



# TEACHER'S GUIDE

History · Science · Art ·  
Activities · Programs



[WWW.SLOSSFURNACES.COM](http://WWW.SLOSSFURNACES.COM)

# ABOUT THIS GUIDE

Thank you for your interest in Sloss Furnaces Education. This guide aids teachers and other educators in the task of teaching the amazing history, science, technology, and art encompassed in Sloss Furnaces National Historic Landmark. As one of our most important purposes, education plays a huge role in the life of Sloss Furnaces, and we could not succeed without teachers and educators like you.

You will find in this guide information on the topics of education Sloss Furnaces covers, as well as photos, activities, and detailed descriptions of the programs we offer.



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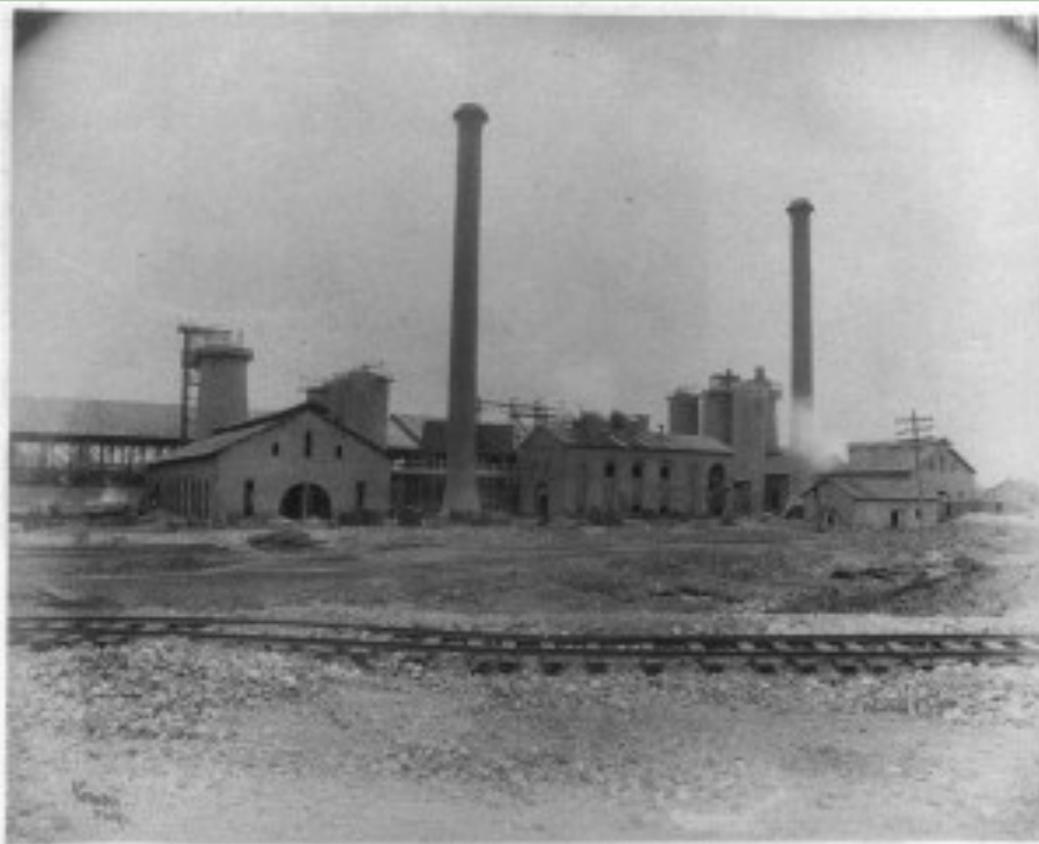
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The original Sloss Furnaces before they began the modernization process in the early 1900s.

# THE RISE OF BIRMINGHAM AND ITS IRON AND STEEL INDUSTRY

The rise of the Birmingham District directly connects to the rise of the iron and steel industry—one could not have happened without the other. The drive to create a city in the heart of the Jones Valley Mineral District stemmed from a larger movement happening all over the South. The idea of a New South based on industry became lodged in the minds of Southern businessmen and promoters as well as Northern industrialists and opportunists. Many of the large cities in the South (Atlanta, Mobile, Nashville, Charleston, etc.) rebuilt themselves in the vein of industry after the devastation of the Civil War. Birmingham sought to do the same, however they had to start from scratch.

## Discussion Questions:

Do you think it would be easier to build an industrial city from scratch, or change an existing city to accommodate industry?

Why?

What problems do you think might happen when trying to build an industrial city from scratch? How would you fix or prevent them from happening?

