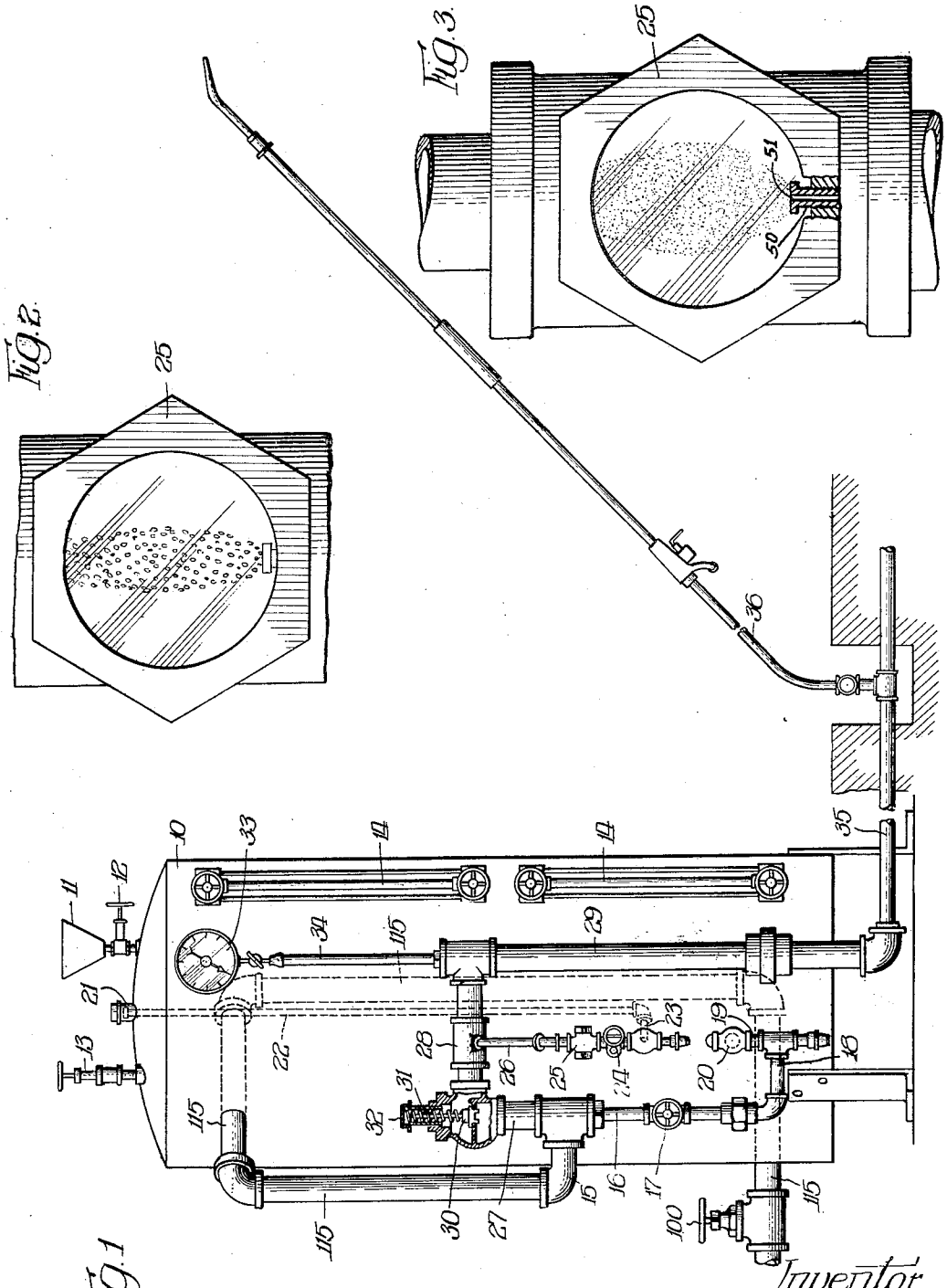
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CLEANING APPARATUS

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CLEANING APPARATUS

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This invention relates to a new and improved apparatus for producing a permanent suspension of oil in water, in the nature of a colloidal suspension, which has special usefulness and value as a cleaning fluid adapted for removing oil, grease and dirt from surfaces such as the metallic and other surfaces of locomotives, railway cars, machinery and the like.

