



★  
Class 669.1 Book A51



*Presented by*

*Amon.*

SCITECH r HD9514.A5  
1892

American Iron and Steel  
Association.

Statistics of the American  
and foreign iron trades ...  
Annual statistical report o

STATISTICS  
OF THE  
AMERICAN AND FOREIGN IRON TRADES  
FOR 1892.

---

ANNUAL STATISTICAL REPORT  
OF THE  
AMERICAN  
IRON AND STEEL ASSOCIATION,

CONTAINING  
COMPLETE STATISTICS OF THE AMERICAN IRON TRADE  
FOR 1892 AND FOR TWENTY PRECEDING YEARS; ALSO A  
BRIEF REVIEW OF ITS PRESENT CONDITION; ALSO  
THE LATEST STATISTICS OF THE IRON AND  
STEEL INDUSTRIES OF FOREIGN COUNTRIES.

---

PRESENTED TO THE MEMBERS, MAY 1, 1893.,,

---

PHILADELPHIA:  
THE AMERICAN IRON AND STEEL ASSOCIATION,  
No. 261 SOUTH FOURTH STREET.  
1893.

✓21

---

Entered, according to act of Congress, in the year 1893,  
BY JAMES M. SWANK,  
In the office of the Librarian of Congress, at Washington.

---

Printed by  
ALLEN, LANE & SCOTT,  
Nos. 229-231-233 South Fifth Street,  
Philadelphia.



# CONTENTS.

	PAGE
LETTER TO THE PRESIDENT OF THE ASSOCIATION, . . .	7, 8

IRON AND STEEL NECROLOGY FOR 1892 AND 1893, . . .	9-12
---	------

## STATISTICS OF THE AMERICAN IRON TRADE.

General Review of the Domestic Iron Trade, . . . . .	13-16
General Summary of Production, . . . . .	17-20
Shipments of Iron Ore from the Lake Superior Mines, . . . . .	17, 30, 31
Imports of Iron Ore in 1892 and previous years, . . . . .	17, 31, 32
Shipments of Connellsville and Pocahontas Flat Top Coke, . . . . .	17, 18
Prices of Connellsville Coke in 1892 and 1893, . . . . .	17, 18
Shipments of Anthracite Coal from the Mines of Pennsylvania, . . . . .	18, 50, 51
Number of Miles of Railroad Built in 1892 and previous years, . . . . .	18
Number of Locomotives and Freight Cars Built in 1891 and 1892, . . . . .	18
Number of Miles of Street Railways in the United States, . . . . .	19
Production of Tinplates in 1891 and 1892, . . . . .	19, 54
Wages and Labor Troubles, . . . . .	20, 21
Average Monthly Prices of Iron and Steel from 1890 to 1893, . . . . .	21, 22
Average Yearly Prices of Iron and Steel, . . . . .	23
Monthly Prices of Wire Nails at Chicago, . . . . .	23
Lowest Prices of Iron and Steel, . . . . .	24
Prices of Lake Superior Iron Ore, . . . . .	25
Imports of Iron and Steel, . . . . .	25-27
Exports of Iron and Steel, . . . . .	27, 28
Imports of Tinplates, . . . . .	28
Production of Iron Ore, . . . . .	28-31
Shipments of Iron Ore by Leading Districts, . . . . .	30, 31
Receipts of Iron Ore at Lake Erie Ports, . . . . .	31
Consumption of Iron Ore, . . . . .	33
Production of Pig Iron, . . . . .	33-37, 59, 60
Production of Pig Iron by States in 1891 and 1892, . . . . .	34, 59
Production of Pig Iron according to Fuel used from 1889 to 1892, . . . . .	34, 35
Production of Bituminous Pig Iron by States in 1891 and 1892, . . . . .	35, 60
Production of Anthracite and of Mixed Anthracite and Bituminous Pig Iron by States in 1891 and 1892, . . . . .	35, 59
Production of Charcoal Pig Iron by States in 1891 and 1892, . . . . .	35, 60
Production of Bessemer Pig Iron by States from 1887 to 1892, . . . . .	36
Production of Bessemer Pig Iron in Pennsylvania by Districts in 1892, . . . . .	36
Production of Bessemer Pig Iron in Ohio by Districts in 1892, . . . . .	36