Railroads were very important to Birmingham's and other cities' industries. How do you think railroads helped in creating and helping industry?

On December 20, 1870, a group of promoters known as the Elyton Land Company (named after the largest town in Jefferson County at that time) set out to build a new city based on industry. They chose Jones



Valley because it contains all three ingredients needed to make iron (coal, limestone, and iron ore) within a thirty-mile radius. Unfortunately, the company became locked in a constant struggle to remain financially stable. With backing from the Louisville and Nashville Railroad, though, Col. James Withers Sloss raised the funds just in time to keep the Elyton Land Company from declaring bankruptcy in 1871.

Elyton Land Company building in early Birmingham

# THE RISE OF BIRMINGHAM AND ITS IRON AND STEEL INDUSTRY

In that same year, the first lot sold in Birmingham (named after the great industrial center in England) located on the corner of First Avenue and Nineteenth Street. Within two years the city had grown so much that

James Powell (the first president of the Elyton Land Company) described it as “this magic little city of ours”, forever cementing the nickname “The Magic City”.

Led by Henry DeBardeleben and T. T. Hillman, the Alice Furnace went into blast in 1880, the first to do so in Birmingham. By 1890, the Birmingham District had 28 furnaces in blast.

The state of Alabama mirrored this growth pattern. In 1880, the state produced 68,919 tons of pig iron. Just ten years later in 1890, Alabama production grew to 816,911 tons of iron. These numbers continued to grow until 1950 when the state finally saw a drop off in amount of pig iron produced.

## Discussion Questions:

What kinds of things do you think were made out of iron in the early 1900s? What kinds of things are made out of iron today?

What do you think might have caused the decline of pig iron production in Birmingham and Alabama in 1950? What would you do to stop the decline?

## POSSIBLE ACTIVITIES:

- Design an industrial city. Where would the railroads go? Is it on a river or other body of water? What kinds of industry are in your city? Where are the schools, churches, homes, and grocery stores going to be? What is your city’s name?
- Draw an advertisement for your city. How are you going to convince people to live, work, and invest money in your city?

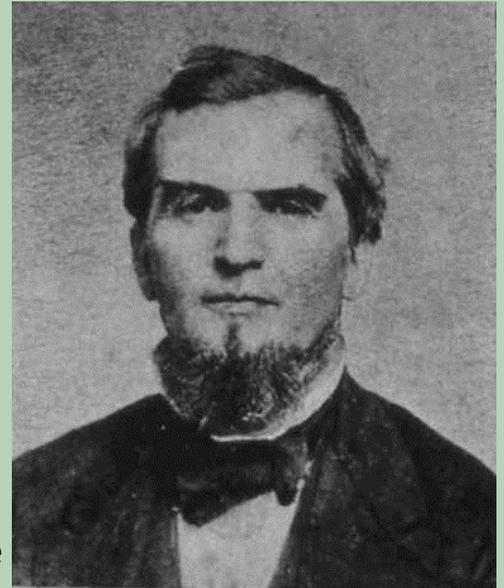


# COL. JAMES WITHERS SLOSS

## AND HIS FURNACES

Born of Scotch-Irish descent in Mooresville, Alabama, James W. Sloss (1820-1890) eventually evolved into one of the wealthiest merchant and plantation owners in the state.

In the early 1860s, realizing the need for the expansion of southern rail lines, Sloss became active in railroad construction. During the post-Civil War period, Sloss not only promoted the expansion of southern rail lines, but became one of the chief proponents of Alabama's postwar industrial development, most notably the area around present day Birmingham. As one local newspaper stated years later, "His influence will be found connected with every important industrial and commercial enterprise in the State during the latter half of the nineteenth century."



Soon after DeBardleben and Hillman built the Alice Furnace, they convinced Sloss to build his own furnaces and create the Sloss Furnace Company in 1881. The first of two original furnaces went into blast in 1882, the second to do so in 1883.

In 1899, the Sloss Furnace Company merged with several other companies to form the Sloss-Sheffield Steel and Iron Company more than doubling the company's size. Sloss-Sheffield now produced the second largest amount of pig iron in Birmingham. Not until the late 1920s did the furnaces see improvement. They rebuilt the furnaces bigger and better than before. Now they could produce 400 tons of iron a day each, twice as much as before. They continued to modernize into the 1930s and even some in the 1940s, but just like the city and the state around them Sloss' production began to slow by 1950.

### POSSIBLE ACTIVITY:

- Have the students pick one type of industry or industry-related business to own (try to get them to not all pick the same type). Have them find another student in the class to merge companies with, or team-up. Have them write down reasons why they feel these two companies will be more successful together as well as some obstacles they might face together that wouldn't happen if they were alone.

