

CLAYTON'S SILICA MINE

by

Harold L. Bischoff

The Clayton Silica Sand Mine, a small but significant mining operation, is nestled among the high, picturesque bluffs of northeast Iowa. This section of the state, often referred to as "the little Switzerland of Iowa," impresses visitors with its physical beauty, but few people know of the wealth that lies under the rolling hills and high bluffs. The Clayton Silica Mine is located on the banks of the Mississippi River, approximately two miles below the town of Clayton. Since 1878, there have been three separate silica sand mine operations in the area. The first, an open pit quarry started by William Buhlman in 1878, changed hands several times before closing in the 1930s. The second, under the management of Richard Kolch, made brick and tile from the silica sand at Clayton from 1919 to 1929. The present mine operation was started by John Langworthy in 1916, and was purchased by the present operators, the Martin-Marietta Corporation, in 1959.

The town of Clayton itself was founded in 1849 by Frank Smith and Gilbert Douglas and was important initially as a landing and shipping joint for flour manu-

factured at the nearby Elkader Mills. Located in Clayton County, the community was named after John M. Clayton, an eastern congressman. The town grew rapidly and by the early 1870s was an important milling center in the area. By the mid-1870s, however, wheat yields began to decline because the area had been cropped extensively since early settlement. Local farmers were also plagued with wheat rust brought in from the southern states.

With the decline of wheat in the Clayton area, the production of silica sand deposits became increasingly important. First mined commercially in 1878, Clayton sand is part of the St. Peter Sandstone formation. The sand from this formation is extremely pure. Quartz is the only mineral in the sand and the grains are smaller than salt crystals. The formation received its name from exposures on the St. Peter River (now the Minnesota River) in Minnesota. The St. Peter runs throughout the Midwest, in Illinois, Indiana, Iowa, Kentucky, Michigan, Minnesota, Missouri, Ohio, Oklahoma, and Wisconsin. Geologically it is Middle Ordovician and is roughly 463 to 470 million years old.

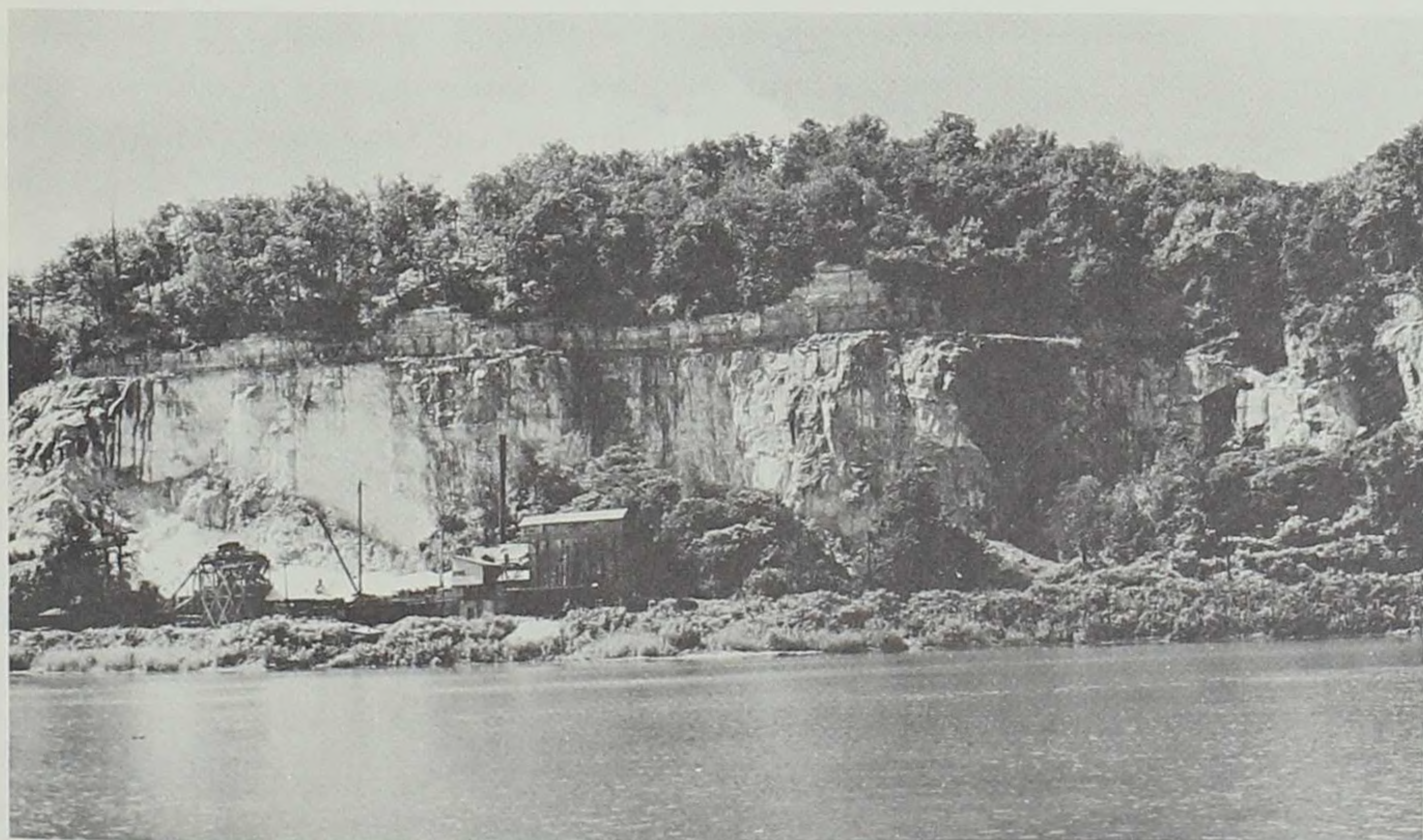
The formation is probably best described as a giant sheet of sand which varies in thickness and in depth. Charles Schuhert, a former professor of paleontology at Yale University, estimated that its thickness in Iowa varies between 15 and 223 feet. The formation usually changes thickness quite gradually; how-

