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FUEL.

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To all whom it may concern:

Be it known that I, JEAN F. P. DE LA RIBOISIERE, a citizen of France, residing at Washington, D. C., have invented certain new and useful Improvements in Fuels, of which the following is a specification.

My invention relates in general to the preparation and combustion of fuels. More specifically, my invention is directed to the economical and efficient utilization of heavy oils adapted for use under burners or in internal combustion engines, particularly those of the Diesel type.

I have found that when oils of this character are combusted in the presence of a catalytic agent, the heat-content obtainable therefrom is greatly increased. In its preferred form, I propose to add to oils, a metallic or metalloid catalytic agent and I have found that the best results are obtained by adding to the oils, a material containing a hydrocarbon radical and a metal or metalloid, for example, one containing the phenyl radical and a metalloid such as selenium. Compounds of this nature may be considered materials which generate a hydrocarbon radical and a metal.

My invention may be applied to various types of oils including fuel oil for burners, Diesel oil, gas oils, tar oils, heavy shale oil, oils obtained from lignites, asphaltic materials and peat. Referring to petroleum hydrocarbons, the term, "heavy oil" is usually applied to hydrocarbons from which the gasoline or kerosene contents have been removed. Therefore, I include under the term, "heavy oil", those petroleum distillates having densities above the upper limit of the range of kerosene densities. Usually the maximum limit for kerosene density is .82 absolute density or 40° Bé. While these figures may vary somewhat, they are indicative of the upper limit. The term, "heavy oil" also includes non-petroleum oils and its significance is clear in view of the explanation given in connection with petroleum distillates.

It appears from my experiments that when the catalytic agent has certain properties, the most satisfactory results are obtained. For example, the catalytic agent functions better when it is soluble in the oil, further it should have a low boiling point and still be relatively stable, that is it does not decompose before boiling. The molecular weight of the metal or metalloid which may be a constituent of the catalytic agent does not appear to have any substantial influence upon the development of the increased B. t. u.'s obtainable. Compounds containing a metal or metalloid of low molecular weight appear to work equally as well as those containing a metal or metalloid of high molecular weight, provided the other properties before referred to are substantially identical.

In order that my invention may be clearly understood the following examples are given:

1. To one thousand pounds of Diesel oil or fuel add for example, one to two pounds of dibenzyl diselenite. This particular compound of selenium is used because it is stable under the condition in which it is used. Other selenium compounds, such as phenyl, diphenyl, tri-phenyl and tetra compounds are not particularly suitable since they decompose at low temperatures. They may be used if proper precautions are taken. By using the dibenzyl diselenite the proportion of carbon mono-oxid resulting from the combustion is decreased about two thirds and the fuel shows an increased efficiency ranging from 15 to 25%. In other words, when using the catalytic agent specified, the amount of power obtained from the fuel is increased in amount ranging between 15 and 25%, or an amount of power comparable to that obtained when the catalytic agent is not used results from using 15 to 25% less fuel; that is to say, when the catalytic agent is used, less fuel is required to produce a given amount of power, then when it is not used.

2. To one thousand pounds of heavy fuel oil, such as Diesel oil, one to two pounds of diphenyl sulfide, $(C_6H_5)_2S$ is added. This increases the efficiency of the fuel as heretofore specified.

3. To one thousand pounds of heavy fuel oil, such as Diesel oil, add one or two pounds of benzyl sulfide, $(C_6H_5CH_2)_2S$.

Other materials which may be used as the catalytic agent are thio phenol, tri phenyl of thallium, diphenyl telluride, diphenyl selenide and diphenyl diselenide.

The halogen derivatives of the naphthalenes have been found to give satisfactory results. For example, the mono-di- and tri substituted chlor-naphthalenes having the

formula, $C_{10}H_7Cl$, $C_{10}H_6Cl_2$, $C_{10}H_5Cl_3$ may be used. The brom-naphthalenes may also be used.