# THE DECLINE OF IRON AND STEEL IN BIRMINGHAM AND AT SLOSS FURNACES

The iron industry in Birmingham went through several rough periods of time. The recession of 1873 nearly killed the still young city. The recession of 1887 nearly put an end to the growth of iron. The Great Depression in 1929 hit Birmingham so hard the city was called “The Hardest Hit City in the Country”. Through it all, however, Birmingham and its iron industry persevered. Even as production began to decline in the 1950s, Birmingham still boasted large amounts of iron production. It wasn’t until the 1960s when things really started looking bad for Birmingham’s iron industry. Several factors played a part in the decline of Birmingham’s iron industry: new environmental pollution regulations, the use of scrap iron instead of pig iron, the importation of cheaper foreign iron, out-of-date furnaces that needed costly improvements, but most importantly plastic became a more viable resource to use in place of iron. The most common use for Sloss’ and other iron furnaces pig iron in Birmingham was in cast iron pipes.

Once plastic pipes replaced cast iron in popularity, Sloss lost their best customer.

With this decline a similar decline in industrial jobs came as well. In 1930 68% of Birmingham’s jobs were in

blast furnaces, steel mills, foundries, and fabricating plants. By 1979 that number had dropped to 5% or just 33,000 of the 645,900 jobs in the Birmingham area in that kind of industry. Today, very little remains of Birmingham’s once powerful iron and steel industry.

Sloss finally shut its doors completely in 1971 after almost 90 straight years of operation. Experiencing the same issues that had plagued the rest of the city’s industrial businesses, it was time to call it quits. By this point in its history, the site was owned and run by the Jim Walters Corporation who recognized the historic aspect of the site and donated the furnaces to the City of Birmingham.

## Discussion Questions:

What are some other types of technology that are now outdated? Is there anything that is not used anymore, but played an important part in your life? How do you still remember those things?

## POSSIBLE ACTIVITY:

- Have the class put together a time capsule of things that are important to their lives right now. Have them explain why those things are important and worth saving.

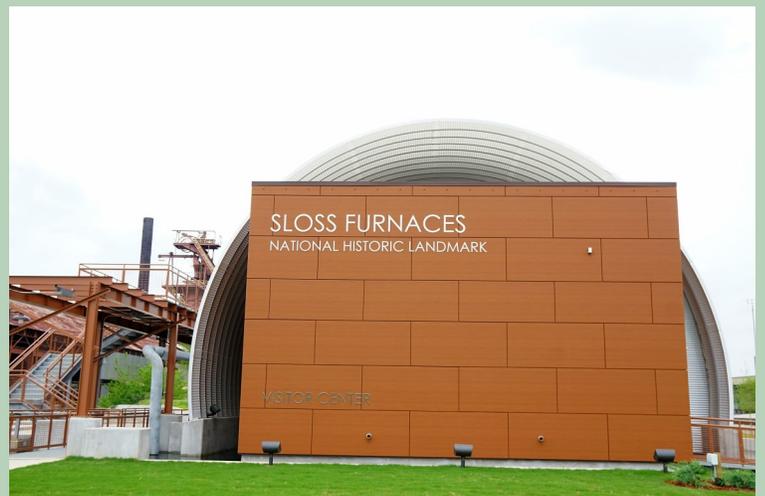
# SLOSS FURNACES NATIONAL HISTORIC LANDMARK

Following years of neglect and vandalism, a group of concerned citizens formed the Sloss Furnace Association to save the site. In the summer of 1976, with the financial backing of the Birmingham City Council and the National Park Service, the Historic American Engineering Record (HAER) conducted a detailed survey of the Sloss Furnace property, to assess its historical significance and prepare a permanent architectural record. In 1977, the city of Birmingham designated \$3 for refurbishing the furnaces and turning them into an industrial museum.

On Labor Day weekend, 1983, Sloss opened its gates to the public as a museum of history and industry. Yet Sloss is more than just a museum. It is a unique urban center, a quiet place near the heart of the city, where friends can



meet for lunch or enjoy a walk. Sloss is also a performing arts center. In the giant East Cast Shed, where molten iron was once cast, a dramatic stage hosts symphonies and jazz bands, dancers and musicians, and also weddings and parties. Iron still flows from the West Cast Shed where the internationally recognized Metal Arts Program is housed.

