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The Pioneer Iron Industry In Western Pennsylvania

By George W. Hughes

It has been said that iron ore is more important in the development of a nation than wheat because there are substitutes for wheat, but there is none for iron ore; and without iron ore we can have neither iron nor steel. The story of steel is the story of the industrial development of this country. Steel is the most universally useful and important product of the world.

The discovery of iron ore in America, briefly stated, was the result of a romance between Queen of England and Sir Walter Raleigh. About 90 years after Columbus discovered America, Queen Elizabeth fell in love with Sir Walter Raleigh and gave him a grant of land in America in what is now the states of Virginia and North Carolina. Soon afterward Raleigh sent men over to explore his new possessions. When they returned to England, they reported having found iron ore in great abundance. This was the first discovery of iron ore in America. Soon a company was formed, and men were sent over here to build an iron works on the New Continent. A site on the James River in Virginia, about 60 miles above the present town of Jamestown was selected. They erected a small village and built a forge, and first made iron in 1620. Two years later there was an Indian uprising, and all the people were killed with the exception of one boy. The village was burned and the iron works destroyed. It was never rebuilt. The cinder that marks the location of the furnace and the old ore pits, where ore to supply the furnace was dug, is all that remains today to commemorate the story of the first martyrs to the iron and steel industry in America.

In 1716, the iron industry in Pennsylvania had its humble birth in the forests of Berks county. Two men, Thos. Rutter and Thos. Potts, built the Pool Bloomery forge on a creek near the present town of Pottstown. Four years later they erected a blast furnace and named it "Colebrookdale".

*Read before the Westmoreland-Fayette County Branch of The Historical Society of Western Pennsylvania.

The capacity of this furnace was, from two to three tons of iron a day. The most of the iron was made into stoves and sold to colonists. Recently one of the stove plates was dug up and found to be in a good state of preservation. It bore the name "Colebrookdale" and "Thos Rutter." The plate is now in the Pennsylvania Museum in Philadelphia.

One of the oldest furnaces in Pennsylvania worthy of note was the "Durham" furnace at Reiglesville, Pennsylvania, on the Delaware river, built in 1727. To transport the iron down the river to Philadelphia, long flat bottom boats that carried 15 tons were used. These were the boats used by General Washington in his historic crossing of the Delaware the night he surprised the English and Hessians at Trenton. The original stack was replaced by three other stacks which were operated until 1912, making almost two centuries of continuous iron making on the same location. So rapidly did the iron industry develop that by the time war with England broke out in 1775, the Colonists were able to make their own war material with which they defeated Britain in the war for Independence. The first iron west of the Allegheny Mountains was made in Fayette County. F. H. Oliphant of Uniontown credits John Hayden with having made the first iron in a blacksmith forge in 1790. Hayden carried a sample of the iron on horseback to Philadelphia, where he interested John Nicholson in a proposition to build a blast furnace at Fairfield, seven miles south of Uniontown, on George's Creek. In the spring of 1789, John Hayden hauled a four-horse load of store goods from Hagerstown, Md., to Brownsville for Jacob Bowman, a merchant, and pleased with the beautiful valleys west of the mountains, decided to settle in "the West" and bought out a settler near what is now Fairchance. Hayden and Nicholson took up a tract of land near the base of Laurel Hill, where Fairchance is now located, and built a little furnace called Fairfield. The enterprise was not a financial success, and, in a few years, the property fell into the hands of F. H. Oliphant's father. It may be set down as a fact that John Hayden made the first iron west of the mountains, but he did not get his furnace into operation until others, profiting by his discovery, built furnaces and began the manufacture of iron.