	PAGE
Production of all kinds of Pig Iron in Pennsylvania and Ohio by Districts in 1892, . . . . .	36, 37
Production of Spiegeleisen in 1892 and previous years, . . . .	37
Production of Pig Iron in the South and West in 1891 and 1892, . . . .	37
Number of Furnaces in Blast from 1873 to 1892, . . . . .	38
Number of Furnaces in Blast since 1888, according to Fuel used, . . . .	38
Furnaces in course of Erection at the close of 1892, . . . . .	38
Stocks of Unsold Pig Iron, . . . . .	38, 39, 61
Stocks of Pig Iron in Yards of the American Pig Iron Storage Warrant Company, . . . . .	39
Consumption of Pig Iron, . . . . .	39, 40
Production of Bessemer Steel, . . . . .	40, 41
Production of Clapp-Griffiths Steel, . . . . .	40
Production of Open-hearth Steel, . . . . .	41, 42
Production of Crucible Steel, . . . . .	42
Production of Miscellaneous Steel, . . . . .	42
Total Production of Steel, . . . . .	42
Total Production of Rolled Iron and Steel, . . . . .	43, 44
Production of Bars, Hoops, Skelp, and Shapes, . . . . .	44
Production of Plates and Sheets, . . . . .	44, 46
Production of Wire Rods, . . . . .	44, 46, 47
Production of Iron and Steel Rails, . . . . .	44, 45
Production of Street Rails, . . . . .	45
Production of all kinds of Rails from 1849 to 1892, . . . . .	45
Production of Iron and Steel Structural Shapes, . . . . .	45, 46
Production of Cut Nails, . . . . .	47, 48
Production of Wire Nails, . . . . .	47, 48
Production of Iron Blooms and Billets, . . . . .	48, 49
Production of Iron and Steel in Allegheny County, Pa., . . . . .	49
Iron and Steel Shipbuilding, . . . . .	49, 50
Production of Coal, . . . . .	50, 51
Circular Prices of Anthracite Coal from 1889 to 1892, . . . . .	51
Imports and Exports of Coal and Coke, . . . . .	51, 52
Statistics of Immigration, . . . . .	52, 53
Our New Tinplate Industry, . . . . .	53-57
Highest and Lowest Prices of Tinplates at Liverpool from 1863 to 1892, . . . . .	56
Prices of Tinplates at Liverpool from January, 1890, to April, 1893, . . . . .	56
Prices of Tinplates at New York from January, 1890, to April, 1893, . . . . .	56, 57
Railroad Statistics, . . . . .	57
Summary of Statistics for 1891 and 1892, . . . . .	58
Manufacture of Rolled Iron and Steel in Pennsylvania in 1891 and 1892, by Districts, . . . . .	62
Manufacture of Rolled Iron and Steel in Ohio in 1891 and 1892, by Districts, . . . . .	63

## STATISTICS OF THE FOREIGN IRON TRADE.

	PAGE
Summary for 1892 and for the First Quarter of 1893, . . . . .	65-68
Production of Basic Steel, . . . . .	68
Great Britain, . . . . .	68-71
Germany, . . . . .	72
France, . . . . .	72
Belgium, . . . . .	72, 73
Sweden, . . . . .	73
Italy, . . . . .	73, 74
Spain, . . . . .	74
Austria-Hungary and Russia, . . . . .	74
Algeria, . . . . .	74
India, . . . . .	75
China, . . . . .	75
Japan, . . . . .	75
Australia, . . . . .	75
Canada, . . . . .	75, 76

## SUPPLEMENT.

Twenty Years of Iron Ore Development, . . . . .	1-7
Twenty Years of Pig Iron Production, . . . . .	7-13
Twenty Years of Progress in the Manufacture of Steel, . . . .	13-16
Twenty Years of Rolling Mill Development, . . . . .	17-19
Twenty Years of Changes in the Manufacture of Iron and Steel Rails, . . . . .	19-22
Twenty Years of Progress in the Manufacture of Nails, . . . .	23-24
Twenty Years of Progress in Iron and Steel Bridge-building, . .	24, 25
Twenty Years of Iron and Steel Shipbuilding, . . . . .	25-27
Efforts to Establish the Tinsplate Industry, . . . . .	27-29
A Branch of the Iron Industry which has Declined, . . . .	29
Twenty Years of Prices of Iron and Steel, . . . . .	30
The United States now the first of all Iron and Steel Manufac- turing Countries, . . . . .	30, 31
The World's Production of Iron Ore, Coal, Pig Iron, and Steel, .	31
Graphic Exhibit of the foregoing Statistical Statements, . . .	32



## LETTER TO THE PRESIDENT.

HON. B. F. JONES,

*President of The American Iron and Steel Association, Pittsburgh, Pa.*

DEAR SIR: I submit herewith the Annual Statistical Report of this Association for the year 1892, containing the usual statistical statements and comments relating to the progress of the iron and steel and allied industries of our own country and of other countries. Full information is given concerning the production and prices of iron and steel and iron ore in the United States in 1892; also concerning the imports of iron and steel and iron ore and the exports of iron and steel in the same year. Railroad, coal, and shipbuilding statistics are given in detail; also statistics of immigration in 1892 and immediately preceding years. The iron and steel necrology which was commenced in 1887 is continued. The British statistics are of startling significance.

