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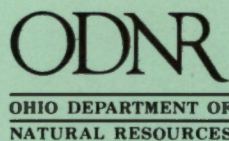
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A HISTORICAL SKETCH OF THE MINERAL INDUSTRIES IN OHIO

by
Horace R. Collins

Columbus
1987



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Reprinted from the Division of Geological Survey's
1986 Report on Ohio mineral industries

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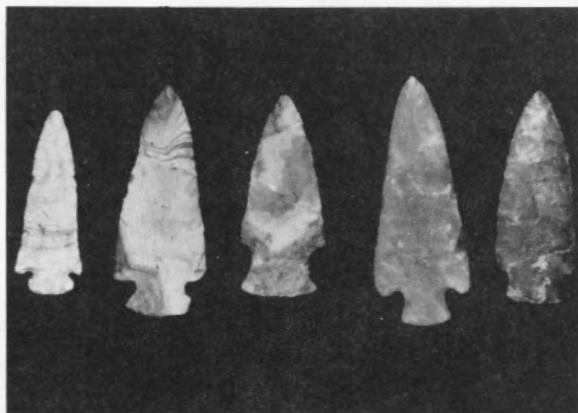
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The Ohio Division of Geological Survey is celebrating the 150th anniversary of its inception in 1837. The Survey's Sesquicentennial Year seems an appropriate time to review briefly the history of mineral production in Ohio. The Geological Survey, from its foundation to the present time, has played a major role in providing data and technical assistance for the economic development of Ohio's mineral resources. Indeed, one of the primary reasons for establishing a geological survey in 1837 was to aid in the development of our resources and to provide objective data to protect citizens against various types of frauds and schemes involving minerals.



Indian projectile points of Ohio flint

FLINT

Ohio has a long history of mineral production—a history so long, in fact, that it is unknown when minerals were first produced. Aboriginal Americans had exploited native raw materials long before the advent of the first European settlers. American Indians carried on extensive quarrying in the Pennsylvanian-age Vanport flint in the area now known as Flint Ridge, in Licking and Muskingum Counties. An area of several hundred acres underlain by flint up to 10 feet thick was worked from open pits as large as 100 feet in diameter and several feet deep. A portion of these aboriginal flint quarries is preserved at Flint Ridge State Memorial. Flint quarried from the area was used for scrapers, knives, drills, and arrow and spear points. This flint was also extensively traded by the Indian craftsmen. Because of its distinctive characteristics, Flint Ridge flint has been traced from the Atlantic seaboard to Kansas City, Missouri, and as far south as Louisiana. Interestingly, early settlers also found this flint to be a valuable resource and quarried it for use as grindstones for grist mills and as a source of sparks to fire their flintlock rifles. The only modern-day use of flint is in making colorful jewelry.

SALT

Another mineral resource exploited by the Indian population was salt. There were many sites in the state where natural brine seeps attracted buffalo and deer, which in turn attracted humans to their salty waters. One of the better known examples was in Jackson County at what is now the city of Jackson. Indians produced a low-grade salt in this vicinity by evaporating the weak brine solutions flowing from the springs or licks, as they were commonly known. The existence of these salt springs was known to settlers in Virginia as early as 1755. It is commonly believed that Europeans captured by Midwestern Indians during raids as far east as Virginia escaped and carried the word of the springs back to Virginia. The first European settlers visited the Jackson County site in 1794. This visit was very brief, however, as Indians were a very real threat. The party departed the day after arriving, just escaping an Indian war party which nearly caught them at the Ohio River.

As in the instance of flint, the settlers quickly began exploiting this resource. Salt was an especially important find to the early settlers, as their only other source was salt brought in over the mountains from the east by wagon or packhorse and which sold at \$4.00 to \$6.00 a bushel. This was a very high price for cash-poor settlers to pay for salt, which obviously became a luxury on the frontier. Because of its high price and high demand, early settlers quickly exploited existing springs and expanded their search for sources of salt, thus in effect creating the first mineral-resources extractive industry in Ohio.



Salt kettles at brining operation at Durant,
Morgan County, 1903

The salt licks of Jackson had ceased to be an important salt source by 1818. From 1818 until 1889, salt was produced in Ohio primarily from the evaporation of natural brine reached by drilling. By the time of the Civil War, Ohio was a leading salt-producing state. Attempts were made to

establish salt plants in Columbiana, Guernsey, Hocking, Meigs, Morgan, and Tuscarawas Counties, with varying results. By far the most successful industry was established in Meigs County in the vicinity of Pomeroy. Salt was produced from natural brines from Mississippian- and Pennsylvanian-age sandstones in the Pomeroy area from before the Civil War until the 1970's.