The type of oil suspension and the nature of the cleaning fluid produced by the apparatus of this invention will be better understood by referring to United States Patent No. 1,135,001 issued on April 13th, 1915, to Durham and McGuirk, wherein the value of a suspension of finely divided oil particles in water as a cleaning fluid for the purposes herein referred to is set forth. The Durham patent however, provides a method for obtaining an oil suspension which involves the feeding of a relatively small quantity of oil into a water line which terminates with a spraying nozzle, and, the use of an air blast at the nozzle for ejectment with the oil and water mixture. In other words, Durham's process utilizes air under pressure as the means for subdividing the oil and as the means producing the desired oil suspension. The cleaning value of a permanent suspension of a relatively small quantity of oil and hot water under pressure is set forth in the Durham patent and in addition, has been proven by years of successful commercial application. The theory of operation as set forth in said patent, and as now understood by those skilled in the art, is based upon what is believed to be an electro-chemical activity of the oil particles when sub-divided to that degree, productive of a permanent or colloidal suspension in water.

The impingement, as when directed from a nozzle under pressure, of such suspension is found to exhibit a remarkable cleaning effect which is greatly in excess of the cleaning effects, acting jointly, provided by, first, the dislodging action of the stream, and secondly, the washing and dissolving effects of the oil and water. Apparently the oil particles possess a marked affinity for the particles of foreign matter with the result that the washing and dislodging effects are greatly multiplied in producing the unusual and effective cleaning action.

The commercial application of this type of cleaning fluid, up to the present time, has involved the use of a blast of air, introduced into the hot mixture of oil and water at the location of the nozzle in substantially the manner described in the Durham patent above referred to. This method and apparatus by which it was effected have been highly successful in commercial applications, particularly in view of the improved results realized over the prior practice of hand washing and scrubbing and the like. However, the uses for this type of cleaning process have so increased and the necessity for greater efficiency has become so important the present invention has been developed as a marked improvement over the processes and apparatus heretofore known and used.

Accordingly, it is an object of the present invention to provide an apparatus which will produce a greater sub-division of the oil particles in the water or at least produce an oil and water suspension which is more active in its cleaning properties than suspensions heretofore provided and used.

It is a further object of this invention to provide an apparatus for feeding predetermined quantities of oil to a stream of hot water which is effective to cause a greater subdivision of the oil in water at the point of introduction than has been possible heretofore. In the accomplishment of this object, the apparatus of this invention involves means for heating the oil prior to its introduction into the water stream whereby an entirely new and unexpected feeding action results. The heating of the oil to approximately the temperature of the water as contemplated in this invention apparently causes the oil to approach the vapor phase and in so doing, to exhibit an entirely novel feeding action. Under these circumstances, the oil, when ejected, from the nozzle of the control valve enters the water stream in the form of a mist which is highly suggestive of the action of a gas. This characteristic behavior is represented in Figure 3 of the drawing.

The individual oil particles are many times smaller than those obtained by oil feeding mechanisms of prior art cleaning devices of this type.

It should be understood that the feeding mechanism here described produces a colloidal suspension of oil in water without requiring increased subdivision at the ejecting nozzle and therefore it is unecessary for the purpose of securing good cleaning results to provide ejecting nozzles of special construction. In certain instances however, if desired, it is entirely in keeping with this disclosure to use a nozzle which may produce mechanical agitation or to utilize compressed air at the nozzle to agitate and further mix the suspension just prior to ejectment.

The action here described is obtainable with any of a large number of different types of oils. The only restriction is that the oil must be a

freely flowing oil and it is preferred although not absolutely necessary, that the oil be a mineral oil having a paraffin base.

This invention possesses special advantages in that the expense and trouble of providing and using compressed air may be dispensed with.

These and other objects not specifically enumerated are contemplated for the present invention as will readily appear to one skilled in the art as the following description proceeds.

The present invention utilizes the discovery that an improved cleaning fluid may be provided and a highly permanent or colloidal suspension of oil in water may be obtained with the elimination of the blast of air formerly employed, if a greater degree of subdivision of the oil is effected during the oil feeding and introducing operation as when the oil is fed into the water line while hot.

This invention is therefore productive of the highly improved results flowing from a greater subdivision of the oil at the point of entering the water stream. This invention contemplates the use of hot oil as distinguished from oil at ordinary temperatures as formerly employed.

In the present disclosure, by way of example the heating is accomplished by causing the hot water supply pipe to pass through the oil tank so that as here disclosed, the oil feed to the water line will be at a temperature equal to substantially that of the water. Whereas it would be expected that the heating of the oil would have the utility of lowering the viscosity of the oil, and would serve in winter, to establish an operation substantially like that of summer, it has been found that an entirely new and unexpected feeding action results. Instead of the oil entering the water line in minute globules such as occasioned when fed from old types of apparatus, it enters as what appears to be a fan-shaped mist of infinitesimal individual and separated particles, of size almost imperceptible to the naked eye, except collectively.

