

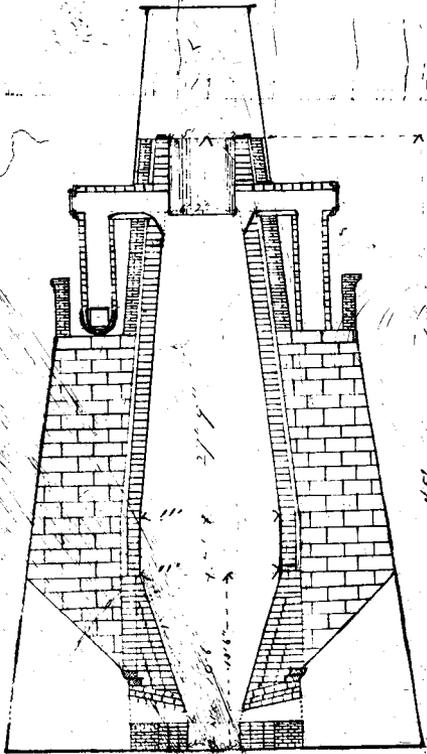
# *The Anthracite Iron Industry of Lancaster County: Rolling Mills 1850-1900*

By John Ward Willson Loose

## *I. General Description*

Although rolling mills had been used early in the nineteenth century for reducing the thickness of bar iron produced at the forges, rolling mills as a separate industry were slow to develop until the era of anthracite coal iron furnaces. Whereas bloomery forges usually made iron blooms directly from ore and fuel, and then hammered the iron into bars or plates, the rolling mills after 1840 depended upon pig iron, especially that cast at anthracite furnaces.<sup>1</sup> Charcoal iron, because of its smaller slag content, about one per cent, possesses somewhat more ductility than does wrought iron. This higher degree of ductility is most pronounced opposite to the fibre direction. The slag of charcoal iron was mainly iron oxide, but in anthracite iron produced for the mill a certain amount of iron silicate slag was entrained.<sup>2</sup> Thus the grain of the wrought iron extended in the direction of rolling, giving the iron great strength and resistance to fracture. Wrought iron is a matrix of high purity iron in which thousands of fibres of ferrous silicate are embedded—approximately 250,000 fibres in a cross-sectional square inch of good wrought iron.<sup>3</sup>

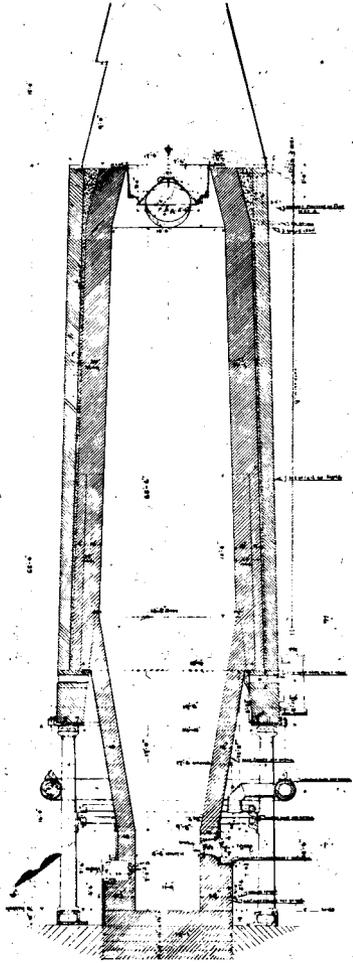
Two major processes are used in the rolling mills. First, the pig iron must be puddled in a puddling furnace. This was a simple coal-fired reverberatory furnace, either single or double, with a tall stack in which



Chickies Furnace No. 1.

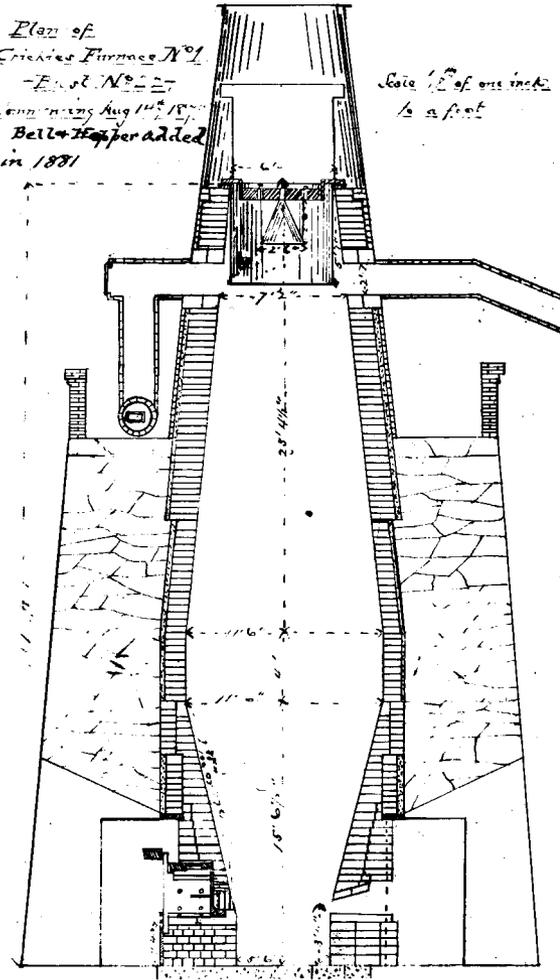
The above plan was adopted for Blast No. 20, commencing Decem<sup>r</sup> 13<sup>th</sup> 1870.

