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SOOT REMOVER

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This invention relates to improvements in soot removers, and in particular, soot removers adapted for use in oil burning furnaces.

It is common practice in coal burning furnaces to periodically apply soot removers to the coal bed for the purpose of removing soot deposits in the furnace, flue pipes, chimney, etc. When applied to the hot coal bed the soot remover is volatilized and when deposited upon the soot formations, lowers the ignition temperature of the latter thereby facilitating the burning thereof. The known soot removers are substantially all inorganic compounds insoluble in oil or organic solvents. For this reason, in oil burning heaters soot removal is generally effected by spraying an aqueous solution of the soot remover on the soot deposit, and with a hot fire in the heater burn off the soot. This method is not entirely satisfactory since it requires added labor and time. Furthermore, soot deposits are frequently inaccessible for spraying.

It is therefore an object of this invention to provide a soot remover soluble in furnace oil.

Another object of this invention is to provide a furnace oil capable of removing and/or preventing soot deposits.

A further object of this invention is to provide an improved method of removing soot deposits from oil burning heaters.

Other objects and advantages of this invention will become apparent from the following description thereof.

The formation of soot deposits in oil burning heaters presents a problem more difficult to combat than the deposition of soot in coal burning heaters. As aforementioned, soot in the latter type of heater may be readily removed by the application of the necessary quantity of soot remover to the burning coal bed. This method cannot be followed in the oil burning heater and, until the present invention, the use of soot removers in such units had been limited to spraying an aqueous solution of the soot remover on the soot deposits. This requires the shutting down of the unit for a period of time so that the solution of soot remover may be applied. This inefficient and time consuming procedure is, at best, not completely successful since those soot deposits which cannot be treated by spraying are not removed and continue to accumulate until operation of the heater is substantially interfered with.

We have discovered that the problem of soot removal and/or prevention in oil burning heaters may be effectively solved by adding to the fuel oil certain oil-soluble compounds which are volatilized by the heat of combustion and deposited upon the soot formation. These compounds per se, or the compounds resulting from the combustion thereof, when deposited upon the soot possess the property of lowering the ignition temperature of the soot and thereby facilitates the burning thereof. Satisfactory results may be obtained by adding to the fuel oil certain metallic derivatives, in particular the copper, calcium, lead and zinc derivatives of oil-soluble petroleum acids, particularly the oil-soluble sulfonic and naphthenic acids, the former being more popularly known in the oil refining art as mahogany acid. The metallic derivatives of petroleum acids resulting from the oxidation of petroleum products may be used.

We have further discovered that the addition of a mixture of a chlorinated organic compound such as ethylene chloride, para-di-chlorobenzene, chlorinated wax and the like and an oil-soluble metallic mahogany soap or naphthenate to a fuel oil is very effective in removing and/or preventing soot deposits. The desirable results obtained are attributed to the conversion of the metallic naphthenates or sulfonates to metallic chlorides upon the burning of the fuel oil and the deposition of the latter on the soot formations whereby the ignition temperature of the same is materially lowered.

The effectiveness of soot removers is indicated by a reduction in the ignition temperature of soot deposits, the ignition temperature being the lowest temperature at which the soot ignites and continues to burn. In the following table are tabulated the ignition temperature of soot deposited upon wire screens in the absence of a soot remover and the ignition temperature of soot resulting from the burning of a furnace oil containing some of the aforementioned addition compounds.

	Soot remover	Ignition temperature	Average reduction in ignition temperature
		°F.	°F.
1	None	1245–1285	
2	20% solution lead mahogany soap in furnace oil	700–750	540
3	20% solution calcium mahogany soap in furnace oil	+835	430
4	20% solution copper mahogany soap in furnace oil	800–850	440
		825–835	415
5	No. 4+chlorinated wax	700–725	554
6	No. 4+dichlorobenzene		

While the above results were obtained with a 20% solution of metallic organic derivatives in furnace oil, satisfactory results may be obtained using from 0.5 to 30% in furnace oil. When a fuel oil containing the aforementioned compounds is used continuously a smaller percent may be employed as a soot preventer, but when the fuel oil containing the aforementioned compounds is used only periodically to remove soot deposits, fuel oil containing a larger percentage of these compounds should be used. Although the lead derivatives give better results, this advantage is to some extent off-set by the toxic nature of lead compounds. Extra caution should therefore be taken when the lead derivatives are employed.

While we have specified above certain preferred compounds, this invention contemplates the use of other soil-soluble organo-metallic compounds, such as the oil soluble metallic derivatives alcohols, amines, ketones, and esters in furnace oils for the purpose herein specified.

While this invention has been described in connection with preferred examples thereof, the same is not limited thereto except as defined in the following claims which should be given the broadest interpretation permitted by the prior art.

We claim:

1. A liquid composition for removing soot from oil burning furnaces comprising a fuel oil and an oil-soluble metallic derivative of a petroleum acid having as the metal constituent an element selected from the group consisting of copper, calcium, lead and zinc.

2. A liquid composition for removing soot from oil burning furnaces comprising a fuel oil and a metallic mahogany soap selected from the group consisting of copper mahogany, calcium mahogany soap, lead mahogany soap and zinc mahogany soap.

3. A liquid composition for removing soot from oil burning furnaces comprising a fuel oil and a copper mahogany soap.

4. A liquid composition for removing soot from oil burning furnaces comprising a fuel oil and a zinc mahogany soap.

5. A liquid composition for removing soot from oil burning furnaces comprising a fuel oil and a metallic naphthenate selected from the group consisting of copper naphthenate, calcium naphthenate, lead naphthenate and zinc naphthenate.

6. A liquid composition for removing soot from oil burning furnaces comprising a fuel oil and a copper naphthenate.

7. A liquid composition for removing soot from oil burning furnaces comprising a fuel oil, an oil-soluble metallic derivative of a petroleum acid having as the metal constituent an element selected from the group consisting of copper, calcium, lead and zinc, and a halogenated organic compound.

8. A liquid composition for removing soot from oil burning furnaces comprising a fuel oil, an oil-soluble metallic derivative of a petroleum acid having as the metal constituent an element selected from the group consisting of copper, calcium, lead and zinc, and a chlorinated organic compound.

9. A liquid composition for removing soot from oil burning furnaces comprising a fuel oil, copper mahogany soap and chlorinated wax.

10. A liquid composition for removing soot from oil burning furnaces comprising a fuel oil, copper mahogany soap and dichlorobenzene.

11. The method of removing soot from an oil burning furnace which comprises burning in said furnace a furnace oil to which has been added 0.5 to 30% copper mahogany soap.

12. The method of removing soot from an oil burning furnace which comprises burning in said furnace a furnace oil to which has been added 0.5 to 30% of a mixture comprising copper mahogany soap and a chlorinated organic compound.

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