

Richard W. Pascoe,

Mine Superintendent

By
L. Michael Kaas

Richard W. Pascoe was a Cornishman. He learned his mining skills as a youth working in the copper mines of Cornwall, where he became a mine captain at an early age. Like so many of his Cousin Jack brethren in the mid-1800s, he immigrated to the United States in search of new opportunities. He worked in anthracite coal, copper, zinc, lead, and iron mining.

Pascoe's semi-nomadic career had a unique twist. During the Civil War, Pascoe was the superintendent of the Silver Hill Mine near Lexington in Davidson County, North Carolina. The mine was an important source of supply of lead for the Confederacy. All the while his family was living in Friedensville, Pennsylvania, a zinc mining village about five miles south of Bethlehem. The 1860 Census showed him as living in both places. What was a Yankee northerner from Pennsylvania doing running a lead mine for the Confederates? It was this question that prompted this research on his life and the mines in which he worked.

Growing Up in Cornwall

Richard Pascoe was born in the mining village and parish of Breage, in the county of Camborne, Cornwall, England, in 1818.¹ He was the fourth of eleven children born to John and Mary Pascoe. Breage and Sithney, the home towns of his parents, are at the southeastern edge of the Tregoning-Godolphin Granite. The copper and tin lodes in Cornwall are associated with the granite intrusions. In the early 1800s, copper was being mined from the south coast to Camborne. The more famous of the mines in this area include the Great Work, Great Wheal Vor, Wheal Metal, and the Great Wheal Fortune.²

From the children's birth records we know that the family moved from Breage to Crowan in the 1820s, and then to Rosewarne, near Camborne, in the 1830s. In the 1841 census, Richard's father was listed as a mine agent in Rosewarne. Richard and his four brothers, including his eight-year-old brother Joseph, were listed working as copper miners.³ It was customary then for fathers to teach their sons mining skills through on-the-job training. Unlike other mining families in the area, Richard's mother and six sisters did not work in the mines. This may indicate that the family had a more secure financial footing and status in the community. Richard's mining skills developed quickly and he became a mine captain by the age of twenty-one.⁴

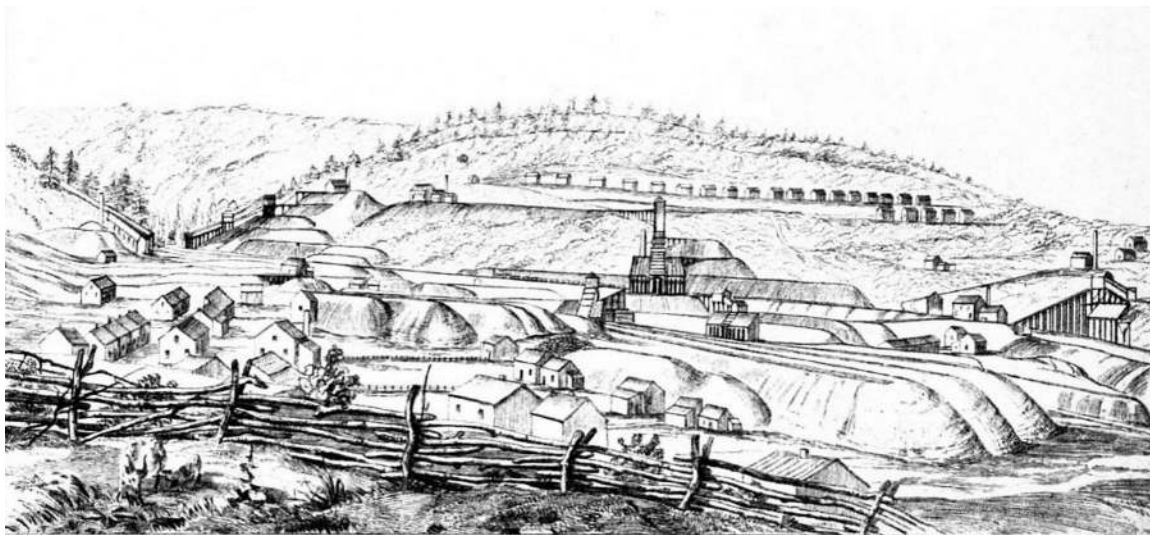
Mining in Scotland

In the 1840s, shortly after his twenty-first birthday, English investors sent Richard Pascoe to Scotland to open a copper mine.⁵ The specific details of this assignment are not known; however, while in Scotland, he married Jessie Campbell in Edinburgh. Jessie was born around 1821 on the

Island of Islay, Argylshire. She was the daughter of Colonel Neil Campbell of the 24th Highlanders. The regiment was connected to the Campbell family of Glendaruel House.⁶ Richard and Jessie's son, Archibald, was born in Scotland around 1848 and named for his grandfather, Archibald Campbell. Richard emigrated to the U.S. in 1848 or early 1849 and was joined by Jessie and Archibald in late 1849.⁷

Coming to America and Mining Anthracite

In 1850, the Pascoe family was living in Blythe Township, near Pottsville, Schuylkill County, Pennsylvania.⁸ According to family legend, Richard Pascoe may have originally planned to head west to the California Gold Rush, but contacts in New York pointed him toward the booming anthracite mines.⁹ In 1849 and 1850, and again in 1851 and 1853, Pascoe worked as a foreman at the Kaskawilliam Colliery, located near Middleport.¹⁰ In 1851, Pascoe applied for U.S. citizenship.¹¹ While living in Schuylkill County, the couple's second son, John Henry, and two daughters, Mary and Sarah, were born. Unfortunately,



A view of the anthracite mines near the Kaskawilliam Colliery, Blythe Township, Pennsylvania, in 1853. ("Silver Creek Collieries in 1853," from: H. D. Rogers, The Geology of Pennsylvania, v. II, pt. I (Philadelphia: J. B. Lippincott and Co., 1858, 120).)

the two girls died in infancy.

Payroll ledgers show that as a foreman Pascoe made as much as \$1.30 per day.¹² Typical miners were paid \$0.80 to \$1.00 per day, and boys were paid \$0.30 per day. These pay rates were before deductions for rent, store purchases, and mining supplies. Most months, Pascoe received a few dollars after deductions. For example, his gross pay for a month in early 1853 was \$33.75, but after deductions his take-home-pay was \$6.95. That was a very good month. The same could not be said for those working for lower wages who frequently found themselves in debt to the company.

The steeply dipping anthracite beds of the Southern Anthracite Field were mined by methods more typical of metal mining than of those used in the flat-lying bituminous coal seams being developed in central and western Pennsylvania at that time. A coal breaker was located at the colliery.¹³ After working for a year in anthracite mining, Pascoe received a challenging opportunity that took him to the Canadian frontier.¹⁴

Copper Mining in Canada

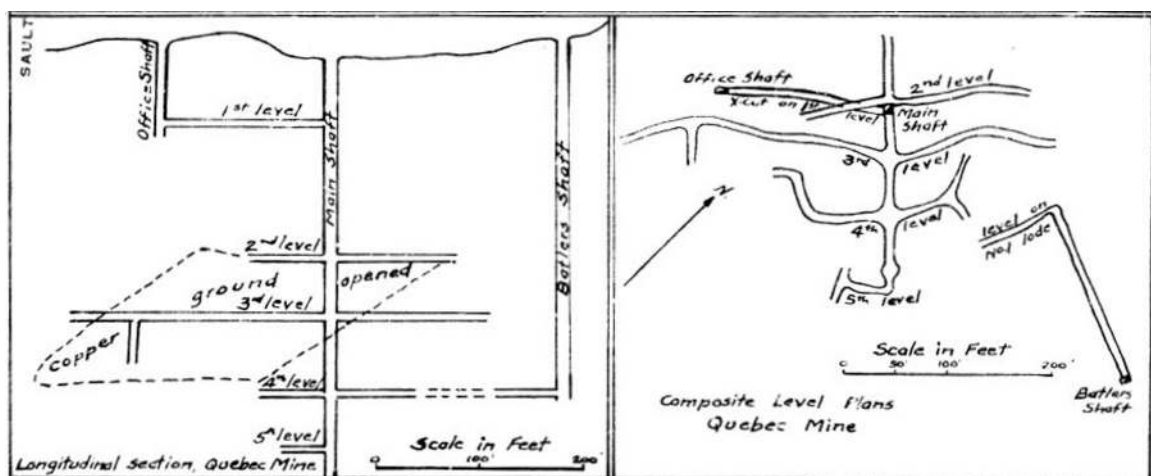
In 1851, after a year in anthracite mining, Pascoe was hired by New York investors to open

a copper mine on Michipicoten Island at the eastern end of Lake Superior. The island lies about thirty-eight miles west of the modern village of Michipicoten, near Wawa, Ontario, and about nine miles from the closest point on the still uninhabited Superior shoreline. Pascoe's family remained in Pennsylvania.¹⁵

Few specifics about this assignment are known, but from historical documents on the mining area, it appears that his work may have been more related to underground exploration—prospecting through mining—than to actual production. Copper had been discovered on the island in the late 1840s.¹⁶ The geology of the island is believed to be an extension of that of the Keweenaw Peninsula of Michigan, which by then had several producing copper mines.