The earliest official reference to the existence of an iron works in Western Pennsylvania is found in the court records of Fayette County. At the June term of court in 1789, reference is made to a "road view" for a road from the furnace on Jacob's Creek to Kyle's Mill. This is the earliest official reference to any iron works west of the mountains and confirms the statement that the Jacob's Creek furnace was built prior to 1790. Bishop says that the first furnace built in Western Pennsylvania was built by Turnbull, Marmie & Co., of Philadelphia, on Jacob's Creek in Fayette County, about two and a half miles from where it flows into the Youghiogheny River. The furnace was built in 1789 and blown in November first and was known as the "Alliance Iron Works". The firm was composed of Col. John Holker, Wm. Turnbull, and Peter Marmie; the first two were engaged in the iron business in Philadelphia, and Marmie was a Frenchman, who came to America during the Revolutionary War as Private Secretary to Lafayette. He liked the country and remained here after the war. William Turnbull, one of the owners of the Jacob's Creek furnace, had been purchasing agent for the Pennsylvania troops during the Revolution. After the war, the three formed a partnership and started a mercantile establishment at the "Point" near Fort Pitt in Pittsburgh. Marmie managed the business in the West and Turnbull remained in Philadelphia. The marked success the firm met with induced the partners to build a furnace west of the mountains. They made castings required by the settlers such as: stoves, grates, pots, and skillets. On the sixth of January, 1792, Major Craig, Commandant at Pittsburgh, placed an order for four hundred six-pound shot for the garrison at Fort Pitt. It is stated on good authority that this furnace furnished shot for General Anthony Wayne's expedition against the Indians.

For some years the furnace did a large business and was the center of capital and labor for the whole region. It controlled the price of labor for the entire community and gave employment to many men. But the firm failed: for what reason, other than indiscreet management, is not known. The furnace was operated until 1802, when the fires went out and were never relighted. The stack is still standing and, with the exception of one corner that has fall-

en down, is in fair condition. Trees have grown up to a height of from 60 to 80 feet in what was once the casting beds. The writer was at the furnace a short time ago and picked up pieces of charcoal that were made 140 years ago. The property is now owned by the Jacob's Creek Oil Company. The extension of the Pittsburgh & West Virginia Railroad that is now building passes through the property and within three hundred feet of the furnace. There are no "slag dumps" at the furnace as are found at most old furnace locations, because, owing to the crude way in which iron was separated from the cinder, much iron was carried off in the slag and the slag has been hauled away to other furnaces to reclaim the iron it contained. Connected with this furnace is the romantic story of Marmie, the sporting Frenchman, who committed suicide by jumping into the open top of the furnace while in blast, after driving his dogs before him. Broken in spirit and in health by the loss of his fortune, he met the fate of the unfortunate, dying by his own hand. It would be a fine thing if this Society could preserve this Furnace for future generations. Its location is the birthplace of the greatest industry west of the Allegheny Mountains.

Union Furnace, now Dunbar, was built by Col. Isaac Meason, on Dunbar Creek four miles south of Connellsville and was put in blast in March, 1791. It is said that Col. Meason came over with General Braddock thirty-five years before on his disastrous trip to Fort Duquesne. Two years later, Col. Meason, John Gibson, and Moses Dillon formed a company known as Meason, Dillon & Co., and built a much larger furnace on the site of the old one. They also built and operated a foundry in connection with the furnace. The new firm produced large quantities of castings, stoves, pots, and sugar and salt kettles for which they found a ready sale. The following advertisement of their business appeared in the *Pittsburgh Gazette* of April 10, 1794: "Meason, Dillon & Co., have for sale at their furnace on Dunbar Run, Fayette County, three miles from Stewart's Crossing, on the Youghioghenny River, a supply of well assorted castings which they will sell for cash at the reduced price of 35 pounds per ton (\$93.33)." In 1804, Union furnace filled a large order for sugar kettles to be used on the sugar plantations in Louisiana. The works was operated by various

men until 1868, when it passed into the hands of the Yougheny Iron and Coal Company. In 1871, the company was reorganized as the Dunbar Iron Co. and later as the Dunbar Furnace Company. During the late war, the furnace was operated by the American Manganese & Manufacturing Company of Philadelphia. The company failed Nov. 28, 1922, and the property was sold April 28, 1924, and was purchased by the bondholders, who formed the Dunbar Corporation. The original stack was replaced by four other stacks which were operated until 1922, thus making 131 years of continuous iron making on the same site. The furnace was dismantled in 1928, and the work it did in developing this country has passed into history. It is worthy of note that the first fire brick hot blast stoves were erected at Dunbar and the first by-product coke ovens were built at Dunbar. Another of Col. Meason's enterprises was Mount Vernon furnace on Mountz Creek, eight miles from its mouth. It was built of large cut sand stone according to an old advertisement before 1800 and is still standing.

