March 11, 1941. J. A. ERICKSON 2,234,555

FUEL TREATING SYSTEM

Filed Dec. 6, 1937 2 Sheets-Sheet 1

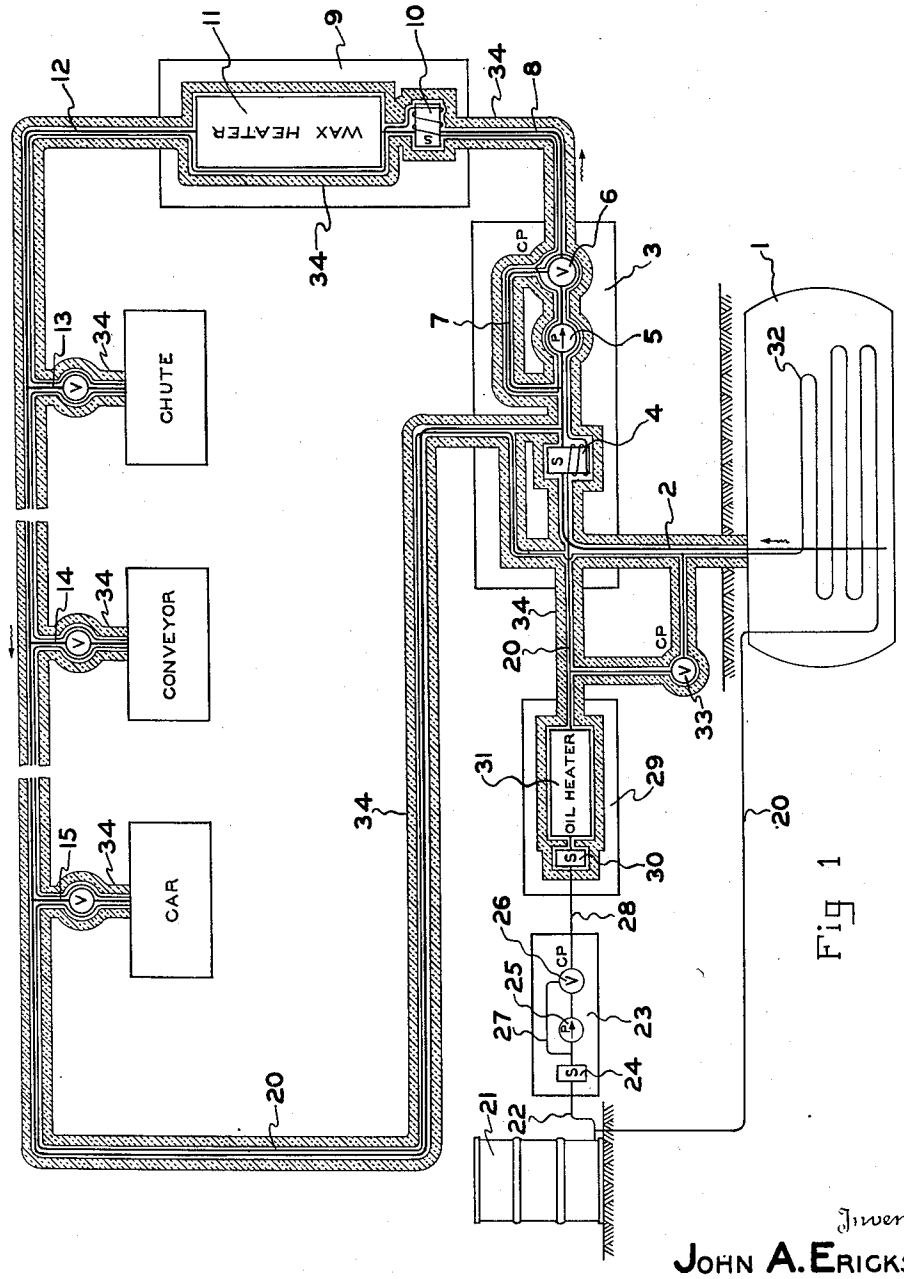


Fig 1

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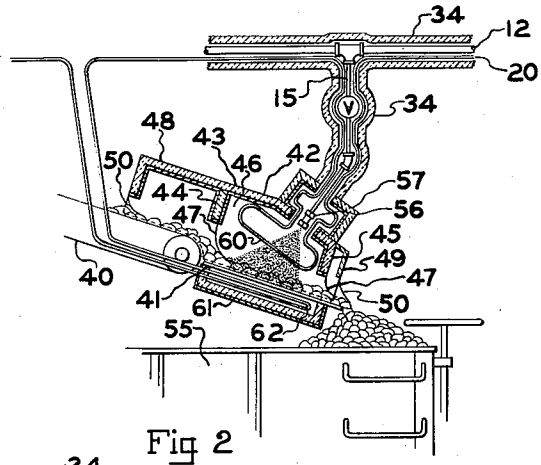


Fig 2

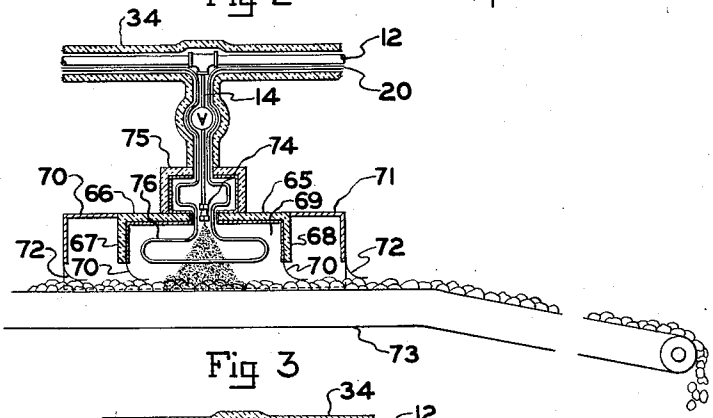


Fig 3

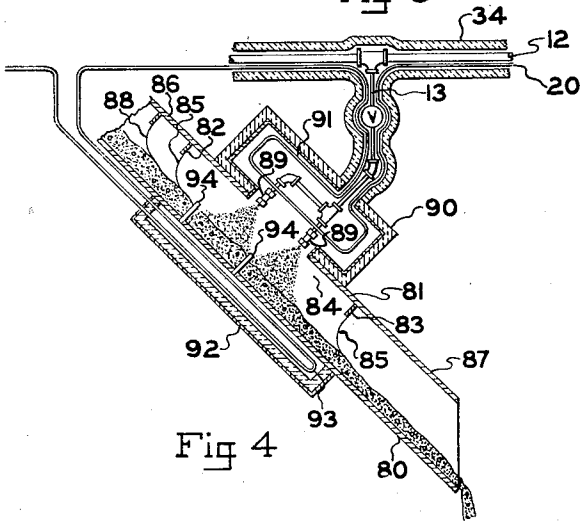


Fig 4

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UNITED STATES PATENT OFFICE

2,234,555

FUEL TREATING SYSTEM

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7 Claims. (Cl. 91—44)

This invention relates to fuel treating systems and more particularly to a system by which heavy oil or wax is sprayed on coal for dustproofing the same.

When extremely heavy oil or wax is sprayed on coal for dustproofing purposes, the problems of starting the system in operation and preventing the sprayed material from congealing or solidifying on equipment adjacent the point of application heretofore have not been solved economically. The present invention in general overcomes the above difficulties by providing a conduit in which is circulated hot oil to warm the supply of spraying material and which conduit is in heat exchanging relation with all parts of the equipment through which the spraying material passes or with which it comes in contact.

An object of the invention is to provide a system for spraying fuels for dustproofing with a heavy hydrocarbon or the like, wherein the temperature of the equipment is elevated by circulating of a fluid in a closed system adjacent the parts of the equipment.

Another object is to conduct the spraying material in a closed system to the spraying nozzles.

A further object of the invention is to heat the spraying hoods provided at the point of spraying.

These and other objects will be apparent from the following specification when taken with the accompanying drawings in which:

Fig. 1 is a diagrammatic illustration of the system comprising the invention,

Fig. 2 is a diagram of the equipment for spraying coal at the end of a loading boom,

Fig. 3 is a diagram of the equipment for spraying coal on a horizontal conveyor, and

Fig. 4 is a diagram of the equipment for spraying coal on an inclined chute.

