STATE OF SOUTH DAKOTA
Nils Boe, Governor

MINERALS REPORT 12

the

MINERAL INDUSTRY

of

SOUTH DAKOTA

in 1964

by R.B. Stotelmeyer, C.A. Koch,
and Duncan J. McGregor

South Dakota Geological Survey
Vermillion, South Dakota
January 1, 1966
The Mineral Industry of South Dakota

This chapter has been prepared under a cooperative agreement between the Bureau of Mines, U.S. Department of the Interior, and the South Dakota State Geological Survey for collecting information on all minerals except fuels.

By R. B. Stotelmeyer, A. C. Koch, and Duncan J. McGregor

MINERAL production in South Dakota for 1964 was valued at $53 million. Metals as a group increased 5 percent and fuels 14 percent in value of production; nonmetals declined 8 percent, or more than $2 million. The first production of molybdenum in South Dakota, as a byproduct in processing uranium-bearing lignite ash, was reported in 1963; however, no shipments were made until 1964. For the 16th consecutive year, the State was the leading gold producer in the Nation.

<table>
<thead>
<tr>
<th>Mineral</th>
<th>1963 Quantity</th>
<th>1963 Value (thousands)</th>
<th>1964 Quantity</th>
<th>1964 Value (thousands)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cement thousand 375-pound barrels</td>
<td>1,914</td>
<td>$6,107</td>
<td>2,044</td>
<td>$7,073</td>
</tr>
<tr>
<td>Clay thousand short tons</td>
<td>1240</td>
<td>960</td>
<td>245</td>
<td>1,076</td>
</tr>
<tr>
<td>Coal (lignite)</td>
<td>16</td>
<td>62</td>
<td></td>
<td>13</td>
</tr>
<tr>
<td>Copper (recoverable content of ores, etc.) short tons</td>
<td>1</td>
<td>(?)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feldspar long tons</td>
<td>25,590</td>
<td>157</td>
<td>26,980</td>
<td>180</td>
</tr>
<tr>
<td>Gem stones</td>
<td>5</td>
<td>20</td>
<td>11</td>
<td>20</td>
</tr>
<tr>
<td>Gold (recoverable content of ores, etc.) troy ounces</td>
<td>676,726</td>
<td>20,155</td>
<td>616,913</td>
<td>21,562</td>
</tr>
<tr>
<td>Gypsum thousand short tons</td>
<td>24</td>
<td>97</td>
<td>19</td>
<td>70</td>
</tr>
<tr>
<td>Lead (recoverable content of ores, etc.) short tons</td>
<td>4</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mica: Scrap</td>
<td></td>
<td></td>
<td>W</td>
<td></td>
</tr>
<tr>
<td>Sheet</td>
<td>10,000</td>
<td>(?)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Petroleum (crude) thousand 42-gallon barrels</td>
<td>215</td>
<td>428</td>
<td>247</td>
<td>495</td>
</tr>
<tr>
<td>Sand and gravel thousand short tons</td>
<td>20,896</td>
<td>16,313</td>
<td>13,770</td>
<td>13,641</td>
</tr>
<tr>
<td>Silver (recoverable content of ores, etc.) thousand troy ounces</td>
<td>117</td>
<td>160</td>
<td>133</td>
<td>172</td>
</tr>
<tr>
<td>Stone thousand short tons</td>
<td>2,794</td>
<td>7,339</td>
<td>2,118</td>
<td>6,245</td>
</tr>
<tr>
<td>Uranium ore short tons</td>
<td>72,088</td>
<td>1,831</td>
<td>110,147</td>
<td>1,551</td>
</tr>
<tr>
<td>Value of items that cannot be disclosed: Beryllium concentrate, lime, lithium minerals, molybdenum (1964), vanadium, and values indicated by symbol W.</td>
<td>XX</td>
<td>54,116</td>
<td>XX</td>
<td>608</td>
</tr>
</tbody>
</table>

| Total | XX | 54,116 | XX | 608 |

Revised.

W Withheld to avoid disclosing individual company confidential data.

1 Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2 Less than $500.

3 Weight not recorded.

1 Mining engineer, Bureau of Mines, Denver, Colo.


3 Director and State geologist, South Dakota State Geological Survey, Vermillion, S. Dak.

787-976—65
Employment and Injuries.—Final statistics for 1963 of employment and injuries in the mineral industries, excluding the petroleum industry, and preliminary data for 1964, compiled by the Bureau of Mines, are given in table 3.