Near the close of 1892 I prepared a paper of 32 printed pages, for publication by the Department of the Interior at Washington, in which was given a summary of the annual progress of the iron and steel industries of the United States during the twenty years from 1872 to 1891. The production and prices of leading iron and steel products in these twenty years were given in detail, and the development of the Southern iron industry, the changes in the processes of manufacture, and the growth of new branches of production in the same period were fully noted. This paper forms a part of the Report herewith presented. With its preparation and presentation to our members it will not be necessary to give in subsequent Reports many of the elaborate tables of production and prices which have heretofore appeared.

In that part of the present Report which is devoted to the production of iron and steel in our own country in 1892 the gross ton has been used exclusively, the demand for its substitution for the net ton having become so general that it would not have been proper to longer resist it. In dismissing the net ton from our statistical records for the present and future I desire simply to remark that its use never had my approval. The net ton had, however, been formally authorized by the Association many years ago, and I did not until recently feel at liberty to abandon it.

The office work of the Association in 1892 and thus far in 1893 has been of the same general character as in previous years, but I will frankly say that in 1892 we did not distribute as many tariff tracts as in other recent years, and for the reason that they were not so widely called for, although offered free of cost. Only 550,000 tract pages were printed. Some of the tracts which were printed were entirely new, while others were old tracts for which there had been a large demand in previous years. Although the tariff question was declared



by both the great parties of the country to be the leading political issue in the campaign of 1892 the usefulness of the tariff tract as an educational influence appears to have largely waned before that campaign commenced. The general discussion of the tariff question from the stump and in the newspapers in late years will largely but not wholly account for this lack of interest in the tariff tract. The whole truth, however, is that the tariff question as an issue by itself in the campaign of 1892 was overshadowed by other issues, both local and general, some of which were spontaneously evolved while it was in progress, or had previously existed in an embryonic state and had suddenly become prominent. The day of the tariff tract may not be over, but it is probable that the value of Protection to the people of this country will now be taught in the severe school of experience with low duties, and that the discussion of the Protective policy in this country will hereafter be more complicated than ever with other political issues.

Another revision of the tariff is near at hand. Protectionists who have faith in the present tariff, which was enacted in 1890, and who have had that faith proved by results, can not hope to have much influence in shaping the details of the new tariff. The American Iron and Steel Association will, however, not hesitate to present its view of the evils which would follow the adoption of very low duties, and it will cheerfully respond to any official application that may be made to it for information concerning the various branches of our iron and steel industries. The new tariff may be framed upon theories entirely different from those which underlie the present tariff. Until the new rates are definitely determined there must naturally exist great anxiety concerning their effect upon the country's prosperity. The existing depression is aggravated by apprehension concerning tariff revision.

The financial condition of the Association during the year 1892 is shown by the following brief exhibit: On January 1, 1892, the balance in the hands of our Treasurer, Mr. Andrew Wheeler, was \$3,791.45; the receipts from members during the year were \$15,175; the expenditures were \$15,723.97; and the balance on hand on December 31, 1892, was \$3,242.48. These figures do not include that part of the cost of our various publications which was met by the income derived from their sale to merchants, brokers, and others who are not members of the Association.

The preparation of a new edition of our Directory to the Iron and Steel Works of the United States will be undertaken immediately, and the volume may be expected to appear during the present year.

In the task of collecting and tabulating the statistics for 1892 which are embodied in this Report I have had the assistance of Mr. William G. Gray, who has been engaged for many years on our statistical work.

Very Truly Yours, JAMES M. SWANK, *General Manager.*

No. 261 SOUTH FOURTH STREET, PHILADELPHIA, April 29, 1893.

# IRON AND STEEL NECROLOGY.

FROM MAY, 1892, TO APRIL, 1893.