Referring particularly to the drawings, the reference character 1 indicates a storage tank having connected thereto an outlet pipe 2. The outlet pipe 2 is connected to a pumping unit 3 having a strainer 4, a pump 5 and a constant pressure valve 6. The constant pressure valve 6 is connected to the inlet side of the pump 5 by a pipe 7. A pipe 8 connects the pumping unit 3 with the heating unit 9, which consists of a strainer 10 and a heating device 11. The device 11 preferably is electrical, although some other source of heat may be employed. A pipe 12 is connected with the outlet of the heating unit 9 and returns to the inlet side of the pump 5. Tapped into the pipe 12 are a plurality of pipes 13, 14 and 15, to which are connected various spraying devices disclosed respectively in Figs. 4, 3, and 2.

As the wax in the system, including the tank 1, at usual temperatures is a solid or semi-solid, it cannot be pumped by the pumping unit 3 unless its temperature is elevated. Accordingly, there is provided throughout the system a heating circuit which consists of a tube 20, through which is continuously circulated a hot oil or its equivalent. Oil has been found to be especially desirable as a heat transferring medium for the reason that it will not freeze up in the tube 20 during cold weather. Oil for circulating through the tube 20 is taken from a storage drum 21 by means of a tubular connection 22 which connects the drum 21 to a pumping unit 23. The pumping unit 23 consists of a strainer 24, a pump 25 and a constant pressure valve 26. A tube 27 connects the constant pressure valve 26 with the inlet side of the pump 25. A connecting tube 28 connects the pumping unit 23 with the heating unit 29, which consists of a strainer 30 and a heating device 31. The heating device 31 is preferably electrical, although any other type of heater may be used. The tube 20 is connected to the outlet of the heating unit 29.

The tube 20 is arranged in a continuously closed circuit contiguous to the various wax conducting pipes, strainers, pumps, valves, etc., and then is formed into a coil 32 disposed in the storage tank 1. From the coil 32 the tube 20 returns to the inlet side of the pumping unit 23.

In order to be sure that some of the heat transferring oil from the tube 20 passes through the storage tank before it loses the major portion of its heat, a constant pressure valve 33 is provided, which is connected between the portion of the tube 20 adjacent the outlet of the heating unit 29 and the portion of the tube 20 about to enter the storage tank 1. Thus, a portion of the oil coming from the heating unit 29 is by-passed through the valve 33 directly to the heating coil 32 in the storage tank 1, while the remainder of the oil from the heating unit 29 passes through the main heating circuit. The constant pressure valve 33 should be set at a pressure somewhat below that delivered from the heating unit 29.

It should be observed that while the drawings are diagrammatic, the heating tube 20 is in contacting relation with the various portions of the wax conducting pipe line 12, as well as the pumping unit 3 and the heating unit 9. It will be understood that the purpose of the tube circuit 20 is not only to raise the temperature of the entire system before the actual pumping of wax from

the storage tank is started, but is also to maintain the temperature of the system at the correct operating temperature. The oil circulating in the tubing 20 has the additional function of warming the air spaces adjacent the point at which the wax from the storage tank 1 is applied to the coal. This feature of the invention is disclosed in Figs. 2, 3 and 4. All pipes, tubes and parts carrying wax are covered with a heat insulating material 34.

Referring particularly to Fig. 2, the reference character 40 indicates a continuous belt conveyor which is discharging coal onto the chute 41. Disposed over the end of the conveyor 40 and the chute 41 is a spraying hood 42. The spraying hood 42 may be of any conventional or usual construction, is insulated, and consists of a top portion 43, a front portion 44 and a rear portion 45, together with side portions 46, which extend downwardly to the level of the coal. Depending from the front portion 44 and the rear portion 45 are skirts 47 for the purpose of enclosing the space over which the hood 42 is disposed and preventing the escape of dustproofing spray. Projecting forwardly and rearwardly from the hood 42 are insulated extension hoods 48 and 49, respectively. The extension hoods 48 and 49 each have depending skirts 50 similar to and for the same purpose as the depending skirts 47 of the hood 42. The extension hoods 48 and 49 provide an additional sealing against escape of coal treating spray from the hood 42.