It is estimated that the oil particles are from one-fiftieth to one hundredth the size of the particles formerly obtained. It is believed that this action is attributable to the fact that the oil at the higher temperature has approached the vapor phase and in this condition of existence is subject to an entirely different behavior upon entering the water stream.

With this in mind, it will be appreciated that the desired colloidal suspension may be readily obtained with greater ease and less expense and that the invention eliminates the necessity for using air at the nozzle and therefore is adapted for use in connection with an ordinary nozzle or mechanical agitating means at the location of the nozzle.

The nature of the invention may be more readily understood by referring to the accompanying drawing in which—

Figure 1 is an elevational view of an apparatus constructed in accordance with this invention;

Figure 2 is an enlarged view taken through the sight gauge of the apparatus showing a characteristic feeding action with unheated oil in accordance with practice prior to this invention and

Figure 3 is an enlarged view similar to Figure 2 showing the feeding action resulting from this invention for exactly the same apparatus and adjustment of the valve except for the heating of the oil.

By referring to the drawing it will be noted that the apparatus disclosed comprises an oil tank 10 adapted to contain oil which may be introduced through a funnel controlled by the valve 12. In the filling operation, the tank may be vented at the top by means of a valve 13, which controls a communicating passage between the upper portion of the tank and the external atmosphere. The tank is preferably provided with sight gauges 14, arranged to indicate the oil level throughout substantially the entire height of the tank. It is of course obvious that a single sight gauge may be provided to replace the two sight gauges arranged as here shown.

In connection with the tank, a supply of hot water under pressure is provided from any suitable source but which is directed through a pipe 115 which enters the lower portion of tank 10 as shown in Figure 1. Just before entering the tank, it is preferable to provide a valve 100 for controlling the supply of water. Pipe 115 passes to the central portion of the tank and is then directed upwardly to a point near the top thereof and thence outwardly and downwardly to connect on the outside of the tank with pipe 15.

A portion of the water supplied in the line 15 is directed downwardly through a pipe 16, the passage in which may be controlled by the valve 17, and then through pipes 18 and 19 past the ball check valve 20, and into the base of the tank. The water thus introduced may be regulated as to quantity and upon entering the tank, acts to displace the oil upwardly in a manner to force the oil into the upwardly extending chamber 21, at the top of the tank and downwardly through the centrally disposed oil feed pipe 22.

The oil feed pipe 22 penetrates the wall of the tank at a suitable location such as at 23, and then extends upwardly through the feed control valve 24, sight gauge 25 and pipe 26, and connects with the continuation of the main water line designated on Figure 1 as 27, 28 and 29. It will be seen from Figure 3 that the oil enters the sight gauge by passage through a nozzle 50 which is provided with a relatively small orifice 51. At the juncture of pipe portions 27 and 28, a one-way spring-pressed valve 30, is provided, the spring 31 of which is adjustable by means of cap 32, to vary at will, the seating pressure of the valve. A pressure gauge 33 is preferably provided in communication with pipe line portion 29 by means of a connecting pipe 34. The lower end of pipe line portion 29 extends to and is connected with the pipe line 35 which leads to a location in convenient proximity to the place where the cleaning operations are performed. Inasmuch as one oil tank and its accompanying oil feeding mechanism is, under ordinary practice, sufficient to supply cleaning fluid to a plurality of nozzles it will be usual to extend pipe line 35 sufficiently to enable the connection of a number of take-off pipes or hoses 36; corresponding to the number of nozzles to be used. As the nozzles will be duplicates of each other in construction and in the manner of connecting with pipe line 35, only one is here shown, which will be understood to be representative of any desired number or types which can be conveniently supplied from one tank and oil feeding mechanism.

This invention constitutes an improvement over prior apparatus in that it is productive of a positive oil feed into the water line subject to the minute control, and a greater sub-division of the oil in the water resulting in a more thorough mixture of oil and water in the water line.

Referring now particularly to Figures 2 and 3,

the marked difference in the feeding action will be noted, and from Figure 3, it will be observed that the heating of the oil is productive of a fan-like stream of minute particles which are many times smaller than the globules produced with unheated oil.

In actual performance, the difference in the particle size is even greater than here represented as the size of the particles in Figure 3 have been exaggerated for the purpose of illustration.

In operation, it is preferable to employ water under pressure at a temperature of approximately between 130 and 160 degrees F. However, the same advantageous feeding action results with a water and oil temperature as low as 110 to 120 degrees F.