Chickies Furnace No. 1, Blast No. 20.



Section of 12' x 65' Chickies Furnace.

Plan of  
Chickies Furnace No. 1  
- Blast No. 21 -  
Commencing Aug 14<sup>th</sup> 1871  
Bell & Hopper added  
in 1881



Scale 1/2 of one inch = 1 foot

Chickies Furnace No. 1, Blast No. 22.

usually was located a boiler to utilize waste heat for the generation of steam. In the furnace was a hearth having a cinder or iron oxide bottom and side walls lined with ore. Cold pig iron placed in the furnace was melted, and to the molten mass was added iron oxide, generally scale taken from the rolls. Two skilled workers called "puddlers" agitated and worked the molten iron. An oxidizing reaction occurred in which nearly all the carbon, silicon, phosphorus, sulfur, and manganese present in the pig iron was removed, but this allowed the iron, albeit nearly pure, to become a pasty mass. Next the iron was worked by the puddlers until it became a "spongy, plastic mass impregnated with the liquid slag."<sup>4</sup> Quality of the iron depended on the skill and experience of the puddler—the "aristocrat" among rolling mill employees.<sup>5</sup> The pasty iron was gathered into a large ball after one and three-quarter hours of puddling, and put under a mechanical squeezer which discharged the excess slag and pressed the iron into blooms.<sup>6</sup>

The second process consisted of rolling the bloom into a rough bar, called a muck bar. This was done on a puddling mill; and the finished muck bar, if intended for rolling into bar iron, was  $\frac{3}{4}$  inch thick and from  $2\frac{1}{2}$  to 8 inches wide. Usually five to nine passes through the rolls were required. Following this, the muck bar was sheared into two- to three-foot lengths which were bound together in piles of five to seven pieces, and charged into a heating furnace. Here the pieces became welded together, after which the pile was rolled to produce a bar of wrought iron, called merchant bar. To make a more uniform product, merchant bars were cut into pieces, heated to a weld, and rolled again.<sup>7</sup>

A train of rolls consisted of a series of rolls designed to produce a specific bar or rail. Inasmuch as it was not the American practice to use reversing engines, as did the English, our early rolling mills could operate only in one direction, necessitating the motion-wasting and clumsy operation of turning and looping the iron around the machinery to effect the second pass. John Fritz developed a three-high train of rolls in 1865 at the Cambria Iron Works for heavy iron working in which the engine-driven middle roll and the upper roll were used for the first "pass" of the bar, and the middle roll and lower rolls were employed for the return "pass."<sup>8</sup>

In addition to the highly-skilled puddlers, employees of the rolling mills included rollers, who operated the trains of rolls; heaters, who kept the iron heated to facilitate welding and rolling; screw-down boys, who adjusted the space between the rolls; and catchers and hookers, who used tongs and considerable human agility to keep the writhing bars flowing between the machines and furnaces.<sup>9</sup>

Large boilers, often set into the puddling furnace stacks, contributed to the steam generation necessary for the engines. Regular boilers,

mounted in orthodox manner, furnished steam when requirements exceeded the stack boiler supply and when puddling furnaces were not in operation.<sup>10</sup> Puddling furnaces in eastern Pennsylvania tended to use anthracite coal, according to Temin, the proximity of the mines and the earlier development of canal and rail transportation in the East being advantageous. The Safe Harbor Rolling Mill was cited by Temin as using anthracite fuel in its puddling furnaces.<sup>11</sup> Availability of bituminous coal and coke from western Pennsylvania at Lancaster, Columbia and Marietta suggests the possibility of their use in puddling furnaces in Lancaster County after the Pennsylvania Railroad was completed across the state in 1854.<sup>12</sup> In fact, during the previous year the first "coal train" consisting of nineteen cars brought bituminous coal from Westmoreland County to the East.<sup>13</sup>