Government Programs.—The Federal Bureau of Mines was engaged in studies to determine whether lignite coal from extensive deposits in the State could be used successfully as a soil conditioner and fertilizer. An investigation of iron occurrences was completed. Other projects under way included a study of the petroleum and natural gas resources in the State and a mineral industry survey of the State.

At Sioux Falls, the Pathfinder atomic reactor operated by Northern States Power Co. achieved criticality in the boiler region on March 24. Loading of the boiler core was completed in September, superheater fuel was loaded during November.

The 1964 South Dakota Legislature voted a reduction in the State severance tax from 2.5 to 1 percent.

Cement.—Shipments of cement from the State-owned plant at Rapid City consisted of approximately 2 million barrels of portland cement and 43,000 barrels of masonry cement. The average price of portland cement in 1964 was $3.43 per barrel, compared with $3.16 in 1963; the price of masonry cement increased from $4.43 to $4.70 per barrel. Out-of-State shipments were made to Iowa, Minnesota, Montana, Nebraska, North Dakota, and Wyoming.

Cement-plant profits of $2.5 million were allocated to the State general fund, $500,000 to the State highway fund, and $500,000 allocated to counties and cities according to a formula established by the State Legislature in 1963. One-third of the $500,000 was distributed in equal shares to all counties. The remaining two-thirds was allocated to counties and cities, on the basis of assessed valuation.

Clays.—Bentonite was mined on State-owned land west of Belle Fourche and processed for use mainly as a refractory in foundries and in preparing well-drilling muds; bentonite also was used in adhesives, animal feed, briquette binding, enameling, filters, insecticides, manufacturing paper, plaster, and reservoir sealants. Processing plants continued to be supplied with crude material from deposits in Wyoming.

Miscellaneous clay was mined near Belle Fourche and was used for manufacturing building brick; shale produced near Rapid City was used as a raw material for cement and in manufacturing lightweight aggregate.

Feldspar.—Output of feldspar increased 5 percent over that of 1963, although five fewer mines were operated. There were 17 mines in Custer County and 7 in Pennington County. Most of the feldspar, purchased by International Minerals & Chemical Corp. (IMC), was
ground at the company plant near Custer for shipment to out-of-State markets. The feldspar section of the Northwest Beryllium Co. plant, at Keystone, was destroyed by fire on March 30. The section was rebuilt and the entire plant was enlarged.

The ground feldspar was shipped to manufacturers of brick and tile, enamel, glass, porcelain, and pottery in Canada and Mexico in addition to domestic consumers.

Gypsum.—Gypsum, used as a retarder in portland cement, was mined by the South Dakota Cement Commission from deposits in Pennington County.

Lime.—Late in 1964, Pete Lien & Sons began lime production at a new $500,000 plant situated at the company-owned limestone quarry near Rapid City. The quantity produced was four times that originally projected. The company planned to market its product in western North Dakota and Nebraska, eastern Wyoming and Montana, and all of South Dakota. Much of the lime was used for soil stabilization in highway construction.

Production of metallurgical lime was continued by Black Hills Lime Co. at Pringle, in Custer County. Utah-Idaho Sugar Co. produced lime for use in manufacturing beet sugar at its Belle Fourche plant. Late in the year, the company announced that the plant, which was opened in 1927, was to be closed permanently.

Lithium.—Production of lithium (hand-sorted amblygonite) was recorded at the Hugo mine, owned by L. W. Judson, and at the Ingersoll mine, operated by Keystone Chemical Corp. Both mines are near Keystone, in Pennington County. Only two other States, California and North Carolina, reported lithium production.

Mica.—Scrap mica was produced at the Ingersoll mine of Keystone Chemical Co. and at the Peerless mine of Northwest Beryllium Co. Both mines are near Keystone. The mica was sold to manufacturers of paint and roofing materials.

No production of sheet mica was reported, thus ending 12 consecutive years of production.

Sand and Gravel.—Production of sand and gravel was reported in 63 of the 67 counties: Jackson, Jones, Stanley, and Ziebach Counties had no production. Large production was reported for those counties where major road construction was underway.

There were 169 commercial operations in 39 counties and 261 Government-and-contractor operations in 61 counties. Seven of the commercial operators reported production of over 100,000 tons of sand and gravel.

Ten million tons of gravel and 3 million tons of sand—94 percent of the output—was used for paving. The remainder was used mostly in building construction and as fill and railroad ballast. Of the total production, 97 percent was processed by being washed, sized, or otherwise prepared. Except for 164,000 tons moved by rail, all sand and gravel was transported by truck.