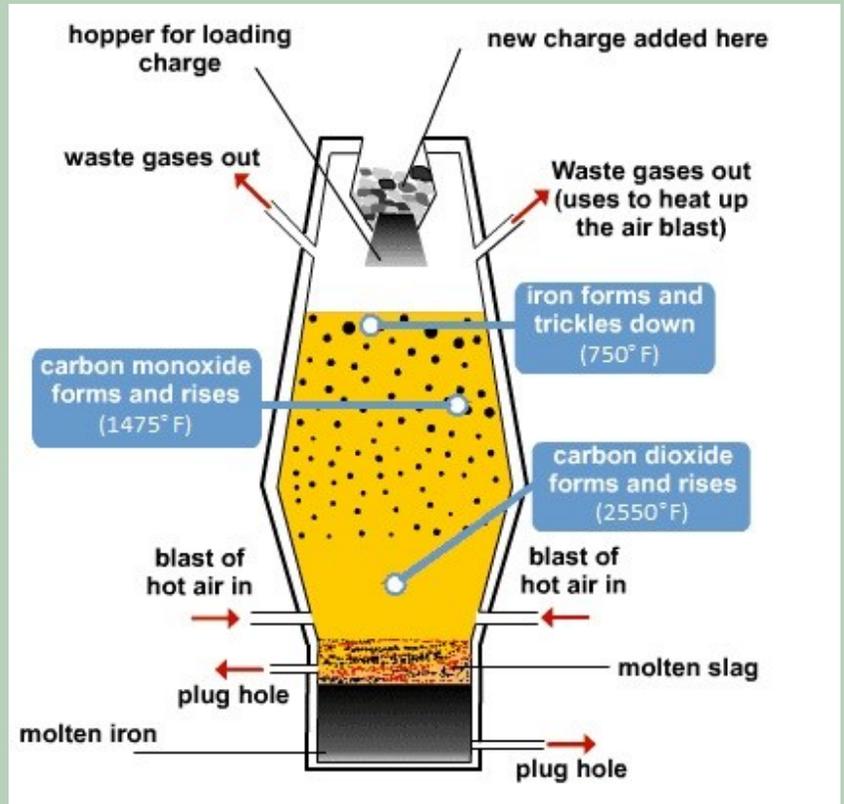


# SLOSS FURNACES HISTORY TIMELINE

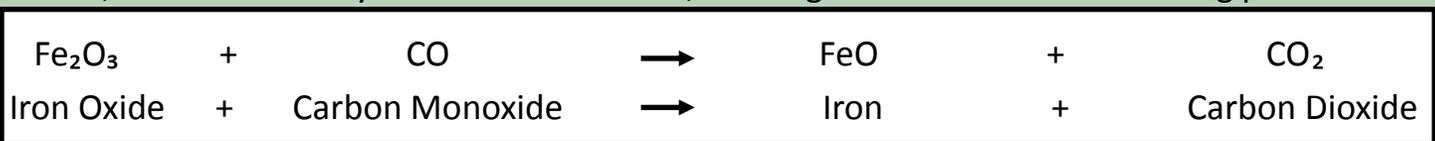
<b><u>1881-1883</u></b>	The Sloss Furnace Company organized and established by Col. James Withers Sloss. The first furnace blown in on April 12, 1882, followed by the second furnace approximately one year later.
<b><u>1886-1887</u></b>	The company sold to John W. Johnston, president of the Georgia Pacific Railroad, and Joseph F. Johnston, president of the Alabama National Bank.
<b><u>1891</u></b>	Company changed to the Sloss Iron and Steel Company. Sloss began using convict labor only in its coal mines, and continued the practice until it was legally abolished in 1929.
<b><u>1894</u></b>	Sloss iron exported for the first time; 100 tons shipped to Liverpool via the port of New Orleans.
<b><u>1898-1899</u></b>	Sloss bought out twelve smaller companies and in the process acquired three blast furnaces in the Florence-Sheffield District, coal lands in Walker County, and ore lands in Franklin County. The company reorganized as the Sloss-Sheffield Steel and Iron Company, incorporated in New Jersey in 1899.
<b><u>1902-1919</u></b>	City Furnaces and North Birmingham Furnaces rebuilt, new blowing engine house built (still standing), Rust boilers built (still standing), additional stoves built.
<b><u>1918-1920</u></b>	A modern coke by-products plant built in North Birmingham. 1380 beehive coke ovens replaced by 120 Semet-Solvey and 30 Koppers by products ovens.
<b><u>1923-1924</u></b>	Sloss acquired the Sheffield Iron Corporation, with one furnace in Sheffield, and the Alabama Company, with two furnaces at Gadsden, and two at Ironaton, near Talladega.
<b><u>1926-1928</u></b>	Sloss closed all its north Alabama furnaces, and concentrated efforts on the two City Furnaces and the two North Birmingham Furnaces. The City Furnaces totally rebuilt, doubling their capacity, and the North Birmingham Furnaces improved. A pig casting machine from Gadsden installed at North Birmingham.
<b><u>1931</u></b>	Pig casting machine installed at the City Furnaces.
<b><u>Late 1940s</u></b>	Slag granulators installed.
<b><u>1949-1951</u></b>	Turbo blowers installed, replacing the reciprocating steam blowing engines.
<b><u>1952</u></b>	Sloss-Sheffield Steel and Iron Co. merged with U.S. Pipe Corporation.
<b><u>1952-1958</u></b>	The capacity of the North Birmingham coke works doubled.
<b><u>Late 50s-60s</u></b>	North Birmingham Furnaces dismantled. Sloss began importing ores and discontinued mining operations on Red Mountain and at Russellville.
<b><u>1969</u></b>	The Jim Walter Corporation acquired control of U.S. Pipe.
<b><u>1971</u></b>	Sloss City Furnaces closed due to technological obsolescence, declining market for pig iron, and high cost of installing pollution control equipment. Furnace site donated to the Alabama State Fair Authority.
<b><u>1974</u></b>	Sloss Furnaces entered into the National Register of Historic Places. Bonds issued to convert the furnaces into an industrial museum.
<b><u>1981</u></b>	Sloss Furnaces designated as a National Historic Landmark by the United States Department of the Interior.
<b><u>1983</u></b>	Labor Day, . September 5th, Sloss Furnaces National Historic Landmark opened to the public.