The largest prospect on Michipicoten Island was the Quebec Mine. In the 1850s it had workings on five levels and had blocked out some ore.¹⁷ A modern historian summarized the few reports that trickled out from Michipicoten as follows:

In 1853 a Detroit reporter found many explorations in progress. Descending a shaky ladder into what was “termed a Silver mine,” he found a scene close to Hell.



*Map of the workings of the Quebec Mine, Michipicoten Island, Ontario, Canada.
(From the “Mineral Property File on Michipicoten Island Copper Mines,”
courtesy of the Ontario Ministry of Northern Development and Mines.)*

Ankle-deep in black glue-like mud, with claustrophobic black walls, illuminated by feeble candles, and separated from instant death by a few rotten props, men breathed humid, bad air, while tearing fiercely at dripping, ragged rocks. Such work was hardly effective and his report was realistic. "It is all very well to call this a silver mine, if a small percent of copper, and seven or eight percent of silver, in a metal which is said to be manganese, is a silver mine."

Reverend John Ryerson, on landing there after two days of fog, one year later, found two mines being operated, one for copper and one for silver. Yet only seven or eight barrels of ore had been shipped for smelting in England.¹⁸

Its isolated location not only made it difficult to get men and supplies to the island, but the early miners on Michipicoten faced hostile Indians. In 1854, three years after Pascoe was there, an attack by the Chippewa temporarily drove off the miners, who returned the following year.¹⁹ Several small mines and prospects were eventually opened on the island by New York and English investors, but none was profitable. By 1885 the mines were all closed. Several subsequent exploration efforts in the twentieth century found no economic mineralization.²⁰

Michipicoten Island is now a wilderness Provincial Park. Extreme hikers willing to endure the rugged conditions on the island can still see the remains of mining equipment left behind by nineteenth-century miners.²¹

Back to Pennsylvania and Mining Zinc

In April 1852, Pascoe returned to the Kaskawilliam Colliery and his job as a mine foreman.²² In 1853 he became associated with Joseph Wharton and the Pennsylvania and Lehigh Zinc Company, which was opening mines in Friedensville to supply the Wetherill and Gilbert Zinc Works in

South Bethlehem. The Friedensville mines played a critical role in the development of the zinc oxide and spelter (zinc metal) industries in the United States. Their story is worthy of a more extensive treatment than can be given here.²³

Pascoe was the superintendent of the Uberroth Mine, the first and largest in the Friedensville district, which opened in 1853. The rich oxidized ores, calamine (zinc silicate, hemimorphite) and smithsonite (zinc carbonate), occurred on the surface and as crevasse fillings (veins) between large blocks of the surrounding limestone country rock.

Initially, mining was done by open pit. Later, the veins were followed underground through shafts and drifts to the stopes.²⁴ The principle veins were aligned in a northeast-southwest direction, and intersected by cross-veins. At the intersections particularly large and rich concentrations of ore minerals were found. The ore was crushed, washed, and sorted at the surface. It was then transported by mule train or wagon to the zinc works, four or five miles to the north.

The zinc works itself was founded by Samuel Wetherill and Charles Gilbert. Wetherill had invented and patented furnaces used to produce zinc oxide. Using his furnace design and Samuel Jones' patent for the collection of the oxide in a bag house, the zinc works produced the first commercial-scale output of zinc oxide in the U.S. The oxide was sought by paint producers eager to find a substitute for toxic lead pigments. The Friedensville ore was well suited for oxide production because it contained no impurities. This was not true of the Franklin-Sterling Hill, New Jersey, zinc ores being mined at the time. Because Pennsylvania laws of the day did not permit a manufacturing company to own mines, Pennsylvania and Lehigh Zinc Company was established to mine the ore on leases originally obtained by Wetherill.

In 1854, Pennsylvania and Lehigh's Philadelphia Quaker owners sent Joseph Wharton to Bethlehem to run the company. He quickly saw the need to improve the operation and profitabili-

Eagle Harbor
Michigan

Office North Pass
Mining Co
Lake Superior
July 3. 1858

Joseph Wharton Esq
Dear Sir

I take the liberty of writing you as I find by my wife's letters that people are giving her some trouble in relation to money matters my reason for my writing you is that Mr Day my friend will probably leave Ishla^h for this place before a letter from you could reach him - I send my wife \$50 by this mail and I trust you will pardon me for requesting her to call upon to cash it for her as I am not sure that Mr L. & Mops or any other friend of mine that would for me.

our mine is looking very well and the Co have a very valuable property here. our Farm is not quite so nice as yours at Friedmansville owing having a few more rocks & white pine stumps altho we can grow good Hay and better Potatoes & such than you can

this is rough country but I like it very much and I think you would enjoy a trip up here in the summer season very much indeed. I shall be home next month if all well. I shall be pleased to hear from you at any time

Very Respectly
Richard Pascoe

A letter from Pascoe to Joseph Wharton from Eagle Harbor, Michigan, in 1858. (From the Joseph Wharton Family Papers, courtesy of the Friends Historical Library, Swarthmore College.)



The North West Mining Company's engine house and shaft, constructed in the 1850s, are to the left of the smokestack in the center of this 1886 photograph. (From the prospectus "The Conglomerate Mining Company" (Philadelphia: The Company, 1887).)

ty of the zinc works. Wharton also implemented a strategy to take control of the entire supply chain, from the mine to the customers. This required integrating mining and manufacturing into a single company, then prohibited by Pennsylvania mining law, and wresting control of oxide manufacturing from Wetherill.

In 1855, Pennsylvania and Lehigh's influential owners succeeded in getting the Pennsylvania legislature to change the state's mining law to permit integration of mining and manufacturing. One way for Wharton to gain control of the manufacturing end of the business was to strictly limit Wetherill's supply of ore to the tonnage specified in the contract between Pennsylvania and Lehigh Zinc and Wetherill. This prevented Wetherill from increasing his production and profits. Wharton's plan required a temporary shut-down of the Uberroth Mine, which placed Pascoe's position in limbo.²⁵