The State Highway Commission awarded 177 construction contracts totaling $24 million. There was 925.6 miles of Federal-Aid projects: 652.3 miles in the National System of Interstate and Defense Highways and 260.4 miles in the Federal-Aid Primary and Secondary Highway Systems (ABC programs). As of December 31, 1964, 311.9 miles or 46 percent of the designated 679.2 miles of the interstate system was open to traffic; in addition, engineering planning and right-of-way acquisitions were under way on 302.1 miles and 65.2 miles was under construction. South Dakota was one of nine States where work was either in progress or completed on 100 percent of the designated interstate mileage.1

Planned State highway department contracts for 1965 totaled $55.3 million, compared with $34 million in 1964 and $60.4 million in 1963.

Stone.—Granite, all mined at seven quarries in Grant County, accounted for 45 percent of the value of stone produced. Most of the granite was produced at plants in Minnesota for use in building construction and as monumental stone. Crushed and broken limestone was mined in Custer, Fall River, Lawrence, and Pennington Counties.

### Table 4. Sand and gravel sold or used by producers, by classes of operations and uses

<table>
<thead>
<tr>
<th>Class of operation and use</th>
<th>1963 Quantity</th>
<th>Value</th>
<th>1964 Quantity</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Commercial operations:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sand</td>
<td>596</td>
<td>$597</td>
<td>361</td>
<td>$305</td>
</tr>
<tr>
<td>Paving</td>
<td>317</td>
<td>324</td>
<td>301</td>
<td>293</td>
</tr>
<tr>
<td>Railroad ballast</td>
<td>44</td>
<td>9</td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>Fill</td>
<td>3</td>
<td>20</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>Total</td>
<td>663</td>
<td>932</td>
<td>727</td>
<td>738</td>
</tr>
<tr>
<td><strong>Gravel:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction</td>
<td>390</td>
<td>421</td>
<td>376</td>
<td>334</td>
</tr>
<tr>
<td>Paving</td>
<td>1,899</td>
<td>1,813</td>
<td>1,468</td>
<td>1,326</td>
</tr>
<tr>
<td>Railroad ballast</td>
<td>39</td>
<td>40</td>
<td>34</td>
<td>31</td>
</tr>
<tr>
<td>Fill</td>
<td>58</td>
<td>64</td>
<td>54</td>
<td>54</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>139</td>
<td>70</td>
<td>120</td>
<td>115</td>
</tr>
<tr>
<td>Total</td>
<td>2,207</td>
<td>2,367</td>
<td>2,022</td>
<td>1,735</td>
</tr>
<tr>
<td><strong>Total sand and gravel:</strong></td>
<td>3,869</td>
<td>4,199</td>
<td>3,259</td>
<td>2,474</td>
</tr>
<tr>
<td><strong>Government-and-contractor operations:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sand</td>
<td>1,182</td>
<td>1,304</td>
<td>2,453</td>
<td>2,435</td>
</tr>
<tr>
<td>Paving</td>
<td>2,162</td>
<td>1,294</td>
<td>2,453</td>
<td>2,435</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>3,344</td>
<td>2,598</td>
<td>4,906</td>
<td>4,868</td>
</tr>
<tr>
<td><strong>Gravel:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Building</td>
<td>15,944</td>
<td>11,668</td>
<td>8,700</td>
<td>6,846</td>
</tr>
<tr>
<td>Paving</td>
<td>15,944</td>
<td>11,668</td>
<td>8,700</td>
<td>6,846</td>
</tr>
<tr>
<td>Fill</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>15,955</td>
<td>11,700</td>
<td>8,702</td>
<td>6,848</td>
</tr>
<tr>
<td><strong>Total sand and gravel:</strong></td>
<td>17,307</td>
<td>13,994</td>
<td>11,211</td>
<td>11,167</td>
</tr>
<tr>
<td><strong>All operations:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sand</td>
<td>2,214</td>
<td>2,214</td>
<td>3,173</td>
<td>3,174</td>
</tr>
<tr>
<td>Gravel</td>
<td>18,692</td>
<td>16,987</td>
<td>20,060</td>
<td>10,467</td>
</tr>
<tr>
<td>Total</td>
<td>20,906</td>
<td>19,201</td>
<td>23,234</td>
<td>13,641</td>
</tr>
</tbody>
</table>

for asphalt filler, in manufacturing cement and lime, as railroad ballast and riprap, and in road construction. Noncommercial uses were by the U.S. Army Corps of Engineers, the Federal Bureau of Reclamation, the Federal Forest Service, and the South Dakota and Wyoming State Highway Departments. Crushed and broken sandstone was produced in Hanson, Minnehaha, Pennington, and Tripp Counties for concrete and road aggregates, filters, railroad ballast, refractory stone, riprap, and roofing granules.