ever, it sometimes increases rapidly. The St. Peter reaches its highest elevation in Allamakee County at nearly 1200 feet above sea level and from this point slopes gradually downward across the state. It is exposed in the northeastern part of Iowa but then is buried more deeply in other parts of the state except for the northwestern corner, where it was removed by pre-Cretaceous erosion.

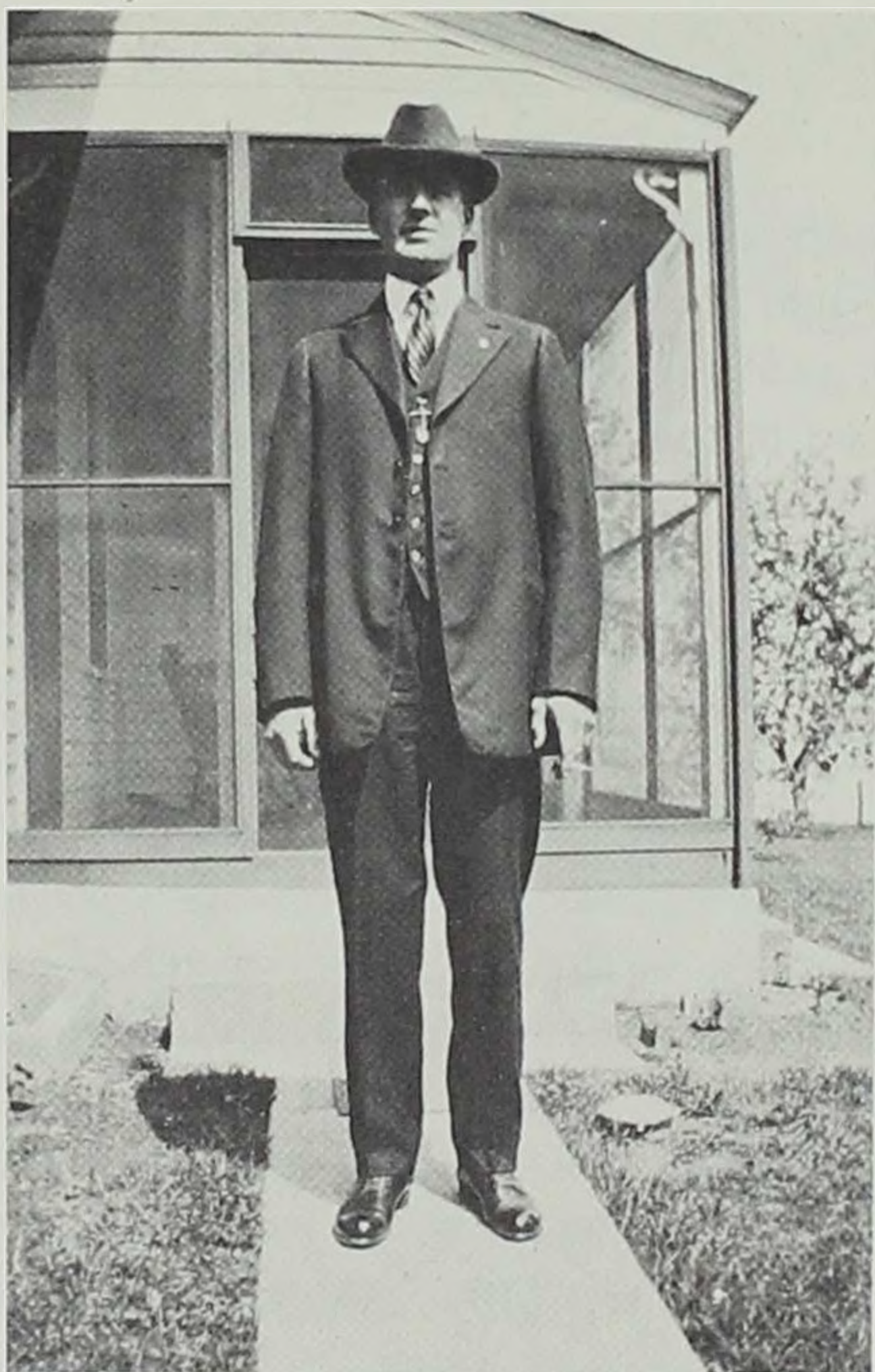
The first person to remove sand commercially from the formation around Clayton was William Buhlman who moved to the town in 1865. He first worked for several grain firms, but after the wheat failures in the 1870s, the firms went bankrupt, and he was forced to seek other

employment. In 1878, he supplied white sand to the Rock Island Glass Company for making glass; two years later he disposed of the business to his brother Julius Buhlman.