# THE SCIENCE BEHIND SLOSS FURNACES

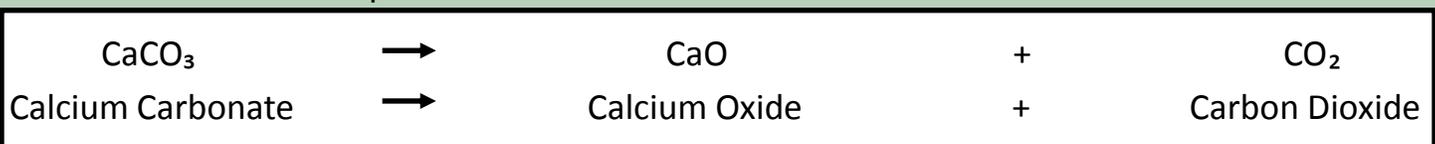
The blast furnace is the core of the iron-making operation. Within the furnace iron ore, flux (limestone, dolomite, or a combination of the two), coke (processed coal), and hot air combine to produce pure molten iron and two waste products: molten slag and exhaust gas. The slag mainly consists of the limestone mixed with the impurities of the iron (namely phosphorous, sulphur, and silica). The gas is a mixture of various gases including carbon monoxide, carbon dioxide, and nitrogen.



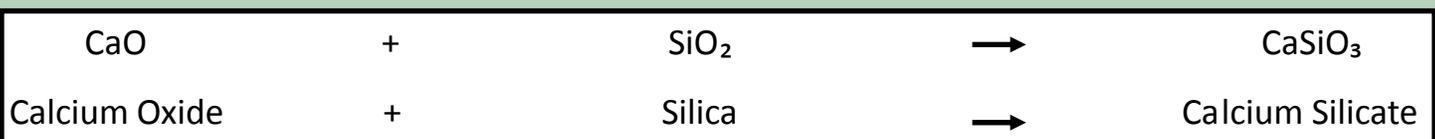
The blast furnace worked 24 hours a day, 7 days a week, so it was continually being charged with raw materials and drained of its molten products. New materials were added at the same rate at which iron and slag were produced. Iron ore, flux, and coke were charged into the top, through a stock channel just six feet above the blast. Hot air was blown into the bottom through openings called tuyères (pronounced “tweers”). The hot air fueled the burning coke which released both carbon monoxide  $C + O_2 \rightarrow CO$ , and an extreme amount of heat (over 2000 degrees Fahrenheit) which swept upward, heating the slowly descending stock. The carbon monoxide, hungry for oxygen atoms, drew them away from the molten ore, forming carbon dioxide and freeing pure iron:



The furnace also decomposes the limestone into calcium oxide:

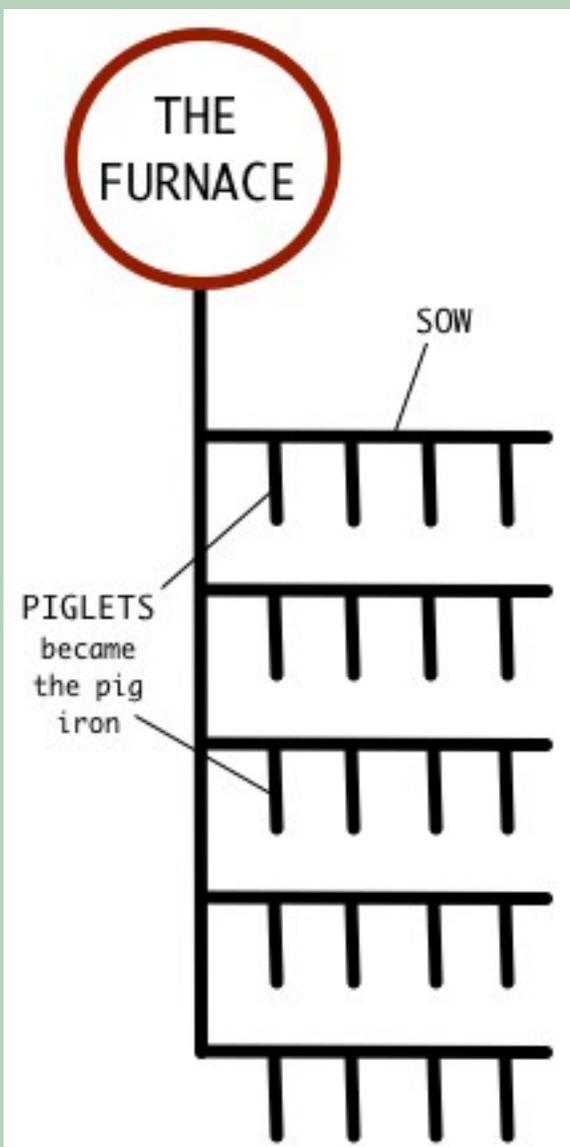


The calcium oxide then absorbs impurities such as silica to make slag:



# WHY'S IT CALLED PIG IRON?

Pig iron was made by melting iron ore in furnaces fired with coke (coal processed to produce extreme heat) and vast quantities of heated air. Molten iron separated from its ore's impurities and sank to the bottom of the furnace. The lighter waste material, combining with molten limestone, formed slag which floated above the iron. While slag was tapped every two hours, the liquid iron was tapped every four hours and run into the cast shed. Prior to the exclusive use of the pig casting machine, molten iron flowed down hand-formed sand channels into small sand molds. The resulting shape resembled piglets suckling the sow, hence the name "pig iron." This process was dangerous and difficult as men worked alongside and even on top of molten iron and would have to carry the bars by hand to the other end of the casting shed. Tough as it was, though, they needed the work and with their regular pay schedule were able to provide a stable financial environment for their families. Without these workers and their sacrifices, Birmingham would never have survived.



## POSSIBLE ACTIVITY:

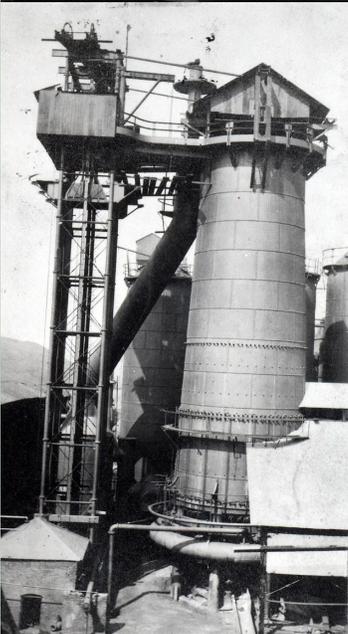
- Have the students draw or describe their normal day. Then have them draw or describe what they think a normal day would be for a worker working at a furnace. Discuss with them the differences and any similarities between the two.

Example of molds dug into the ground to make pig iron.



# THE TECHNOLOGY OF SLOSS FURNACES

As Sloss Furnaces began to modernize in the early 1900s, several innovations to the iron-making process were created. Many of these helped make the jobs easier and save the company money. Though one of the most important results from this new technology was that it made the jobs safer for the men. In the late 1920s, the Skip Hoist system was implemented. This system brought up and loaded the ingredients into the top of the furnace. This kept men from having to shovel in ingredients by hand, exposing them to the extreme heat and poisonous gases in the furnace. In 1931, Sloss adopted the Pig Casting Machine and Ladle Car which kept men from having to work alongside and on top of molten iron. Now pig iron was created almost entirely by machines, with men rarely ever having to touch or work directly around the iron. The main two men behind these innovations were Edward Uehling and James Pickering Dovel. Both employees at Sloss at one time and prolific engineers and inventors, they changed the way the world made iron through their ideas.