It is to be understood that any suitable heating means may be employed for heating the oil prior to its introduction into the water line. This may be accomplished by means associated with the oil tank either in or around said tank or associated with the feed line from said tank so that the oil is brought to the proper elevated temperature. The advantage which results from utilizing the heated oil is that the apparatus is converted into what may be considered as a colloidal machine which produces colloidal suspensions of the type herein referred to, adapted for cleaning purposes without the utilization of compressed air or any particular action at the location of the spraying nozzle.

I claim:

1. An apparatus of the character described comprising in combination, a water pipe adapted to be connected at one end to a source of hot water under pressure and at its other end to a spray nozzle, a tank of oil, pipe connections for feeding water from said water pipe to said oil tank and oil from said oil tank to said water pipe and an adjustable check valve in said water pipe located between the points of connection with said water pipe of said water feed and oil feed pipes, said water pipe passing through said tank of oil whereby to heat said oil to substantially the temperature of said water.

2. An apparatus of the character described, comprising in combination, a water pipe connected at one end, to a source of hot water, maintained under substantially uniform pressure and at its other end, to a spray nozzle, a tank of oil, having a portion of said water pipe passing therethrough in heat transferring association with said oil, a water feed pipe connecting said water pipe and tank of oil and an oil feed pipe connecting said tank of oil and said water pipe and means in said water pipe for decreasing the water pressure at the connection where the oil enters said water pipe.

3. An apparatus for producing a collodial suspension consisting of the following elements, in combination; a water pipe adapted for connection at one end to a source of hot water under pressure and at its other end to a spray nozzle, a tank containing oil having means associated therewith for heating said oil, a pipe connecting the lower portion of said oil tank, and said water pipe, and a second pipe connecting the top portion of said oil tank and said water pipe and a check valve in said water pipe located between the connections of said two pipes and constructed to permit the flow of liquid in said water pipe in the direction of from said first connecting pipe to said second connecting pipe while preventing flow in the reverse direction.

4. An apparatus for producing a colloidal suspension consisting of the following elements, in combination; a water pipe adapted for connection at one end to a source of hot water under pressure and at its other end to a spray nozzle, a tank containing oil having means associated therewith for heating said oil, a water feed pipe connecting the lower portion of said oil tank to said water pipe and an oil feed pipe connecting the top portion of said tank and said water pipe and means in said water pipe located between the connections of said two feed pipes for decreasing the water pressure in said water line whereby the pressure at the point of connection of said oil pipe and water feed pipe is less than the pressure in said tank.

5. An apparatus for producing a colloidal suspension consisting of the following elements, in combination; a water pipe adapted for connection at one end to a source of hot water under pressure and at its other end to a spray nozzle, a tank containing oil having means associated therewith for heating said oil, a water feed pipe connecting the lower portion of said oil tank to said water pipe and an oil fed pipe connecting the top portion of said tank and said water pipe and means in said water pipe located between the connections of said two fed pipes for decreasing the water pressure in said water line whereby the pressure at the point of connection of said oil pipe and water feed pipe is less than the pressure in said tank.

6. An apparatus for producing a colloidal suspension consisting of the following elements, in combination; a water pipe adapted for connection at one end to a source of hot water under pressure and at its other end to a spray nozzle, a tank containing oil having means associated therewith for heating said oil, a water feed pipe connecting the lower portion of said oil tank to said water pipe and an oil feed pipe connecting the top portion of said tank and said water pipe and means in said water pipe located between the connections of said two feed pipes for decreasing the water pressure in said water line whereby the pressure at the point of connection of said oil pipe and water feed pipe is less than the pressure in said tank, and a relatively small oil feeding orifice at the location of said last named connection.

7. An apparatus of the character described for producing a colloidal suspension consisting of the following elements, in combination; a water pipe connected at one end to a source of hot water under pressure and at its other end to a spray nozzle, a tank of oil having means associated therewith, for heating said oil, a water feed pipe connecting said water pipe and tank of oil and an oil feed pipe connecting said tank of oil and said water pipe and means in said water pipe for decreasing the water pressure at the connection where the oil enters said water pipe.

8. An apparatus of the character described for producing a colloidal suspension consisting of the following elements, in combination; a water pipe connected at one end to a source of hot water under pressure, and at its other end to a spray nozzle, a tank of oil having means associated therewith for heating said oil, a water feed pipe connecting said water pipe and tank of oil and an oil feed pipe connecting said tank of oil and said water pipe, means for decreasing the water pressure at the connection where the oil enters said water pipe and means at said last named connection constituting a relatively minute oil feeding orifice.

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