During these first years the sand was hauled to the train depot in gunny sacks. Under Julius Buhlman's management the pit was developed in several ways. Employing three to six men, Buhlman built a large "V-shaped" trough which started at the top of the bluff and stretched to a holding bin at the bottom. The sand was blasted and broken up by picks at the top of the hill and washed down the trough by water from a spring. The hopper at the foot of the bluff was construct-



The Langworthy mine operation in 1940.



Charlie Blake

ed so that the sand would flow into railroad cars on the siding. In one corner of the bin there was a six-inch opening that extended up the side of the hopper. As the water and sand flowed into the bin from the trough, one inch blocks were placed across this opening. Because the sand was heavier it settled to the bottom, pushing up the water until the sand deposits built up to the top of the obstruction when another block was put in the opening. This was repeated until the hopper was full. The sand was sent to glass factories in Milwaukee and to iron foundries for use as coring sand. About 1897, Buhlman moved his family to Nebraska City, Nebraska, and later to Widson, Illinois. At these locations he also worked

in sand mines. Around 1900, he moved back to Clayton and resumed his silica mine operation.

In 1905, Buhlman sold his three and one half acre site for \$3000 to Victor Drumb. During Drumb's tenure as operator the sand was mainly used for glass and was quarried by a pick and a stream of water from a hose. In 1909, Drumb leased the mine to the Clayton White Sand Company whose main offices were located in Milwaukee, Wisconsin. Sometime between 1905 and 1909, Charlie Blake was hired as mine manager. He continued to use the same mining process except that he installed a crusher in the pit to break up the sand. The average production of the Blake operation was one railroad car a day. The mine employed two to five men, depending on the number of orders received.

The Buhlman and Blake operations were open-pit, not underground mines. The over-lying soil and rock were stripped off from the sandstone, and holes were then drilled into the sand for dynamite. When detonated, the charges broke up the sand which was then put into a crusher. After crushing, sand was carried down the hill in the V-troughs to the hopper and the railroad tracks.

The work in the pit was wearisome and required considerable strength. The men were paid approximately 50¢ per hour. Pit operations began in the spring and continued until the first hard freeze in the fall. The Blake operation lasted until about 1929. At the time the pit closed, sand sold for less than 80¢ per ton. The Depression and the completion of the more efficient Langworthy operation forced the Blake pit to shut down. The old Blake pit

can still be seen south of Clayton in Devil's Hollow in nearly the same condition as it was in the 1920s.

The second operation to remove silica from the bluffs was a brick factory started in 1920. Richard Kolch initiated the Clayton Brick & Tile Company for the Korite Corporation of Delaware. At the time it was opened, plant officials imported several steam processing machines from Germany as well as a German technician, Bernard Elsner, to operate them. The factory's main business was making brick which they sold in three colors: white,

buff, and red. In addition to brick they manufactured red and buff floor tile in ten inch by ten inch squares and uniflow sewer tile. There were several sizes of uniflow tile made by the company, but the main feature was its odd construction. It was wider at the top so flowing water could carry out any solids which might settle in the tile. The brick made by the German machinery was of good quality, but the process was time-consuming. Moreover, when the machinery broke down, parts had to be taken to a Dubuque foundry to have a duplicate made.



A truck rumbles through the cavernous rooms of the present-day mine (Neal Brown photo).

Eventually, the factory was sold to Kendall Birch of Dubuque. The plant owed a great deal of money to the Consolidated National Bank of Dubuque and Birch's father was one of the bank directors.

The brick factory was located a short distance down river from the Blake mine. Sand for the brick was taken from a bluff just behind the plant. The sand was blasted, broken by pick, and then put in a buck suspended from a ninety-foot mast. The bucket deposited the sand in wagons on a conveyor which carried the sand down the hill into the plant at the bottom of the bluff. When the plant and its equipment were salvaged, it took two flat cars to move the large mast.

When workmen first started removing sand from the bluff, they found five rooms carved out of the sandstone. There were small portholes in all the rooms as well as small passageways that connected one room to the next. When they initiated the operation, four of the rooms were destroyed, but the last remains on top of the bluff. It is unclear who made the rooms or why. Before they were destroyed some of the area residents tried to save the "castle" or "white fort" as the rooms were called, but without success.

Although the brick made by the plant was back-up brick and not intended for outside facing, several local people did use it to construct buildings. Some of these buildings still stand including the Clayton Town Hall and churches in West Union and Guttenburg.