As disclosed in the drawings, the coal drops from the chute 41 into a car 55. At the top of the hood 42 is provided a spraying nozzle 56 which communicates with the pipe 15, as disclosed in Figs. 1 and 2. Mounted on the hood 42 about the portion thereof, through which the nozzle 56 projects, is a heat insulated box 57 for the purpose of permitting access to the nozzle 56 for inspection and the like.

Disposed within the hood 42 is a tubular heating coil 60, which is within the circuit provided by the tube 20 disclosed particularly in Fig. 1. Oil circulating through the tube 20 circulates through the heating coil 60 and thereby elevates the temperature within the hood 42 to prevent the material being sprayed through the nozzle 56 from solidifying or congealing before it strikes the coal passing beneath the hood. The heating coil 60 is disposed at one side of the spray being directed from the nozzle 56, but may be disposed at both sides thereof if desired.

Beneath the chute 41 is provided a heat insulated enclosure 61, within which is disposed a tubular heating coil 62. The heating coil 62 is in communication with and in the circuit of the tube 20 and is for the purpose of heating the chute 41 as the coal passes over it to prevent the dustproofing material being sprayed on the coal from solidifying or congealing on the chute 41.

Referring particularly to Fig. 3 of the drawings, there is disclosed a heat insulated spraying hood 65 having a top 66, a front 67 and a rear 68, together with side portions 69. Depending from the front 67 and the rear 68 are skirts 70 similar to the skirts 47 in Fig. 2. The hood 65 is also provided with extension hoods 70 and 71, each of which is provided with a depending skirt 72, the object and function of the extension hoods 70 and 71 being the same as the object and function of the extension hoods 48 and 49 disclosed in Fig. 2.

The hood 65 is disposed over an endless conveyor 73, on which coal is being carried. A nozzle 74 projecting into the hood 65 communicates with the pipe 14, which in turn communicates with the main supply pipe 12. Disposed over the top of the hood 65 about the portion thereof through which the nozzle 74 projects is a heat insulated box 75 for permitting access to the nozzle 74. Within the hood 65 is a tubular heating coil 76, which is disposed at one side of the spray from the nozzle 74 but may be disposed at both sides thereof. The heating coil 76 communicates with the tube 20, as disclosed in Fig. 1, and elevates the temperature of the interior of the hood 65.

Referring particularly to Fig. 4, there is disclosed the application of the present invention to an inclined tubular chute 80. Formed in the chute 80 is a spraying hood 81 having an inlet end 82 and an outlet end 83, and sides 84 which comprise portions of the tubular chute 80. Depending from the ends 82 and 83 are skirts 85. The hood 81 is also provided with an extension hood 86 in the chute 80, which is provided with a skirt 88. The extension hood 86 and the skirt 85 are for the purpose of preventing the escape of the spraying material from beneath the hood 81.

Through the top of the hood 81 project two spraying nozzles 89 communicating with the pipe 13, which also communicates with the main supply pipe 12. Disposed about the nozzles 89 and against the top of the spraying hood 81 is a heat insulated box 90 having an opening for permitting access to the nozzles 89. Disposed within the box 90 is a tubular heating coil 91, which is in circuit with the tube 20 for the purpose of heating the interior of the chamber 90 to maintain the nozzles at an elevated temperature. It will be observed that the opening in the top of the hood 81, through which the nozzles 89 project, is sufficiently large to permit the escape of heat into the hood 81 over the coal passing down the chute 80.

Beneath the chute 80 is disposed a heat insulated enclosure 92 similar to the enclosure 61 disclosed in Fig. 2 and for the same purpose, that is, the heating of the underside of the chute for preventing the adhesion of dustproofing material. Disposed within the enclosure 92 is a tubular heating coil 93 in circuit with the tube 20. It will be noted that rods 94 project upwardly through the coal in the chute 80 for the purpose of breaking up the coal as it slides thereover and obtaining a better coverage by the spraying material.

The spraying arrangement disclosed particularly in Figs. 2, 3 and 4 are merely examples of spraying arrangements that may be incorporated in my system. It will be understood, of course, that my system may include all of the arrangements shown in Figs. 2, 3 and 4, particularly as disclosed in Fig. 1 or any one of them, or can include additional arrangements if desired. In the use of the invention with the hot oil tube circuit 20 continuously connected to the storage tank 21 through the connecting tubing 22, any make-up oil that may be needed for the heating system will be automatically supplied from the storage tank 21. Also, upon the heating of the oil in the tubing 20, any expansion thereof will automatically back up into the storage tank 21. It should also be understood that the pumping and heating units disclosed in Fig. 1 are merely examples and that some other units may be used if desired. It should also be understood that the dustproofing material may be other than wax, as, for instance, a highly viscous oil or a high pour point oil in cold weather.