Besides these more important furnaces, there were many others. Laurel furnace on Laurel Run, near Union Furnace, was built by Mockbee and Wurtz, before 1800 and was rebuilt by James Paull on another site. The same firm built Hampton forge to work up the pig metal from Laurel furnace. In 1800 this furnace advertised for sale "Castings, neat, light and tough at \$100.00 per ton; also bar iron nail rods and cut nails at 8 cents per pound." Cool Spring furnace was located on Shut's Run, in North Union Township, Fayette County. The furnace was built by Thompson McKean in 1816 and operated by him until 1842 when it passed to other hands and the fires went out. Wharton furnace was built by Hon. Andrew Stewart in 1837. Its location is a short distance south of the National Pike and just east of the Summit in Wharton Township, Fayette County. This furnace was operated intermittently and changed owners frequently, until 1875, when it was blown out and dismantled. The Oliphant furnace was the last furnace with which F. H. Oliphant was connected. It was located four miles south of Uniontown on the Southwestern Pennsylvania Railroad. This furnace was built by Oliphant after he had disposed of Fairchance and Spring Hill furnaces. He operated the furnace for a number of years, but the enterprise

proved disastrous. Redstone furnace, three miles east of Uniontown, was built in 1800 by Joseph Huston. It was later owned by his nephew, Judge John Huston, and still later by John Snyder. Spring Hill furnace was built in 1805 by Robert Jones and was later owned by Jesse Evans. Mary Ann furnace, nine miles from Uniontown, was built by Richard Lewis in 1800 and in 1818 was bought by Joseph Victor, who was living on the premises and was 90 years old in 1877. Victor rebuilt the furnace and changed the name to Fairview. Lesser furnaces built in Fayette County early in the past century were: Pine Grove, 11 miles from Uniontown, built in 1805; Mount Etna, 1½ miles above Connellsville; Center Furnace, 9 miles from Uniontown, on Dunbar Creek; Fayette Furnace, 12 miles from Connellsville; Little Falls, 12 miles from Uniontown, built by Nathaniel Gibson; St. John's, built by James Paull, 8 miles from Connellsville. There was a forge at Little Falls built in 1809. Findley furnace, 4 miles northeast from Connellsville, was built in 1826.

In 1805 there were four furnaces and six forges in Fayette County. In 1811 there were ten furnaces and eight forges and one furnace for making steel. The steel furnace was located at Bridgeport, near Brownsville, and was owned by Morris Truman & Co. It is said that it made good steel. It will be seen that Fayette County was a great iron center at the close of the eighteenth century. For many years Fayette and Westmoreland Counties almost entirely supplied Pittsburgh, the Ohio, and Mississippi valleys with pig iron, castings, and bar iron. A furnace named Mary Ann was erected very early twenty miles from Uniontown, in Greene County, on the opposite side of Ten Mile Creek from Clarksville. This furnace was abandoned about 1820 and was the only Blast Furnace ever erected in Greene County. Pine Grove Forge was built by Thomas Lewis prior to 1798 and was located on Pine Grove Run, about four miles from Smithfield, in Georges Township, Fayette County. Lewis became involved financially in 1799 and in 1800 the forge and 600 acres of land were sold by the sheriff. It is said that the ore for this forge was carried in sacks on the backs of horses from the places where it was dug to the forge.

There were, too, many mills which made specific products. The first nail factory west of the Alleghenies was

built at Brownsville by Jacob Bowman, about 1798. Wrought nails were made by hand and were produced in large quantities for that time. The first rolling mill of any kind west of the Allegheny Mountains of which we can obtain reliable information is described in "Cramer's Pittsburgh Almanac", issued in 1812, as follows: "Jackson & Updegraff on Cheat River, have in operation a furnace, forge, rolling and slitting mill and nail factory—nails handsome and tough." Hon. James Veech records that its location was in West Virginia on the road from Uniontown to Morgantown and about three miles south of the Pennsylvania state line and eight miles from Morgantown. The first rolling mill erected west of the Alleghenies to puddle iron and roll iron bars was built in 1816 on Redstone Creek, midway between Connellsville and Brownsville, at a place called Middletown, better known as Plumsock, Fayette County. This enterprise was undertaken by Col. Isaac Meason of Union Furnace. It is extremely probable that, at this mill at Plumsock, the first iron was puddled and the first bar iron rolled in America. Careful investigation fails to discover in the United States any rolling mill to roll bar iron from puddled pig iron prior to the enterprise at Plumsock in 1817. Thomas C. Lewis, a native of Wales, had worked in a rolling mill in Wales before coming to this country. Lewis presented the matter to Col. Meason and was engaged by the latter to build a mill and put it in operation. Meason met with considerable success in its operation until 1824 when a heavy flood that year destroyed part of the mill. The machinery was subsequently moved to Brownsville. Christopher Cowan, an Englishman, built the first rolling mill in Pittsburgh in 1812, but this mill did not puddle iron nor roll bar iron. It rolled sheet iron and sheets for nails and spikes. This mill later became known as the Pittsburgh Rolling Mill.