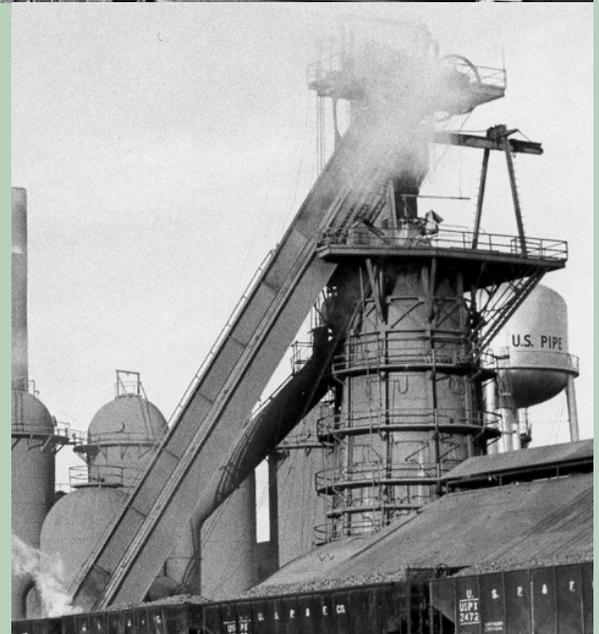


Above left: Ladle car brought in during 1931.

Above Right: Pig Casting Machine adopted in 1931.

Lower Left: Pre-1920s furnace at Sloss using the Vertical Hoist system.

Lower Right: Post-1920s furnace at Sloss employing the Skip Hoist system.



# METAL ARTS AT SLOSS FURNACES



Today, iron is still being poured at Sloss Furnaces. We have several artists-in-residence at Sloss constantly pouring all sorts of metals, creating art, and teaching classes. Sloss Metal Arts offers Workshop Weekend classes on everything from cast iron sculpture to creative welding. They also have a monthly Bowl-O-Rama where the public is invited to come to Sloss and design a bowl made of cast iron. The metal arts program

also runs a Summer Youth Internship program that allows young people to learn the craft of making iron and other metals into art.

The National Conference on Contemporary Cast Iron Art & Practices is another important aspect of Sloss Metal Arts. Every two years Sloss Furnaces hosts this prestigious event. Over 400 artists from all over the world come to Sloss to showcase their knowledge and skills, as well as learn from the top experts in the field.



Lastly, the metal arts program opens its doors to school groups interested in learning about iron-making and iron art. During the iron pour experience field trip, students learn about the history of making iron and then watch iron being poured right in front of them. They make a piece of iron art that they take home so they can always remember their trip to Sloss Furnaces.

# EDUCATION PROGRAMS—FIELD TRIPS

We offer two different types of field trips for students:

## Guided Tour

The tour consists of an educational film and touring the site to learn about the raw ingredients, how the furnace worked, the importance of Sloss Furnaces in Birmingham's iron and steel industry and what it was like to be a worker during production. Students experience the site by visiting the underground stock tunnel where the ingredients were loaded in the blast furnace, the blower engine room that dates back to the 1890s, and the base of the blast furnace to see where the molten hot iron flowed for 90 years.

There is a 15 person minimum.

Approximately 1 hour.

\$5.00 per person (Teachers are free)

## Iron Pour Experience

In addition to the tour mentioned above, students make their very own piece of cast iron art. Students etch their own design in a sand mold, see the film and tour the site. They complete their visit in our metal arts foundry to watch a live iron pour and see the molten hot iron flow into the mold they designed. Students take their cast iron art home the same day. A unique experience, allowing students to experience the sights, sounds and smells of iron casting.

Your school may be scheduled with additional groups.

Approximately 2 hours.

This field trip is only offered on Wednesday mornings.

Closed-toed shoes and long pants are required.

\$17.00 per student & \$5.00 per chaperone\* (Teachers are free)

\*If chaperones would like to make cast-iron art, the cost is \$17.00 per chaperone.

\*For these kinds of trips, the number of chaperones must be limited per group. Contact our Education Coordinator for more information and inquires.

If you would like to schedule a field trip, please contact our Education Coordinator Ty Malugani at (205) 254-2254 or at [tyler.malugani@birminghamal.gov](mailto:tyler.malugani@birminghamal.gov).

In the event of inclement weather your field trip will be rescheduled.