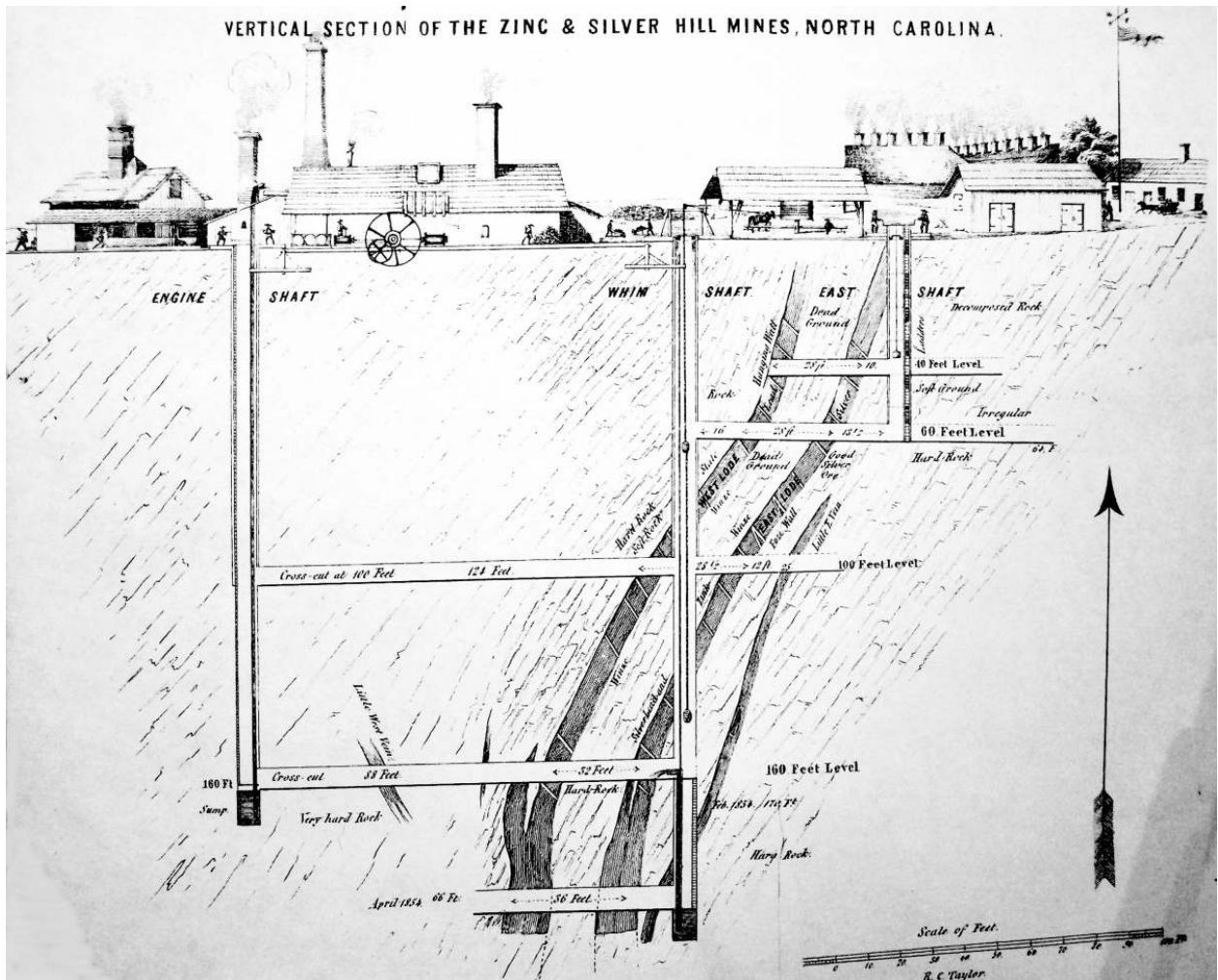
In March 1857, while the Uberroth was shut

down, Pascoe received an inquiry from A. A. Moss of the North West Mining Company regarding his availability to serve as agent for their copper mine on the Keweenaw Peninsula of Michigan. Pascoe asked for Wharton's advice on the matter and, presumably based on that advice, turned down the initial offer to wait for a better one.²⁶

Five more sons were born to the Pascoe family while it lived in Friedensville. Joseph, Richard, and William survived into adulthood, Benjamin and Thomas did not. During those years Richard also completed the naturalization process and became a U.S. citizen.

The Michigan Copper Country

Pascoe did eventually go to work for the North West Mining Company, although his exact starting and ending dates are uncertain. In July 1858 he wrote to Wharton from Eagle Harbor, Michigan, favorably describing the mine and rec-



*A cross-section of the Silver Hill Mine in North Carolina, c. 1854.
 (From: H. Schoonmaker, Statement of the Conditions and Prospects
 of the Zinc and Silver Hill Mine, in Davidson County, N.C.
 (New York: Baker, Goodwin, and Company, 1854).)*

ommending that Wharton visit it during the next summer.²⁷

North West Mining Company was chartered in 1849 as the successor to the North West Copper Association and North West Copper Company, established in 1846 and 1847 respectively. Horace Greeley, an early investor, had been North West Mining Company's president for a while. Perhaps heeding his own advice to "go west," Greeley actually visited the mines on the Keweenaw Peninsula in 1847. The company's mines were located in the area of the present near ghost town of Delaware, Michigan.²⁸

During 1858, when Pascoe was there, the company produced 166,100 pounds of copper from several fissure veins.²⁹ These veins were transverse to the series of bedded rocks that form the backbone of the Keweenaw and that in some areas contained the famous conglomerate and amygdaloid copper deposits. The Stoutenburgh Vein was probably the most productive during Pascoe's time there. Four shafts had already been sunk on the vein.³⁰ A stamp mill was located below the mines on the banks of the Montreal River. The copper concentrate from the stamp mill was hauled via a rugged, five-mile-long mining road to

Eagle Harbor, where it was loaded on Lake Superior ships. It is doubtful that the mine was profitable while Pascoe was there.

Through the years that followed, in an effort to gain profitability and benefit from its large land holdings, a series of new companies were formed from the North West Mining Company, starting with the Pennsylvania Mining Company in 1861. Each new company brought in additional investors and capital. In 1863, the separate Delaware Mining Company was formed from part of the Pennsylvania's holdings.

In 1876 the Pennsylvania and Delaware companies consolidated as a new Delaware Copper Mining Company, which reopened North West's mine on the Stoutenburgh Vein for production. In 1881, the Delaware Copper Mining Company was reorganized as the Conglomerate Mining Company, which drove drifts from the old North West workings to access the ore in the conglomerate beds. Copper production reached 734,249 pounds in 1882 and 1,140,173 pounds in 1884, but dropped sharply after that.³¹

From 1849 to 1887, over seven million pounds of copper were produced by these companies. In spite of repeated infusions of capital to improve the operations, however, the low-grade ore could not be mined profitably. Once again the mines became idle. In 1888, the Conglomerate Mining Company was reorganized as the Lac La Belle Mining Company, but the new firm did no additional mining. The Oneida Mining Company, formed in 1899, did additional exploration work but no mining. Eventually, the Calumet and Hecla Mining Company acquired the properties, but it did not resume mining either.

Today, portions of the Delaware Mine's workings can be visited by tourists. The dozens of frame buildings that once formed the mining town of Delaware are long gone; however, those willing to explore the woods near the mine will still find the ruins of many of the stone structures built in the 1800s.³²

Lead Mining in North Carolina

June 1860, found Pascoe the "Agent"—meaning superintendent—of the Silver Hill Mine near Lexington in Davidson County, North Carolina.³³ Silver Hill, discovered in 1838, produced impressive quantities of native silver and lead ore (cerrusite) in the early 1840s. As mining went deeper, the oxidized ore gave way to sulfides of lead (galena) and zinc (sphalerite). The complexity of that ore defeated several experimental metallurgical processes, and by the early 1850s the mine had shut down.³⁴ In the late 1850s, a New York capitalist, Franklin Osgood, purchased the mine. He also owned the Bergen Point Zinc Company in New Jersey, and was an America's Cup sailing enthusiast.³⁵

The outbreak of the Civil War on 12 April 1861 either made it impossible for Pascoe to return north or he chose to stay in the South and continue his work at the mine. In either case, his involvement at Silver Hill continued at least through December 1863.³⁶ Throughout the war, Silver Hill was the Confederacy's back-up source for lead after the mines at Austinville, Virginia.

The lead ore from Silver Hill was shipped via the North Carolina Railroad to the Confederate Lead Works smelter in Petersburg, Virginia. A receipt for one shipment of 7,113 pounds of ore was assayed to contain 4,640 pounds of lead (65%), 753 ounces of silver, and 602 pennyweight of gold. Another receipt was for 61,636 pounds of ore containing 41,904 pounds of lead (67.99%).³⁷ The silver in the ore was not recovered at the smelter and that generated the legend that the Rebels were shooting Yankees with silver bullets.³⁸

In 1861, George C. Irwin, a Baltimore stock broker, appears in Southern records as the president of the Silver Hill Mining Company and an agent for the Confederate States' Niter and Mining Bureau.³⁹ The bureau was responsible for obtaining the mineral raw materials needed to support Southern forces. Irwin was the channel

His Excellency
 Edward Stanley
 Governor C. Sir

Easton, Pa Sept 3. 1862

As I served in Congress with
 you some years ago you may perhaps recollect me. - Hence I
 presume to write to you in behalf of a poor woman and her
 5 Children now residing at Bethlehem near this place. -
 She is the wife of Richard Pascoe who went to N. Carolina
 before the war, is now working in the mines in that state,
 is not in the Army and is said to be & I believe is a
 British Subject. - She is very poor, has been selling her
 furniture to obtain a subsistence, and forced by selling
 the balance of her goods & extra clothing obtain perhaps
 20 or 25 dollars. -
 She wants to go with her children to New
 Bern (N.C) where her husband writes to her he can get
 her or obtain such subsistence for her. -
 My object in writing to you is to
 ascertain ~~the~~ whether, and how she can go there. -
 Could she not by giving all she has got (say \$20 or 30
 dollars) go with her children in one of the Govt transports
 to New Bern? You would greatly oblige a poor woman
 now cast upon the cold charity of the world if you would give
 me an early reply. -
 Truly Your Friend
 R. W. Pascoe

A letter from Richard Broadhead to Governor Edward Stanley in 1862, regarding Jessie Pascoe's
 desperate financial situation. (From the Union Citizen File, U.S. National Archives.)

through which Confederate funds were provided for operating the mine during the war years.