### TABLE 5. Sand and gravel production in 1964, by counties

<table>
<thead>
<tr>
<th>County</th>
<th>Quantity (thousand tons)</th>
<th>Value ($1000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aurora</td>
<td>265</td>
<td>$205</td>
</tr>
<tr>
<td>Beadle</td>
<td>409</td>
<td>409</td>
</tr>
<tr>
<td>Bennett</td>
<td>287</td>
<td>287</td>
</tr>
<tr>
<td>Bon Homme</td>
<td>191</td>
<td>191</td>
</tr>
<tr>
<td>Brookes</td>
<td>233</td>
<td>233</td>
</tr>
<tr>
<td>Brown</td>
<td>579</td>
<td>579</td>
</tr>
<tr>
<td>Brule</td>
<td>1,096</td>
<td>1,096</td>
</tr>
<tr>
<td>Buffalo</td>
<td>117</td>
<td>117</td>
</tr>
<tr>
<td>Butte</td>
<td>59</td>
<td>59</td>
</tr>
<tr>
<td>Campbell</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Charles Mix</td>
<td>583</td>
<td>583</td>
</tr>
<tr>
<td>Clark</td>
<td>229</td>
<td>229</td>
</tr>
<tr>
<td>Clay</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Codington</td>
<td>135</td>
<td>135</td>
</tr>
<tr>
<td>Corson</td>
<td>430</td>
<td>430</td>
</tr>
<tr>
<td>Custer</td>
<td>82</td>
<td>82</td>
</tr>
<tr>
<td>Davison</td>
<td>98</td>
<td>98</td>
</tr>
<tr>
<td>Deuel</td>
<td>101</td>
<td>101</td>
</tr>
<tr>
<td>Dewey</td>
<td>49</td>
<td>49</td>
</tr>
<tr>
<td>Douglas</td>
<td>281</td>
<td>281</td>
</tr>
<tr>
<td>Fall River</td>
<td>411</td>
<td>411</td>
</tr>
<tr>
<td>Fall River</td>
<td>97</td>
<td>97</td>
</tr>
<tr>
<td>Fall River</td>
<td>38</td>
<td>38</td>
</tr>
<tr>
<td>Grant</td>
<td>56</td>
<td>56</td>
</tr>
<tr>
<td>Grant</td>
<td>94</td>
<td>94</td>
</tr>
<tr>
<td>Haakon</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Hamlin</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Hand</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>Hanson</td>
<td>45</td>
<td>45</td>
</tr>
<tr>
<td>Harding</td>
<td>290</td>
<td>290</td>
</tr>
<tr>
<td>Hughes</td>
<td>85</td>
<td>85</td>
</tr>
<tr>
<td>Hutchinson</td>
<td>383</td>
<td>383</td>
</tr>
</tbody>
</table>

The total production of sand and gravel in 1964 was 2,783,563 thousand tons, valued at $3,348,612.

### METALS

**Beryllium**—Production of beryllium increased substantially. Beryllium concentrate (beryllium) was produced by Beryl Ore Co., Golden, Colo., from independent producers, including Keystone Chemical Co., operator of the Ingersoll mine, in Pennington County.

**Copper**—No production of copper was reported in 1964; a small amount had been produced in Pennington County in 1963.

**Gold and Silver**—Gold production increased 7 percent and silver 14 percent. Except for a small amount of gold recovered from placer operation in Pennington County, all of the gold and silver was produced by Homestake Mining Co. at its Homestake mine at Lead, Lawrence County. The quantity of ore mined and the value of gold and silver recovered in 1964 were the largest in the history of the company.

### TABLE 6. Stone sold or used by producers, by kinds

<table>
<thead>
<tr>
<th>Year</th>
<th>Granite</th>
<th>Limestone</th>
<th>Sandstone</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Short tons</td>
<td>Value ($1000)</td>
<td>Short tons</td>
</tr>
<tr>
<td>1961</td>
<td>17,915</td>
<td>$3,004,488</td>
<td>1,478,618</td>
</tr>
<tr>
<td>1962</td>
<td>26,478</td>
<td>2,025,441</td>
<td>1,478,092</td>
</tr>
<tr>
<td>1963</td>
<td>26,583</td>
<td>2,442,181</td>
<td>1,487,542</td>
</tr>
<tr>
<td>1964</td>
<td>26,513</td>
<td>2,070,351</td>
<td>1,576,852</td>
</tr>
</tbody>
</table>

