

UNITED STATES PATENT OFFICE.

DANIEL HOWARD HAYWOOD, OF NEW YORK, N. Y., ASSIGNOR TO THE
POWTER COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW
JERSEY.

APPARATUS FOR EXTRACTING OIL FROM WATER.

No. 804,400.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, DANIEL HOWARD HAYWOOD, a citizen of the United States of America, residing at New York city, county and State of New York, have invented certain new and useful Improvements in Apparatus for Extracting Oil and Grease from Water, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

My invention relates to apparatus for extracting oil and grease from water, and particularly to apparatus for treating boiler feed-water received from the condenser of engines.

Condensed steam from a condensing-engine carries with it a comparatively large quantity of lubricating-oil, which of course is very bad for the boilers. By the use of my invention such oil and greasy matter may be readily, quickly, and inexpensively extracted from the water, and the water may then be fed into the boiler free from such material.

My invention comprises a receiver arranged to contain an oil and grease solvent having a specific gravity greater than water and having a supply-passage for the water containing oil and grease opening into the lower end thereof and a clear-water discharge at the upper end of the receiver.

The grease solvent will not only have a specific gravity greater than water, but preferably also its boiling-point lower than the boiling-point of water; and my invention further consists in means for separating the grease and oil from the solvent by distillation and in returning the purified solvent to the receiver, so that it may be again employed for extracting further oil and grease, so that practically a continuous process may be carried on.

I will now proceed to describe my invention and will then point out the novel features in claims.

The drawing illustrates somewhat diagrammatically an apparatus embodying my invention, certain portions of the apparatus being shown in central vertical section and other parts in side elevation.

In carrying out my invention I provide a suitable receiver 1, adapted to contain therein an oil and grease solvent 2 having a greater specific gravity than water. The receiver is provided with an inlet or supply passage 3 for

water containing oil and grease and from which it is desired to extract the oil and grease, which opens into substantially the lowermost end of the receiver, and said receiver is provided with a clear-water discharge at the upper end thereof. The grease solvent having a specific gravity greater than the water will remain at the bottom of the receiver 1, while the water will float upon the top thereof. I have shown a gage-glass 5 in order that the level of the grease solvent may be noted from the exterior of the apparatus. The supply-passage 3 being in open communication with the lower portion of the receiver 1 will also contain some grease solvent at its lower end.

Water containing grease and oil will be received by the supply-passage 3, which may for this purpose connect directly with the condenser 5 of a condensing steam-engine. A valve is shown at 6 for the purpose of closing the supply, if desired. As water containing oil and grease is received within the supply-passage 3 and the column in the said supply-passage rises above the level of the liquid in the receiver 1 the upper level of the grease solvent in the supply-passage will be gradually lowered until finally a certain amount of water containing grease and oil will pass into the receiver 1 and will, because of the difference in specific gravity between it and the grease solvent therein, instantly rise to the top of the grease solvent, while a certain quantity of grease solvent will then take its place in the perpendicular portion of the supply-passage 3. I have arranged an inverted cone 7 in the path of the flow of the liquid from the passage 3 through the solvent 2 in the receiver 1, which cone will act to break up and distribute the water and grease through the solvent, so that the oil and grease may be taken up by the solvent during its attempted passage therethrough and by becoming dissolved therein be held back from rising to the surface with the water, while clear water will be permitted to rise to the surface and will finally be discharged through the discharge 4.

The grease solvent that I preferably employ is carbon tetrachlorid, (CCl_4) Carbon tetrachlorid has a specific gravity of 1.6, and its boiling-point is 169° Fahrenheit. Further, carbon tetrachlorid has quite a remarkable affinity for oil and grease and will pick it up

and dissolve it very quickly, it being remembered, of course, that the oil and grease is merely carried in suspension in the water.

After the apparatus has been employed for some length of time and the solvent contains a quantity of oil and grease such solvent may be drawn off from the receiver 1 through a discharge 8 and may conveniently be received within a closed vessel 9. The closed vessel 9 is shown as provided with a jacket 10, within which steam may be introduced through a pipe 11. The vessel 9 connects, through a pipe 12, with the upper end of the receiver 1 and preferably with a condensing-coil 13, arranged within the upper portion of said condenser. The perpendicular portion of the pipe 12 as it rises from the vessel 9 is jacketed at 14.

When it is desired to extract the oil and grease from the solvent, a portion of the same may be passed into the vessel 9, the temperature of which may then be raised by the admission of steam through the pipe 11 to a point sufficient to vaporize the solvent therein, and the vapors will then be carried through the pipe 12 back into the receiver 2. The condenser 13 will condense these fumes and will return the solvent in liquid form into the lower end of the vessel 2. By the proper manipulation of the various valves a small quantity of the solvent may be constantly received within the vessel 9 and constantly vaporized and returned thereto, so that the apparatus may be operated continuously. A funnel and valve are shown at 17, whereby additional solvent may from time to time be added to replace any which may be lost or carried away accidentally or unintentionally.