## *II. Individual Rolling Mills*

### *Safe Harbor Rolling Mill*

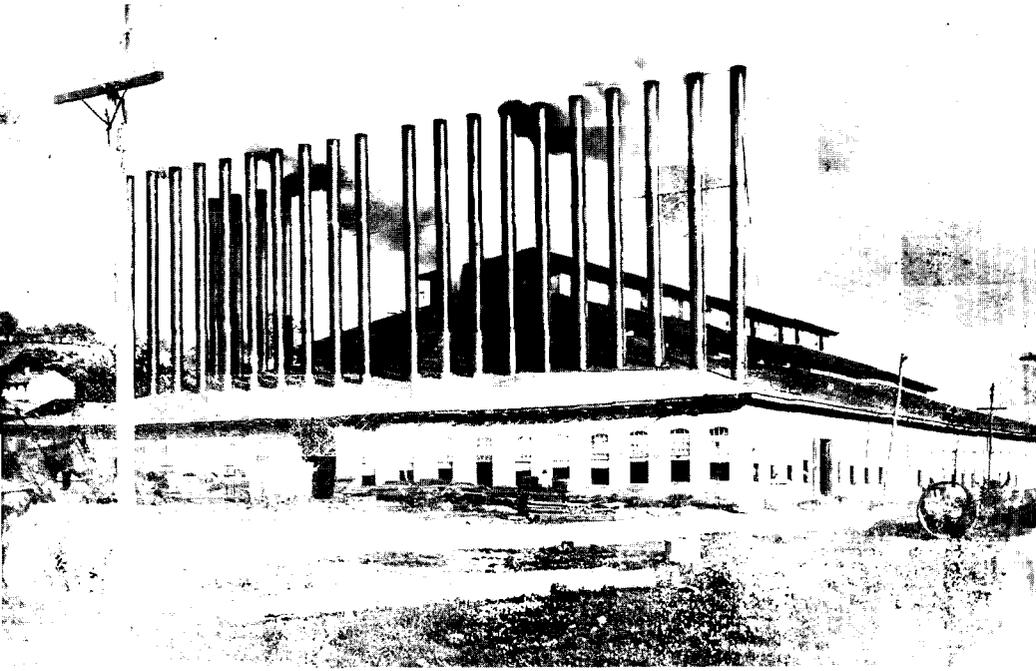
Reeves, Abbott and Company built the Safe Harbor Rolling Mill in 1848 primarily to roll rails for the rapidly-expanding railroads in general, and for the Pennsylvania Railroad in particular.<sup>14</sup> The Safe Harbor Iron Works was an "integrated plant," that is, the owners controlled the ore sources, pig iron production, and manufacture of wrought iron into a finished product.<sup>15</sup>

Organization, ownership and financing of the Safe Harbor Iron Works were treated in Chapter II and need not be repeated here.<sup>16</sup> Twenty-four puddling furnaces, six heating furnaces, and two trains of rolls comprised the original equipment of the rolling mill. In 1849, the mill used 175,000 tons of bituminous coal and 5,996 tons of anthracite coal, and 7,805 tons of pig iron to produce 5,567 tons of rails. Only sixteen puddling furnaces were used during 1849, indicating approximately one-third of the mill's productive capacity was unused. The payroll numbered 375 men and boys in 1849.<sup>17</sup> By 1855, production of railroad iron had climbed to 10,653 tons in addition to 145 tons of bars rolled round; the following year only 7,347 tons of rails were produced.<sup>18</sup>

The Pennsylvania Railroad Company contracted with Reeves, Abbot and Company for 15,000 tons of rails at \$60.50 per ton, or approximately \$10 per ton less than the market price on the seaboard in 1848.<sup>19</sup> The *Spy* reported in 1856 that "600 tons of T rail have been delivered to the Railroad Depot in Lancaster from Safe Harbor for the purpose of re-laying the south track of the Columbia and Philadelphia Railroad."<sup>20</sup>

In 1855, the rolling mill was enlarged to produce more rails. When completed it covered an acre of ground, measuring 165 feet wide and 265 feet long, and was surmounted with a roof containing 5,000 square feet of Peach Bottom slate.<sup>21</sup>

During the Civil War the rolling mill converted from rail production to making wrought iron cannon for the Union forces. John Griffen, first superintendent of the works, developed and patented a cannon in 1855; these were turned out in quantity at Safe Harbor Rolling Mill.<sup>22</sup>



*The old Safe Harbor rolling mill as it appeared about 1905 after it had been converted to an air compressor station and machine shop for the construction company that built the low-grade railroad. The many smoke stacks were added for the boilers that powered the air compressors. Originally six brick chimneys for puddling furnaces lined the front side and four more were along the right side of the building.*

The advent of steel rails after the Civil War spelled the doom of the rail mill, although the rolling mill operated at intervals for the Phoenix Iron Company, another firm owned by the Reeves family.<sup>23</sup>

Opening of the Columbia and Port Deposit Railroad in 1877 raised new hopes of reviving the rolling mill; to facilitate a rail connection a mile-long

spur was built from the mill to the Columbia and Port Deposit Railroad tracks along the east bank of the Conestoga River.<sup>24</sup> From 1879, when it was re-opened, until 1883, the rolling mill produced thousands of tons of muck bar for the Phoenix Iron Company.<sup>25</sup> The rolls turned out their last wrought iron during the first week of February, 1883.<sup>26</sup> After standing idle for a decade, the mill was sold to Adolph Segal who converted it to a match factory.<sup>27</sup> During the construction of the "low grade" railroad line in 1903, the former rolling mill became the machine shop and air compressor station used by the contractor. The structure was razed about 1907.<sup>28</sup>

