, constant pressure inlet valve 31, inlet pipe 21, typical inner cross-heads 40 or 53, variable delivery pump 64, the air suction ejector 37, etc., may be employed to free plumbing waste lines which have become clogged from accumulation of coagulated grease and sludge without the necessity of expensive repairs, replacements or disassembly.

An oil and chemical preheater or reheater can be used in connection with my device through the medium of one of the outlets of one of the outer cross-heads 65. Said preheater or reheater has an outer jacket 84 and an inner jacket 85, the inner jacket 85 forming a container 86 for receiving oil and chemical solution. Said inner jacket 85 is concentrically located within the outer jacket 84, forming a water containing space 87 around all sides and the bottom of said inner jacket 85. A heat exchanger coil 88 is positioned within said space 86 of said inner jacket 85. Said heat exchanger coil 88 is provided with an inlet connection 89 and an outlet connection 90, said ends 89 and 90 being fastened to a source of heat such as the steamer 70. A drain plug 91 is positioned at the lower portion of the inner jacket 85 so that the oil and chemical solution may be drained out of the space 86 without disturbing the water in the space 87.

By means of a hose from one of the outlets of a typical outer cross-head 65, the preheated oil and chemical solution within the space 86 may be pumped into the particular line being cleaned by means of the reversible variable delivery pump 64, or the oil and chemical solution may be withdrawn from the line being freed and redeposited in the space 86 of the perheater or reheater receptacle for reheating said oil and chemical before ramming it back into the line to be freed. This operation is carried out entirely through the medium of the reversible variable delivery pump 64.

The preheater or reheater receptacle is provided with the water space 87, in addition to the heat exchanger coil 88, so that the preheater or reheater receptacle may be set directly on an open flame, if desired, to speed up the process of preheating or reheating the oil and chemical solution within the space 86. The preheater or reheater also serves as an auxiliary supply source for oil and chemical solution which is available in the event the lines being cleaned are so long that more solution is required than can be held in the reservoir pressure and heating tank 10, or in the event that it is more convenient to draw oil and chemical from this source in connection with the operation of the reversible variable delivery pump in cleaning lines or in shooting a fuel storage tank.

As shown in the drawings, my device is equipped with a screw type valve and a butterfly valve, coupled together in series wherever used to control an outlet or inlet opening of my device. This arrangement has been embodied in my device so that the operator will have a valve available for rapidly shutting off or opening an outlet or inlet by means of the butterfly type valve, and will also have available a slower operating but more positively locking screw type valve. It is understood that the arrangement as shown in the drawings is the preferable embodiment of this invention, but that I am not limiting myself to this particular embodiment. It is further understood that in the use and operation of my equipment I first place the oil selected for the particular cleaning operation or the said oil in combination with a desludging chemical in the reservoir pressure and heating tank 10 and, if a greater quantity of oil and/or chemical and oil solution is required, such additional supply is placed in the space 86 of the receptacle shown in Fig. 7 of the drawings, which receptacle is a combination preheater, reheater and auxiliary heater and auxiliary supply reservoir for oil or oil and chemical solution.

It is also understood that in connection with the operation of the reversible variable delivery pump 64 hot oil, chemicals and dissolved sludge may be returned to the reservoir pressure and heating tank 10, the auxiliary heater and supply reservoir receptacle combination device shown in Fig. 7 of the drawings, or a waste barrel, selectively, or that said oil, chemical and/or dissolved sludge may be deposited in a waste barrel by means of the air ejector 37, 37*a*, 37*b*.

Having thus described my invention what I claim is:

1. A process for cleaning the interior of a plugged, inaccessible line having an accessible end consisting of drawing hot oil from an exterior source, forcing said hot oil into the accessible end of said line and against the plug therein at a controlled and predetermined pressure until said plug has been dissolved, withdrawing said hot oil and dissolved plug through said accessible end at a controlled and predetermined suction and redepositing said hot oil and dissolved plug in said exterior source.

2. A process for cleaning the interior of a plugged, inaccessible line consisting of withdrawing hot oil in combination with a desludging chemical from an exterior source, forcing said hot oil and desludging chemical combination into an accessible end of said line and against the plug therein until said plug is dissolved, withdrawing said hot oil and chemical combination and said dissolved plug from said line and redepositing said hot oil and chemical combination and said dissolved plug in said exterior source.

3. A process for cleaning the interior of plugged transmission pipe lines of a fuel supply system, said pipe lines being inaccessible, consisting of withdrawing hot oil from an exterior source and forcing said hot oil under a controlled and predetermined pressure into the interior of said plugged lines through one accessible end of each thereof and against the obstruction therein, alternately withdrawing the said hot oil under a controlled and predetermined suction from within said line and away from said obstruction through said accessible end until said obstruction is dissolved and redepositing said hot oil and dissolved plug in said exterior source.