---

(1892.) Philip W. Flower, prominent in the English tinplate trade and the author of a "History of the Trade in Tin," March 26, aged 54 years.—John Williams, for 47 years in the service of the Crane Iron Company and for 30 years its cashier, at Catasauqua, Pa., May 24, aged 67 years. He was born in Wales, and with his family came to Catasauqua over 50 years ago.—Henry Light, a pioneer in the rolling-mill industry of Lebanon county, Pa., at Lebanon, May 27, aged 60 years.—Robert J. Anderson, a member of the steel manufacturing firm of Anderson, DuPuy & Co., of Pittsburgh. Born in Pittsburgh, April 18, 1827; died June 2, aged over 65 years.—Caleb S. Maltby, owner of Phenix Furnace, at Millerton, New York, at his summer home in Greenwich, Conn., June 2, aged over 60 years.—James Morgan, of Pittsburgh, for many years superintendent of the American Iron and Steel Works of Jones & Laughlins Limited, at his home in Shadyside, in June.—Major E. V. Wilkes, interested in the iron industry of Oaxaca, Mexico, at Pueblo, Colorado, June 3.—John Park Agnew, formerly engaged in the manufacture of pig iron in Western Pennsylvania, and one of the owners of Sharpsville Furnace, where, in 1853, Lake Superior iron ore was first used in a blast furnace, at Mount Zephyr, near Mount Vernon, Va., June 7, in his 73d year.—Joseph Corns, senior member of the firm of Joseph Corns & Son, owners of the Massillon Rolling Mill, at Massillon, Ohio, June 24, aged over 70 years. He was born at Tredegar, South Wales, November 9, 1821.—James O. Richardson, at one time manager of Atkins Brothers' Pioneer Furnace, at Pottsville, Pa., many years prominent in iron circles in Eastern Pennsylvania, at Philadelphia, June 25, aged 66 years.—John H. Snyder, once superintendent of the Albany Iron Works, of Troy, N. Y., and of the Tredegar Iron Works, of Richmond, Va., at St. Louis, Mo., June 26. At Troy he supervised the rolling of the plates for the first *Monitor*.—I. J. Worton, superintendent of the Carbon Steel Company, of Pittsburgh, June 27, aged 55 years.—William Pollock, a pioneer pig-iron manufacturer of Youngstown, Ohio, at Youngstown, July 18, aged 80 years.—Peter R. Stoy, vice president and treasurer of the Ohio Falls Iron Works, of New Albany, Indiana, at Louisville, Ky., July 19, aged 67 years.—Theodore Sturges, president of the Oxford Iron and Nail Company, and treasurer of the Lackawanna Iron and Steel Company and of the New Jersey Zinc and Iron Company, at New York City, August 2.—Amos G. West, for twenty years president of the Cherokee Iron Company, of Cedartown, Ga., at his home in Cedartown, August 2, aged 65 years.—William Reese, the oldest

ironworker in the United States, at Bolivar, Pa., August 4, aged 104 years. He was born at Brocton, Gloucestershire, England, of Welsh parents, in 1788. He came to this country in 1832.—Captain James H. Murdock, secretary of the Wrought Iron Pipe Manufacturers' Association, at Sewickley, Pa., August 4, aged 52 years.—Clinton S. Ingraham, superintendent of the Chicago Horse Shoe Company, at East Chicago, Ind., August 6, aged 35 years.—William Penn Cresson, in early life extensively engaged in the iron business in Philadelphia, at his home in Philadelphia, August 7, in his 80th year.—Benjamin G. Clarke, president of the Thomas Iron Company, the Lackawanna Iron and Steel Company, and the New Jersey Zinc and Iron Company, at Antwerp, Belgium, August 12, aged 72 years. He was born in New York in 1820.—William W. Marsh, a director of the Thomas Iron Company, at Schooley's Mountain, N. J., August 30, aged 65 years.—William Thaw, identified with the iron and railroad interests of Western Pennsylvania, at Cologne, Germany, about September 1, aged 39 years.—Gen. Joseph R. Anderson, president of the Tredegar Company, at Richmond, Va., September 7, aged 80 years. General Anderson was a brigadier-general in the Confederate army.—Col. Daniel V. Ahl, projector and president of the Harrisburg and Potomac Railroad Company, and once connected with various iron enterprises in Pennsylvania and Maryland, at Newville, Pa., September 16, aged 68 years.—William R. Hart, of the firm of William R. Hart & Co., iron merchants, of Philadelphia, at Rosemont, Pa., September 18, aged 59 years. He was born in January, 1833, at Charleston, N. H.—Arthur G. Tompkins, of the firm of Arthur G. Tompkins & Co., proprietors of the Danvers Iron Works, at Boston, Mass., September 18, aged 45 years. He was born April 11, 1847.—James Cartwright, formerly connected with the firm of Cartwright, McCurdy & Co., of Youngstown, Ohio, and afterwards with a rolling mill at Alikanna, Ohio, at Youngstown, September 25, aged 64 years. He was a native of England.—John P. Salmon, near Lock Haven, Pa., September 27, aged 78 years. He came to this country from Somersetshire, England, in 1837, to manufacture pig iron at Farrandville, Clinton county, Pa.—Hon. Thomas Struthers, banker, ironmaster, railroad builder and manager, and connected with navigation enterprises, at Warren, Pa., September 29, in his 90th year.—John M. Kennedy, for many years a director of the Cambria Iron Company, and for over 20 years a director of the Pennsylvania Railroad Company, at Bryn Mawr, Pa., September 30, aged nearly 86 years. He was born in Philadelphia, November 5, 1806.—James I. Bennett, for nearly half a century one of Pittsburgh's most prominent business men, formerly connected with the iron manufacturing firm of Graff, Bennett & Co., at Pittsburgh, October 11, aged about 70 years. He was born in Crawford county, Pa., in 1822.—Reuben B. Seidel, a pioneer iron manufacturer of the Schuylkill Valley, Pa., at Gibraltar, Berks county, Pa., October 21, aged 71 years. He was born at Pine Grove Forge, in Schuylkill county, December 20, 1821.—Oliver W. Chrystie, superintendent of the wheel foundry of the Taylor Iron and Steel