**Total**

<table>
<thead>
<tr>
<th>Year</th>
<th>Short tons</th>
<th>Value ($1000)</th>
<th>Short tons</th>
<th>Value ($1000)</th>
<th>Short tons</th>
<th>Value ($1000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1961</td>
<td>89,015</td>
<td>5,059,593</td>
<td>7,037,817</td>
<td>5,783,218</td>
<td>13,175,563</td>
<td>8,063,817</td>
</tr>
<tr>
<td>1963</td>
<td>89,015</td>
<td>5,059,593</td>
<td>7,037,817</td>
<td>5,783,218</td>
<td>13,175,563</td>
<td>8,063,817</td>
</tr>
</tbody>
</table>

### TABLE 7. Stone sold or used by producers, by uses

<table>
<thead>
<tr>
<th>Use</th>
<th>1963</th>
<th>Value ($1000)</th>
<th>1964</th>
<th>Value ($1000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimension stone:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rough construction and</td>
<td>22,087</td>
<td>$167,776</td>
<td>26,537</td>
<td>$198,762</td>
</tr>
<tr>
<td>rubble</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rough architectural</td>
<td>22,087</td>
<td>$167,776</td>
<td>26,537</td>
<td>$198,762</td>
</tr>
<tr>
<td>cobble</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dressed architectural</td>
<td>22,087</td>
<td>$167,776</td>
<td>26,537</td>
<td>$198,762</td>
</tr>
<tr>
<td>dimensional</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dressed monumental</td>
<td>22,087</td>
<td>$167,776</td>
<td>26,537</td>
<td>$198,762</td>
</tr>
<tr>
<td>dimensional</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flagging</td>
<td>175,801</td>
<td>2,402,407</td>
<td>260,394</td>
<td>2,404,912</td>
</tr>
<tr>
<td>Other</td>
<td>71,900</td>
<td>1,024,003</td>
<td>71,900</td>
<td>1,024,003</td>
</tr>
<tr>
<td>Total (approximate, in short tons)</td>
<td>25,430</td>
<td>2,784,848</td>
<td>25,430</td>
<td>2,784,848</td>
</tr>
</tbody>
</table>

Crushed and broken stone:

- Riprap: 184,820, 298,984, 238,242, 252,444
- Railroad ballast: 36,070, 3,900, 3,626, 30,174
- Concrete and roadbase: 1,950,760, 3,355,193, 1,100,020, 1,100,020
- Other: 1,950,760, 284,462, 6,445,118, 252,444

Total: 2,788,188, 4,523,938, 2,099,912, 6,447,181

W Withheld to avoid disclosing individual company confidential data; included with "Other."
Iron Ore.—Magnetic highs, often indicative of iron occurrences, were discovered near Bristol and near Crandall, in Day County, and Langford, in Marshall County. The discoveries were the result of surveys made in 1963 by the South Dakota Geological Survey and the University of South Dakota. American Metal Climax, Inc., leased approximately 4,500 acres in the area.

Iron ore mined in prior years from deposits near Nemo and stockpiled was used in manufacturing cement at Rapid City. None was produced in 1964.

Lead.—No production of lead was reported in 1964; a small amount had been produced in Lawrence and Pennington Counties in 1963.

Molybdenum.—Molybdenum was recovered as a byproduct in the treatment of uranium-bearing lignite ash at the mines Development mill at Edgemont and at the Kerma Nuclear mill in New Mexico. This was the first known shipment of molybdenum from the State.

Uranium.—The quantity of uranium ore mined increased 59 percent over that of 1963; however, the value of the contained uranium declined 20 percent because of a drop in the average grade of ore mined. The greatest increase was in the sandstone ores mined in Custer and Fall River Counties. Output of uranium ores from Harding County declined.

Kerma Nuclear Fuels Corp. began burning uranium-bearing lignite ore, mined in South Dakota, at the company burning plant at Bowman, N. Dak. The lignite was burned under controlled conditions to yield an ash amenable to treatment. The ash was processed at the company uranium mill near Grants, N. Mex.

At the Edgemont, Fall River County, uranium mill of Mines Development, Inc., a subsidiary of Susquehanna-Western, Inc., lignite ash and sandstone ores were treated for recovery of uranium, vanadium, and molybdenum. The sandstone ores were from South Dakota and Wyoming and included both company-mined and custom ores. The ash was processed at the company burner near Buffalo, in Harding County. The plant also processed lignite ash from deposits in Billings County, N. Dak. Operation of the mill was to continue until the 1966 Atomic Energy Commission (AEC) contract expires.

Vanadium.—Production of vanadium oxide (V₂O₅) was continued at the Mines Development, Inc., uranium mill at Edgemont. The vanadium was contained in sandstone ores from Custer and Fall River Counties, S. Dak., and from Wyoming.

