This invention relates to improved lubricants for gas compressors. More specifically, the invention relates to gas-compressor lubricants with improved lubricating properties which are colorless and which, when carried off with the gases handled into reaction chambers, do not participate in the chemical reactions nor produce discoloration of the reaction products.

The lubricating oils which are commonly employed to lubricate the sliding parts of gas compressors, such as piston rings or plunger packings, dissolve to a large extent in the gases handled, especially at high gas pressures, as for example at 1000 atmospheres or more. The lubricating oil is therefore carried out of the cylinder chamber of the compressor together with the gases, the lubricating film becoming thinner and friction between the moving parts becoming greater. As a result, the packings are damaged by the heat of friction evolved and must be replaced after short operating periods. Another disadvantage resulting from the solubility of the lubricating oil in the gases resides in the fact that the lubricating oil carried away with the gases may cause damage to other parts of the apparatus, for example when it passes into chambers in which chemical reactions are taking place. In such a case, the lubricating oil may participate in the chemical reaction or deleteriously affect the reaction product by its presence, for example by imparting the color thereof.

Therefore, the dissolution of lubricating oils in compressed gases cannot be prevented, lubricating oils of very high purity, i.e. colorless oils, must be used. In many cases, however, such oils, as for example paraffinum liquidum, have inadequate lubricating properties.

We have found that lubricating oils for gas compressors can be improved by the addition of small amounts of a hard wax which contains polar groups. Suitable polar groups include ester, amide and free acid groups. In general, the addition of only small amounts of hard wax, for example of 0.01 to 5% by weight or preferably of 0.1 to 2% by weight, is sufficient to improve the lubricating action of lubricating oils.

If, for example, a hard wax containing polar groups is dissolved at a temperature above its melting point in paraffinum liquidum and the mixture is cooled, while stirring, to room temperature, the mixture becomes cloudy. The wax which separates out in extremely fine distribution remains suspended in the oil for several months without settling. This suspension is a very good lubricant. The oil acts as a carrier substance for the hard wax which produces the actual lubricating effect. The lubricated sliding surfaces become coated with a dead-smooth wax film which is continuously renewed from the suspension.

Hard waxes containing polar groups which may be used with good results include montan wax and montan wax acids, especially when esterified with alcohols, such as ethylene glycol, butylene glycol or higher molecular weight alcohols. In some cases, it has proved advantageous to add to the said products calcium salts of montan wax acids in amounts of, for example, 10, 20 or 30% by weight or more. Mixtures of montan wax acids and esters of high molecular weight alcohols also improve the properties of lubricating oils for gas compressors. Amaligated montan wax has likewise proved suitable in some cases.

As carrier substances for the said hard waxes, lubricating oils, preferably well-refined pale lubricating oils, are used. Oils suitable for the said purpose include colorless lubricating oils refined with hydrogen, in the presence of highly active catalysts such as tungsten sulphide or molybdenum sulphide, at very high pressures, for example at pressures of 300, 500 or 1000 atmospheres or more. Paraffinum liquidum, above all, has proved to be an eminently suitable carrier.

The following table lists the results of experiments conducted in the Almen-Wieland machine. The results show the excellent improvement in lubricating efficiency which is achieved by the addition of hard waxes to paraffinum liquidum. In experiments 2 to 7, the hard waxes specified were dissolved at a temperature above their melting point in paraffinum liquidum and the mixture was cooled to room temperature, while stirring. The lubricants used in the experiments were as follows:

**Experiment 1:** Paraffinum liquidum without additive.

**Experiment 2:** Paraffinum liquidum plus 1% of montan wax acids esterified with ethylene glycol plus 20% of calcium salt.

**Experiment 3:** Paraffinum liquidum plus 2% of montan wax acids esterified with ethylene glycol plus 20% of calcium salt.

**Experiment 4:** Paraffinum liquidum plus 5% of montan wax acids esterified with ethylene glycol plus 20% of calcium salt.

**Experiment 5:** Paraffinum liquidum plus 0.5% of montan wax acids plus 15% of esters of higher alcohols.

**Experiment 6:** Paraffinum liquidum plus 1% of montan wax acids plus 15% of esters of higher alcohols.

**Experiment 7:** Paraffinum liquidum plus 0.5% of montan wax.

**TABLE**

<table>
<thead>
<tr>
<th>Coefficient of Friction (Steel Shaft Against Steel Bearing)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of Experiment</td>
</tr>
<tr>
<td>-------------------</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
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<td>3</td>
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<tr>
<td>5</td>
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<tr>
<td>6</td>
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<tr>
<td>7</td>
</tr>
</tbody>
</table>

See load in kilograms

We claim:

1. A colorless, liquid, lubricating oil for gas compressors consisting essentially of a colorless petroleum lubricating oil in which is uniformly dispersed 0.1 to 5% by weight of a hard wax containing polar groups.

2. A colorless, liquid, lubricating oil for gas compressors consisting essentially of paraffinum liquidum in which is suspended fine particles of a hard wax containing...
polar groups and selected from the group consisting of montan wax, montan wax amides, montan wax acids, montan wax acids esterified with alcohols, and mixtures of montan wax acids and montan wax acids esterified with alcohols.

3. A colorless, liquid, lubricating oil for gas compressors consisting essentially of a colorless petroleum lubricating oil in which is uniformly dispersed 0.1 to 5% by weight of a hard wax containing polar groups, plus about 10-30% by weight of the calcium salt of montan wax acids.

4. A process for preparing a colorless, liquid, lubricating oil for gas compressors which comprises dissolving 0.1 to 5% by weight of a hard wax containing polar groups in a liquid, colorless, lubricating oil heated to a temperature above the melting point of said hard wax, and cooling the resultant solution with stirring to obtain a suspension of fine particles of said hard wax in said liquid, lubricating oil.

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