parallel to the valley. Caved ground west of the shaft indicates the position of a drift. The association of limonite ore and much chalcedony and the absence of sericitic material indicate that the ore lies within the Hardyston. Pieces of dense Hardyston sandstone and arkosic sandstone were picked up near-by.

**ANALYSES OF THE LIMONITE ORES**

The following analyses made by the Second Geological Survey of Pennsylvania* have been tabulated to show the great variation in the four principal constituents of the brown hematite ores. The first chart gives the analysis of the "mountain" ore in the Hardyston sandstone and jasper ores; the second chart gives the analysis of the "valley" ores in the limestone.

A comparison of these analyses will show that it is not possible to differentiate absolutely between these two types of ore. In general the iron content is lower and the silica higher in the "mountain" ore, which is natural because of the association with Hardyston sandstone and jasper. The percentage of iron in the "mountain" ore ranges from 30.1 in mine 195 to 47.2 in mine 194. The "valley" ores range from 58.5 in mine 182 down to 26.4 in mine 10. Although the spread is larger in these ores, most of them analyze about 43 to 50 percent iron. Some of the ores may analyze as high as 75 to 80 percent silica. These contain much jasper and quartz. Material of this sort was discarded. The "insoluble residue" is almost entirely silica.

The sulphur content of both types of ores varies little and is under 0.3 percent with the exception of one or two mines where there was considerable pyrite. The phosphorus content also varies little and, although high for iron, is less than 1.0 percent in all but a few mines. The quantity of manganese in both these types of ores is much higher than that of sulphur or phosphorus. In mine 10 the ore contained 17.648 percent manganese, due to a fairly thick bed of manganese ore in the mine. In general the "mountain ore" contains somewhat more manganese than the "valley ore," although the collected analyses scarcely indicate it.

**Analyses of "mountain" iron ores**

<table>
<thead>
<tr>
<th>Sample</th>
<th>Fe</th>
<th>Mn</th>
<th>S</th>
<th>P</th>
<th>Insoluble residue</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>30.10</td>
<td>0.589</td>
<td>.062</td>
<td>.299</td>
<td>43.035</td>
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<td>2</td>
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<td>0.115</td>
<td>.020</td>
<td>.676</td>
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<td>1.325</td>
<td>.107</td>
<td>.547</td>
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<tr>
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<td>37.00</td>
<td>3.033</td>
<td>.033</td>
<td>.186</td>
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<td>.029</td>
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<td>trace</td>
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<td>.039</td>
<td>.075</td>
<td>14.980</td>
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</tbody>
</table>

3. Trexler and Kline's mine, 190. Lump ore.