# EDUCATION PROGRAMS—IN THE CLASSROOM

We can also bring Sloss Education to your classroom! Our Education Coordinator, Ty Malugani, can come out to your school to teach about Sloss Furnaces, its history, science, technology, workers, or any other aspect of its storied past. We can tailor the lessons to what your class is studying at the time, or just tell the general story and workings of the furnaces. We can also bring some primary-source materials and artifacts so that your students can still get a feel of what it took to run Sloss.

This experience is free.

If you are interested in bringing the magic of Sloss Furnaces to your classroom, please contact our Education Coordinator, Ty Malugani, at either 205-254-2254 or at [tyler.malugani@birminghamal.gov](mailto:tyler.malugani@birminghamal.gov).



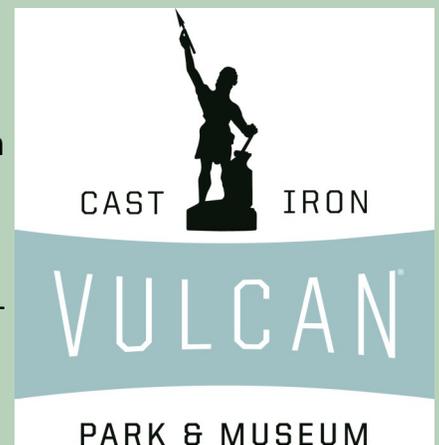
## EDUCATION PARTNERS

If your group is interested in expanding the education past Sloss Furnaces, our field trips pair well with other cultural institutions around Birmingham. The two main partnerships that we have are with Red Mountain Park and Vulcan Park & Museum.

**Red Mountain Park** offers great activities and educational programs relating to the mining that occurred in Birmingham. This pairs well with our trips because students can see where the ingredients to make iron come from and how they got to Sloss Furnaces. They have several walking and hiking trails, zip lines, archaeological and environmental science programs, and much more in their amazing park. Visit their website [www.redmountainpark.org](http://www.redmountainpark.org) for more information!

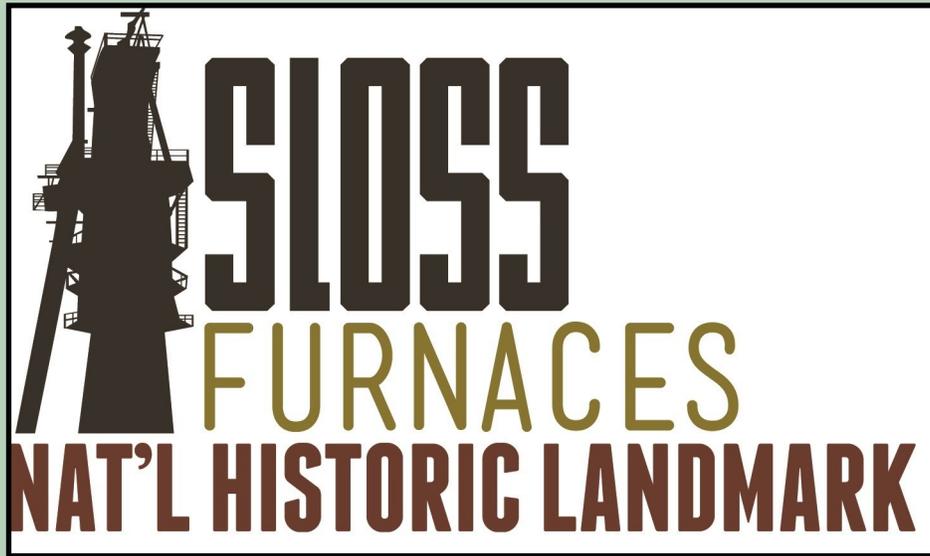


**Vulcan Park & Museum** offers a wonderful view of downtown Birmingham, but it also gives students a broader scope into Birmingham's history. While Vulcan also has displays and information on mining and iron-making, it also tells the story of how Birmingham used that iron to build a city. It also helps that Vulcan was cast in Birmingham, using Birmingham iron so it is a natural transition from Sloss Furnaces. Visit their website [www.visitvulcan.com](http://www.visitvulcan.com) for more information!



These two places, along with Sloss, creates a natural flow in the story of iron in Birmingham. The process starts with mining at Red Mountain, turns into pig iron at Sloss Furnaces, and creates products at Vulcan Park & Museum.

While there are many great museums, parks, and other cultural institutions in Birmingham, these are the two that we are connected to most. We recommend seeing all the institutions in Birmingham as they all have a wonderful story to tell and add to the overall education of Birmingham's past and present. Birmingham truly is lucky to have so many great institutions in one place.



We hope to see you soon!

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