4. A process for cleaning the interior of plugged transmission pipe lines in a fuel oil supply system, said lines being inaccessible, consisting of withdrawing hot oil in combination with a desludging element from an exterior source, forcing said hot oil and desludging chemical combination into the interior of said lines and against the obstruction therein through accessible ends of said lines, alternately withdrawing the hot oil and desludging chemical combination until the obstruction in the interior of

said line is removed and redepositing said hot oil and desludging chemical combination and removed plug in said exterior source.

5. A process for cleaning the interior of plugged, inaccessible fuel transmission lines and of fuel supply tanks connected therewith, each of said lines and said tank having only one point of access, consisting of heating oil in combination with a desludging chemical solution in exterior containers, withdrawing said heated oil and desludging chemical solution from said exterior containers and forcing said heated oil and desludging chemical solution combination into the interior of said transmission lines through the points of access to each of said lines and against the plug therein, controlling and predetermining the pressure applied to the said heated oil and desludging chemical solution, withdrawing the heated oil and desludging chemical solution and dissolved sludge through the point of access of each of said transmission lines being cleaned, controlling and predetermining the suction influence applied to said heated oil and desludging chemical combination and dissolved sludge while withdrawing it through the point of access of each of said lines, alternately forcing the heated oil and desludging chemical solution into and withdrawing it from each of said transmission lines being cleaned through the point of access of each, controlling and predetermining the pressure and suction applied to said heated oil and desludging chemical combination during the alternate forcing and withdrawing of said heated oil and desludging chemical combination, redepositing the withdrawn oil and desludging chemical solution and dissolved sludge in said exterior containers, inserting a heater into the fuel supply tank through the point of access thereof and heating the fuel in said fuel supply tank, withdrawing heated oil and desludging chemical combination from another exterior container, and through the point of access of said fuel supply tank, dispersing said heated oil and desludging chemical solution under controlled pressure at various levels throughout the fuel in said tank, thereby dissolving sludge accumulations from the interior surfaces of said tank.

6. A process for cleaning sludge from the interior of plugged, inaccessible transmission lines and vent lines for oil heating equipment and from other inaccessible lines in which sludge accumulates, each of said lines having one accessible end, consisting of withdrawing hot oil from one of several exterior sources, forcing said hot oil into the accessible end of each of said lines under a controlled and predetermined pressure, alternately withdrawing said hot oil through the accessible end of each of said lines at a controlled and predetermined suction, repeating between forcing the hot oil into the accessible end of each of said lines and withdrawing it through the accessible end of each of said lines under controlled pressure and suction until the sludge accumulation therein is dissolved and each of said lines is clean, relieving the pressure put upon each of said lines by forcing air at a predetermined pressure past the accessible end of each of said lines and thereby withdrawing said hot oil and dissolved sludge and redepositing said hot oil and dissolved sludge in any one of the said exterior sources.

7. A process for cleaning sludge from the interior of a plugged, inaccessible transmission line having one accessible end, consisting of withdrawing hot oil in combination with desludging chemicals from one of several exterior sources, forcing said hot oil and desludging chemicals combination under a controlled and predetermined pressure through the accessible end of said line, alternately withdrawing said hot oil and desludging chemicals combination from said pipe through its accessible end at a controlled and predetermined suction, alternately reintroducing said hot oil into the interior of said line through its accessible end and withdrawing the same through said end at predetermined and controlled pressures and suctions until said line is clean and then withdrawing said hot oil and desludging chemicals combination from said line through its accessible end and redepositing said oil and desludging chemicals combination and dissolved sludge into any of said several exterior sources.

8. A process for cleaning the interior of plugged, inaccessible fuel transmission lines and of fuel supply tanks connected therewith, each of said lines and said tank having only one point of access, consisting of heating a desludging chemical solution in exterior containers, withdrawing said heated desludging chemical solution from said exterior containers and forcing said heated desludging chemical solution into the interior of said transmission lines through the point of access to each of said lines and against the plug therein, controlling and predetermining the pressure applied to the said heated desludging chemical solution, withdrawing the heated desludging chemical solution and dissolved sludge through the point of access of each of said transmission lines being cleaned, controlling and predetermining the suction influence applied to said desludging chemical solution and dissolved sludge while withdrawing it through the point of access of each of said lines, alternately forcing the heated desludging chemical solution into and withdrawing it from each of said transmission lines being cleaned through the point of access of each, controlling and predetermining the pressure and suction applied to said heated desludging chemical solution during the alternate forcing and withdrawing of said desludging chemical solution, redepositing the withdrawn desludging chemical solution and dissolved sludge in said exterior containers, inserting a heater into the fuel supply tank through the point of access thereof and heating the fuel in said fuel supply tank, withdrawing heated desludging chemical solution from another exterior container, and through the point of access of said fuel supply tank dispersing said heated desludging chemical solution under controlled pressure at various levels throughout the fuel in said tank, thereby dissolving sludge accumulations from the interior surfaces of said tank.

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