One of the most interesting buildings constructed of Clayton brick was a small house located a short distance from the plant. It was one of the first buildings constructed after the factory started, and

culls (rejected bricks) were used for most of it. The entire structure was made of products from the plant. Red tiles were used on the roof and floor tile was used in the basement. The house is still standing and in good condition. Intended as a home for the plant supervisor, it was at one time also used as a kitchen and dining hall for the workers.

Bernard Elsner was the first occupant of the house when he came from Germany to supervise the brick-making operation soon after the close of World War I. At that time, there was strong prejudice against Germans, and rumors circulated constantly that he was a former German soldier or a deserter from the German Army. If this were not enough, Elsner had a very bad temper. One day while he was in Greenly's store in Clayton, Frank Gibbs, a local hunter and fisherman, came in from duck hunting and set his gun down. Elsner picked up the gun to examine it, and Gibbs told him to put it down. One word led to another, and soon Elsner provoked a fight. At this point they went outside to settle the dispute, and in the ensuing scuffle, Elsner's jaw was broken. Despite his differences with the local townspeople, Elsner continued to work at the plant until it closed, moving then to Red Wing Minnesota to work in another brick factory.

In 1925, the Topet Taylor Engineering Company of Pittsburgh, Pennsylvania gained control of the brick factory, and the name was changed to the Iowa Burnt Slate Factory. Ten thousand shares in the plant were sold at \$10 per share. Some of the larger investors were J. A. Ries, M. J. Poull, L. M. Bink, F. J. Laarveld, and C. W. Colfelt. Colfelt came from the East

to manage the plant as well.

Upon his arrival, Colfelt thought the deposit of sand too small and the cost of mining too expensive. In order to save money he decided to make brick from coal tailings or slage instead of sand. The slage was shipped in open hopper cars from Peru, Illinois and was called "Red Dog." He ordered nearly fifteen car loads of slage. Upon arrival, workers were unable to unload the material in the two or three days allocated by the railroad company. The company eventually paid demurrage on the cars only to see the cargo repossessed by the railroad. But this was only the beginning of Colfelt's problems. Since none of the men working at the brick factory had any experience with coal tailings, they were unable to make a brick that would hold together.

Other adversities also struck the mine. In early February 1926, Colfelt, perhaps disillusioned by the failure of his brick making scheme, left Clayton with most of the company's funds. An indictment was drawn against him for cheating by false pretenses on February 18, 1926. He was arrested on March 4 in Dubuque and returned to Clayton County for trial. Found guilty, he was sentenced to hard labor in the county jail for one year. Since it was his first offense and he had made full restitution of the funds, he was given a suspended sentence and placed on parole to George Yohe. Yohe, a Clayton banker, was deeply concerned about keeping the mine open because many of the investors in the brick factory as well as its employees were patrons of the Clayton Bank.

In January 1927, Colfelt allegedly wrote a bad check and again left town. This

time, however, he did not return. Soon afterward, the factory closed for inventory and never reopened. Sometime before 1930, the machines and buildings were salvaged. Soon afterward, the Clayton Savings Bank also closed. Today, only a few walls remain of the plant in which several area residents saw their life's savings destroyed.

The present-day mine started in 1916 and has been, unlike the brick factory, a successful operation ever since. A chiropractor from Dubuque, John Langworthy, started the Langworthy Silica Company. For years he had known of the silica sand deposits in the hills south of Clayton and had hoped to develop a glass industry in northeastern Iowa to use the resource. "Doc" Langworthy, as he was called, also