Having thus described my invention, what I desire to secure by Letters Patent and claim is:

1. A device of the character described com-

prising a source of viscous material, too solid to be pumped at ordinary temperatures, a pump, heating means, a device for spraying said material, a fluid connection between said source and said pump, fluid connections between said pump, heating means and spraying device, a closed fluid circuit paralleling and in juxtaposed relation to said pumping system and first connection in heat exchanging relation thereto, heat insulation jacketing said system and circuit, and means to circulate a hot fluid through said circuit to heat said pumping system.

2. A device of the character described comprising a source of viscous material, too solid to be pumped at ordinary temperatures, a pump, heating means, a device for spraying said material, a fluid connection between said source and said pump, fluid connections between said pump, heating means and spraying device, a closed fluid circuit paralleling and in juxtaposed relation to said pumping system and first connection in heat exchanging relation thereto, means to circulate a hot fluid through said circuit to heat said pumping system, said last means including a second pump and heating means in said circuit, and means for automatically replenishing the fluid in said circuit.

3. A device of the character described comprising a source of viscous material, too solid to be pumped at ordinary temperatures, a pump, heating means, a device for spraying said material, a fluid connection between said source and said pump, fluid connections between said pump, heating means, and spraying device, a closed fluid circuit paralleling and in juxtaposed relation to said pumping system and first connection in heat exchanging relation thereto, a casing having a passageway therethrough, said spraying device being within said casing for spraying a material moving through said passageway, tubing within said casing, said tubing being included in said circuit, and means to circulate a hot fluid through said circuit to heat said pumping system, and the interior of said casing.

4. A device of the character described comprising a source of viscous material, too solid to be pumped at ordinary temperatures, a pump, heating means, a device for spraying said material, a fluid connection between said source and said pump, fluid connections between said pump, heating means, and spraying device, a closed fluid circuit paralleling and in juxtaposed relation to said pumping system and first connection in heat exchanging relation thereto, tubing within said source, said tubing being within said circuit, and means to circulate a hot fluid through said circuit to heat said pumping system and said source of viscous material.

5. A device of the character described comprising a source of viscous material, too solid to be pumped at ordinary temperatures, a pump, heating means, a device for spraying said material, a fluid connection between said source and said pump, fluid connections between said pump, heating means, and spraying device, a closed fluid circuit paralleling and in juxtaposed relation to said pumping system and first connection in heat exchanging relation thereto, tubing within said source, said tubing being within said circuit, means to circulate a hot fluid through said circuit to heat said pumping system and said source of viscous material, said tubing in said source being in that portion of said circuit past said spraying device, and means to by-pass a portion of said hot fluid to form a secondary circuit through said tubing and circulating means.

6. A device of the character described comprising a source of viscous material, too solid to be pumped at ordinary temperatures, a pump, heating means, a device for spraying said material, a fluid connection between said source and said pump, fluid connections between said pump, heating means, spraying device and first named connection to provide a closed fluid circuit, a second closed fluid circuit paralleling and in juxtaposed relation to said first circuit and first connection in heat exchanging relation thereto, tubing within said source, said tubing being within said second circuit, means to circulate a hot fluid through said second circuit to heat said first circuit and said source of viscous material, said tubing in said source being in that portion of said second circuit past said spraying device, means to by-pass a portion of said hot fluid to form a secondary second circuit through said tubing and circulating means, and means for automatically replenishing the fluid in said circuit and said secondary circuit.

7. A device of the character described comprising a source of viscous material, too solid to be pumped at ordinary temperatures, a device for spraying said material, a pipe system including a pump connecting said source and said spraying device, a closed fluid circuit paralleling and in juxtaposed relation to said pipe system in heat exchanging relation thereto, heat insulation jacketing said system and circuit, and means to circulate a hot fluid through said circuit to heat said system.

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