### *Columbia Rolling Mill*

The firm of Smith, Bruner, Sourbeer and Company erected the Columbia Rolling Mill in 1854 on land west of the Shawnee Furnaces in Columbia, at a cost of \$160,000. Original equipment included seven puddling furnaces and two trains of rolls designed to make merchant bar and rods.<sup>29</sup> Inasmuch as the members of the firm were local businessmen without much iron experience, James A. Richards was employed to manage the mill. One year later, the firm was advertising itself as Smith, Richards and Company.<sup>30</sup> In operation only thirty-four weeks in 1856, the mill produced 1,066 tons of merchant bar and rod.<sup>31</sup> Between 1856 and 1860, the Columbia Rolling Mill was idle, and the newly-formed Committee on Trade sought to find a buyer for the property as its first project.<sup>32</sup> Their efforts bore fruit when Colonel William C. Case of Danville, Pennsylvania, and Caleb S. Maltby of Connecticut, purchased the rolling mill on 1 October 1860.<sup>33</sup> Maltby and Case invested \$100,000 in new and larger machinery, including an upright steam engine that cost \$15,000 and a power punch that cost \$3,500.<sup>34</sup> Although the mill proved less successful than the optimism of Maltby and Case warranted, a large addition was built, six more furnaces were installed, and facilities for rolling and punching iron rails were added in early 1872.<sup>35</sup>

The Columbia Board of Trade took a proprietary interest in the rolling mill, probably because its members were responsible for inducing Maltby and Case to buy and operate the mill. At its May 23, 1873 meeting, John B. Bachman, chairman of the Manufactories Committee, reported:

The manufacture of iron from the ore into metal by our furnaces, and their product into rail and merchant bar iron by our rolling mills, and machinery by our foundries, are the most prominent manufacturing industries of Columbia. It gives us pleasure to note the prosperity and large business of our rolling mills, foundries, and machine shops.<sup>36</sup>

By October, 1873, Maltby and Case were forced out of operation by the Panic, and the property was acquired by Maitland, Audenreid and Company of Philadelphia who formed an operating company styled "Columbia Steel and Iron Company."<sup>37</sup> This company announced it would re-open the rolling mill in January, 1874, and would employ more than 300 persons.<sup>38</sup> These ambitious plans failed to materialize, and by April, 1874, the Columbia Steel and Iron Company was declared bankrupt. The creditors released the company in May, 1874, on payment of fifty per cent of the claims. Colonel Case apparently had obligated the Columbia Steel and Iron Company to pay his former employees their back wages, and at his insistence this claim was paid in full.<sup>39</sup> The company, now discharged from bankruptcy, announced it would resume production as soon as conditions warrant.<sup>40</sup> Instead of things getting better, however, the mill found itself back in the clutches of its creditors. The property was to be sold at a sheriff's sale on 12 August 1876, but it was withdrawn from the block by the creditors at the last moment when it was discovered no one, including the creditors, wanted the mill.<sup>41</sup>

A firm controlled by the Catassauqua Iron Company leased the mill in 1880, and operated it at one-quarter capacity, making muck bar, for a few months.<sup>42</sup> The Pennsylvania Railroad Company held a mortgage for \$20,000 on the property, and when the Catassauqua affiliate relinquished its lease in 1883, the railroad company hastened to cover its "investment" by purchasing the mill for \$40,000, which it then sold to the Chestnut Hill Iron Ore Company for \$45,000.<sup>43</sup> Again the Columbia Board of Trade got busy to find someone to operate the mill. Messrs. John Bachman and S.S. Detweiler found three men, John Q. Denney, Michael Schall, and John Keller, who were willing to invest \$20,000 in a rolling mill. The building was rebuilt, and once more the Columbia Rolling Mill was in operation, this time as a skelp mill which made strips of wrought iron used in forming tubes and pipes.<sup>44</sup> Between 1885 and 1898 the mill operated with a fair amount of success, labor problems and strikes being the most notable events during this period. J.W. Steacy replaced Keller and Schall, and became secretary-treasurer, with Denney as president. By 1894, the mill was equipped with four trains of rolls, and produced 13,500 tons of skelp annually when in full operation.<sup>45</sup>

In 1898, the Susquehanna Iron and Steel Company was formed for the purpose of buying and integrating all iron-producing facilities in the lower Susquehanna valley. The Columbia Rolling Mill was acquired by this corporation, but since it produced only skelp, a pipe and tube mill was built nearby in 1902, thus completing the manufacturing process to a finished product.<sup>46</sup> The mill was razed about 1920.<sup>47</sup>

## *Lancaster Rolling Mill (Rohrerstown Rolling Mill: Franklin Iron Works)*

The Lancaster Rolling Mill has its beginnings in the buildings of a former distillery located along the Columbia Branch of the Pennsylvania Railroad at the village of Hempfield, later known as Rohrerstown. John Eshleman, Jacob Baer, John and Benjamin Powers, and Jacob Mauk associated themselves in a firm trading as John Eshleman and Company and commenced operations in 1858.<sup>48</sup> On 1 April 1863, Michael Hertzler Moore acquired the property.<sup>49</sup> Moore and A.J. Hindmeyer formed a company for rolling iron, using seven puddling furnaces and two trains of rolls. On 17 June 1865, Moore, Hindmeyer and Company sold the works to William Eagle, Michael Maag, A.J. Hindmeyer, and Colonel David W. Patterson.<sup>50</sup> In 1870, the mill was owned by Colonel Patterson, a prominent Republican political figure, attorney, and judge. Forty employees were idled when Patterson closed the mill in 1870.<sup>51</sup>