Company, at High Bridge, N. J., October 31, aged 62 years.—William McKinley, a pioneer iron manufacturer of Ohio, father of Governor William McKinley, Jr., at Canton, Ohio, November 24.—Nicholas R. Miller, for many years secretary and treasurer of the Lochiel Rolling Mill Company, of Harrisburg, Pa., at San Antonio, November 27.—W. Mattieu Williams, in England, November 28, in his 74th year. He was at one time chemist to John Brown & Co., of the Atlas Works, Sheffield. He was a voluminous writer on the early history of the iron and steel industries of Great Britain.—Colonel John J. Gormley, for many years foreman in the Delaware Iron Works of Morris, Tasker & Co., at New Castle, Del., December 1, aged 55 years.—Dr. E. W. Siemens, an eminent scientist, at Berlin, Germany, December 6, aged about 76 years. He was born at Lenthe, in Hanover, in 1816.—Professor John S. Newberry, a noted scientist, Professor of Geology in the School of Mines, Columbia College, New York, at New Haven, Conn., December 7, aged about 70 years. He was born at Windsor, Conn., in 1822.—John T. Knight, president of the Thomas Iron Company, at Easton, Pa., on December 15, in his 71st year. He was born at East Thompson, Conn., in June, 1822.—Joseph N. DuBarry, second vice president of the Pennsylvania Railroad Company, at his home in Philadelphia, December 17, aged 62 years. He was born at Bordentown, N. J., November 19, 1830.—James Ludlum, president of the Pompton Steel and Iron Company, at Pompton, N. J., December 20, aged 64 years.—Morris Ramsey, general manager of the Southwest Coal and Coke Company, of Fayette county, Pa., December 29.

(1893.) Eckstein Norton, ex-president of the Louisville and Nashville Railroad Company, at his home on Staten Island, N. Y., January 12, aged 61 years. He was born at Russellville, Ky., December 10, 1831.—Henry O. Bonnell, a prominent iron manufacturer, at Youngstown, Ohio, January 16, aged 54 years. He was born on January 11, 1839, at Newlay, Yorkshire, England.—Samuel Fawcett, an experienced ironworker, at Joliet, Ill., January 23, aged 55 years. He was born in England and came to this country in 1871.—Henry E. Russell, president of the Russell and Erwin Manufacturing Company, of New Britain, Conn., at his home in New York, January 26, in his 77th year. He was born at Litchfield, Conn.—Daniel R. Cofrode, many years superintendent of the Philadelphia Bridge Works of Cofrode & Saylor, at Pottstown, Pa., February 3, in his 52d year.—William T. Carter, prominent in the iron and coal industries of Pennsylvania, at his home in Philadelphia, February 9, aged 65 years. He was born in Cornwall, England, in 1827. He came to this country in 1850.—John M. Robinson, president of the Old Dominion Steamship Company, at Baltimore, Maryland, February 14, aged about 58 years. He was born in Philadelphia in 1835.—C. Corrin, late assistant manager in Park, Brother & Co.'s steel works, at Pittsburgh, February 28, aged 36 years.—George C. Stone, for several years in the employ of the Illinois Steel Company, and recently superintendent of the steel de-