Room-and-pillar mining of salt beneath Lake Erie at Cleveland, 1985 (photo by Michael C. Hansen)

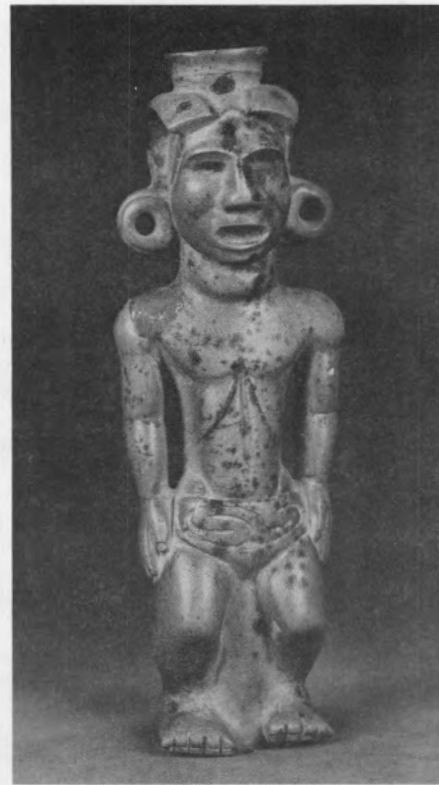
Rock salt was discovered in 1889 near Cleveland during the drilling of a well in search of natural gas. This discovery resulted in development of a large salt industry in northeastern Ohio, primarily in Cuyahoga, Lake, Medina, Summit, and Wayne Counties, based on the artificial brining of Silurian-age deposits of rock salt. In the early days of this segment of the industry, salt was produced for table and dairy use as well as for making ice cream and for glazing in the ceramic industry. Ultimately, there was a major buildup of industries in northeastern Ohio, particularly chemical and other industries which use salt as a raw material in the manufacture of industrial chemicals. In the late 1950's, work was begun on sinking shafts for salt mines in Cleveland and in Lake County. The salt produced from these mines is used almost exclusively for ice control.

In 1986 the two underground mines and three brining operations produced approximately 4 million tons of salt valued at almost \$41 million—a far cry from days of the salt licks.

CLAY AND SHALE

Clay also was utilized by aboriginal Ohioans. Pottery fragments made from alluvial and glacial clays as well as from coal underclays are found at many archeological sites. Some of this ancient ware shows skills of workmanship suggesting that it does not represent the first stages of the art.

The first use of clay by European settlers appears to have been during the construction of Campus Martius in Marietta in 1788-1791. Brick was made at this site from alluvial clays. The brick industry expanded rapidly in Ohio with the influx of settlers in large numbers in the late 1700's and early 1800's. Most of the early brick works exploited alluvial and glacial clays. Underclays and shales were exploited as a burgeoning population required more and more products which could be made from these resources. One of the earliest uses of clay by European settlers was for pottery, which was being made in Cincinnati as early as 1799. Ohio was a leader in American china and art-pottery production.



Adena pipe, prehistoric Indian artifact made from Scioto-ville clay. Photo courtesy of Ohio Historical Society

Pieces from the Rookwood, Roseville, and Weller potteries are among the most collectible of American pottery. The Pottery Museum at East Liverpool and the Ohio Ceramic Center near Roseville display the variety of Ohio pottery.

Other uses for clay and shale which quickly followed were roofing tile, paving brick, terra cotta, decorative tile, sewer tile, fire brick, drain tile, sanitary ware, and numerous other products which can be made from clay and shale. Although many products formerly made from clay or shale are now made of substitute materials, Ohio continues to produce many valuable ceramic products. In 1986, production of these commodities totalled 2.4 million tons with a raw value of \$8 million. To gain some appreciation of the



Pottery at East Liverpool, Columbiana County, 1800's. Photo courtesy of Ohio Historical Society



Athens Brick Plant, Athens County, circa 1910

value of the finished products, the interested reader is referred to the article "Clay and shale in the economy of Ohio" published in the 1985 *Report on Ohio mineral industries*.