Jacob Jamison bought the rolling mill in 1871 and sold it the following year to Manual McShain and Company of Philadelphia.<sup>52</sup> The latter company enlarged the mill, installed seven double puddling furnaces and a rotary squeezer, and equipped the rolls to produce 3,000 tons of muck bar annually.<sup>53</sup> After one year of operation, McShain and Company sold the mill in 1873 to Henry Coyle and William McDevitt.<sup>54</sup> In 1874, the mill was bought by the "Franklin Iron Company, Limited," the new owners being a limited partnership association consisting of William G. Mendenhall, J. Taylor Huddleson, Thomas McClarnen, and John W. Lorentz. Mendenhall was the principal partner, and served as chairman.<sup>55</sup> The company brought a number of immigrants to Rohrerstown to work in its mill, and the *Lancaster Daily Express* observed, "many of the foreigners have become assimilated into the life of Rohrerstown."<sup>56</sup> A report of the Secretary of Internal Affairs in 1879 mentions seventy-five employees that produced 4,000 tons of merchant bar, forgings, and railroad bolts.<sup>57</sup>

Samuel Evans, writing in 1883, stated the works had been acquired by the Colemans at a foreclosure sale, and were not then in operation.<sup>58</sup> Henry S. Eckert of Reading purchased the mill in 1890. Eckert died 10 January 1894, and his estate sold the property.<sup>59</sup> Eventually the buildings were removed. The site is now occupied by the Pennfield Corporation.

## *Susquehanna Rolling Mill*

Four months after the founding of the Columbia Board of Trade, its president, Jeremiah G. Hess, and another member, George Mitchell,

announced on the 12 July 1860, meeting that they would erect a new rolling mill for the production of boiler plate if Columbia citizens would subscribe \$15,000 to the enterprise. Hess and Mitchell offered to underwrite personally the balance required and would lease the mill for five years at six per cent on the cost.<sup>60</sup> A number of the borough's merchants and leading citizens subscribed to the project, but a building was not constructed nor was the Susquehanna Iron Company organized until 1864.<sup>61</sup> Officers and directors of the company were George Bogle, president; J.G. Hess, treasurer; H.S. Hershey, secretary; Isaiah E. Richards, superintendent; and C.S. Kauffman, Ephraim Hershey, M.M. Strickler, and Robert Crane, directors.<sup>62</sup>

William Patton and John Q. Denney came into the Board in 1868.<sup>63</sup> Patton served as manager of the works from 1865 until his retirement in 1884.<sup>64</sup> In 1874, the mill was equipped with twelve single puddling furnaces and three trains of rolls for the production of merchant bar and rods.<sup>65</sup> A rail mill had been installed in 1872. Known originally as the "little mill," in contra-distinction to the Columbia Rolling Mill, the Susquehanna Rolling Mill now exceeded in size the earlier works. It occupied the area between the Columbia and Port Deposit Railroad tracks and Front Street for a distance of two squares between Fourth and Florence streets.<sup>66</sup>

Early in 1874, the *Spy* congratulated the managers for being able to operate day and night when other rolling mills were trying to find enough work to keep one "turn" (shift) busy.<sup>67</sup> More congratulations were in order later in 1874 when the Franklin Institute of Philadelphia presented an award to the Susquehanna Iron Company for "excellence of quality" of its wrought iron.<sup>68</sup>

Stockholders in 1882 were surprised happily to receive a semi-annual dividend of ten per cent in addition to a special dividend. Crowded the *Spy*,

This is the largest semi-annual dividend ever declared by a corporation in Columbia, and is evidence of the highest prosperity. The stockholders had to wait many years for a return on their investment. All that time it was one steady bee-hive of industry for the employment of our iron workers. They, and through them, the town reaped the profits of the investment which the stockholders had had.<sup>69</sup>

Prices of Susquehanna Iron Company stock soared in 1883 to \$206.50 a share issued at par value of \$100.<sup>70</sup>

Michael Schall, one of the owners of the Columbia Rolling Mill, was elected president of the Susquehanna Iron Company in 1888.<sup>71</sup> Between 100 and 200 employees worked at the mill between 1880 and 1894; and in 1894 production of merchant bar iron reached 10,500 tons.<sup>72</sup>

The Susquehanna Iron and Steel Corporation purchased the mill in 1898, after which it was operated as a unit of the corporation until 1905. The structure was razed about 1920.<sup>73</sup>

### *Chickies Rolling Mill*

Probably the smallest rolling mill in Lancaster County, the Chickies Rolling Mill, was built by John Becker in 1865 near the mouth of the Chikiswalungo Creek in East Donegal Township.<sup>74</sup> Becker's son-in-law, Edwin L. Reinhold, became a partner.<sup>75</sup> In 1874, the mill was equipped with one single and three double puddling furnaces, and two trains of rolls for producing muck bar. By 1894, the mill had been abandoned and razed.<sup>76</sup>

### *Penn Iron Works Rolling Mill (Lancaster Manufacturing Company Mill)*

Using the buildings of the former Lancaster Locomotive Works along the Pennsylvania Railroad between North Plum and North Ann streets in Lancaster, the Lancaster Manufacturing Company opened a rolling mill in April, 1873.<sup>77</sup> C. Augustus Bitner was the principal partner in the venture, the purpose of which was to make bolts, nuts, spikes, and other forged iron hardware for railroads. It was furnished with eight single puddling furnaces, three trains of rolls, and two steam hammers. Annual production in 1873 was 3,600 tons of bar iron, splice bar, bolts, axles, spikes, and forgings. The firm failed in 1874.<sup>78</sup>