MINERAL FUELS

Coal (Lignite).—Output of coal (lignite), other than uraniumiferous lignite, was from the Dewey County Coal Co. strip mine near Firesteel. The coal, under 27 feet of overburden, was mined with a power shovel and dragline for stripping and loading.

Petroleum.—Production of crude petroleum in 1964 was 247,422 barrels. Of this, 195,551 barrels was from 20 wells in the Buffalo field in Harding County, and the remainder from 4 wells in the Baker Dome field in Custer County. Some oil was recovered from a remote well in Dewey County. The showing was with a large amount of water, produced in a well drilled to the Red River formation.

Leasing was a highlight of petroleum activity marked by the largest lease sale in South Dakota history in December when 369,555 acres was leased.

Drilling activity increased with the drilling of 26 wells, 8 more than in 1963. The well in Dewey County was not considered completed in 1964.

### TABLE 2—Wildcat and development well completions in 1964, by counties

<table>
<thead>
<tr>
<th>County</th>
<th>Oil</th>
<th>Dry</th>
<th>Total</th>
<th>Footage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wildcat:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall River</td>
<td>11</td>
<td>10</td>
<td>21</td>
<td>36,300</td>
</tr>
<tr>
<td>Gregory</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2,100</td>
</tr>
<tr>
<td>Harding</td>
<td>3</td>
<td>2</td>
<td>5</td>
<td>18,500</td>
</tr>
<tr>
<td>Jones</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>5,000</td>
</tr>
<tr>
<td>Meholite</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>5,000</td>
</tr>
<tr>
<td>Rippl</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>3,300</td>
</tr>
<tr>
<td>Stanley</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2,100</td>
</tr>
<tr>
<td>Tripp</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2,100</td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
<td>20</td>
<td>40</td>
<td>64,100</td>
</tr>
</tbody>
</table>

| Development: |     |     |       |        |
| Custer | 2   | 3   | 5     | 7,700  |
| Harding | 1   | 1   | 2     | 6,800  |
| Total | 3   | 4   | 7     | 14,500 |
| Total all drilling | 3   | 23  | 26    | 90,500 |

Source: Oil and Gas Journal.

Exploration and development drilling in the Minnelusa formation in eastern Wyoming prompted the drilling of wildcat wells in southwestern South Dakota. A series of Minnelusa tests were started in Meade and Butte Counties.

Kanab Pipe Line Co. expanded its system by laying 120 miles of 6-inch products pipeline from Yankton to Wolsey.

### REVIEW BY COUNTIES

Mineral production was reported from all but 4 of the 67 counties in the State. Jackson, Jones, Stanley, and Ziebach Counties reported no mineral production.

Butte.—American Colloid Co. produced bentonite and operated its processing plant at Belle Fourche. IMC processed bentonite at its Belle Fourche plant from the raw material mined in Wyoming. Bentonite was used as refractories in foundries and steel plants, in rotary-drilling mud, and in many other uses.

Black Hills Clay Products Co. produced clay for manufacturing building brick.

Sand and gravel was produced by three commercial and two Government-and-contractor operators. Sand was used in paving; gravel was used in building construction and in paving.

Utah-Idaho Sugar Co., a producer of lime used in manufacturing beet sugar, announced that the Belle Fourche plant was to be closed early in 1965.
### Table 10. Value of Mineral Production in South Dakota, by Counties

