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A pinpoint of fighting metal placed in the arc of the spectrograph writes its own signature on a photographic plate. Inside the instrument, the light from that flame is broken up by a prism as a prism breaks up sunlight. Each element identifies itself by a series of characteristic lines, always the same for the same basic element. It reveals to the spectrographer each constituent, what impurities are present and in what quantities. Thus spectrography helps in controlling inspection. It keeps tough fighting steels tough, helps in development of new fighting metals. Spectrography is used too in other fields . . . chemicals, foodstuffs, vitamins. It speeds research, control, and analysis. Today, spectrography is helping to build the tools of Victory as in peacetime it helps to make better cars and better breakfast foods.

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PRODUCTION OF OIL FROM PLANT MATERIAL

By Professor E. BERL
Carnegie Institute of Technology

INTERESTING information is given about the oil situation in this country in the excellent article by Dr. P. K. Frolich, past president of the American Chemical Society. Dr. Frolich states that the time is not far off when oil products should be obtained from sources other than natural oil, for example, by the hydrogenation of coal or carbon monoxide produced from coal or from natural gas or from oil shales. Not all experts in this field agree with statements about the coming scarcity of oil within the boundaries of the United States.

In previous communications to SCIENCE, I have stated that carbohydrates which are contained in farm products, wood, algae, etc., and which are formed by nature in enormous amounts and with greatest ease (see Table 1) can be converted into liquid fuel.

According to such statistics, at the present rate of oil extraction, the cheap oil in this country would be gone in about fourteen years; therefore, it is imperative

### Table 1

<table>
<thead>
<tr>
<th>Plants</th>
<th>$2.7 \times 10^{11}$ metric tons of C content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual production of cellulose and other carbohydrates</td>
<td>$3 \times 10^6$</td>
</tr>
<tr>
<td>Crude oil reserves in U.S.A.</td>
<td>$2.64 \times 10^9$</td>
</tr>
<tr>
<td>Crude oil reserves in world</td>
<td>$4.4 \times 10^9$</td>
</tr>
<tr>
<td>Annual oil production in U.S.A.</td>
<td>$1.93 \times 10^8$</td>
</tr>
<tr>
<td>Annual world oil production</td>
<td>$2.94 \times 10^8$</td>
</tr>
</tbody>
</table>

2 W. Pratt, Oil and Gas Jour., January 30, 1944, p. 78.