Prior to the start of the war, Irwin had been president of the Gardner Hill Mining Company, which owned a copper mine about thirty miles from Silver Hill. He had also brokered the sale of Silver Hill to Osgood and his investors.⁴⁰

After the war started, Irwin went south, ostensibly to look after his interests at Gardner Hill. The Confederates had confiscated a stockpile of copper ore from the Gardener Hill Mine and sent it to the smelter at Petersburg. When the war ended, Irwin was arrested for aiding the enemy in an alleged scheme to obtain copper gun caps in Philadelphia and ship them south.

After a few weeks in jail, Irwin was released for lack of evidence and the charges dropped. There is no indication in his case files that federal authorities were aware of his involvement with the Niter and Mining Bureau or at the Silver Hill Mine. It seems likely that he was a Southern sympathizer, as were many Baltimore citizens. No evidence survives of Pascoe's wartime sympathies.⁴¹

Because Pascoe was unable to return north or send money to his family, Jessie and his children back in Friedensville, Pennsylvania, were in desperate financial straits. Their plight is recorded in a 3 September 1862 letter to Governor Edward Stanley, the federal military governor of North Carolina in New Bern, from the Honorable Richard Broadhead of Easton, Pennsylvania.

I presume to write to you in behalf of a poor woman and her 5 children. . . . She is the wife of Richard Pascoe who went to N[orth] Carolina before the War, [and] is now working in the mines in that state. . . . She is very poor, [and] has been selling her furniture to obtain a subsistence. . . . She wants to go . . . to New Bern where her husband . . . can obtain subsistence for her.⁴²

There is no indication that this appeal was ac-

cepted. How the family endured the hardships of the remaining two-and-a-half years of war is not known.

After the war, control of the Silver Hill Mine reverted to Franklin Osgood and his investors. The commercialization of zinc oxide and spelter production pioneered by Samuel Wetherill and Joseph Wharton before the war made the mine a valuable source of ore for the Bergen Point Zinc Company. It is quite likely that sphalerite, which had been discarded in prior years, was reclaimed after the war. Silver Hill continued to supply the Bergen Point plant until its commercial ore was exhausted about 1875.

Lead Mining in Austinville, Virginia

Lead was discovered in southwestern Virginia in 1756 by Colonel John Chiswell. The mines developed provided lead for George Washington's army during the Revolution. Moses and Stephen Austin purchased the mines in 1780, and the village of Lead Mines was renamed Austinville in their honor. During the Civil War, the mines at Austinville supplied around 3.5 million pounds of lead to the Confederacy.

Richard Pascoe served as mine captain for the Wythe Lead Mines Company in Austinville, Virginia, from 12 March to 12 August 1864. His salary of \$150 per month was presumably paid in Confederate dollars.⁴³ Like Silver Hill, the Austinville mines were under the direction of the Confederate Niter and Mining Bureau. Oxidized lead ore (cerrusite) was produced from surface pits dug in the local residual clay between pinnacles of the limestone bedrock.⁴⁴ When surface ores were exhausted, mining moved underground. Lead shot was produced on site using a shot tower and shaft. Lead slag and ore were also shipped to the Petersburg Lead Works by the Virginia and Tennessee Railroad and the Southside Railroad. Zinc ores—hemimorphite, smithsonite, and sphalerite—were not recovered until after the war.

Being located well within Confederate terri-

Confederate States of America,

To *Richard Pascoe* Dr.

1864.	DESIGNATION.	REMARKS.
<i>Augt 12</i>	<i>for 5 months service from March 12th 1864 to Augt 12th 1864. at \$1800⁰⁰ per an. as Mining Captain at the Lead mine.</i>	<i>750 00</i>
	$ \begin{array}{r} 4 \frac{1}{2} \times 1800 \\ \hline 8100 \\ - 600 \\ \hline 7500 \end{array} $	

I certify that the above account is correct and just, amounting to *Seven hundred and fifty dollars* and that the services have been performed as stated, and were necessary.

D. H. Tuttle Super.

RECEIVED at *Austinville, Va* this *12* day of *August* 1864 of *D. H. Tuttle*, C. S. Nitre and Mining Service, *Seven Hundred & fifty* dollars *00* cents, in full of the above account.

750 00

(Signed in Duplicate.) *Richard Pascoe*

Confederate Nitre and Mining Bureau pay voucher, Austinville, Virginia, mines, 1864. (From the Confederate Citizen File, U.S. National Archives.)

tory, Austinville's lead mines escaped destruction for most of the war. It is also likely that the U.S. government failed to appreciate their strategic importance. Finally, on 17 December 1864, Union forces under General George Stoneman attacked the mines and burned the facilities before leaving the area. The facilities were rebuilt and back in production in late March 1865, only to be destroyed again by the Federals on 7 April 1865, just two days before Lee's surrender at Appomattox.⁴⁵

After the war, zinc became an important product at Austinville. The New Jersey Zinc Company later acquired the mines and operated them until 1981. Today, an historic shot tower, dating from about 1820, is preserved in a state park along the banks of the New River about three miles east of Austinville.

Pascoe in the Confederate Navy

The details of just what happened to Richard Pascoe after his work at Austinville are not precisely known, except that at some point he was conscripted into the Confederate Navy. He served on CSS Virginia II, an ironclad in the James River Squadron that guarded the river approach to Richmond. On 23 January 1865, Virginia II, two other ironclads, and eight wooden vessels attempted to penetrate barriers placed across the James by Union forces. Their objective was to attack the critical federal supply base at City Point (now Hopewell), Virginia. The three-day Battle of Trent's Reach ended in a stalemate. Pascoe was wounded during intense Union shelling of Virginia II. Fortunately, his injuries were minor.⁴⁶

Under relentless pressure from Ulysses S. Grant's army, the Confederate government and Robert E. Lee's forces abandoned Richmond on 3 April 1865. The ships of the James River Squadron were burned to prevent them from falling into Union hands. The officers and crews were ordered to receive arms and rations and to try to join Lee's retreating army at Amelia Courthouse, Virginia.

The newly formed Naval Brigade, under Commodore J. R. Tucker, participated in the Battle of Sailor's Creek on 6 April. The Confederates were defeated and seven thousand men forced to surrender in the last battle before Lee surrendered at Appomattox, Virginia, on 9 April 1865. On 28 April 1865, Pascoe was paroled from a naval brig in Burkeville, Virginia, just a few miles from Sailor's Creek.⁴⁷ After nearly five years he was finally able to return to his family in Friedensville.

Pascoe's Return to Friedensville

In 1865, Pascoe resumed his earlier position as captain (superintendent) of the Uberroth Mine in Friedensville. In the seven years since Richard Pascoe left the Uberroth to go to the Michigan copper country, many changes had occurred at the mine and the zinc works. His old employer, Joseph Wharton, had successfully ousted Samuel Wetherill and gained full control of the mines and zinc oxide plant in Bethlehem. The name of the company had been changed to the Lehigh Zinc Company. Wharton had experimented with different processes to make zinc metal (spelter). He successfully adapted the Belgian Process for recovering vaporized zinc in ceramic retorts.