You will notice that nearly all furnaces in the early days had a forge in connection with the furnace. Westmoreland furnace, near Laughlinstown, in Ligonier Valley in Westmoreland County, was built in 1792 by John Probst, who also built a forge. This plant ceased to make iron about 1815. Aug. 1, 1795, George Anshutz became manager of Westmoreland furnace after closing down the furnace at Shadyside. This was the first furnace built in what is now Westmoreland County. At this furnace, grape and

canister shot was made for use in the war of 1812. General Arthur St. Clair built Hermitage furnace, second furnace in Westmoreland County, on Mill Creek, two miles northeast of Ligonier on the road to Johnstown about 1802. The following advertisement appeared in *The Farmers Register*, printed in Greensburg, Nov. 1, 1806. The advertisement had for heading "Hermitage Furnace in Blast" and read as follows: "The subscribers, being appointed by General Arthur St. Clair for the sale of his castings generally and for the Borough of Greensburg exclusively, they will contract with any person for the delivery of castings and stoves, for any number of tons, on good terms. Sample of castings and stoves to be seen at their store in Greensburg any time after the 20th instant." Signed—Henry Weaver & Son. In 1810, the Hermitage furnace passed from General St. Clair and stood idle for some time. In 1816 it was started again by O'Hara & Scully under the management of John Henry Hopkins, afterwards Bishop of Vermont. This is the only instance on record where a furnaceman ever became a Bishop. In 1817 Mr. Hopkins left the furnace a bankrupt and it was never again operated. General St. Clair died a poor man at the age of 84 in a log cabin on Chestnut Ridge and was buried in Greensburg. At one time he was considered a wealthy man but he spent all his money for the cause of the Revolutionary War and died in poverty.

There were five other major furnaces in Westmoreland County. One, Mount Hope furnace, was built about 1810, Donegal Township, Westmoreland County, by Traver & McClurg. Washington Furnace, near Laughlinstown, was built in 1809 by Johnston, McClurg & Co. This furnace was abandoned 1826 and rebuilt in 1848 by John Bell & Co. This furnace was in blast as late as 1859 and was then owned by L. C. Hall.

Ross furnace on Tub Mill Creek, in Fairfield Township, was built in 1815 by Jas. Paull, Jr., Col. J. D. Mathiot, and Isaac Meason, Jr. This furnace was abandoned in 1850. The furnace made pig iron, stoves, sugar kettles, pots, ovens, and skillets. Another furnace was built nearby on Tub Mill Creek, by John Beninger, about 1810. Baldwin furnace on Laurel Run, near Ross furnace, is said to have been built by Henry Baldwin, afterwards Judge of the United States Supreme Court. The early Westmoreland furnaces shipped

pig iron by boats or arks down the Conemaugh and Allegheny rivers to Pittsburgh and from there on the Ohio to Cincinnati and Louisville.

Other furnaces in Westmoreland County were: Mount Pleasant furnace, built in 1810 by Alexander McClurg; operated by a man named Freeman until 1820. Little is known of this furnace. California furnace, built by Col. J. D. Mathiot and S. Cummings about 1852, on Furnace Run, a branch of Loyalhanna Creek. Oak Grove, built in 1854 by Col. John Clifford, near Ligonier. Valley furnace, at Hillsvie, 9 miles south of New Florence, built by L. C. Hall in 1855. Laurel Hill furnace, about 3 miles below Baldwin furnace, on Laurel Run, built in 1846 by Hezekiah Reed. Shade Furnace, built in 1807, was the first furnace built in Somerset County. It was located on Shade Creek. The furnace had a number of owners; it went out in 1858.