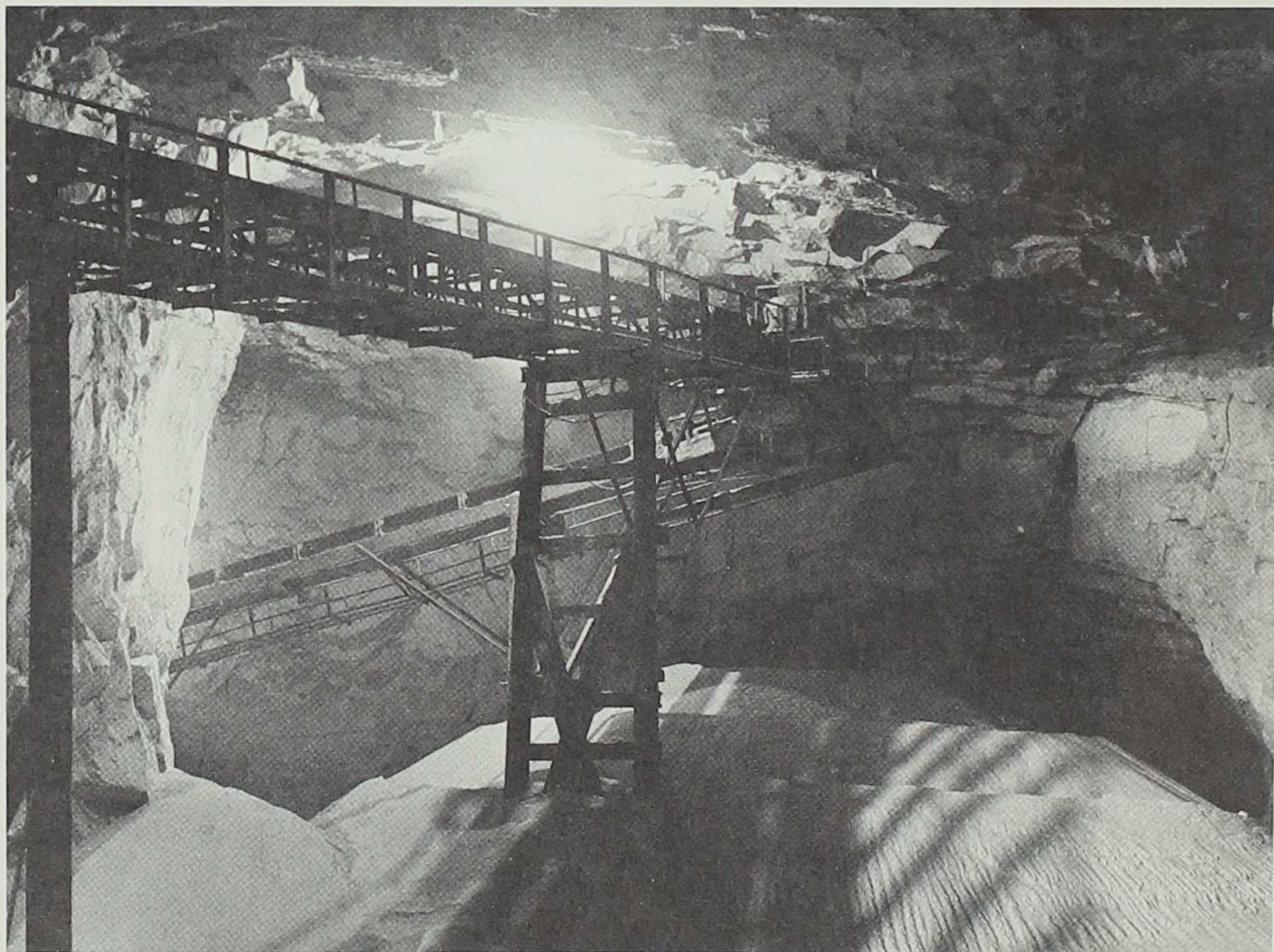
Note on Sources

The number of written sources on the Clayton operation are few and their content shallow. The early history of the mine is derived from *History of Clayton County, Iowa* (Chicago: Interstate Publishing Company, 1882) and the *Iowa Geological Survey*, 1 (Des Moines, Iowa: George Miller, 1892). Two valuable articles dealing with the operation of the mine in the 1920s and 1930s appeared in *Cement, Mill, & Quarry*, 32, 8 (April 20, 1928) and *Sauerman News*, 14, 1 (February 1936).

Several sources were helpful in describing the geological character of the St. Peter formation, including Iowa State geologists Donald Briggs and Karl Siefert. Records from the Clayton County Abstract Company in Elkader as well as the Clayton County Clerk of Court Office were helpful in determining the sequences of the mine owners.

Arnold Roggman and Frank Baxter, both of Garnaville, provided the information on the early history of Clayton as did Louis Liers of Clayton. Past and present employees of the various operations who supplied information were John Griffin (manager of the present mine), Kenny Wilker (foreman of the present mine), Harvey Lange (son of Otto Lange, manager of the Langworthy mine), and Leo Frommelt (employee at the brick factory).

Mrs. H. J. Hansel, Mrs. Blanche Pederson, and Mrs. Donald Blake were helpful in depicting life in the early mines and Clyde Bothmer, former railroad agent at Clayton, in describing the scope of the operations.



A conveyor which carries the silica out of the mine (Neal Brown photo).

hoped to build a house in Clayton after opening the mine. A heart attack in 1919 ended his dreams. Other large investors in the operation included Ed Beaman, Judge Chalmers, and Otto Lange, all of Dubuque. Altogether, twelve to fifteen people shared in the new mine.

After Langworthy's death, the Board of Directors elected Otto Lange of Dubuque as president and gave him the responsibilities formerly held by Langworthy. In this capacity Lange was to serve in virtually all facets of the operation from

salesman to business manager. Otto Lange was at the time busy with his Lange Insurance Agency, so he turned many of the mine duties over to his son, Harvey Lange, who had just graduated from Harvard University.

The Langworthy Silica Company was much larger than the Blake operation and employed eight to twenty men depending on the seasonal demand. The company could ship up to ten railroad cars of wet sand a day but averaged between five and six. Production was reduced in

winter because the wet sand would freeze during shipping. During one of the depression years, only forty-one railroad cars of sand were removed from the pit as compared to nearly 1200 cars shipped out in other years.

The Langworthy Silica Company sold only wet sand until the late 1930s. Then, at the urging of John Deere officials, they began to sell dry sand. The tractor company wanted to avoid the need to stockpile sand for the winter months. At that time, a small dryer was added to the mine operation, and in 1940, a larger dryer was purchased to meet the heavy demand. In the early 1940s, wet sand was selling for 80¢ per ton. The going rate for dry sand was \$1.75 per ton.