partment of the Congdon Brake Shoe Company, at Englewood, Ill., March 4, aged 26 years.—Edward Granger Gilbert, president of the Gilbert Car Manufacturing Company, of Troy, New York, at Troy, March 7, aged 46 years. He was born in Troy, January 28, 1847.—James C. Warr, proprietor of the Franconia Iron and Steel Works, of Wareham, Mass., at Wareham, March 8, in his 54th year. He was born in Saugerties, N. Y., June 25, 1839.—George W. Anderson, at Pittsburgh, March 16, aged 66 years. He was born in Waterville, Maine. He is said to have been the first to introduce natural gas in a puddling furnace, that of Rogers & Burchfield, in Leechburg, Pa., in 1874.—Irving A. Kilmer, vice president of the Kilmer Manufacturing Company, of Newburg, New York, at Newburg, March 23, in his 35th year. He was born in Cobleskill, New York, in 1858.—Amos Cheney White, one of the founders of the Globe Iron Works, of New York, in 1852, at his home in New York City, April 3, aged 85 years. He was born at Spencer, Mass.—James H. Collins, at Pottstown, Pa., April 5, aged nearly 78 years. He was well known in the old days as a forge and furnace manager.—Erastus Corning, Jr., oldest son of Erastus Corning, the iron and steel manufacturer, at Albany, N. Y., April 9. He was born in Albany 41 years ago.—Dr. Thaddeus S. Gardner, treasurer of the Altoona Iron Company, of Altoona, Pa., at Hollidaysburg, Pa., April 12, aged 54 years.—Peter Jones, many years ago identified with the iron industry of Berks and Schuylkill counties, Pa., at Reading, April 18, aged 84 years. He was a native of Berks county.—Robert Patterson, of the firm of Hughes & Patterson, extensive manufacturers of rolled iron in Philadelphia, at Philadelphia, April 19, in his 75th year. He was born near Collegeville, Montgomery county, Pa.—Dr. Curtis Grubb Hussey, a pioneer in the development of the Lake Superior copper industry and in the establishment of the crucible steel industry in this country, at Pittsburgh, April 25, aged over 90 years. Dr. Hussey was born on a farm near York, Pa., August 11, 1802.—Edward L. Clark, of the firm of William Clark's Son & Co., proprietors of the Solar Iron and Steel Works, of Pittsburgh, at the Fifth Avenue Hotel, New York, April 25, aged about 39 years.—Matthew H. Taggart, of the firm of Taggarts & Howell, manufacturers of cut nails and muck bar, at Northumberland, Pa., April 27, aged 67 years.



# STATISTICS OF THE AMERICAN IRON TRADE FOR 1892.

---

## GENERAL REVIEW OF THE DOMESTIC IRON TRADE.

IN the spring of 1892, when our last Annual Report appeared, it was strongly intimated that the year as a whole would not be a prosperous one for our iron and steel industries, and the reasons for this belief were frankly stated. Some of these reasons were also applicable to many other productive industries of the country, among these general reasons being the still active consequences of the Baring failure of 1890. As the year wore on it was discovered that the textile, pottery, glass, and some other leading industries had recovered from the depressing effects of the Baring failure and were fully employed at fairly remunerative prices. The activity in most of these industries has continued to the present time. The production of both anthracite and bituminous coal during the year 1892 was also large. So also was the production of iron and steel and iron ore, but the prices of most iron and steel products, which had fallen all through 1891, fell to still lower figures in 1892, reaching a lower average of quotations for some time before the close of the year than had ever before been known. Prices had utterly failed to respond to a very great demand for consumption, in some lines the largest in our history. It can not, therefore, be truly said that our iron and steel industries were prosperous in 1892. While other industries recovered their normal prosperity during the year these did not. No industry is prosperous which does not yield a fair profit to those whose capital and enterprise and skill have established or promoted it. Last year was a year of good profits for very few iron and steel manufacturers, of small profits for many, and of no profits at all for a large number. Many failures in the iron trade of this country have occurred since the beginning of 1892.

Nor were the farmers of the West favored in 1892 with a continuance of the large grain crops and favorable prices of 1891. There was a great shrinkage in the aggregate yield of the grain harvest and a great decline in prices, the prices of wheat especially falling to lower figures than had been known for many

years. The shrinkage in the wheat harvest of 1892 as compared with that of 1891 was probably 75,000,000 bushels, and of Indian corn it was about 400,000,000 bushels. In the South the cotton crop of the year also fell greatly below that of 1891, and prices, although better than the exceptionally low prices of 1891, were lower than the Southern cotton planter had been accustomed to receive. The cotton crop of 1891 was about 9,000,000 bales, while that of 1892 was about 7,000,000 bales. Higher prices than were received for wheat and corn and cotton in 1892 would naturally have followed the decreased production of the year if there had not been left over from 1891 a large surplus of both wheat and cotton, and if the European demand for both products had not declined in the latter part of 1892.

It will be seen that the lack of prosperity for our iron and steel industries in 1892 was conspicuously shared by the farmers of the West and the cotton planters of the South. Thus far in 1893 there has been no noteworthy improvement in the prices of Western wheat and corn and Southern cotton, while the prices of most iron and steel products are lower now than they were at the end of 1892. If other industries of the country were prosperous in 1892 and are still fairly prosperous we have indicated a few leading industries which have not shared in this prosperity.

Of the railroad situation in 1892 the New York *Tribune* says: "Thirty-six railroads, with 10,508 miles in operation, and \$368,000,000 of stocks and bonds, went into the hands of receivers, and, though more than half of the mileage and amount is due to the Richmond Terminal default, the aggregates still remaining are larger than usual. Such results, within the year after the harvesting of the greatest crops ever grown, attract the attention of foreign as well as American investors to the hurtful influence of National and State legislation. While many of the railroads are earning handsome dividends some others evidently have not been helped even by the enormous traffic of last year." Since the beginning of 1893 the Philadelphia and Reading Railroad and its extensive connections have passed into the hands of receivers, this event occurring on February 20th. Railroad receivers can not buy many rails, or cars, or locomotives.