In 1860, he contracted with the Philadelphia owners of the company to permit him to build a spelter plant and operate it for three years, after which they would retain ownership. The plant was a success and, thanks to the increased demand for zinc because of the Civil War, zinc prices rose, making Wharton a rich man. In 1863, following the terms of his contract, Wharton left Bethlehem, Friedensville, and the zinc industry. After Wharton's departure, Lehigh Zinc continued to be a major producer of zinc oxide and spelter. In 1865, a rolling mill was added to the zinc works. It produced the first sheet zinc in the U.S.⁴⁸

At the Uberroth, the near-surface oxidized ores that had been mined in the open pit were followed at depth into the veins and fractures of the surrounding limestone. Below 150 feet in depth,

the principal ore was sphalerite. It was necessary to separate the sulfide ore from the zinc oxide ore, which could be sent directly to the smelter. The sphalerite was roasted to remove the sulphur before that ore was sent to the zinc works.

Underground, the miners sought to recover only the rich ore minerals, sometimes freeing huge blocks of the barren limestone which were unstable and required extensive timbering for support.⁴⁹ In 1865, Pascoe was injured in an incident at the mine, likely a rock fall, that affected him for the rest of his life.⁵⁰ This injury may have been the reason that Pascoe took no further consulting jobs requiring long periods away from home.

By far, the greatest change at the mine was the large inflow of water that increased as the mine went deeper. By the late 1860s, with the mine at a depth of 150 feet, it was evident that the inflow was increasing to a point that the existing pumps would not be able to handle it. In a bold and expensive move, Lehigh Zinc contracted for delivery of the world's largest Cornish-type walking beam steam engine to operate additional pumps at the mine. The engine and pumps were dedicated on 29 January 1872 and dubbed "the President" in honor of President Ulysses S. Grant.⁵¹

The massive engine alone weighed 650 tons. The steam boilers, pumps, and associated equipment raised the total weight of the installation to over 1,000 tons.⁵² The engine was designed by John West, an engineer for Lehigh Zinc. It was constructed by Merrick and Sons' Southwork Foundry in Philadelphia. The pumps were manufactured by the I. P. Morris Company of Philadelphia and intended to eventually pump seventeen thousand gallons per minute from a depth of three hundred feet.

Pascoe would have been responsible for preparing the underground workings for the installation of the new pumps. The pump shaft, located immediately outside the engine house, measured thirty by twenty feet and contained two pump rods (each two by three feet), four thirty-inch lift pumps, and four thirty-inch plunger pumps. The

engine and associated equipment cost \$350,000.

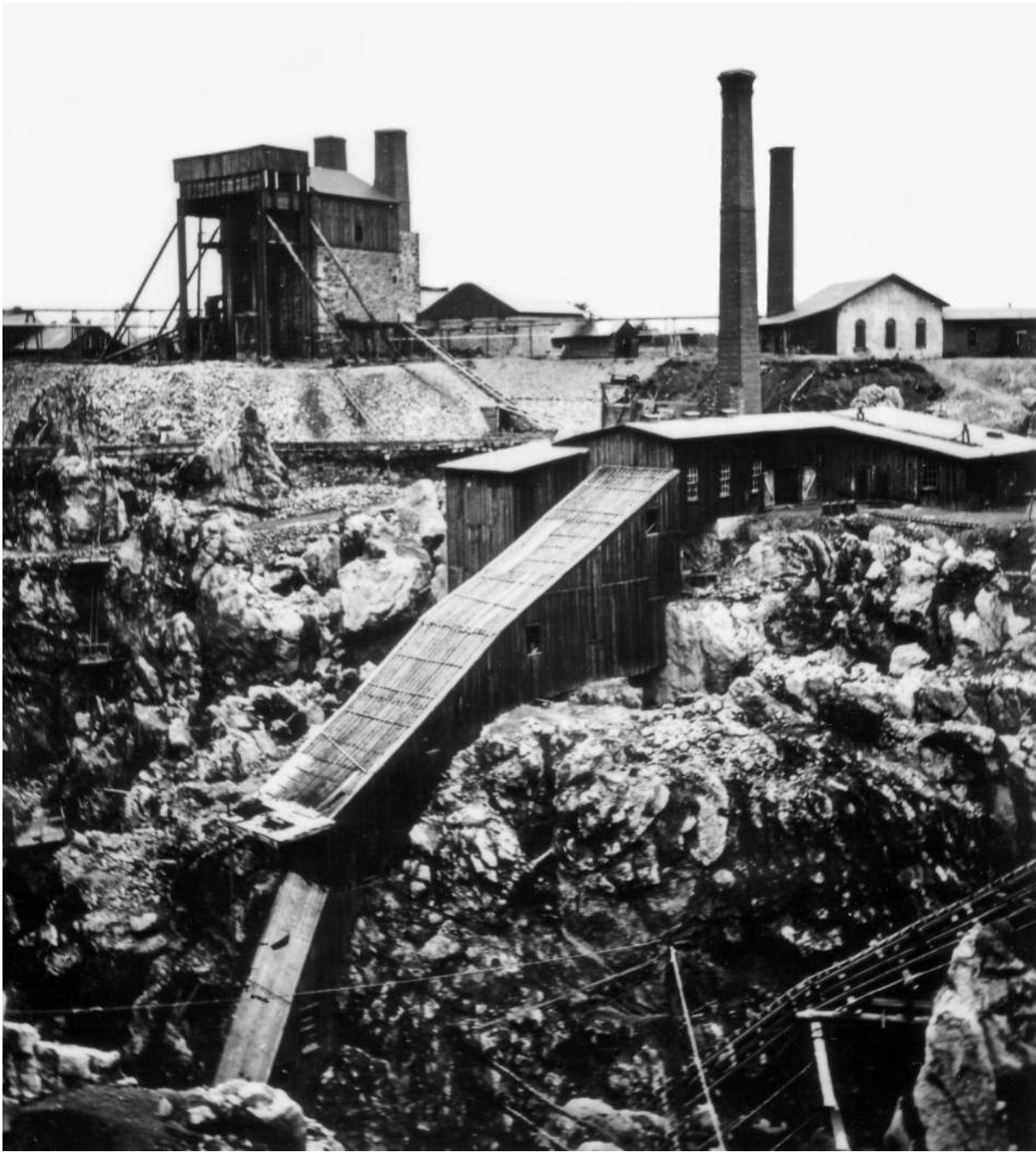
The engine operated continuously from its dedication until 28 October 1876. After that it was operated for short periods of time to dewater neighboring mines. When the Uberroth was producing ore, pumping costs were estimated to be from four to six dollars per ton of ore mined.⁵³ Most of the stone portions of the huge fifty-six by forty-five foot rectangular stone engine house still stand as a testament to this engineering accomplishment.

The declining fortunes of the Friedensville mines began in 1876 with the expiration of the Wetherill patents. Having lost its competitive advantage of the exclusive use of the patents, Lehigh Zinc shut down production at its Friedensville mines and contracted for cheaper zinc ore from mines at Franklin and Sterling Hill, New Jersey. The Uberroth Mine was apparently kept in an operational status so that the President could be used as needed to help dewater neighboring mines. Pascoe remained mine captain until 1881.⁵⁴

Of the five mines in Friedensville, all were owned by Lehigh Zinc except the Correll Mine, which had been leased from 1850 by the Passaic Zinc Company. When that lease expired in 1875, Franklin Osgood leased the Correll to supply his Bergen Point Zinc Company and to replace the ore supply from Silver Hill. In 1881, Osgood purchased the Lehigh Zinc Company's mines, formed the Friedensville Zinc Company, and erected a zinc-oxide plant and zinc smelter in Friedensville. These plants replaced the Bergen Point zinc works in 1885.⁵⁵ The great President pumping engine last operated on 15 September 1891, and was sold for ten thousand dollars for scrap in 1892. The high mining and pumping costs at Friedensville caused all of the mines to shut down for good by 1893.⁵⁶

Mining Iron Ore

The sale of the Uberroth Mine and the unlikely prospects for its continued operation probably



*The Uberroth Mine with the President pump house, Friedensville, Pennsylvania, c. 1876.
(From Benjamin Miller, "Lead and Zinc Ores in Pennsylvania,"
Pennsylvania Geological Survey, Mineral Resource Bulletin, M5.)*

caused Pascoe to end his long connection with the mine. By that time, he had already begun the next phase of his career in iron ore mining. He and his associates leased the Jobst Mine near the village of Vera Cruz, about five miles southwest of Friedensville.⁵⁷ They had a one-year contract to provide five thousand tons of ore to the Hellertown Iron Company, part of the Thomas Iron Company.