The vessel 9 is provided with a discharge 15 at its lower end, through which oil left back in the receiver upon the distillation of the solvent therefrom may be discharged, and I have provided a thermometer 16 for indicating the temperature within the receiver, whereby the rise of temperature therein showing that practically all the solvent has been vaporized and that only grease and oil remain may be readily noted and such oil and grease drawn off.

The grease solvent having a boiling-point lower than the boiling-point of water will of course have a boiling-point far lower than that of the grease and oil, and hence it is a simple and easy matter, first, to produce the proper separation of the grease and oil from the solvent by distillation; second, to vaporize the solvent in a jacketed vessel by the use of steam at low pressure, and, third, to condense the solvent vapors in the fluid contained in the receiver.

It will of course be understood that I may employ other solvents besides carbon tetrachlorid in carrying out my invention, so long as the solvent has a specific gravity greater than water, and it will also be understood that while I have described my invention as being

particularly adapted for removing oil and grease from fluid flowing from a condensing steam-engine condenser I by no means desire to be limited to such application, as obviously my invention is adapted to extract oil and grease from water coming from other sources. It will also be understood that the apparatus herein described and illustrated is but one embodiment of my invention and that the same is capable of many modifications within the spirit and scope of my invention.

What I claim is—

1. In an apparatus for extracting oil and grease from water, the combination with a receiver containing an oil and grease solvent having a specific gravity greater than water, of a supply-passage for water containing oil and grease, opening into the lower end of said receiver, and a clear-water discharge at the upper end of said receiver.

2. In an apparatus for extracting oil and grease from water, the combination with a receiver containing an oil and grease solvent having a specific gravity greater than water, of a supply-passage for water containing oil and grease, opening into the lower end of said receiver, a clear-water discharge at the upper end of said receiver, and a discharge for the solvent at the lower end of said receiver, below the level of the clear-water discharge.

3. In an apparatus for extracting oil and grease from water, the combination with a receiver containing an oil and grease solvent having a specific gravity greater than water, of a supply-passage for water containing oil and grease, opening into the lower end of said receiver, a clear-water discharge at the upper end of said receiver, a discharge for the solvent at the lower end of said receiver, and a vessel connected with said discharge for receiving the solvent.

4. In an apparatus for extracting oil and grease from water, the combination with a receiver containing an oil and grease solvent having a specific gravity greater than water, of a supply-passage for water containing oil and grease, opening into the lower end of said receiver, a clear-water discharge at the upper end of said receiver, a discharge for the solvent at the lower end of said receiver, a vessel connected with said discharge for receiving the solvent, and means for heating the contents in the said receiver.

5. In an apparatus for extracting oil and grease from water, the combination with a receiver containing an oil and grease solvent having a specific gravity greater than water, of a supply-passage for water containing oil and grease, opening into the lower end of said receiver, a clear-water discharge at the upper end of said receiver, a discharge for the solvent at the lower end of said receiver, and a jacketed vessel connected with said discharge for receiving the solvent.

6. In an apparatus for extracting oil and

grease from water, the combination with a receiver containing an oil and grease solvent having a specific gravity greater than water, and a boiling-point lower than the boiling-point of water, of a supply-passage for water containing oil and grease, opening into the lower end of said receiver, and a clear-water discharge at the upper end of said receiver.

7. In an apparatus for extracting oil and grease from water, the combination with a receiver containing an oil and grease solvent having a specific gravity greater than water, and a boiling-point lower than the boiling-point of water, of a supply-passage for water containing oil and grease, opening into the lower end of said receiver, a clear-water discharge at the upper end of said receiver, and a discharge for the solvent at the lower end of said receiver.

8. In an apparatus for extracting oil and grease from water, the combination with a receiver containing an oil and grease solvent having a specific gravity greater than water, and a boiling-point lower than the boiling-point of water, of a supply-passage for water containing oil and grease, opening into the lower end of said receiver, a discharge for the solvent at the lower end of said receiver, and a vessel connected with said discharge for receiving the solvent.

9. In an apparatus for extracting oil and grease from water, the combination with a receiver containing an oil and grease solvent having a specific gravity greater than water, and a boiling-point lower than the boiling-point of water, of a supply-passage for water containing oil and grease, opening into the lower end of said receiver, a clear-water discharge at the upper end of said receiver, a discharge for the solvent at the lower end of said receiver, a vessel connected with said discharge for receiving the solvent, and means for heating the contents of the said vessel.