Much of the sand taken from the Langworthy mine was used as coring or molding sand in foundries. The sand was mixed with a core oil which held the sand in the desired shape. This was then placed in the oven and cooked to make it hard. The molten iron or steel was poured into the mold or around the sand and left to harden. After the iron had hardened, a hammer blow was usually sufficient to break the mold. The hardened steel in its desired form was then machined to remove the roughness caused by the sand.

Some of the businesses that used the Langworthy Silica Company sand for coring purposes were John Deere Waterloo Tractor Works and Oliver (now White) in Charles City. Another use of the silica sand was for plaster in houses since the fine crystals produced a very smooth

finish. The Des Moines Fuel and Supply Company used the silica for this purpose. Other uses were marble cutting and polishing.

In 1940, after experiencing over twenty years of successful operations, the pit was shut down for a short time. Financial difficulties befell the company when officials could not pay their debts and faced foreclosure by several banks. A blow came in 1941 when the mine's twelve pit employees asked for a wage increase. Since wage and price controls were then in effect, Harvey Lange went before an appeals board. He requested a price and wage increase because wages were nearly seventy percent of the cost of operation. The board allowed only fifty percent of the requested increases. Still dissatisfied, the men quit and moved across the river to work at a gravel pit just opened by the Burlington Railroad. Since the gravel pit was a new operation, no wage controls limited the wage level.

Following the wage dispute, the Langworthy mine was inactive for several years. In the meantime, the John Deere Tractor Works purchased river silica from Concrete Materials (also of Waterloo) for use in the foundry as coring sand. At the urging of John Deere officials the Concrete Materials Company leased the Clayton pit and, in 1945, started the process of dismantling and salvaging the old equipment. The company decided to discontinue strip mining and initiate the room and pillar method of underground mining. Instead of removing the rocky



Charlie Blake, framed by the mine pit.

limestone overlay (which had become an extremely expensive process), Concrete Materials began to dig into the bluff to mine the sand. In 1959, Concrete Materials was purchased by Martin-Marietta Corporation.

In the twenty-three years that the mining process has been underground, the cave has grown to the size of fifty acres. The two main roads into the hill are now three-eighths of a mile long. The network of streets extends one-fourth of a mile both up and down the river. The room and pillar method used in the sand mine is similar to that used in coal mines. The rooms are forty feet square and fifty feet apart; every fifty feet the rooms are joined by cross rooms. For every forty square feet of sand removed there is a fifty foot square pillar left intact. Some rooms are

fifty feet high and others are slightly higher. A fifteen foot layer of sandstone is maintained overhead to support the limestone layers above, so no other means of internal support is necessary.

After the sand is blasted loose, it is carried away by trucks to one of the larger rooms. Then it is taken to a jaw-crusher—a series of three roller crushers. After the sand is crushed, a conveyor belt carries it out of the cave. Outside, the sand is screened and crushed alternately until it can fit through a twenty-eight mesh screen (slightly more coarse than a regular window screen). After screening, the sand is put through a twenty horsepower fan. As the fan carries the sand through a series of sieves, the sand falls into one of three hoppers.

Throughout the history of the mining operations, Clayton sand has been shipped all over the world. Eighty-five percent of the sand shipped out is used as foundry or industrial sand. The two main purchasers are John Deere Waterloo Tractor Works and John Deere Dubuque Tractor Works. Silica sand is also used in sand-blasting buildings, bridges, and railroad cars. Ten percent of the mine's shipments go out in bags and the remainder is shipped in bulk. The most common grade shipped from Clayton is #63 which is one of the medium size grades. One type of sand found in the mine was so fine that it required a new classification, the "C" special which stands for "Clayton Special."

About 130,000 tons of silica sand are removed yearly from the mine. At this rate and working outward in all directions, the mining could continue for fifty years before reaching the town of Clay-