On June 2, 1874, a limited partnership association consisting of A.J. Steinman, W.G. Mendenhall, W.B. Middleton, and others was formed to establish and operate a rolling mill, to be called Penn Iron Company Rolling Mill. Andrew Jackson Steinman was the principal investor.<sup>79</sup> The Lancaster Manufacturing Company's rolling mill was purchased, and additional machinery was installed, including a fourth train of rolls. Over 400 men and boys were employed.<sup>80</sup>

The Penn Iron Company reorganized in 1901, at which time the partners were A.J. Steinman, Susan S. Steinman, Amelia Steinman, Charles S. Foltz, Frederick S. Foltz, J. Clinton Foltz, and John Lorentz. At that time the mill was valued at \$200,000.<sup>81</sup> Later, the partnership became the Penn Steel and Iron Corporation. The mill ceased operating in 1921 after bowing to the creditors, and was razed a few years later.<sup>82</sup>



## *Columbia Iron Company Rolling Mill*

Columbians received a belated Christmas present on 29 December 1885, with the announcement that a new rolling mill was to be built in that borough. The mill, to be erected by the Columbia Iron Company, was to manufacture bar iron.<sup>83</sup> Officers of the new concern were A.J. Kauffman, J.W. Yocum, C.S. Kauffman, Frank A. Bennett, Hugh M. North, James Perrottet, Milton Wike, and Hiram Wilson. Nine double and three single puddling furnaces, and three trains of rolls, including two three-high rolls, were installed.<sup>84</sup>

Production began 13 July 1886.<sup>85</sup> In 1887, three more double puddling furnaces were built, increasing the capacity from 120 tons to 180 tons of iron weekly.<sup>86</sup> During 1888, an additional steam engine, puddle mill, and bar mill were installed.<sup>87</sup>

The *Spy* described the Columbia Iron Company's rolling mill on 29 December 1889, as "the finest and most complete mill of its size in Pennsylvania."<sup>88</sup> The editor, it might be mentioned, was a director of the company. Shares of the company's stock were selling for fifty per cent over par value in 1888.<sup>89</sup> Capitalization was increased to \$100,000 in 1890 as plans for expansion were readied.<sup>90</sup>

Columbians were discussing the employment impact new industries were having on old residents in 1892; and investigation revealed that eighty per cent of the skilled workers employed at the Columbia Iron Company's rolling mill were brought to Columbia by the opening of the mill.<sup>91</sup>

The mill was located at the foot of Union Street between the river bank and the Columbia and Port Deposit Railroad tracks; to distinguish it from the Columbia Rolling Mill, old residents of Columbia referred to it as the "Union Street Mill."<sup>92</sup>

The Columbia Iron Company was absorbed into the Susquehanna Iron and Steel Company in 1898, and its rolling mill was operated under that management.<sup>93</sup>

Between 1848 and 1886, seven rolling mills were built in Lancaster County, all of them using pig iron manufactured in anthracite iron blast furnaces. These anthracite iron works—furnaces and rolling mills—were located within a triangle formed by Lancaster City, Marietta, and Safe Harbor. In this iron triangle the greatest concentration of iron works was situated in the Marietta-West Hempfield Township-Columbia area.<sup>94</sup>

A major contribution of the anthracite iron industry to Lancaster County's cultural heritage was the attraction of many Welsh workers to

this area. Early in the eighteenth century numerous Welsh settlers from northern and central Chester County located in what are now the townships of Caernarvon, Brecknock (Brecon), and Lampeter (Llanbedr:Church of Peter) of Lancaster County. Eighteenth century ironworks built and operated in Caernarvon Township by the Welsh immigrant families of Grubb, Jenkins, Old, Jacobs, Attwood, Morris and Lardner provided employment for many Welshmen. After the Civil War another migration of Welsh families arrived in Columbia to work in the rolling mills, many of whose descendants remain as respected citizens of that borough, among them families such as Atlee, Davis, Edwards, Evans, Jenkins, Johns, Jones, Lewis, Lloyd, Morris, Price (Prees), Reese (Rhys), Richards, Russell, Simpson, Thomas, Williams, and Yocum.