10. In an apparatus for extracting oil and grease from water, the combination with a receiver containing an oil and grease solvent having a specific gravity greater than water, and a boiling-point lower than the boiling-point of water, of a supply-passage for water containing oil and grease, opening into the lower end of said receiver, a clear-water discharge at the upper end of said receiver, a discharge for the solvent at the lower end of said receiver, and a jacketed vessel connected with said discharge for receiving the solvent.

11. In an apparatus for extracting oil and grease from water, the combination with a receiver containing an oil and grease solvent having a specific gravity greater than water, and a boiling-point lower than water, of a supply-passage for water containing oil and grease opening into the lower end of said receiver, and means for applying heat to the solvent to vaporize same and for condensing the solvent vapors, and returning same to the vessel.

12. In an apparatus for extracting oil and grease from water, the combination with a receiver containing an oil and grease solvent having a specific gravity greater than water, and a boiling-point lower than water, of a passage for water containing oil and grease opening into the lower end of said receiver, a vessel for receiving the solvent, means for applying heat to the solvent therein to vaporize it, and a condenser for the vaporized solvent.

13. In an apparatus for extracting oil and grease from water, the combination with a receiver containing an oil and grease solvent having a specific gravity greater than water, and a boiling-point lower than water, of a supply-passage for water containing oil and grease opening into the lower end of said receiver, a vessel for receiving the solvent, means for applying heat to the solvent therein to vaporize it, a condenser arranged within the upper part of the said receiver, and connections carrying the solvent vapors to the condenser, and discharging the condensed vapors into the receiver.

14. In an apparatus for extracting oil and grease from water, the combination with a receiver containing an oil and grease solvent having a specific gravity greater than water, of a supply-passage for water containing oil and grease, opening into the lower end of said receiver, a clear-water discharge at the upper end of said receiver, a discharge for the solvent at the lower end of said receiver, a vessel for receiving the solvent so discharged means for heating the contents of the vessel to vaporize the solvent therein, and means for drawing off the oil and grease therefrom.

15. In an apparatus for extracting oil and grease from water, the combination with a receiver containing an oil and grease solvent having a specific gravity greater than water, and a boiling-point lower than the boiling-point of water, of a supply-passage for water containing oil and grease, opening into the lower end of said receiver, a clear-water discharge at the upper end of said receiver, a discharge for the solvent at the lower end of said receiver, a vessel for receiving the solvent so discharged, means for heating the contents of the vessel to vaporize the solvent therein, and means for drawing off the oil and grease therefrom.

16. In an apparatus for extracting oil and grease from water, the combination with a receiver containing an oil and grease solvent having a specific gravity greater than water, of a supply-passage for water containing oil and grease, opening into the lower end of the said receiver, a distributor located in the said receiver in the path of the liquid-supply through said supply-passage, and a clear-water discharge at the upper end of said receiver.

17. In an apparatus for extracting oil and grease from water, the combination with a receiver containing an oil and grease solvent hav-

ing a specific gravity greater than water, and a boiling-point lower than the boiling-point of water, of a supply-passage for water containing oil and grease, opening into the lower end of the said receiver, a distributor located in the said receiver in the path of the liquid-supply through said supply-passage, and a clear-water discharge at the upper end of said receiver.

18. In an apparatus for extracting oil and grease from water, the combination with a receiver containing an oil and grease solvent having a specific gravity greater than water of a supply-passage for water containing oil and grease, opening into the lower end of said receiver, said supply-passage arranged to contain a column of liquid higher than the column of liquid contained in the receiver, and a clear-water discharge at the upper end of said receiver.

19. In an apparatus for extracting oil and grease from water, the combination with a receiver containing an oil and grease solvent having a specific gravity greater than water, and a boiling-point lower than the boiling-point of water, of a supply-passage for water containing oil and grease, opening into the lower end of said receiver, said supply-passage arranged to contain a column of liquid higher than the column of liquid contained in the receiver,

and a clear-water discharge at the upper end of said receiver.

20. In an apparatus for extracting oil and grease from water, the combination with a receiver containing an oil and grease solvent having a specific gravity greater than water, of a supply-passage, opening into the lower end of said receiver, a vessel for water containing oil and grease located at a point above the level of the fluid within the said receiver connecting with said supply-passage, and a clear-water discharge at the upper end of said receiver.

21. In an apparatus for extracting oil and grease from water, the combination with a receiver containing an oil and grease solvent having a specific gravity greater than water, and a boiling-point lower than the boiling-point of water, of a supply-passage opening into the lower end of said receiver, a vessel for water containing oil and grease located at a point above the level of the fluid within the said receiver connecting with said supply-passage, and a clear-water discharge at the upper end of said receiver.

DANIEL HOWARD HAYWOOD.

Witnesses:

MINERVA PAPE,
C. F. CARRINGTON.