The iron industry in Pittsburgh did not have any existence until the nineteenth century. It is worthy of note that in 1792 a blast furnace was built at Shadyside in Pittsburgh and was abandoned two years later because not enough iron ore could be found in the vicinity to keep it in operation. George Anshutz, one of the pioneer manufacturers of iron in this country, migrated to the United States in 1789 from Germany. He located at a place now known as Shadyside, Pittsburgh, where he built a small furnace. It was expected that iron ore could be found in the neighborhood, but investigation developed that very little, if any, ore existed in that vicinity. Iron ore was found on Roaring Run in Armstrong County, from which ore was shipped in arks down the Allegheny River to a point near the furnace and from there it was conveyed by wagons or carts. Some ore was brought by wagons and ox carts from Fort Ligonier and Laughlinstown, but the expense of transporting the ore any distance in those days was too great to justify the operation of the furnace and it closed in 1794. After the abandonment of the Shady Side furnace, Anshutz accepted the management of the Westmoreland furnace, near Laughlinstown, and continued there for about a year, after which he moved to Huntingdon County and, with Judge Gloniger and Mordecai Massey, he built the Huntingdon furnace in 1796; Massey owned the land, Gloniger furnished the money, and Anshutz furnished the skill and ex-

perience. Anshutz remained at this furnace until he retired and he returned to Pittsburgh in 1833, where he died in 1837. Most of the iron produced at these furnaces was made into stoves and grates and sold to the settlers. The ruins of the Shady Side furnace disappeared with the building of the Pennsylvania Railroad in 1851, which was located partly on ground where the furnace stood. In digging the foundation for Alexander Pitcairn's house, part of the cinder bank was exposed.

The Cambria Iron Company was one of the pioneers in the iron and steel business in Western Pennsylvania. The company was organized in 1852 by Dr. Peter Schoenberger for the purpose of operating by lease a number of small charcoal furnaces in the vicinity of Johnstown. At that time the Pennsylvania Railroad terminated at Johnstown. Schoenberger was foresighted enough to see that the railroad would be extended to Pittsburgh and farther west and he immediately planned to build four coke furnaces. In 1853, before the industry got started, the company ran short of funds and failed. New capital was added and a second effort made to start, which also failed. The works were then leased to Daniel J. Morrell and Richard Wood under the firm name of Wood, Morrell & Co. Under the management of Mr. Morrell, the firm prospered and started on the way to prosperity and developed into one of the largest independent steel plants in the country. This plant rolled the rails for the Union Pacific Railroad, the first railroad across the continent. Dr. Schoenberger is credited with having built the "Juniata Iron Works" in Pittsburgh in 1824, which later became the forerunner of the American Steel & Wire Company.

Grant's Hill Works were erected in 1821 by Wm. B. Hays and David Adams where the Court House now stands. The Union Rolling Mill, built in 1819 and owned by Baldwin, Robins, Nickel & Beltzhoover, was the largest and most extensive in the country at that time, and was located in Kensington (pipetown). At that time the furnaces did not supply enough pig iron to supply the rolling mills and foundries and much of the pig iron was brought from the Juniata valley, across the mountains. The pig iron was generally hauled over the mountains in the winter time on sleds.

One of the early pioneers of South Western Pennsylvania, who contributed much to its development and success, was B. F. Jones, Sr., the founder of the Jones & Laughlin Steel Corporation. His ancestors had crossed the Atlantic with William Penn. Jones' father kept a little country tavern, as most people did in those days; and when the son was eighteen he tramped to Pittsburgh and got a job with a canal boat company. The third year he was manager for the company and the fourth year he was a partner in the company. About this time the Pennsylvania railroad was built into Pittsburgh. Young Jones looked far enough ahead to see that the business of the canal would soon be absorbed by the railroad and sold out his interest in the canal boat company and purchased a little rolling mill in Brownsville in 1852. In those days the people of Brownsville were aristocratic and objected to the noise and dirt of the rolling mill. Because of the opposition Mr. Jones met with, he moved his rolling mill to Pittsburgh, and in 1854 Mr. Laughlin, a banker joined him and formed the Jones & Laughlin Company. In 1861, Laughlin & Company built the first of the Eliza furnaces, which was increased to six blast furnaces in later years. The iron made at these furnaces was used at the plant of Jones & Laughlin Company. In 1900, the firm of Jones & Laughlin absorbed the firm of Laughlin & Co., and became the Jones & Laughlin Steel Corporation of today. New furnaces and mills were built, and today the little rolling mill at Brownsville has grown to six blast furnaces in the Eliza group, one at Soho, and five at Woodlawn, with steel mills to work up all the iron they produce. Thus the little rolling mill at Brownsville, 76 years ago, has grown into one of the largest independent steel plants in this country.

