19th CENTURY ZINC MINING IN THE FRIEDENSVILLE, PA DISTRICT AND THE BIRTH OF THE U. S. ZINC INDUSTRY

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ZINC MINES AND SMELTERS, 1850-1890

(Modified from Bleiwas and DiFrancesco, 2010)
1847 EXPLORATION MAP
FRIEDENSVILLE, PA

REFERENCES.

- Buildings and outbuildings
- Church
- Schoolhouse
- Shafts

1. Shaft 37 feet. Depth through zinc ore 31 feet.
   - 2
   - 3
   - 4
   - 5
   - 6
   - 7
   - 8

In none of the Shafts has the zinc ore been penetrated. (That is, the bottom is in ore.)

(Wittman, 1847; Smith, 1977)
Samuel Wetherill
(South Bethlehem Historical Society)
1853 WETHERILL AND GILBERT ZINC WORKS, SOUTH BETHLEHEM, PA

PENNSYLVANIA AND LEHIGH ZINC COMPANY (PLZC) OPERATES THE FRIEDENSVILLE MINES, CONTRACTS WITH WETHERILL FOR OXIDE

WETHERILL PROCESS: WETHERILL’S OXIDE FURNACE PATENT
SAMUEL T. JONES’ BAG HOUSE PATENT

FIRST* U.S. LARGE SCALE ZINC OXIDE PRODUCTION

* New Jersey Zinc and Passaic Zinc were producing smaller amounts of oxide from Franklin-Sterling Hill Ores using other processes

(Henry, 1860)
1854 PHILADELPHIA QUAKER INVESTORS TAKE OVER PLZC

**JOSEPH WHARTON** SENT TO OVERSEE OPERATIONS

*PROBLEMS WITH WETHERILL*
- Declining quality of oxide
- Sale of oxide for own account
- Use of company resources for experiments in making spelter (metallic zinc)

**WHARTON’S ACTIONS**
- Improves management
- Increases profitability
- Hires “competent miner” to run the mines (Richard W. Pascoe)

WETHERILL SELLS OUT

**WHARTON** CONSTRUCTS AND OPERATES FIRST COMMERCIAL METALLIC ZINC SMELTER IN THE U.S. (1860-1863)
1861-1865 CIVIL WAR, ZINC DEMAND AND PRICE INCREASES

WHARTON BECOMES A WEALTHY MAN, LEAVES ZINC IN 1863

(1885 Sanborn Insurance Map)
THE FRIEDENSVILLE MINES, 1853-1893

Pennsylvania and Lehigh Zinc Co. / Lehigh Zinc Co.* (1853-1876/1881)
  Uberroth Mine
  Old Hartman Mine
  Three Cornered Lot Mine
  New Hartman Mine

Passaic Zinc Co. (1853-1875)
  Correll Mine

Bergen Point Zinc Co. (1875-1881)
  Correll Mine

Friedensville Zinc Co. (1881-1893)
  All Mines

* PLZC changed its name to LZC in 1860

(Miller, 1924, Figure 4)
FRIEDENSVILLE MINERALS

Near the Surface
Hemimorphite (Zn$_4$Si$_2$O$_7$(OH)$_2$·H$_2$O)

Deeper Underground
Sphalerite (ZnS)

(From www.mindat.org and John Betts Minerals, 2013)
UBERROTH MINE

(Miller, 1924, Figure 5)
UBERROTH UNDERGROUND MINING METHODS

ZINC ORE SURROUNDED BLOCKS OF LIMESTONE AND DOLOMITE

MINERS TRIED TO TAKE ONLY THE ORE

TIMBERS USED TO SUPPORT THE BLOCKS WHEN ORE WAS REMOVED

INCLINED RAMP USED TO TRANSPORT ORE TO THE SURFACE (NO MAIN SHAFT EXCEPT FOR PUMPING WATER)

(Painting ca1880; AIME, 1925)
UBERROTH UNDERGROUND MINING METHODS

MINERS CLIMB LADDERS

ORE HOISTED UP THE INCLINE
UBERROTH UNDERGROUND MINING METHODS

MINERS SINGLE JACKING

BURLEIGH COMPRESSED AIR DRILL

(Geevor Mine Museum, 2018; Raymond, 1872)
UBERROTH ORE PROCESSING METHODS

Fig. 1. Hand Jig—Operated from Line Shafting. Scale \( \frac{3}{4}'' = 1' \).