<table>
<thead>
<tr>
<th>County</th>
<th>1963</th>
<th>1964</th>
<th>Minerals Produced in 1964 in Order of Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aurora</td>
<td>3145,000</td>
<td>2039,000</td>
<td>Sand and gravel, dolomite, clay, sand, and gravel, lime, sand and gravel.</td>
</tr>
<tr>
<td>Bessemer</td>
<td>269,970</td>
<td>341,000</td>
<td>Dolomite, sand and gravel.</td>
</tr>
<tr>
<td>Bon Homme</td>
<td>18,000</td>
<td>187,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Brookings</td>
<td>190,007</td>
<td>247,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Brookings</td>
<td>204,000</td>
<td>585,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Brown</td>
<td>256,000</td>
<td>1,000,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Buffalo</td>
<td>215,000</td>
<td>118,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Butte</td>
<td>17,000</td>
<td>2,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Campbell</td>
<td>95,713</td>
<td>520,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Charles Mixon</td>
<td>115,000</td>
<td>200,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Clark</td>
<td>70,000</td>
<td>75,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Clay</td>
<td>410,000</td>
<td>154,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Codington</td>
<td>73,000</td>
<td>681,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Corson</td>
<td>17,000</td>
<td>1,000,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Custer</td>
<td>1,066,798</td>
<td>614,389</td>
<td>Feldspar, stone, petroleum, and sand and gravel, uranium ore, vanadium, lime.</td>
</tr>
<tr>
<td>Davison</td>
<td>97,000</td>
<td>95,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Deuel</td>
<td>254,000</td>
<td>254,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Dewey</td>
<td>113,810</td>
<td>70,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>dewey</td>
<td>107,872</td>
<td>162,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Dewey</td>
<td>236,912</td>
<td>227,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Dewey</td>
<td>70,939</td>
<td>140,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Deuel</td>
<td>254,000</td>
<td>254,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Fall River</td>
<td>212,816</td>
<td>447,000</td>
<td>Sand and gravel, coal, sand and gravel.</td>
</tr>
<tr>
<td>Fall River</td>
<td>137,000</td>
<td>48,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Fall River</td>
<td>137,000</td>
<td>48,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Fall River</td>
<td>5,000</td>
<td>2,853</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Gregory</td>
<td>134,000</td>
<td>75,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Hamlin</td>
<td>284,000</td>
<td>504,570</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Hamlin</td>
<td>134,000</td>
<td>134,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Hardin</td>
<td>191,000</td>
<td>191,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Hardin</td>
<td>617,204</td>
<td>617,204</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Hardin</td>
<td>2,205,590</td>
<td>2,205,590</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Hughes</td>
<td>300,000</td>
<td>200,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Hitchcock</td>
<td>450,000</td>
<td>350,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Hyde</td>
<td>54,000</td>
<td>54,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Jackson</td>
<td>68,000</td>
<td>68,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Jefferson</td>
<td>414,000</td>
<td>359,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Kingsbury</td>
<td>136,000</td>
<td>136,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Lake</td>
<td>242,000</td>
<td>167,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Lawrence</td>
<td>207,000</td>
<td>160,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Lincoln</td>
<td>207,000</td>
<td>160,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>McCook</td>
<td>417,000</td>
<td>417,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>McPherson</td>
<td>162,000</td>
<td>160,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>McPherson</td>
<td>162,000</td>
<td>160,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Meade</td>
<td>145,000</td>
<td>145,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Meade</td>
<td>145,000</td>
<td>145,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Miller</td>
<td>35,000</td>
<td>35,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Minnehaha</td>
<td>225,000</td>
<td>165,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Minnehaha</td>
<td>2,214,578</td>
<td>2,214,578</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Moody</td>
<td>234,000</td>
<td>615,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Moody</td>
<td>6,428,405</td>
<td>9,428,405</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Pennington</td>
<td>180,000</td>
<td>200,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Potter</td>
<td>191,000</td>
<td>191,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Roberts</td>
<td>255,000</td>
<td>255,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Sanborn</td>
<td>39,000</td>
<td>50,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Shannon</td>
<td>8,000</td>
<td>50,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Shannon</td>
<td>39,000</td>
<td>50,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Spencer</td>
<td>50,000</td>
<td>50,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Stanley</td>
<td>27,432</td>
<td>27,432</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Stutsman</td>
<td>65,000</td>
<td>47,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Todd</td>
<td>14,000</td>
<td>14,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Tripp</td>
<td>1,000</td>
<td>1,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Tripp</td>
<td>390,000</td>
<td>430,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Tripp</td>
<td>90,000</td>
<td>90,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Tripp</td>
<td>390,000</td>
<td>430,000</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Unnamed</td>
<td>2,611,158</td>
<td>1,145,856</td>
<td>Sand and gravel.</td>
</tr>
<tr>
<td>Unnamed</td>
<td>54,116,000</td>
<td>52,824,000</td>
<td>Sand and gravel.</td>
</tr>
</tbody>
</table>

* Revised. W Withheld to avoid disclosing individual company confidential data.  
  1 Includes production of some sand and gravel (1962), sand, and beryllium concentrates (1963) that  
  cannot be assigned to specific counties, and values indicated by symbol W.
TABLE 11.—Homestake mine ore, milled, receipts, and dividends

| Year | Ore milled (thousand short tons) | Receipts for bullion product Total (thousands) | Per ton Dividends (thousands) |
|------|----------------------------------|-----------------------------------------------|-------------------------------|-----------------------------|
| 1960 | 1,797                            | $19,415                                       | $11.02                        | $4,051                      |
| 1961 | 1,781                            | 16,600                                       | 9.17                          | 3,800                       |
| 1962 | 1,669                            | 20,779                                       | 12.24                         | 5,882                       |
| 1963 | 1,809                            | 20,278                                       | 10.71                         | 5,965                       |
| 1964 | 2,033                            | 21,708                                       | 10.69                         | 5,986                       |

1 From 1979 to 1964, inclusive, this mine yielded bullion and concentrates that brought a net return of $729.5 million and paid $224.7 million in dividends.