The general financial situation in this country and in Europe in 1892 was not favorable to the building of new railroads, and hence was not favorable to our iron and steel industries. Europe needed gold and drained us of nearly \$60,000,000 of the

precious metal in that year. During the early months of 1893 this drain has continued. A lack of confidence in our ability to maintain the parity of gold and silver has been in part the cause of this large exportation. To the same cause as well as to the poverty of Europe resulting from the Baring panic may be attributed much of the unwillingness of European capitalists to promote the building in this country in 1892 of new railroads which would have called for supplies of iron and steel in addition to those which found a market. The attitude of continued hostility to all railroads by the Farmers' Alliance and the People's party of the West also had great influence both at home and abroad in continuing the check to the building of new railroads which had previously existed. With a larger demand for steel rails, freight and passenger cars, and locomotives than existed in 1892 our iron and steel prices could not have been so greatly depressed as they were. But there was another and even a greater cause for the depression of iron and steel prices than the continuance of the check to the building of new railroads, and that cause originated with our iron and steel manufacturers themselves.

We can all understand that a larger production of wheat and cotton than the home and foreign markets can jointly absorb will result in low prices, but it has not generally been supposed that the main cause of the recent low prices of iron and steel was to be found in overproduction or in the capacity to overproduce. We believe, however, that, while general causes affecting all our industries and even the world's industries, the Baring failure included, have had their influence in depressing iron and steel prices in this country, the principal cause of this depression is to be found in our capacity to produce much more iron and steel than the country could consume, notwithstanding the enormous consumption of the last few years.

Pig iron furnishes a good illustration of the correctness of this view. The annual capacity of all the blast furnaces in the United States in November, 1889, was 11,757,351 gross tons, and in January, 1892, it was 14,550,708 gross tons, an increase of 2,793,357 gross tons in about two years; yet in 1890 we produced more pig iron than in 1892 and consumed almost as much, allowance being made in each year for unsold stocks and for pig iron imported. As prices of pig iron have steadily declined from 1890 to the present time, and as stocks of unsold pig iron have not greatly varied in the intervening period, the great increase in furnace ca-

capacity above mentioned may justly be held to be primarily responsible for the steady decline in pig-iron prices. Consumers of pig iron knew that there could be no scarcity in the supply of this product, and hence they were never eager buyers and bought only as their wants required; while producers, knowing that the supply was constantly in excess of the demand, were always urgent sellers and thus were themselves instrumental in depressing prices from month to month. Our capacity to produce all forms of rolled iron and steel, wire, wire nails, and many other iron and steel specialties has also greatly increased from 1890 to 1893, and the steady pressure of these products upon the market, the supply being greater than the demand, has been a constant factor in depressing prices. The experience brought by the first few months of 1893 has only served to emphasize the serious nature of this depression. These months have afforded only a ray of hope here and there that the depression could not much longer continue.

The aggregate production of iron and steel in the early months of 1893 has apparently been less than in the same months of 1892. The production of pig iron has certainly been less. The activity that is now most noticeable is in the production of Bessemer pig iron, steel rails, steel billets, plates and shapes for ship-builders, and all forms of structural iron and steel. In February and March there were slight advances in the prices of Bessemer pig iron and Bessemer billets, while other prices, notably of Southern pig iron, are weaker now than in December. Even Bessemer pig iron and Bessemer billets are lower in April than in March.

If it were not for the expectation of lower duties on iron and steel and on other manufactured products at an early day the check which low prices, a reaction against booms, and a tightened money market have given to the building of new furnaces and rolling mills and steel works would justify the theory that the depression in iron and steel prices is almost over, as the country's population and its need of iron and steel are constantly growing. But the prospect of sharper competition in our own markets with iron and steel manufacturers across the Atlantic discourages the hope that any considerable improvement in prices is possible in the near future. The outlook is not favorable for works that are badly situated, or are of antiquated construction, or are operated with insufficient capital. The law of the survival of the fittest is inexorable and merciless.

## GENERAL SUMMARY OF PRODUCTION.

Our production of pig iron in 1892 was 9,157,000 gross tons, against 8,279,870 tons in 1891, and 9,202,703 tons in 1890. The production in 1892 was only 45,703 tons less than in 1890, in which year our maximum production was attained. Our production of Bessemer steel ingots in 1892 was the largest in our history, amounting to 4,168,435 gross tons, against 3,247,417 tons in 1891, and 3,688,871 tons in 1890. Our production of open-hearth steel in 1892 was also the largest in our history, amounting to 669,889 gross tons, against 579,753 tons in 1891, and 513,232 tons in 1890. Our production of rails of all kinds and sizes in 1892 was 1,551,844 gross tons, against 1,307,176 tons in 1891, and 1,885,307 tons in 1890. The production in 1892, while larger than in 1891, was very much less than in 1890. Leaving other details for their proper place the foregoing figures sufficiently indicate the great activity of our iron and steel industries in 1892.