It is worthy of note that the ground made historic by Braddock's defeat is the exact location of the Edgar Thompson steel plant of the Carnegie Steel Company. This immense plant consists of eleven blast furnaces and steel works stretching along the Monongahela River for some distance. It has been the admiration of the iron masters of the world. Some of the veteran furnace men of the country served their time at this plant. Among them were Captain Bill Jones, James Gailey, Jas. Scott, and others. It was at one of these furnaces that Capt. Jones

was killed in 1889. After the building of this plant, Andrew Carnegie enters for the first time the story of steel; up to this time Carnegie had made iron but not steel. The first Bessemer steel rails rolled west of the mountains were made at this plant in 1875. At this time steel rails were selling at \$120.00 a ton. This plant revolutionized the steel industry in this country and was the beginning of the immense Carnegie fortune.

The blast furnace at the beginning of the nineteenth century was simple in construction, consisting of a mass of stone work, either built round or square on the outside and barrel shaped on the inside, and lined with sand stone, ranging from twenty-four to forty feet in height and about twenty-four square at the bottom. The furnace was usually built against the side of a hill to avoid the necessity of hoisting the coke, ore, and limestone to the top of the furnace; the stock yard on the hillside was connected to the top of the furnace with a bridge over which the raw materials was delivered to the top of the furnace. The charcoal, ore, and limestone were placed in the furnace in alternate layers and the blast was supplied at the bottom of the furnace through a tuyere. The furnace was always built on a stream large enough to furnish water for an over-shot water wheel which furnished power to force the air into the furnace against one-half to one pound pressure per square inch. The air was compressed by a large double bellows, and a later improvement was the use of wooden cylinders with pistons which alternately received and compressed the air before passing it on to the furnace. The air was pumped into the furnace at the atmospheric temperature, and was known as "Cold Blast". The furnace was generally built in the vicinity of the ore to avoid transportation of the heavy material. Transportation in those days was either by horse or oxen drawn carts or wagons. Wood from the cleared forests furnished the fuel for smelting the ores; and in most parts of Pennsylvania strata of limestone furnished the flux. The molten iron was drawn off at the bottom of the furnace through the "iron notch". When the furnace was ready to tap, a hole was drilled through the iron notch, and the iron was drawn off and ran into sand beds, which had been moulded up preparatory to casting. The name "Pig Iron" was given to the iron,

and the long runner through which the iron flowed into the moulds is still known as the "Sow". The product of these early furnaces was from two to three tons of iron in a day.

Contrast this with the modern blast furnace plants along the Monongahela Valley today. Now great steel stacks tower 100 feet and over in the air, with a miniature double track railroad from the ground to the top of the furnace to carry the ore, coke, and limestone for charging the furnace. The modern furnace uses from 2500 to 3000 tons of ore and fuel every twenty-four hours. The modern blast furnace requires four hot blast stoves to heat the air to 1000 degrees or over before it enters the furnace. A train of ladles carries away the slag from the furnace, and another train of ladles carries the hot metal from the furnace to the Open Hearth furnaces where it is made into steel or to a Pig Machine where the metal is cast into pigs. A boiler plant of from four to six thousand horse power furnishes steam to operate enormous blowing engines or steam turbines to supply air to operate the furnace and power to drive the great generators which furnish electric current to drive the mechanical equipment of the plant. The fuel to supply the boilers is furnished by the waste gases escaping from the top of the furnace after it has done its work smelting the ores. In the early days of iron making the gases escaped into the air and were lost. The product of the blast furnace has increased during the last century from two to three tons of iron a day to 700 and 800 tons, and as much as 1000 tons have been made in twenty-four hours. It now looks as if the blast furnace making 400 or 500 tons of iron a day will soon be consigned to the scrap heap, and the ideal furnace will turn out 1000 tons of iron or more. Notwithstanding all this change in scenery and equipment from the pioneer furnace of a century ago, the same action which took place in the early furnace goes on in the modern giants of today.

