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H. J. YOUNG

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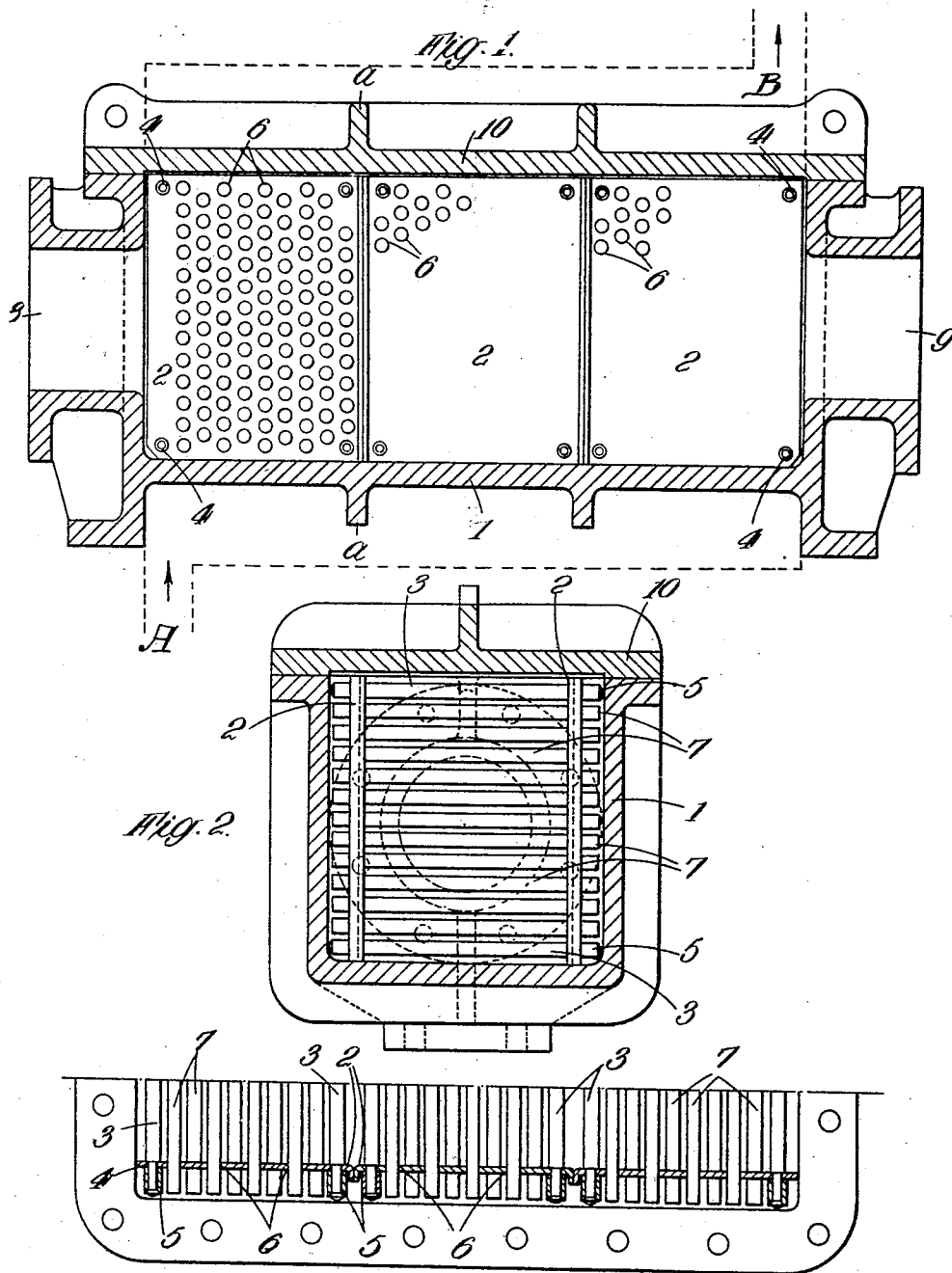


Fig. 3

Inventor
Harace J. Young
By Leckman, Payant & Derby
attorneys

UNITED STATES PATENT OFFICE

HORACE JOHN YOUNG, OF WESTMINSTER, ENGLAND, ASSIGNOR OF ONE-HALF TO SWAN, HUNTER & WIGHAM RICHARDSON LIMITED, OF NEWCASTLE-UPON-TYNE, ENGLAND, AN ENGLISH COMPANY

REGENERATION OR PURIFICATION OF LUBRICATING OILS

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This invention relates to the regeneration or purification of lubricating oils as used for example in connection with the lubrication of engines or of other machinery in which the oil is liable to be contaminated or become altered in such a manner as to render it corrosive or otherwise detrimental to the materials with which it comes into contact.

Oils drawn from the lubrication systems of motor engines—either marine, land or aviation—are found sometimes to be corrosive to steel or white bearing metal or both. This corrosive property appears to be caused in a number of cases by active sulphates such as are found to be present in such oils after but not before use. Such sulphates may be chemically detected or determined in aqueous solutions obtained by digestion of the oil in caustic soda or potash, although however there appeared to exist no test for their detection prior to my having established, as a result of investigations, the fact that lubricating oils, which, tested by the usual recognized chemical methods for acidity, appeared to present no abnormalities or anything to suggest that they might be corrosive, nevertheless possessed in fact corrosive properties the effects of which were found in practice to be of a very serious character.