Underground coal mine, location and date unknown

COAL

Coal has traditionally been considered Ohio's most valuable mineral resource and has been mined in Ohio since before the days of statehood. Both presently and historically coal has contributed substantially to Ohio's energy needs. It is not possible to pinpoint the exact date coal started to be used in the state. The earliest known reference to coal in Ohio is a map published by Lewis Evans in 1755. This map, entitled "A general map of the middle British colonies, in America," shows the word "coals" in the approximate area of what is now southern Stark and northern Tuscarawas Counties. The word "coals" is shown also along the Hockhocking [Hocking] River in the general vicinity of Athens County. It is known, however, that early settlers in the eastern portion of the state used coal that they found cropping out near their homes or settlements. It was not until 1800 that the first mined coal tonnage was reported. In that year production of 100 tons was recorded for Jefferson County. Three years later, when Ohio became a state, reported annual production was 200 tons from two counties. There was undoubtedly some unreported production; many farms in the coal-bearing region had small mines, commonly referred to as "dog holes," from which winter supplies of coal were obtained. Total tonnage from these individual farm mines was probably quite small

relative to statewide figures. Commercial coal production was to grow from this small early start to an all-time peak of 55,136,699 tons in 1970. Cumulative production for the period from 1800 through 1985 totals slightly over 3 billion tons.



Underground coal-cutting machine; note carbide lamps on miners' caps

Coal is mined in Ohio by both strip and underground methods as well as by auger, which, as used in this state, is a combination of strip and underground methods. Underground mining was the principal method until about World War II, when strip mining began to increase at a very rapid rate. However, strip mining got a rather early start in Ohio in 1914, and in some counties, notably Jefferson, considerable coal was being produced by stripping as early as World War I.

The state reached an annual production high of 47,919,202 tons in the last year of World War I. This high was to stand until the all-time production record was set in 1970. Once strip mining began in earnest it grew to become the dominant method of mining in Ohio. During the past decade, strip mining rose to account for over 70 percent of total production. In 1986, stripping accounted for 59 percent of Ohio's total coal production.

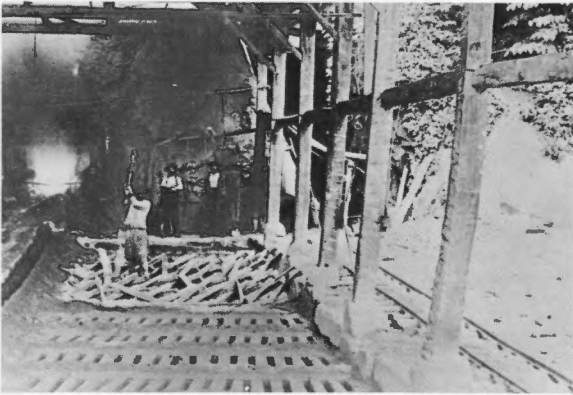
It is not known when auger mining first started in Ohio. However, there is no tonnage attributed to this method



Blue Bell surface coal mine near Strasburg, Tuscarawas County, date unknown. Photo courtesy of Ohio Historical Society

prior to 1954, and, on the basis of discussions with officers of the Ohio Division of Reclamation, it seems that in all probability there was no auger mining until late 1953 or early 1954.

Although the Ohio coal industry has been in decline since 1970, coal is still of vital importance to the state's economy. In 1986 nearly 35 million tons were mined with a raw value exceeding \$1 billion.



Casting iron pigs, Olive Furnace, Lawrence County, circa 1865-1877. Photo courtesy of Ohio Historical Society