In 1848, magnetite iron ore veins had been discovered along the southeast-facing side of South Mountain. In 1875, miners drove an adit into the deposit and discovered two parallel veins. They then drove a 135-foot vertical hoisting shaft upward to the surface from the intersection of the second, larger vein and the adit, and also extended it 75 feet below the adit level. Mining took place in the second vein below the adit level and about three hundred feet along the vein. The vein got larger with depth, up to fifteen feet thick in the lowest level of the mine. During this period of its operation, the mine produced a total of forty thousand tons of ore. The end of the lease marked Pascoe's last involvement in mining. While mining iron ore, he had continued to live in Friedensville.⁵⁸ In 1882 he moved to Bethlehem, Pennsylvania.

The Lehigh Valley Railroad

Pascoe spent the final years of his career working with his son, William, superintendent of bridges stationed at the Lehigh Valley Railroad's shops in South Easton, Pennsylvania. The large South Easton Shops manufactured and repaired rolling stock, switches, bridges, and other railroad equipment, employing about two hundred workers. The facilities included a boiler shop, machine shop, car shop, blacksmith and hammer shop, foundry, warehouse, and twenty-four-stall roundhouse.⁵⁹

We know nothing of Pascoe's actual duties with the railroad, but his varied technical and managerial experience and his personal contacts in the industrial community of the region are

likely to have provided significant value. The opportunities provided by the explosive growth of railroading in the second half of the nineteenth century were not lost on Pascoe's sons. All five worked for the Lehigh Valley Railroad for some portion of their own careers.

Richard Pascoe died at his home in South Easton on 29 November 1887. His career had spanned two continents, four countries, and numerous mining areas. The respect for the old Cornishman was demonstrated by the closure of the Lehigh Valley's Bridge Department so that its workers could attend his funeral.

Following his well-attended funeral, Pascoe was buried in a large plot in the historic Nisky Hill Cemetery in Bethlehem, Pennsylvania. It is fitting that the cemetery overlooks the site of the Lehigh Zinc smelter, as well as the Lehigh River, the Lehigh Canal, the Lehigh Valley Railroad, and the Bethlehem Iron Company (the predecessor of Bethlehem Steel Company). He rests among the giants of the iron and zinc industries of the Lehigh Valley.

Richard Pascoe's Legacy

Richard Pascoe's career illustrates the worldwide demand for Cornish mining expertise in the 1800s and the important contributions of the Cornish Cousin Jacks and Jennies to the establishment and growth of the U.S. mining industry. As a youth he learned his mining skills well, becoming a mine captain at an early age. He earned the respect of mining capitalists both in England and in America.

He was a risk taker who was unafraid of the rigors of the primitive conditions in the camps on the U.S. and Canadian mining frontiers. In hindsight, we know that he didn't always pick the best mines. Kaskawilliam, Friedensville, Silver Hill, and Austinville were good mines, but Michipicoten and North West weren't. His objective clearly was employment. Both he and the mine owners understood the risks inherent in mining.

His political stance during the Civil War is not known. Although his work at Silver Hill and Austinville supported the Confederacy, the hardships that he and his family endured during the war indicate that he may not have understood the potential impact of the war when he started working for the northern owners of Silver Hill in 1860.

Outside of his involvement in mining, Pascoe's legacy and that of his wife, Jessie, can be seen in the lives of their five sons. Jessie raised their children during his extended absences. Each son had some early involvement in mining. The eldest, Archibald, worked for a few years on the Comstock in Gold Hill, Nevada, before returning to Pennsylvania. The other boys, John, Joseph, Richard, and William, each worked for a while at the Uberroth in Friedensville. John was active in mining and quarrying and became the president of a blasting powder company that supplied the anthracite mines.

The careers of all five brothers eventually included employment with the Lehigh Valley Railroad. They worked primarily as managers in bridge construction and at the South Easton machine shops, which supported the rapid expansion of the railroad in the late 1800s. John and Joseph were also very active in politics. At the time of his death, John was a candidate for the Pennsylvania state senate. Joseph served as postmaster in Easton and as comptroller of customs in Philadelphia.

Acknowledgements

The geographic scope of this research would not have been possible without the assistance of many institutions and individuals. The author is particularly grateful to the following: Allentown, PA, Public Library; Bethlehem, PA, Public Library; Easton, PA, Public Library; Earth and Mineral Sciences Library, Pennsylvania State

University, State College; Columbia University Library, New York; Lehigh University Library, Bethlehem, PA; Michigan State University Library, East Lansing; Michigan Tech Archives, Houghton; Department of the Interior Library, Washington, D.C.; U.S. Geological Survey Library, Reston, VA; U.S. National Archives, Washington, D.C.; Library of Congress, Washington, D.C.; Davidson County Historical Museum, Lexington, NC; Lehigh County Historical Society, Allentown, PA; National Canal Museum, Easton, PA; Northampton County Historical Society, Easton, PA; Maryland Historical Society, Baltimore; Historical Society of Schuylkill County, Pottsville, PA; Copper Country Explorer (www.coppercountryexplorer.com); Ontario Ministry of Northern Development and Mines, Sudbury; Moravian Archives, Moravian College, Bethlehem, PA; and the Quaker Archives, Friends Historical Society, Swarthmore College, Swarthmore, PA. Special thanks to Amanda Bielskas, Pamela Daniel, Martha Fox, Carol Herrity, Pat Kaas, Jane Moyer, Linda Musser, Robert and Patricia Pascoe, Don Pugh, Marc Stewart, Peter Yasenchak, and Mary Jo Zeter. ■

L. Michael "Mike" Kaas is a retired mining engineer with a lifelong interest in mining history. His career included employment with the U.S. Bureau of Mines, Office of the Secretary of Interior, IBM Corporation, and several mining companies. He received a BS degree in mining engineering from Pennsylvania State University and an MS degree in mineral engineering from the University of Minnesota. He is the author of numerous technical and historical papers. He serves as a volunteer docent at the Smithsonian Institution's Natural History Museum. His current mining history interests concern mines and mineral processing plants in the eastern states, with a particular focus on those that operated during the Civil War. He is a member and past director of the Society for Mining, Metallurgy, and Exploration (SME).

Notes:

1. None of Richard Pascoe's personal papers have survived. Genealogical information on the Pascoe family was generously shared by Patricia and Robert Pascoe. Robert is the great-great-grandson of Richard W. Pascoe. This information, along with that compiled by the author, was developed from on-line sources including www.Ancestry.com, www.FamilySearch.org, and a variety of other genealogical record sources.
2. Thomas Spargo, *The Mines of Cornwall and Devon: Statistics and Observations* (London: Victoria Press, 1865).
3. "1841 Census Enumeration Schedule," District 7, Rosewarne, Camborne, England, 19. John Pascoe, Sr., is listed as a mine agent and his five sons, John, Richard, William, Thomas, and Joseph, as copper miners. "1851 Census Enumeration Schedule," Camborne District, Town of Camborne, England, 41. John Pascoe, Sr., is listed as a mine agent and his two sons still living at home, William and Joseph, as copper miners. "1861 Census Enumeration Schedule," St. Martin's Camborne District, Town of Camborne, England, 167. John Pascoe, Sr., is listed as a mine agent. Only his daughter, Jane, was still living at home.
4. "Captain Richard W. Pascoe Obituary," *Easton [PA] Express*, 2 Dec. 1887.
5. W. J. Heller, "Joseph W. Pascoe Biography," *History of Northampton County, Pennsylvania*, v. 3 (New York: American Historical Society, 1920), 115-7; W. J. Heller, "Richard Freemont Pascoe Biography," *History of Northampton County, Pennsylvania*, v. 3 (New York: American Historical Society, 1920), 482-4; "Richard Pascoe Obituary." The biographies of Pascoe's sons provide some details about his early life and work in Cornwall and Scotland. Additional information about his early years is provided in his obituary. There are some inconsistencies in these sources.
6. "Jessie C. Pascoe Obituary," *Allentown [PA] Morning Call*, 17 Nov. 1905, 1.
7. Passenger List, Barque *Hyperian*, Glasgow to New York, 14 Sep. 1849. (Jessie and Archibald emigrating to join Richard in the United States.)
8. "United States 1850 Census Schedule 1," Blythe Township, Schuylkill County, Pennsylvania (1850), 98.
9. Heller, *History of Northampton County*, 115-7, 482-4.
10. Henry Darwin Rogers, *The Geology of Pennsylvania*, v. II, p. I (Philadelphia: J. B. Lippincott and Co., 1858), 121.
11. "Richard Pascoe, Naturalization Petition," Schuylkill County, Pennsylvania, 15 June 1851.
12. "Kaskawilliam Mine Payroll Ledger," Schuylkill County Historical Society, Pottsville, Pennsylvania. The ledger contains payroll records for Richard Pascoe, Foreman, June 1851 (starting date of ledger) to July 1851 and April 1852 to May 1853. It is likely that the nine-month gap is the time he was on Michipicoten Island, Ontario, Canada.
13. "Maps of the Kaskawilliam Colliery," Bureau of Mine Safety, Office of Anthracite and Industrial Minerals Mine Safety, Pennsylvania Department of Environmental Protection, Pottsville, Pennsylvania, 2012. This series of maps shows the locations of the underground workings in the steeply pitching anthracite coal seams. The locations of surface features, including the town site and breaker, are also shown.
14. Pennsylvania anthracite mining flourished for decades after Pascoe moved on. Production peaked around World War I, after which the industry collapsed due to competition from other fuels. Anthracite is still being mined on a small scale in this area. The small patch town of Kaska still provides housing for twenty-first century miners.
15. Heller, *History of Northampton County*, 115-7, 482-4.
16. Donald E. Pugh, "Ghosts of Michipicoten Island," *Canadian Frontier* 3, no. 3 (Fall 1974): 27-9. The author describes the discovery of copper and early mining efforts. Of special interest is a Detroit reporter's description of his 1853 visit to the mines. D. E. Pugh, "Michipicoten Island: Tales of Fear and Disasters," *Algoma [ON] News Review*, 8 May 1974. The author describes the discovery of copper and early mining efforts by English and New York investors.
17. "Mineral Property File on the Michipicoten Island Copper Mines," Ontario Ministry of Northern Development and Mines, Sudbury, Ontario, 2012. This file contains several reports that have been generated by various exploration efforts on Michipicoten Island since the 1930s. The reports contain sketch maps of the historic workings of the Quebec Mine, the largest of these mines.
18. Pugh, "Ghosts of Michipicoten Island," 29.
19. Pugh, "Ghosts of Michipicoten Island," 29.
20. "File 03139, Charles Jones Location; Quebec Mine," Abandoned Mine Information System (AMIS), Ontario Ministry of Northern Development and Mines, Sudbury, Ontario (www.geologyontario.mndmf.gov.on.ca, accessed 20 Mar. 2012). This on-line file contains a summary of exploration and mining work from the mid-1800s to the present. "Prospectus of the Michipicoten Mining Company," (New York: C. O. Jones, 1864). This prospectus contains several reports on the geology and mining efforts to-date on the island. Of particular interest is a geological investigation by a Philadelphia consulting geologist, which may indicate the involvement of investors from that city. Pascoe would later become involved with several mining projects promoted by Philadelphians.
21. "Michipicoten Post and Michipicoten Island," Ontario Parks, Ministry of Natural Resources, Sudbury, On-

- tario (Queen's Printer of Ontario, 2004). This background report for management planning contains detailed maps of the island that show geology, patented land, and mining locations. "Team MiBSAR Completes 9-day, Long-Range, SAR Backpacking Expedition on Canada's Seldom-Visited Michipicoten Island," Michigan Backcountry Search and Rescue (MiBSAR): Special Operations Blog (Notes) on Sunday, 11 June 2011 (www.facebook.com/note.php?saved&¬e_id=198086636904891, accessed 24 Apr. 2013). This blog posting contains several excellent photographs of the ruins of the Quebec Mine and describes the rugged terrain encountered on the island.
22. "Kaskawilliam Mine Payroll Ledger," 1853.
 23. L. Michael Kaas, "The History of Zinc Mining in Friedensville, Pennsylvania," unpublished manuscript, 2013.
 24. Benjamin L. Miller, "Lead and Zinc Ores in Pennsylvania," Pennsylvania Geological Survey, *Mineral Resource Bulletin M5* (Harrisburg: Department of Forests and Waters, 1924), 54-85. The author includes maps and photographs of the early mines in the Friedensville district.
 25. W. Ross Yates, *Joseph Wharton, Quaker Industrial Pioneer* (Bethlehem, PA: Lehigh University Press, 1987). The author describes Wharton's ventures in making zinc oxide and spelter. Wharton to Pascoe, letter from Philadelphia, 28 Jan. 1857, "Joseph Wharton Family Papers (1691-1962)," Friends Historical Library of Swarthmore College, Swarthmore, PA. Wharton advises Pascoe of the status of negotiations with Samuel Wetherill and the uncertainty about when the Uberroth Mine will resume operations.
 26. Moss to Pascoe, letter from Philadelphia, 23 Mar. 1857, "Wharton Papers." Moss inquires about Pascoe's availability for the position of agent with the North West Mining Company at their copper mine in the Keweenaw Peninsula, MI. Pascoe to Wharton, letter from Friedensville, PA, 29 Mar. 1857, "Wharton Papers." Pascoe attached the letter from Moss and sought Wharton's opinion of the offer. Wharton to Pascoe, letter from Philadelphia, 7 Apr. 1857, "Wharton Papers." Wharton apparently suggested that Pascoe not take the job offer. The letter was referenced in the subsequent response from Pascoe to Wharton but has not been found in the archives. Pascoe to Wharton, from Friedensville, 10 Apr. 1857, "Wharton Papers." Pascoe says he will not take the job and will wait for a better offer.
 27. Pascoe to Wharton, letter from Eagle Harbor, MI, 3 July 1858, "Wharton Papers."
 28. "North-West Mining Company, First Annual Report" (Philadelphia: John C. Clark, 1849). Ellis W. Courter, *Michigan's Copper Country* [Contributions to Michigan Geology, 92-01] (Lansing: Michigan Dept. of Natural Resources, 1992): 73-5, (www.michigan.gov/documents/deq/CMG92_301731_7.pdf) accessed 28 May 2013. The exploration and mining at the North West Mine are described. Of particular interest is the succession of mining companies organized to invest in and develop the mineral deposit. None were profitable.
 29. B. S. Butler and W. S. Burbank, "The Copper Deposits of Michigan," U. S. Geological Survey, *Professional Paper 144*, (Washington, D.C.: USGPO, 1929), 93.
 30. J. D. Whitney, *The Metallic Wealth of the United States* (Philadelphia: Lippincott, Grambo, and Company, 1854), 269-72. This publication contains cross-sections of the workings on the Stoutenburgh and Hogan Veins at the North West Mine.
 31. "The Conglomerate Mining Company" (Philadelphia: Conglomerate Mining Company, 1887). This prospectus-like booklet describes the extensive physical plant that had been built by the various companies that operated the mines at this site. Photographs show the old buildings of the North West Mining Company's "D" Shaft and engine house. An inventory of the equipment in these buildings is also included. Butler and Burbank, "Copper Deposits of Michigan," 84, 93, 182, 227.
 32. "Delaware: A Site Tour – Part 1," Copper Country Explorer (www.coppercountryexplorer.com/2010/08/delaware-a-site-tour-p1, accessed 25 Apr. 2013). This website contains extensive historic and current photographs and maps of the North West Mine location, subsequently renamed the Delaware Mine and the Conglomerate Mine. An excellent map shows the original position of the many shafts and buildings that once existed at the location.
 33. "United States 1860 Census Schedule 1," South Division, Davidson County, North Carolina (1860), 90.
 34. L. Michael Kaas, "The Silver Hill Mine: First Silver Mine in the United States and Supplier of Lead to the Confederacy," *Mining History Journal* 16 (2009): 29-44. In response to an 1861 interrogatory, General Josiah Gorgas, head of the Ordinance Bureau of the Confederate War Department, noted that Governor Warren Winslow had contacted Pascoe regarding reopening the Silver Hill Mine. This contact was probably made in 1860, before the Civil War had begun.
 35. "Twice He Saved the Cup, Osgood's Career in Business and as Yachtsman," *New York Times*, 14 Jan. 1888. Franklin Osgood's obituary tells that he purchased the Silver Hill Mine shortly before the Civil War. Pascoe went to Silver Hill before the Civil War during the time the mine was owned by Osgood.
 36. "Silver Hill Mining Company Ledger, 1859-1862," Southern Historical Collection, Manuscripts Department, University of North Carolina Library, Chapel Hill, 237, 319, 341. This original, though incomplete, ledger contains financial transactions for Richard Pascoe from 14 June 1860 to 15 Mar. 1862.