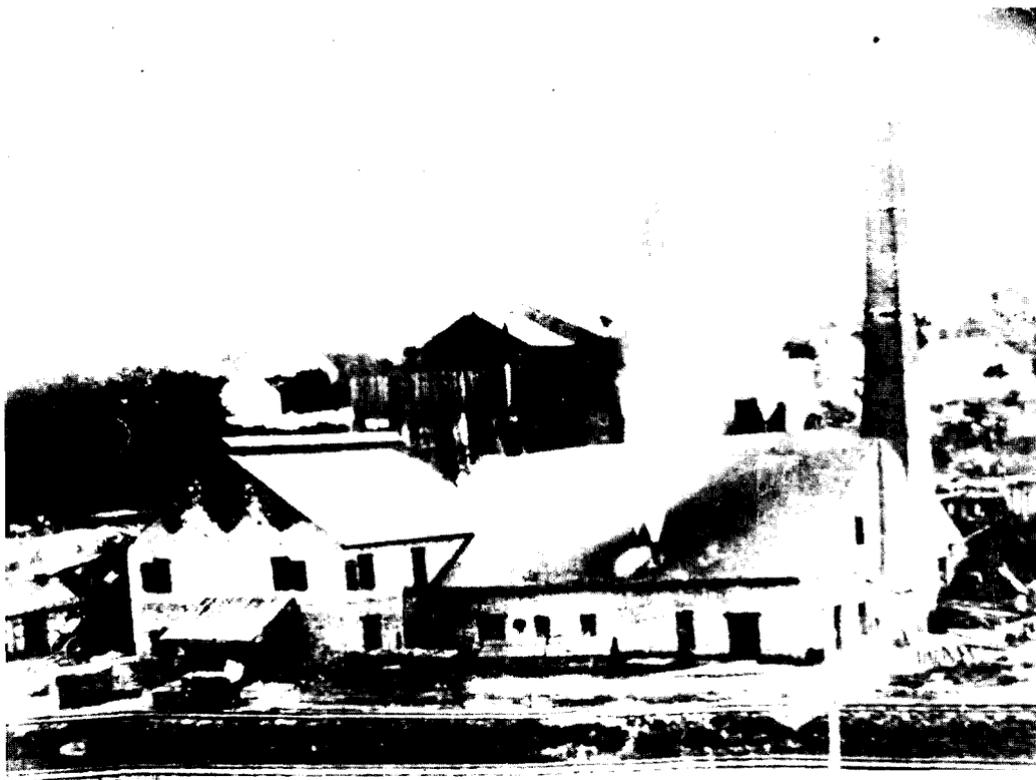
### Notes:

1. Temin, *op. cit.*, pp. 99-100.
2. James Aston, and Edward B. Story, *Wrought Iron: Its Manufacture, Characteristics and Applications* (Pittsburgh, Pa.: A.M. Byers Company, 1941), p. 10. See glossary.
3. *Ibid.*, pp. 18-19.
4. *Ibid.*, pp 12-14.
5. Letter from Frederick Steinman Foltz, son of Charles S. Foltz, treasurer of the Penn Iron Works, quoting from an interview with Thomas Deitl, a puddler, 19 June 1967, in possession of the author.
6. Aston, *op. cit.*, pp. 13-14.
7. Teichert, *op. cit.*, pp. 443-445.
8. Temin, *op. cit.*, pp. 105-106.
9. Letter from B.C. Boylston, Manager of Personnel, Bethlehem Steel Corporation, citing *Iron and Steel Industry Position Descriptions and Classifications Manual*, 16 March 1967, in possession of author.
10. Teichert, *op. cit.*, pp. 433-434.
11. Temin, *op. cit.*, pp. 118-119; note, however, amount of bituminous coal consumed at Safe Harbor Rolling Mill in *Convention of Iron Masters, op. cit.*, Appendix, Table 3.
12. *The Columbia Spy*, 2 February 1856; George H. Burgess and Miles C. Kennedy, *Centennial History of The Pennsylvania Railroad Company: 1846-1946* (Philadelphia, PA.: The Pennsylvania Railroad Company, 1949), p. 65.
13. Robert D. Billinger, *Pennsylvania's Coal Industry* (Pennsylvania History Studies No. 6. Gettysburg, Pa.: The Pennsylvania Historical Association, 1954), p. 37.
14. Pearce, *op. cit.*, p. 227; Reeves, Abbott and Company also owned the Phoenix Iron Works.
15. Temin, *op. cit.*, p. 110.
16. *Supra*, pp. 62-67.
17. *Convention of Iron Masters, Documents. . .*, Appendix Tables.
18. J.P. Lesley, *The Iron Manufacturer's Guide to the Furnaces, Forges and Rolling Mills of the United States* (New York, N.Y.: John Wiley and Company, 1866), p. 238.
19. Burgess and Kennedy, *op. cit.*, p. 54.
20. *The Columbia Spy*. 8 March 1856.
21. *The Lancaster Intelligencer*, 18 February 1855.
22. Lawrence Van Horn, "The Old Buck Cannon," *Journal of the Lancaster County Historical Society*, LXIV (Autumn, 1960), 219-220; United States Patent Office, *Patent No. 13,984*, 25 December 1855.