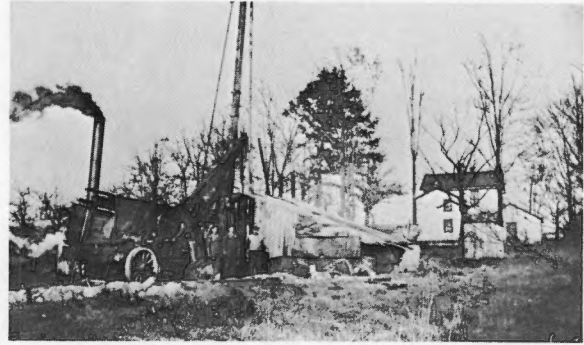
IRON

The production of iron from native ores also was an early enterprise in the history of Ohio. Iron was not a commodity that was easily transported across the eastern mountains, and early settlers quickly turned to local sources. All the raw materials needed to produce iron—ore, limestone for flux, and forests for charcoal—were present in eastern and southern Ohio. The first blast furnace in Ohio, Hopewell Furnace, was built in 1804 near Poland, in Mahoning County. This furnace produced about 1 ton of raw iron per day; the iron was cast directly into pots, kettles, and other items. Although other furnaces were built in the intervening years, a major event was the construction of Union Furnace in 1826 in Lawrence County. Union was the first iron furnace built in the Ohio portion of what came to be known as the Hanging Rock Iron Region. Ultimately 46 charcoal blast furnaces were built in southern Ohio, propelling the state to a leadership role in the production of pig iron. By the time of the Civil War, Ohio was the leading producer of iron in the nation. Ohio has remained a major producer of iron and steel into the modern era, although native iron ore and coal were long ago replaced by richer raw materials brought in from out of state.

OIL AND GAS

The presence of oil in Ohio had been known to both its Indian and European residents from seeps which allowed small quantities of petroleum to accumulate on the surface of streams. Early settlers called it "Seneca Oil" and skimmed it off the surface of the water and used it for medicinal purposes. It is most likely that similar use was made even earlier by the American Indians.

A well drilled for brine in Noble County in 1814 encountered heavy flows of both oil and gas. However, it was not until 1860 that drilling specifically for oil was under-



Drilling rig west of Chesterhill, Morgan County, 1890's

taken. In that year wells were drilled near Macksburg in Washington County and in Mecca Township, Trumbull County. From these early discoveries "oil fever" quickly spread through Ohio, establishing an industry that is still active today.

Commercial development of gas, albeit crude and limited, began in 1838 in Findlay in Hancock County. It was not until 1884 that serious efforts were made to develop gas in the Findlay region. In 1885 the Karg well was discovered; this well reportedly flowed at 12 million cubic feet per day. Findlay was famous for many years for its plentiful and cheap, or in some cases free, supplies of gas. The development of oil in northwestern Ohio took place simultaneously with gas. The Lima-Indiana field was the first "giant" field in the U.S., reaching a production peak of about 24 million barrels in 1896.



Oil derricks at Cygnet, Wood County, 1885; part of the Lima-Indiana field

Oil production fell steadily in Ohio from about 1900 through the early 1950's, when production began to rise. Production currently stands at approximately 13 million barrels annually. Gas production was erratic through the 1960's but has steadily risen since the 1970's and currently is in the range of 182 billion cubic feet per year.

Because of the worldwide drop in oil prices and locally lower gas prices, the total value of oil and gas fell during 1986. In 1986 the combined value of oil and gas was slightly over \$720 million, obviously a major contribution to the state's mineral economy.

GYPSUM

Although not produced in huge quantities, gypsum is mined in Ohio and has supported a substantial industry in



Gypsum quarry, Ottawa County

Ottawa County. Production of gypsum has always been confined to the Sandusky Bay area, primarily on the north shore, although it has been mined in at least one locality on the south shore. Gypsum was reportedly discovered by boatmen on Sandusky Bay in the early 1800's when they pulled up pieces with their anchors. An investigation of the area led to the discovery of outcrops along the north shore, where quarrying was begun in 1822.

Early settlers used gypsum as a soil conditioner commonly known as "land plaster." Gypsum currently is used in the manufacture of plaster and plaster products such as wallboard. Gypsum also is used to retard the setting rate of portland cement. In 1986 only one mine continued to operate in Ottawa County and produced 214 thousand tons of raw gypsum valued at slightly over \$2 million.

Limestone quarry at Tiffin, Seneca County, *circa* 1909

LIMESTONE AND DOLOMITE

Limestone and dolomite are valuable mineral commodities whose first use in Ohio is shrouded in obscurity. It seems likely that use of these resources, particularly limestone, began with the advent of European settlers, who brought a practice of mineral use to the new frontier. Lime for whitewashing and plastering was being advertised for sale as early as 1817 in Lebanon. W. W. Mather, the first