- "Richard W. Pascoe Vouchers from Confederate Niter and Mining Bureau," Confederate Citizen File, National Archives, Washington, D.C. (www.fold3.com/image/#465535531, accessed 2 May 2012 and 25-30 Apr. 2013). Most of these vouchers are for purchases of routine mining supplies such as tallow for miners' candles and blasting powder for the Silver Hill Mine. They span the period from 4 Nov. 1861 to 29 Dec. 1863.
37. "George C. Irwin Vouchers from the Confederate Niter and Mining Bureau," Confederate Citizen File, National Archives, Washington, D.C. (www.fold3.com/image/#135845685, accessed 2 May 2012 and 25-30 Apr. 2013). These vouchers cover many types of transactions relating to mining supplies and lead shipments at Silver Hill and to Irwin's travel expenses as an agent for the Niter and Mining Bureau. The vouchers span the period from 16 Sep. 1861 to 1 Oct. 1864.
 38. Kaas, "Silver Hill Mine," 38.
 39. "Irwin Vouchers."
 40. "George C. Irwin Account and Letterbook, 1845-1875," Special Collections, Maryland Historical Society, Baltimore, MD. This ledger contains accounting transactions including many pertaining to North Carolina mining ventures. Only one transaction involved Richard Pascoe. Its purpose is unknown.
 41. "George C. Irwin Case Files," in the Confederate Citizen File, National Archives, Washington, D.C. (www.fold3.com/image/#287095580 and www.fold3.com/image/#287095577, accessed 2 May 2012). These files contain the documents relating to Irwin's arrest and his alleged involvement in a scheme to illegally obtain copper gun caps from a company in Philadelphia and have then shipped through Latin America and back to the Confederates. The charges were eventually dropped. The records span the period from 27 Apr. 1865 to 27 May 1865. These files do not contain any references to Irwin's involvement at the Silver Hill Mine.
 42. Hon. Richard Brodhead to Military Gov. Edward Stanley of New Bern, North Carolina, letter from Easton, PA, 3 Sep. 1862. Union Citizen File, National Archives, Washington, D.C. (www.fold3.com/image/#291136608, accessed 25 Apr. 2013).
 43. "Payroll Receipt for Richard Pascoe, Confederate Niter and Mining Service, Austinville, Virginia, 12 August 1864," Confederate Citizens File, National Archives, Washington, D.C. (www.Fold3.com/image/#46535998, accessed 2 Apr. 2012). Pascoe was paid for five months work as the mine captain at the Wythe Lead Mines from 12 Mar. to 12 Aug. 1864.
 44. Thomas Leonard Watson, "Lead and Zinc Deposits of Virginia," Geological Survey of Virginia, *Geological Series, Bulletin No. 1* (Richmond: Board of Agriculture and Immigration, 1906), 83-99.
 45. Robert C. Whisonant, "Geology of the Civil War in Southwestern Virginia: The Wythe County Lead Mines," *Virginia Minerals* 42, no. 2 (1996): 1-19.
 46. Heller, "History of Northampton County," 483. His son's biography mentions Pascoe's service in the Confederate Navy. "North Atlantic Blockading Squadron (October 28, 1864-February 1, 1865)," *Official records of the Union and Confederate Navies in the War of the Rebellion*, ser. I, v. 11 (Washington D.C.: USGPO, 1922), 688-9. Pascoe's name is included in the list of those killed and wounded in the Battle of Trent's Reach. Taft Kiser, "The Richmond Ironclads at Trent's Reach," Notes on Virginia no. 53 (Richmond: Virginia Department of Historic Resources, 2005): 48-9, contains a concise description of the battle.
 47. "Richard Pascoe's Discharge (Parole) from the Confederate Navy, 28 April 1865," U.S. National Archives, Washington, D.C. Microfilmed records M260, Roll 6, Records Relating to Confederate Naval and Marine Personnel.
 48. Kaas, "History of Zinc Mining in Friedensville."
 49. Miller, "Lead and Zinc Ores," 65, 77-80. Miller's publication contains several photographs of the Uberroth Mine, c. 1877, showing the surface pit, the stone engine house containing "The President" pump, the mill, and other buildings. Other photographs show the abandoned mine c. 1922.
 50. "Richard Pascoe Obituary."
 51. "Friedensville Zinc Mines," *Engineering and Mining Journal* 13 (1872): 65-6, 73, 329. These articles include the speech of B. C. Webster, Lehigh Zinc Co. president, at the dedication ceremony for "The President."
 52. "Pumping Engine with Pumps and Shaft Works Ledger," *Records of the Lehigh Zinc Company (1841-1881)*, Moravian Archives, Moravian College, Bethlehem, PA. The ledger contains an extensive record of the transactions regarding the purchase, transportation, and installation of The President and other pumping equipment. "Pumping Engine at the Lehigh Zinc-Works, Friedensville, Pennsylvania," *Scientific American Supplement* 1, no. 32 (5 Aug. 1876): 502-4.
 53. Miller, "Lead and Zinc Ores," 74.
 54. "Pascoe Letters," *Records of the Lehigh Zinc Company (1841-1881)*, Moravian Archives, Moravian College, Bethlehem, PA. An extensive series of letters between various officials of Lehigh Zinc and Captain Richard Pascoe, superintendent of the Uberroth Mine, dealing with day-to-day operations at the mine. The letters are dated through June 1881, when the mines were sold to Franklin Osgood and Pascoe left the company. Pascoe to Liebert, letter of 5 Feb. 1881, regarding the need for coal at Pascoe's home in Friedensville. The letter shows that Pascoe was already engaged in mining iron ore while continuing his duties for Lehigh Zinc at the Uberroth Mine.

- 55 Kaas, "History of Zinc Mining in Friedensville."
- 56 Nadine Miller Peterson and Dan Zagorski, "Zinc Mining in the Saucon Valley Region of Pennsylvania, 1846-1986," *Canal History and Technology Proceedings XX* (Easton: Canal History and Technology Press, National Canal Museum, 2001): 159. The sale of The President is described. "Pit of Friedensville Mines," *Beyond Steel*, Lehigh University Digital Library (http://digital.lib.lehigh.edu/cdm4/beyond_viewer.php?DMTHUMB=1&DMTEXT=zincmining&searchworks=searchzincmining_0_0_11&CISOROOT=/postal&ptr=2589, accessed 20 Mar. 2013). This c. 1910 postcard showing the abandoned Uberroth Mine was signed by Alice Pascoe Ritter, granddaughter of Richard Pascoe.
57. "Richard Pascoe Obituary;" Benjamin L. Miller, "Geology of Lehigh County," Pennsylvania Geological Survey, Fourth Series, *Bulletin C39* (Harrisburg: Pennsylvania Topographic and Geological Survey, 1941), 316-7, 323. Mining of magnetite ore at the Jobst Mine near Vera Cruz, PA, is described. The property was leased in 1880 by Pascoe and others to supply ore to the Hellertown Iron Company, owned by the Thomas Iron Company. That company's founder, David Thomas, had pioneered the use of anthracite to make iron and was the first president of the American Institute of Mining Engineers (AIME).
58. "Richard Pascoe Obituary."
59. Lyman Coleman, *Guidebook to the Lehigh Valley Railroad* (Philadelphia: J. B. Lippincott, 1873), 35-6. The facilities of the Lehigh Valley's shops are described. Ethan Allan Weaver, *The Forks of the Delaware Illustrated* (Easton, PA: Press of the Eschenbach Printing House, 1900), 29. This publication has a photograph of the Lehigh Valley's South Easton Shops.