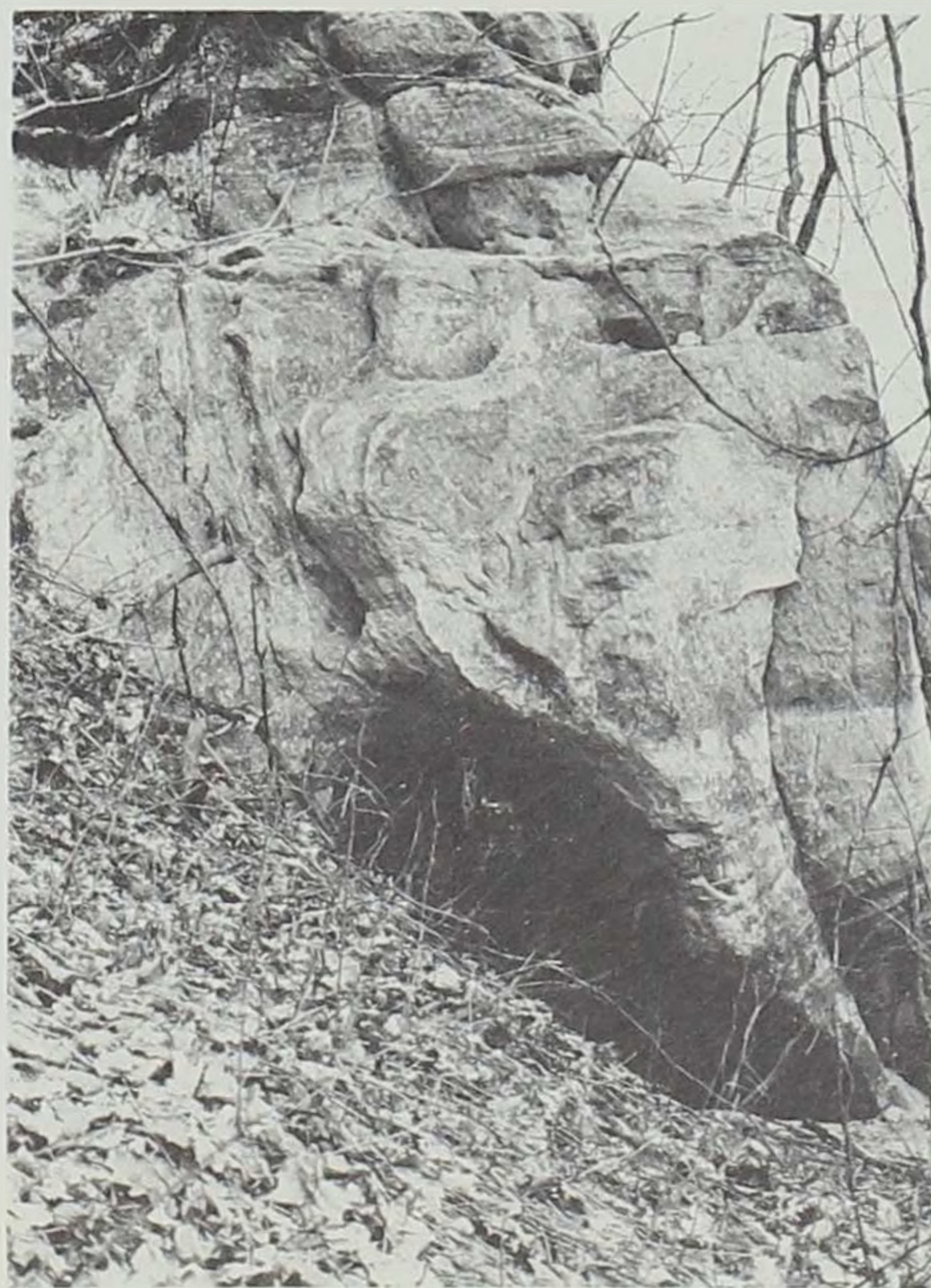
ton. Silica sand is extracted in other parts of the Middle West as well. The two largest operations are located at Festus, Missouri, and Ottawa, Illinois. The Ottawa operation uses the open pit method and is the largest producing silica sand plant in the United States. The largest producing silica mine is at Festus, Missouri, with the Clayton mine following closely in size.

During the early 1960s, Clayton mine officials faced a new situation, unrelated to mining. At that time, people throughout the United States were intensely concerned about the possibility of a nuclear bomb attack. The federal government responded by designating certain areas as civil defense shelters. The Clayton Mine was selected as a shelter site and ten railroad cars and ten semi-trailers of food stuffs were placed in the mine to be used in the event of an attack. The cave has a capacity of 44,000 persons whereas the entire population of Clayton County is only 18,000. The story is commonly told that since there is only one road to the mine, people were to drive to the cave, park their car, and enter the shelter. The next person would push the first car into the river and park in its place. The civil defense director for Clayton County, John Miller, admits that he does not know how that many people would ever get to the mine.

In the many years of mining at the present site there have only been two mine fatalities. Both unfortunate incidents occurred in 1936 when the pit was operated by the Langworthy Silica Company. George P. Yohe, the former Clayton banker, was killed when a cable pulling a dragline snagged and then freed itself,

causing the line to whip back and forth. The cable struck Yohe across the chest and threw him against the limestone layers atop the sandstone. The second fatality occurred only two weeks later when George Tooner was dragging his shovel along the top of the 125-foot cliff; he tripped on his shovel and fell off the cliff.

The present mine safety regulations are quite stringent. The mine is inspected four times a year by the United States Bureau of Mines, and visitors are not permitted into the mine. Workers are given metal tags when they enter the mine and all tags must be accounted for at the end of the day. Only diesel trucks are allowed in the mine, and they must be equipped with special mechanisms to keep carbon monoxide emissions at a



The entrance to the rooms which were discovered in the face of the bluff.