The history of the iron industry in Pennsylvania may be divided into three distinct periods; first, from 1720 to 1840 was the era of charcoal practice, when charcoal was the only fuel for smelting ores. It was also the period of stone stacks, cold blast, and water power. The second

period was that in which anthracite coal was used as fuel. Although anthracite was not used as fuel for iron making west of the mountains, it was used to a great extent in the East for about forty years. With the use of anthracite as fuel, came the steam blowing engine and hot-blast stove. The third period was that of coke manufactured from bituminous coal. With this also came the skip hoist, higher temperatures, the Bessemer process for changing pig iron into steel, the pig machine, and electrification of equipment. The next period that will be written of will be that of iron making without fuel. The rivers and water powers of the country will furnish the power and the heat to smelt the ores. As charcoal contains no sulphur, it is the ideal fuel with which to make iron; it makes a better grade of iron than other fuels, but as the timber supply of this country is limited, it is quite impossible to make charcoal iron to supply the needs of the country.

As coke is germane to our subject, and the immense iron and steel business of Western Pennsylvania has been built upon the fuel furnished by the Connellsville coke region, it is not going afield to refer briefly to the first use of coke for the smelting of iron ores and the development of its manufacture. The early history of coke making in the Connellsville region is more or less obscure; but we do know that coke was made in this region early in the nineteenth century, but it was not until 1836 that it was made commercially. Dr. Frank Cowan states that in the summer of 1841, William Turner, Provance McCormic, and Jas. Campbell employed John Taylor to build two ovens for making coke on his farm lying along the Youghiogheny River two miles south of Connellsville. The ovens were of the beehive type and about ten feet in diameter. After repeated failures, a fair quality of coke was made, and by the spring of 1842 enough coke had been made to load a 90 foot coal barge. During the spring freshet this boat was run down the Youghiogheny, the Monongahela, and the Ohio rivers to Cincinnati, where a purchaser was found after some difficulty. The coke was sold at six and one quarter cents a bushel to a foundry man, one-half cash and one-half in castings. The men lost heavily on the enterprise and became disgusted with the

outlook for marketing coke. Two years later, improved ovens were introduced by Col. A. M. Hill, which gave a great impetus to the coke making business.

This was the beginning of the manufacture of coke in the great Connellsville field which has set the standard for the world as to quality and today sends to market more than twenty-four million tons annually. The first pig iron west of the mountains made with coke as regular fuel was made by F. H. Oliphant at Fairchance furnace, near Uniontown, in 1836.

The history of coal in Pennsylvania parallels that of iron. The earliest authentic record of the use of coal west of the Allegheny mountains is found in a journal kept by Col. James Burd. In the fall of 1759 he was in charge of two hundred men opening a road from Gist's plantation (now Mt. Braddock) to the Monongahela River at the mouth of Dunlap's Creek, where it was proposed to erect a fort. Col. Burd says in his diary that he camped on Coal Run and that "this run is entirely paved in the bottom with fine stone coal, and the hill on the south of it is a rock of the finest coal I ever saw. I burned a bushel of it on my fire." Coal was mined east of the Alleghenies in Virginia as early as 1750, but there was no mining of coal west of the mountains until 1784. After the Revolution, the Penns were permitted to retain their proprietary rights in tracts of land in the state, and they sold rights to mine coal in the vicinity of Pittsburgh; the first coal was dug in Southwestern Pennsylvania in 1784. From this small beginning, what was originally in Westmoreland County, has come one of the richest coal fields in the world. It was said by Judge Veech that "Coal, if not king, was becoming one of the princes of the land, and its seat of empire was in the Monongahela Valley."

The history of coke follows that of coal closely. The earliest authentic account of the use of coke to make iron places it at Allegheny Furnace, in Blair County, in 1811. It is an accepted fact that the first use of coke in Fayette County was at Plumsock (Upper Middletown) Iron Works, by Col. Meason in 1817. It must be borne in mind that coke had not yet been made in coke ovens, but was burned in pits or rather the coal was piled on the ground in heaps and covered with earth to prevent the admission