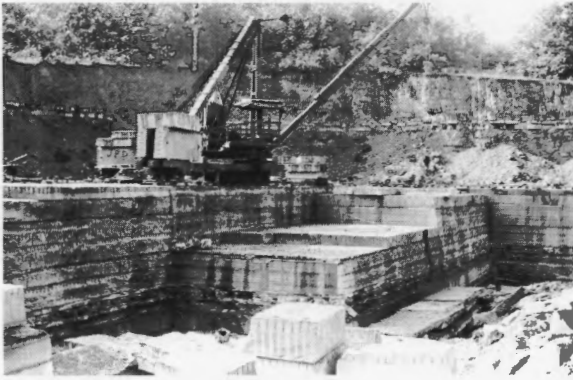
State Geologist of Ohio, reported in 1838 that "Limestone is, undoubtedly, the most valuable building material among the rocks of Ohio." In addition to lime, early uses of limestone would have included foundations, hearth stones, window sills, and other architectural applications. As mentioned earlier, limestone was used extensively as flux stone in the manufacture of iron. The first use of flux stone would have been in 1804 with the building of Hopewell Furnace in Mahoning County. Limestone was used in the 1800's in the manufacture of hydraulic cement, a rather easily made cement which can use impure limestone. The use of limestone for agricultural purposes also became popular during this era.

Blasting at limestone quarry at Custar, Wood County, *circa* 1982 (photo by Robert W. Hites, Jr.)

From these early beginnings both limestone and dolomite expanded into major commodities which are produced for concrete and other aggregates, aglime, railroad ballast, road metal, dimension stone, chemical raw material, SO₂ sorbent stone, burnt lime and dolomite, and many other uses. Limestone came into extensive use for making portland cement, which is superior to hydraulic cement. Dolomite has come to occupy an important position in the manufacture of float glass, insulating glass fiber, and specialty glass. The combined value of both limestone and dolomite in 1986 was \$148 million, with sales of over 40 million tons.

SANDSTONE

Sandstone is a mineral commodity which saw very early use by European settlers. The earliest uses were most probably for building stone, foundations, lintels, and other architectural purposes. Grindstones were being produced in Washington County as early as 1819. Ohio quickly developed into the major producer of sandstone in the nation. At first, native Ohio stone was shipped to cities down the Ohio River and later, as railroads were developed, to cities throughout the United States. Sandstone quarried at South Amherst in Lorain County has been used in buildings from Boston, Massachusetts, to Long Beach, California, and has been exported to Canada, Europe, and Australia. These northern Ohio sandstone quarries have the distinction of holding the record for both the world's deepest and perhaps the world's largest sandstone quarries. Ohio sandstone is



Sandstone quarry near McDermott, Scioto County, 1909

currently used for refractory linings, pool-table tops, laboratory "hot" tops, and other specialty applications, as well as architectural stone and aggregate.

Some sandstones as well as some conglomerates are of sufficient purity to be mined as a source of silica. Glass sand is known to have been mined in Ohio during the Civil War. High-purity-sand units continued to be developed, and by shortly after World War I a large array of high-silica products were being produced in the state. Current high-



Sandstone quarry at South Amherst, Lorain County, 1952; quarry is over 200 feet deep (note workers in lower center of photo for scale)

silica-sand units, either directly or through beneficiation, produce foundry, frac, and glass sand along with silica flour. High-purity conglomerates produce metallurgical pebble and refractory aggregate.

As a commodity, sandstone has had small but remarkably constant production levels over the past 35 years. In 1986, sales of nearly 2 million tons with a value of over \$24 million were reported in Ohio.

SAND AND GRAVEL

Sand and gravel were the last of Ohio's principal mineral resources to be commercially exploited. This commodity was not extensively developed until after the turn of the century. The growth of the sand and gravel industry is closely tied to economic development, as their principal use is for construction aggregate. The expansion of the state's highways and cities required huge volumes of low-cost aggregates for making concrete and bituminous concrete, to provide foundation subbases, for French drains, and for other construction uses. Because sand and gravel deposits are typically well drained, they are also heavily sought after as building sites, thus creating land-use conflicts in the demand not only for aggregates but for construction sites.



Sand pit, Gallia County, date unknown; this mine is still operating

Because sand and gravel are closely tied to construction, production fluctuates widely with the economy. In 1986, sand and gravel sales totalled almost 34 million tons with a value of \$106 million.

SUMMARY

From this short discussion it is obvious that mineral production has always been important to the people occupying the geographic area we call Ohio. Minerals provide jobs for people, supply products for a better way of life, and contribute substantial dollars to the total state gross product.

As we at the Division of Geological Survey celebrate the Sesquicentennial of our founding, it is with pride that we can look back to a long history of service to old and honorable industries. In moving toward the Bicentennial of the Division it is important that we rededicate our efforts to provide objective, scientific information to aid the mineral industries and other segments of society as we continue to produce the mineral wealth of the state in a wise and environmentally sound way.