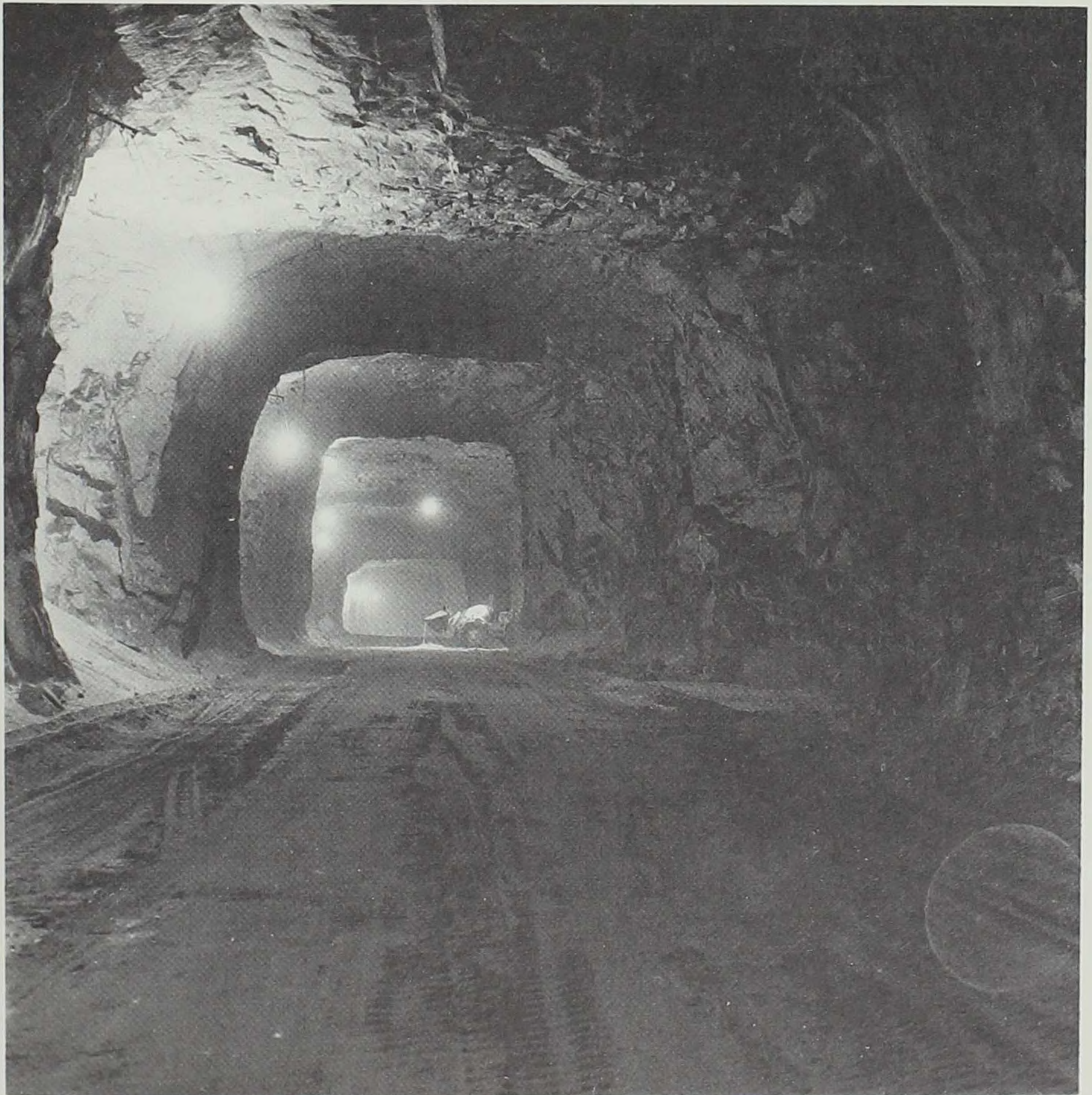
minimum. Silicosis, a disease similar to coal miner's Black Lung, is an occupational hazard for the people who work continuously with silica. The accumulation of dust in the lungs impairs the miners' ability to breathe. As a precaution, employees must undergo physical examinations twice a year. Water is also sprayed on the sand in the crushing and screening process to keep dust at a minimum. Six large fans aid in circulating the air in the mine, but in sections where dust accumulates respirators are worn. The air turnover is so efficient that when it is foggy outside, the mine becomes foggy as well. In the old pit operations these precautions were not taken, and many miners developed the disease. Charlie Blake, in fact, died from silicosis.

Today, the people at Martin-Marietta refer to the Clayton operation as their million dollar mine. Company officials estimate that the sand deposits are unlimited, and the potential for future demand of the product is excellent. The Clayton silica sand deposit is only one of hundreds of mineral beds that lie beneath the surface of the Hawkeye State. Although traditionally known as an agricultural state, Iowa's underground resources have played an important role in the state's economic development. The major mining activity has been coal mining, but limestone and gypsum are also mined in sizeable quantities. In fact, Iowa mine officials state that every county has some form of mining activity. The overall effect has been to provide diversity and

prosperity to Iowa's economic life. Amid the diversified activities, the Clayton operation is the longest continuing mining industry in the state. □



Harvey Lange



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