of air and was then fired from the bottom similar to the lime pit of today. In 1819, there was a furnace built in Armstrong County, called the "Bear Creek Furnace." It was built for coke and was believed to be the largest furnace in the United States at that time. It was blown in on coke, but, after a few casts, the operators found that it could not be successfully operated on coke with cold blast and the furnace was changed to the use of charcoal. The Howard Furnace, built in 1830, in Blair County and the Elizabeth Furnace in 1832 were constructed for the use of coke, and in furnaces in Clearfield, Clinton, Lycoming, and Armstrong counties, erected between 1835 and 1838, repeated attempts were made at the manufacture of iron with coke, but all resulted in failure. The Great Western Iron Co. built four coke furnaces between 1840 and 1844 at Brady's Bend, Pennsylvania, and to that company belongs the credit of making the first coke and iron as a regular product. These furnaces were built especially for the use of coke and never used any other fuel. For a time Brady's Bend was the center of the iron industry in Western Pennsylvania. F. H. Oliphant is accredited with having used coke as a regular fuel, four years before, but it was not on so extensive a scale as at Brady's Bend. Mr. Oliphant sent to the Franklin Institute at Philadelphia some of the metal produced and samples of the various materials used in the furnace. He did not, however, continue to make coke iron, and resumed the manufacture of charcoal iron, possibly because charcoal made better iron than coke. About the same time, William Firmstone was successful in making gray forge iron at the Mary Ann furnace in Huntingdon County with coke made from Broad Top coal. The coke industry did not, however, assume proportions to entitle it to be classed as a basic industry until 1880 when Henry Clay Frick came upon the scene. Mr. Frick was born at West Overton in 1849 and at an early age he became interested in the coke business. Under his remarkable executive and administrative ability, the coke industry developed almost as if by magic. The story of the development of the Connellsville coke region is the story of H. C. Frick. The name "FRICK" is indelibly connected with the coke industry in Western Pennsylvania.

Iron ore was known to exist in the Youghiogheny and Monongahela valleys as far back as 1780, as is shown by the Court records of Fayette County. There are two horizons of iron ore in these valleys. The upper and more important vein lies immediately below the Pittsburgh Coal bed, and is known locally as the "coal ore" and also as the "blue lump ore". This vein is the more important and was the first ore discovered. The lower vein is in the shales underlying the conglomerate, which is the bottom of the coal bearing series. These local ores run from 33 to 39 percent metallic iron, or an average of three tons of ore to make one ton of iron. The veins are thin—from six to 36 inches and were therefore expensive to operate. This ore is found only in the carboniferous period, and is known as carboniferous ore. There is also a lower ore formation, known locally as mountain ore. There is also a lower ore formation, known locally as mountain ore. This ore is persistent throughout the Connellsville region, but varies greatly in quantity in different localities and should be classed with the Brown or Limonite ores; it is a secondary ore formation. These were the only sources of iron ore supply prior to 1860. They were sufficient to supply the Monongahela, Ohio, and Mississippi valleys with iron until a greater and better supply was discovered in the Lake Superior region. Permit me to say: had it not been for the discovery of iron ore in Michigan and Minnesota, there would have been no Greater Pittsburgh as we know it today. The discovery of iron ore in Michigan in 1844 changed the industrial map of the United States. It developed a million dollar wilderness, built new cities and new railroads and did more than any other factor to give America supremacy in the iron and steel business of the world. The ores of the Youghiogheny and Monongahela valleys served a time and generation, yet all the ores that were mined in these valleys would not supply the present blast furnaces of the Pittsburgh District for two weeks. The Lake Superior District last year supplied 66 million tons of iron ore to feed the furnaces of the country.

The advance in earning power of iron and steel workers has kept pace with the increase in tonnage. The highest salaries paid in the early days would only mean one

meal today. From twenty to forty cents a day was considered "a fair day's pay for a fair day's work." The iron worker at that time received about forty cents a day and was seldom paid in cash. Until 1750 the highest wages paid iron workers was eighty-four cents a day. In Europe, wages were even less; so it was cheaper to import iron than to make it. After the Revolutionary War, workers were scarce and wages advanced. One iron works advertised that it would pay \$12.00 a week with board, lodging, and whiskey every day to furnace men. High wages and big profits were unknown until Andrew Carnegie came into the story of steel. It was Pittsburgh that led the way for the steelworker.

The stone stacks of Jacob's Creek and Fairchance, built 140 years ago, had little in common with the modern giants that may be seen along the Monongahela River today. Instead of the stone stacks, erected against the hillside, with its wooden sheds, water wheels and hand barrows, mule and ox teams hauling the ores, charcoal and limestone, we have the towering stacks, hot blast stoves, steam and gas blowing engines, skip filled and closed tops, and a railroad system to handle the materials and take away the product. This represents the beginning and the end of 140 years of iron making in Western Pennsylvania.