

LUKENS, 1850-1870:
A CASE STUDY IN THE MID-NINETEENTH
CENTURY AMERICAN IRON INDUSTRY

BY
Julian Callison Skaggs

An abstract of a dissertation submitted to the
Faculty of the University of Delaware in partial fulfillment
of the requirements for the degree of Doctor of Philosophy
in History.

June, 1975

Approved: _____
Professor in charge of dissertation

Abstract

A case study in mid-nineteenth century American Business History. The study is based on the business records of a small family-owned boiler plate manufacturing firm located in Coatesville, Pennsylvania. Utilizing the financial books and correspondence of the Lukens Rolling Mill, the author reconstructs the changes in the managerial personnel who steered the company through good times and bad in the first seventy years of the nineteenth century. Traditionalist to the core, Lukens continued to use antique methods to produce its high quality iron. Though Lukens was a small scale operation, it successfully marketed its plate in a highly competitive market that extended from Boston to New Orleans.

Despite their staunch Quaker beliefs, the firm's managers abandoned their pacifism during the Civil War and so were able to participate in supplying the enormous demand for iron engendered by that conflict. Output doubled and profits sextupled between 1861 and 1864. Yet serious technological modernization did not occur until the traditional market for boiler plate was supplemented by a new

market for boat-iron in the late 1860's.

Lukens was remarkable up to 1860 only for its typicality. By 1869 it was remarkably backward, remaining wed to water power and antique metallurgical techniques. Its history demonstrates the frailty of any reconstruction of American Business History that stresses bigness, innovations and profit maximization for any period before the 1870's. Lukens pursued the tranquil life, with mixed success, and the profits of riskless sufficiency, with considerable success.

LUKENS, 1850-1870:
A CASE STUDY IN THE MID-NINETEENTH
CENTURY AMERICAN IRON INDUSTRY

BY

Julian Callison Skaggs

Approved: _____
Professor in charge of dissertation on behalf of
the Advisory Committee

Approved: _____
Chairman of the Department of History

Approved: _____
Dean of the College of Graduate Studies

Dedication

This is for my friend Reed Geiger

Acknowledgements

My debts are, of course, considerable and it is a pleasure to recite them here. My thanks go to J. Stewart Huston who allowed me access to the papers and books which make up the Lukens Collection held on deposit at the Eleutherian Mills Historical Library. Dr. Richmond Williams, Director of the Eleutherian Mills Historical Library, and his staff were unfailingly generous and helpful to me. Mrs. B - Bright Low saw to it that I had working space and her staff, Mrs. Carol Hallman, Mrs. Susan Danko, and Mr. Jon Williams, all answered my calls for various manuscripts quickly and with constant good humor. Heaven knows I tormented them enough. Dr. John Riggs very kindly allowed me access to incoming parts of the Lukens Collection before they were catalogued and thereby saved me grief and time. Miss Grace Ottey alerted me to relevant new acquisitions and gave me aspirin when my head hurt.

My thanks also go to Mr. Eugene Di Orio who provided me with copies of several documents held by the Huston family in Coatesville.

Dr. Stephen Salsbury was my advisor throughout this project. His patience with me was a wonder. Special thanks must go to my friend Reed Geiger for constant encouragement and stylistic help. I am afraid however that my stubbornness in certain matters remains in the face of his advice.

Finally I must thank my wife whose quick eye stopped some idiocies from seeing the light of day.

TABLE OF CONTENTS

CHAPTER	PAGE
I The American Iron Industry, 1800-1850	1
II Genesis	23
III Manufacturing Boiler Plate	41
IV Selling Boiler Plate	58
V Consolidation	76
VI Conflict and Change	120
VII Conclusion	165
BIBLIOGRAPHY	179
APPENDICES	182

Glossary

1. **BLOOM:** an intermediate iron product which has been rolled or forged down from an ingot of pig iron into a slab of wrought iron that can be further worked into bars, sheets, tubes, forgings, etc.
2. **BOILER PLATE:** today made from steel. In the mid-nineteenth century made from wrought iron rolled into sheets. The best boiler iron of the earlier period was refined by charcoal fuel.
3. **COLD SHORT:** lack of ductility in iron when worked at fairly low temperatures. Excess phosphorus or the lack of silicon are common causes of cold shortness in wrought iron.
4. **HEAT:** the amount of iron rolled in a single rolling operation.
5. **PIG IRON:** crude metallic iron produced by the reduction of iron ore in a blast furnace and cast into

pigs which are then used for making cast iron, wrought iron or steel. The principal impurities are carbon, silicon, manganese, sulphur and phosphorus.

6. **PILE:** a number of bars, sheets, or scraps of wrought iron placed one on top of the other, ready for heating to a welding temperature and rolling into sheets or sections.
7. **PUDDLED IRON:** wrought iron produced by melting pig iron in a reverberatory coal fueled furnace. As the impurities oxidized out of the pig iron, the melting point of the iron rose and the refined iron was gathered into pasty balls and taken from the furnace for hammering or rolling into blooms. Puddled iron was cheaper to produce than charcoal refined wrought iron and its quality poorer.
8. **RED SHORT:** brittleness in iron when red hot. Red short iron splits when rolled or hammered, a common flaw in improperly refined blooms usually caused by high sulphur content in the iron.
9. **REHEATING FURNACES:** furnaces serving to bring iron to a high heat so that the separate pieces of iron which

made up the pile could be rolled into a single sheet of boiler plate. These furnaces were reverberatory in design so that the fuel was not in contact with the iron.

10. **ROLLING MILL:** in its simplest form, two horizontal rolls, one above the other, revolving at the same speed but in different directions so that the metal is drawn between them and shaped into a flat sheet. The rolls are held in a fixed position by substantial housings which have adjusting screws to control the distance between the rolls and hence the thickness of the sheet.

11. **WROUGHT IRON:** a commercial iron produced by refining pig iron. Wrought iron contains an appreciable amount of slag, even though most of the slag is removed by hammering or rolling. The remaining slag remains intermingled in the iron in thread-like form giving the characteristic fibrous structure of wrought iron.