Source: Homestake Mining Co., annual report to stockholders.

mated grade of $11.02 (0.315 ounces) of gold per ton, a decline of 31 cents per ton. For the first time, the measured reserve included ore in Eleven Ledge, from the 3,950-foot level to the 4,400-foot level, and from the 5,000-foot level to the 6,000-foot level.

Progress was made in preparation for mining below the 4,850-foot level. The planned rate of 800 tons per day from the lower levels was achieved late in the year. In the lower levels, ore shoots, though numerous, were small and irregular; and rock pressures were higher. As depth of mining increased, ventilation and air conditioning continued to be major factors. Rock temperature at the surface of the Homestake mine was 44° Fahrenheit. The temperature and latent humidity increased about 1.5° Fahrenheit with each 100 feet of depth. At the lowest point in the mine, 6,800 feet below the surface, air temperature reaches 120° Fahrenheit. In addition to an extensive ventilation system, Homestake used portable refrigeration units. The units were specially designed and custom built, patterned on similar units in use in South Africa, by Yale Inc., Minneapolis, Minn. The air conditioners are operated from 100 to 1,000 feet from the working face.

Pennington.—Eleven minerals were produced, more than in any other county, and all of the State production of cement, gypsum, lithium, and mica came from the county.

Shipments of portland and masonry cements from the State-owned cement plant at Rapid City were valued at more than $7 million, a 16 percent increase. Limestone, shale, gypsum, and sand used at the plant were mined near Rapid City. Iron ore, used in manufacturing specialty cements, was obtained from stockpiles. Cement shipments were made to all of the States bordering South Dakota.

Crushed and broken limestone also was produced by Hills Materials Co., L. G. Everist, Inc., and Pete Lien & Sons, for use in manufacturing lime, as railroad ballast and riprap, and in road construction. Crushed sandstone, produced by Newlon & Cordes, was used as roofing granules.

Sand and gravel for use in building and paving was produced by commercial and Government-and-contractor operators. The commercial operators were Birdsell Sand & Gravel Co., and L. G. Everist,

Inc. Government operators were the South Dakota Cement Commission, the Federal Forest Service, and the South Dakota Department of Highways.

Feldspar production was reported from seven mines and five producers: Hough & Judson, IMC, Keystone Chemical Co., Northwest Beryllium Co., and Robert Stien. Mica also was produced by Keystone Chemical Co. and Northwest Beryllium Co.

Northwest Beryllium Co. continued to operate its flotation mill at Keystone. In March, fire destroyed the building housing the feldspar section. A new building was constructed containing feldspar-concentrating equipment, filter, magnetic separators, and a shop. Reportedly, a modification of a flotation process developed by the Bureau of Mines was used to recover pegmatite minerals. The process was adopted after considerable research and laboratory work by the company. The mill was equipped to recover scrap mica, soda feldspar, high-purity silica sand, beryl, columbite-tantalite, and cassiterite. The company also planned to recover potash feldspar, which was to be selectively mined, dry crushed, and hand sorted. Metallurgical steps were to include crushing and screening to produce a scrap mica product and to provide rodmill feed; grinding followed by gravity concentration to produce a concentrate of columbite-tantalite and cassiterite; flotation to recover fine mica, feldspar, and beryl; magnetic concentration to remove impurities; and acid digestion and magnetic separation to produce silica sand. Planning was designed to increase daily mill capacity to 200 tons of ore.

Production was begun at the lime plant operated by Pete Lien & Sons of Rapid City. The 175-ton-per-day calcining and hydrating plant used a rotary kiln with continuous hydrator and automatic mill to treat the raw material obtained from the 40-foot-thick Minnekahta limestone formation near the plant. Most of the product was to be used as a soil stabilizer in road construction. The firm had been awarded a contract by Northwestern Engineering Co. of Denver (Colo.) and Rapid City, to provide 8,035 tons of hydrated lime for highway construction. About 50 men were to be employed at the plant.

Miscellaneous clay, in addition to that used for cement, was produced from deposits near Rapid City for manufacturing lightweight aggregate. Lithium was produced at the Hugo and Ingerson mines near Keystone. Virgil Williams, of Keystone, produced a small amount of gold from a stream gravel placer deposit.