Fig. 2. Round Buddle. Scale \( \frac{3}{4}'' = 1' \).

Fig. 3. Plain Buddle. Scale \( \frac{3}{4}'' = 1' \).

Fig. 4. Picking Table. Scale \( \frac{3}{4}'' = 1' \).

(Landis, 1896)
UBERROTH MINE, ca1880s

Wetherill Patents Expire, 1876

Lehigh Zinc Closes Its Mines, 1876

Bergen Point Zinc Co. Owns All Mines, Forms Friedensville Zinc Co., 1881

Mines Close, 1893

(Miller, 1924, Plate II A)
UBERROTH MINE AFTER CLOSURE, ca1910

Alice Pascoe was the granddaughter of Richard W. Pascoe, Uberroth Supt.

(Left to right) Engine House, Boiler House, and Mine Office (Lehigh University, Bill Weiner Collection)
NEW HARTMAN MINE DURING NJ ZINC CO. EXPLORATION, 1916-17
NJZ FRIEDENSVILLE MINING METHOD, 1958-1983

CROSS SECTION SHOWING PROPOSED MINING SYSTEM FOR FRIEDENSVILLE
-LOOKING EASTERLY-

(New Jersey Zinc Company, 1962)
NJZ FRIEDENSVILLE MINE UPPER LEVELS, 1962

New Hartman Workings, 1893
NJZ FRIEDENSVILLE MINE

(Clockwise) Mine and Mill, Scaling the Back from a “Giraffe,” Underground Pump Station, Loading Ore (Photos Courtesy Ken Cox, ca1976)
FRIEDENSVILLE MINES REDEVELOPMENT

NJZ
FRIEDENSVILLE MINE WORKINGS SHOWN IN RED, 1958-1981

(Google Earth Image 2013, annotations by author)
FRIEDENSVILLE PRODUCTION ESTIMATES

1853-1893 Period (Based on Miller, 1924; Smith, 1977)

Est. Total Production (All Mines): 800,000 tons ore
  Uberroth Mine: 450,000 tons ore
  Old Hartman Mine: 200,000 tons ore
  Correll Mine: 100,000 tons ore
  Three Cornered Lot Mine: 50,000 tons ore
Average Ore Grade: 30% Zinc
Hand-Picked Sphalerite Grade: 45% Zinc

1958-1983 Period (Based on Metsger, 1973; Smith, 1977)

Friedensville Mine Capacity 2000-2200 tpd ore
Friedensville Mill Capacity 2500 tpd ore
Est. Total Ore Production (25 years): 14,000,000 tons
Est. Total Zinc Production: Over 900,000 tons
Ore Grade: 5.5-6.5% Zn

TOTAL VALUE $3.0 BILLION (Based on Zinc Price, 3 May 2018)
FRIEDENSVILLE HISTORIC MINE SITES

(Clockwise from Upper Left) Uberroth Mine with Cornish Engine House, Engine House Stonework, Breccia Exposed in Old Hartman Pit, and Old Hartman Pit (Kaas Photos, 2007 and 2012)
HISTORIC FRIEDENSVILLE VILLAGE

(Clockwise from Upper Left) Friedensville Church, ca1839; Uberroth Mine Superintendent’s House, ca1840; David Hartman House, ca1870; and New Jersey Zinc Employee Housing, ca1950 (Kaas Photos, 2012)
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