Tellurium, selenium and other elements sometimes act as metals and at other times as metalloids. Conventionally, the elements have been divided into metals and metalloids; however these classes gradually grade into each other. In view of the above, in the claims, the term "metal" is used to include true metals and metalloids.

Dibenzyl diselenite, benzyl sulfide, thio phenol and diphenyl disulfide are all examples of a material containing a hydrocarbon radical derived from a phenolic substance and, as stated, in the preferred form of my product and process, substances of this type are used. But it is to be understood that, in general, I wish to include by the expression, "a material containing a hydrocarbon radical derived from a phenolic substance" any body having a metal or metalloid present and exhibiting the characteristics of the phenolic compounds.

Sulphur, selenium, tellurium are elements which appear in group 6 of Mendeleef's Periodic Classification of the Elements, appearing on page 808 of "Modern Inorganic Chemistry" by J. W. Mellor, 1916, Longmans, Green & Co.

I claim:

1. The process of increasing the heat-units obtainable from a heavy hydrocarbon fuel comprising combusting the fuel in the presence of a small proportion of a compound of a hydrocarbon radical and a metal.

2. The process of increasing the heat-units obtainable from a heavy hydrocarbon fuel comprising combusting the fuel in the presence of a small proportion of a material generating a hydrocarbon radical and a metal.

3. The process of increasing the heat-units obtainable from a heavy hydrocarbon fuel comprising combusting the fuel in the presence of a small proportion of a material generating a phenyl radical and a metal.

4. The process of increasing the heat-units obtainable from a heavy hydrocarbon fuel comprising combusting the fuel in the presence of a small proportion of dibenzyl diselenide.

5. A liquid fuel comprising a heavy hydrocarbon and a small proportion of a compound of a hydrocarbon radical and a metal adapted to increase the heat-content obtainable from the fuel on combustion.

6. A liquid fuel comprising a heavy oil and a small proportion of material generating a hydrocarbon radical and a metal adapted to increase the heat-content obtainable from the fuel on combustion.

7. A liquid fuel comprising a petroleum hydrocarbon and a small proportion of material generating a hydrocarbon radical and a metal adapted to increase the heat-content obtainable from the fuel on combustion.

8. A liquid fuel comprising a heavy petroleum hydrocarbon and a small proportion of material generating a hydrocarbon radical and a metal adapted to increase the heat-content obtainable from the fuel on combustion.

9. A liquid fuel comprising a heavy oil and a small proportion of a material generating a phenyl radical and a metal adapted to increase the heat-content obtainable from the fuel on combustion.

10. A liquid fuel comprising a heavy petroleum hydrocarbon and a small proportion of material generating a phenyl radical and a metal adapted to increase the heat-content obtainable from the fuel on combustion.

11. A liquid fuel consisting of a heavy hydrocarbon and a small proportion of dibenzyl diselenide adapted to increase the heat-content obtainable from the fuel on combustion.

12. A liquid fuel comprising a heavy hydrocarbon and a small proportion of a material generating an aromatic hydrocarbon radical and a metal adapted to increase the heat content obtainable from fuel on combustion.

13. A liquid fuel comprising a heavy petroleum hydrocarbon and a small proportion of a material generating a hydrocarbon radical derived from a phenolic substance and a metal adapted to increase the heat content obtainable from the fuel on combustion.

14. A liquid fuel comprising a heavy hydrocarbon and a small proportion of a material comprising a compound of an organic radical and a metal, said metal being one of the elements of group 6 of Mendeleef's Periodic Classification of the Elements.

15. A liquid fuel comprising a heavy hydrocarbon and a small proportion of a material comprising a compound of an aromatic organic radical and a metal, said metal being one of the elements of group 6 of Mendeleef's Periodic Classification of the Elements.

In testimony whereof I hereunto affix my signature.

JEAN F. P. DE LA RIBOISIERE.