23. Schuleen, *op. cit.*, p. 90.
  24. Henry V. Poor, *Manual of the Railroads of the United States for 1885* (New York, N.Y.: H.V. and H.W. Poor, 1885), p. 267.
  25. *Annual Report of the Secretary of Internal Affairs, 1879-1880, op. cit.*, p. 44; 1880-1881, *op. cit.*, p. 36; Schuleen, *op. cit.*, p. 90.
  26. *The Columbia Spy*, 10 February 1883.
  27. Schuleen, *op. cit.*, p. 98.
  28. *Ibid.*, p. 102.
  29. *The Columbia Spy*, 7 March 1885.
  30. *Ibid.*, 28 April 1855.
  31. Lesley, *op. cit.*, p. 238.
  32. *The Columbia Spy*, 24 March 1860.
  33. *Ibid.*, 6 October 1860.
  34. *Ibid.*, 7 March 1885.
  35. *Ibid.*, 13 April 1872.
  36. *Ibid.*, 17 May 1873.
  37. *Ibid.*, 7 March 1885.
  38. *Ibid.*, 13 December 1873.
  39. *Ibid.*, 23 May 1874.
  40. *Ibid.*, 4 July 1874.
  41. *Ibid.*, 19 August 1876.
  42. *Ibid.*, 7 March 1885.
  43. *Ibid.*
  44. *Ibid.*
  45. *Directory of Iron and Steel Works, 1894, op. cit.*, p. 104.
  46. *The Columbia Broadcaster (Sesquicentennial Edition)*, 29 April 1938, section 6, pp. 2, 7.
47. While not within the scope of this study, mention of the eventual disposition of the Columbia Rolling Mill may be of interest to persons trying to analyze the industrial decline of Columbia which apparently began at the dawn of the twentieth century. The Susquehanna Iron and Steel Company went into receivership in 1905, after which its bondholders leased the facilities to other firms. Edward T. Edwards operated the rolling mill from 1912 to 1915. Next the mill was leased to A.M. Byers Company of Pittsburgh for three years. That company operated two puddling mills, a nine-inch and a sixteen-inch bar mill, a bell weld pipe mill, a lap weld mill, and a socket shop in which couplings were produced. In the fall of 1918 the Byers firm terminated the lease and ceased operations in Columbia. Later the mills were leased to the Reading Iron Company, and eventually that company purchased the property, and razed the mills. See correspondence between Frank Farnan, A.M. Byers Company, Pittsburgh, and the author, 8 February 1955, and 16 February 1955.
48. *Lancaster Daily Express*, 10 August 1875.
  49. *Deed Book*, B-Miscellaneous-51.
  50. *Deed Book*, M-9-102; *Directory of Iron Works in the United States, 1874, op. cit.*, p. 69.
  51. *The Columbia Spy*, 1 January 1870.
  52. *Deed Book*, P-9-518; E-10-61.
  53. *Deed Book*, E-10-61; *Directory of Iron Works, 1874, op. cit.*, p. 69.
  54. *Deed Book*, N-10-19.
  55. Lancaster County, Office of Recorder of Deeds, *Limited Partnership Register*, pp. 60-61.
  55. *Lancaster Daily Express*, 10 August 1875.
  57. *Annual Report of the Secretary of Internal Affairs, 1879-1880, op. cit.*, p. 49.
  58. Ellis and Evans, *op. cit.*, p. 307.
  59. *Directory of Iron and Steel Works, 1894, op. cit.*, p. 112.
  60. *The Columbia Spy*, 14 July 1860.
  61. *Ibid.*, 29 October 1864.
  62. Ellis and Evans, *op. cit.*, p. 307.
  63. *The Columbia Spy*, 18 January 1868.
  64. *Ibid.*, 28 January 1884.

65. *Directory of Iron Works, 1874, op. cit.*, p. 70.
66. *The Columbia Democrat*, 29 August 1872.
67. *The Columbia Spy*, 7 February 1874.
68. *Ibid.*, 28 November 1874.
69. *Ibid.*, 14 January 1882.
70. *Lancaster Daily Intelligencer*, 7 May 1883.
71. *The Columbia Spy*, 14 January 1888.
72. *Directory of Iron and Steel Works, 1894, op. cit.*, p. 112.
73. *The Columbia Broadcaster (Sesquicentennial Edition)*, 29 April 1938, section 6,  
pp. 2, 7.
74. Ellis and Evans, *op. cit.*, p. 307.
75. Gramm, *op. cit.*, p. 145.
76. *Directory of Iron and Steel Works, 1894, op. cit.*, p. 182.
77. Ellis and Evans, *op. cit.*, p. 307.
78. *Directory of Iron Works, 1874, op. cit.*, p. 68.
79. *Limited Partnership Register*, p. 45.
80. *Annual Report of the Secretary of Internal Affairs, 1879-1880, op. cit.*, p. 49.
81. *Limited Partnership Register, op. cit.*, p. 74.
82. Letter from John Frederick Steinman, 16 June 1967; and Frederick S. Foltz, 19  
June 1967, to and in possession of the author.

*Conestoga Furnace, also called Peacock Furnace, South Prince St., Lancaster.  
Built in 1846 by George Ford and Calvin Brothers. Ceased operation in 1892.*



83. *The Columbia Spy*, 26 December 1885.
84. *Directory of Iron and Steel Works, 1894, op. cit.*, p. 111.
85. *The Columbia Spy*, 17 July 1886.
86. *Ibid.*, 26 November 1887.
87. *Ibid.*, 15 September 1888.
88. *Ibid.*, 29 December 1889.
89. *Ibid.*, 11 February 1888.
90. *Ibid.*, 25 January 1890.
91. *Ibid.*, 10 September 1892.
92. Interview with the late J. Jay Wisler, Sr., in 1951, by the author.
93. *The Columbia Broadcaster (Sesquicentennial Edition)*, 29 April 1938, section 6.