Contamination of lubricating oils whereby they acquire corrosive properties may be due to solid, liquid or gaseous matters from the combustion chambers or zones of internal combustion engines mixing with the lubricating oil, or may be due to salt water or chemical effluents or other injurious matters which may be of an acid or alkaline nature gaining access to the said oils. In other cases the corrosive properties may be due to deterioration of the lubricating oil itself or to the original nature of the lubricating oil as supplied. It is very desirable and important that any corrosive condition of the lubricating oil should be corrected or avoided and the objects of the present invention are to accomplish these results.

For this purpose according to the present invention the lubricating oil is treated by bringing it into intimate contact with a non-ferrous metal or metals or an alloy of non-

ferrous metals reactive with the corrosive ingredients present in the oil but without producing reaction products having the same deleterious effects as those of the aforesaid corrosive ingredients. Examples of substances suitable for use for such purification of lubricating oils are metallic zinc, aluminium, magnesium, or alloys of two or all of the aforesaid metals, or alloys of calcium or sodium or of calcium and sodium with one or more of the aforesaid metals.

The treatment of the lubricating oil with the purifying reagent can be effected in the oil supply or circulating system or in some outside tank or plant. The purifying reagent is used in the form of solid, hollow or perforated plates, bars, or wires, or in the form of granules or small particles, or in any other convenient form to constitute a regenerator or purifier that will provide for a large surface of contact with the impure oil to be treated; for example the regenerator or purifier, which may be in the form of a chamber or tank or of one or more straight or suitably bent pipes, can be constructed of or lined with or otherwise provided with zinc or other non-ferrous metal or alloy hereinbefore stated with which the impure lubricating oil to be treated is brought into contact.

As an example of the treatment of a lubricating oil according to the present invention there may be instanced that of a mineral oil drawn from a marine engine. Before use in the engine this oil was a recognized mineral lubricant having a flash point of 297° F. a specific gravity of 0.8893, and a Redwood viscosity of 1047 seconds at 70° F., whilst it contained no sulphates according to my special test therefor and was not corrosive either to a steel or white bearing metal. After having been used in the engine the lubricating oil in question drawn therefrom, although showing no content of mineral acid when subjected to the usual recognized tests for such heretofore employed, nevertheless was found to be highly corrosive to both steel and white bearing metal, and further was shown to contain an actual amount of 0.149 per cent sulphates when it was subjected to the special chemical test previously mentioned for the

determination of sulphates devised by me. This corrosive oil was then warmed for about seven hours in intimate contact with a large area of zinc, after which treatment its corrosive properties were found to have been entirely removed. I have found that as little as 0.0188 per cent SO_4 added as concentrated sulphuric acid to an uncorrosive oil caused that oil to become corrosive both to steel and white bearing metal, even though it could not be detected by the usual recognized mineral acid test heretofore in use. This oil however was again rendered innocuous both to steel and white bearing metal by bringing it into contact with zinc. It has been found that although the purifying action of the non-ferrous metal or alloy takes effect when the oil is cold it is expedited when the oil is warm.

In one method of carrying the invention into effect, the lubricating oil under treatment is continuously circulated through a purifying chamber or chambers arranged and constructed so that it or they can be easily inspected, cleaned and overhauled without the stoppage of the circulation of the lubricating oil in the oil circulating system of the engine or other machinery. One construction of purifying chamber or tank adapted for carrying out the process according to the present invention is illustrated in the accompanying drawings in which:—

Figure 1 is a vertical section.

Figure 2 is a transverse section of the line *a, a* of Figure 1, and

Figure 3 is a fragmentary plan view partly in section.

The purifying chamber or tank constituting in the particular example shown the regenerator or purifier comprises a cast-iron body portion 1 in the interior of which are arranged steel supporting plates 2 retained in position by steel distance pieces 3 the reduced ends of which pass through holes 4 in the plates and are fitted with ferrules 5. Through holes 6 in the steel plates there are inserted zinc rods 7 which occupy substantially the whole interior space of the tank, and over which rods the oil to be treated flows in its passage therethrough, entering by the inlet 8 and leaving by the outlet 9. The tank is provided with an easily removable cast-iron cover 10, so that the parts of the whole apparatus are easily accessible for cleaning or renewal purposes when desired. For heating the purifying chamber or tank, there may be provided a heating jacket surrounding the tank, as diagrammatically shown in dotted lines in Figure 1, such tank having an inlet A and an outlet B for the heating medium. A suitable location for the tank is to insert it in the circuit between the settling tank for lubricating oil discharged from the system and the sumps or reservoir from which the lubricating oil enters the system for its circulation

to the desired parts of the engine or other machinery.

Although the invention is particularly suitable for the treatment of the lubricating oil of internal combustion engines it is also applicable to that of any type of engine or machinery, for marine, land or aviation purposes.

What I claim and desire to secure by Letters Patent of the United States is:—

1. A process for freeing used lubricating oil from corrosive impurities which consists in bringing the oil to be treated into intimate contact with a non-ferrous metallic substance reactive with the corrosive ingredients of the oil without producing reaction products having the same deleterious effects as those of the aforesaid corrosive ingredients.

2. A process as in claim 1 in which the reactive substance employed comprises a non-ferrous metal.

3. A process as in claim 1 in which the reactive substance comprises metallic zinc.

4. A process as in claim 1 in which the reactive substance has a large surface of contact with the oil to be treated.

5. A process as in claim 1 in which the reactive substance comprises metallic zinc having a large surface of contact with the oil.

6. A process as in claim 1 in which the oil is warmed for several hours while in intimate contact with the reactive substance.

7. A process as in claim 1 in which the oil is warmed for several hours while in intimate contact with metallic zinc.

8. A process as in claim 1 in which the oil is warmed for several hours while in intimate contact with a large area of metallic zinc.

HORACE JOHN YOUNG.