The shipments of iron ore from the Lake Superior mines in 1892 were the largest in the history of the Lake Superior region. They amounted to 9,069,556 gross tons, against 7,062,233 tons in 1891, and 9,012,379 tons in 1890. Included in the shipments in 1892 were 4,245 tons from the newly-opened Mesabi mines in Minnesota. The ore from these new mines is of Bessemer quality.

The imports of iron ore in 1892 amounted to 806,585 gross tons, against 912,856 tons in 1891, and 1,246,830 tons in 1890. Of the imports of 1892 over 330,000 tons, or more than two-fifths of the total quantity imported, came from Cuba, the Juragua Iron Company Limited sending 322,527 tons and the Sigua Iron Company sending 7,830 tons.

The shipments of Connellsville coke in 1892 are said by the *Connellsville Courier* to have amounted to 6,300,691 tons of 2,000 pounds, against 6,221,518 tons in 1890, and 4,929,960 tons in 1891. The year 1892 was the year of largest production in the district. The prices quoted during the year were uniformly as follows: Furnace coke, \$1.90; foundry coke, \$2.30; crushed coke, \$2.65: all per ton of 2,000 pounds free on board at the ovens. The quoted prices of 1892 have been continued thus far in 1893. The *Courier* says, however, that the quoted price of furnace coke has been shaded during both 1892 and 1893. In referring to the quoted price of furnace coke in 1892 the *Courier* said in January last: "It is an open secret that much furnace coke sold below the



market rate during the year and is still selling under \$1.90. Sales have been made as low as \$1.45 per ton, and \$1.50 to \$1.60 have been common prices. On the other hand foundry and crushed cokes have sold steadily up to quotations." The shipments of Pocahontas Flat Top coke in 1892 amounted to 499,777 net tons, against 466,016 tons in 1891, and 499,148 tons in 1890.

The shipments of anthracite coal from the mines of Pennsylvania in 1892 were also the largest ever made. They amounted to 41,893,321 gross tons, against 40,448,337 tons in 1891, and 35,855,175 tons in 1890. Of the total shipments last year 54.46 per cent. was from the Wyoming region, 15.40 per cent. from the Lehigh region, and 30.14 per cent. from the Schuylkill region.

The number of miles of new railroad constructed in the United States in 1892 is estimated by H. V. and H. W. Poor at 4,467 miles, no account being taken of second, third, and fourth tracks added to old roads, or of sidings, or of the tracks of industrial establishments. Poor's *Manual* gives the mileage of new railroad built in 1891 as 4,471 miles, and in 1890 as 5,671 miles. In 1889 the mileage was 5,696 miles; in 1888 it was 7,066 miles; and in 1887 it was 12,984 miles, which was the largest annual mileage ever recorded. The mileage of both 1891 and 1892 was only a little more than one-third that of 1887.

The New York *Railroad Gazette* has received returns of the locomotives which were built by 12 private establishments in this country in 1892, which it compares with the production of the same establishments in 1891. Returns from other private establishments are wanting. The 12 establishments referred to built 1,764 locomotives in 1892, against 1,963 in 1891, a decrease of 199. The *Gazette* says that 1890 seems to have been the year of maximum production of locomotives by private establishments. The same paper says that the car builders seem to have done a better business in 1892 than the locomotive builders. In 1891 there were 95,514 freight cars built by 50 private companies. In 1892 there were 93,293 cars built by 48 companies. The *Gazette* adds: "These returns of freight cars built and the returns of locomotives given show that neither the World's Fair nor two years of bountiful crops have been sufficient to make a boom in these industries any more than they have in the steel-rail industry." The number of locomotives built at the Baldwin Locomotive Works in 1892 was 731, against 899 in 1891. In 1892 we exported 141 locomotives, against 357 in 1891, a decrease of 216.

As has already been stated, the production of rails of all sizes and patterns in this country in 1892 was 1,551,844 gross tons. The new railroad mileage built during the year, namely, 4,467 miles, would call for about 110 tons of rails per mile, or less than 500,000 tons in all, estimating the average weight of rails used at 70 pounds to the yard. There would therefore remain about 1,050,000 tons of the rails of 1892 to be used in repairs to old roads, in the construction of second, third, and fourth tracks, in sidings, and in the construction and improvement of street railway lines.

During the last few years there has been great progress in this country in the building of street railways. In 1892 and thus far in 1893 this progress has been particularly marked. The supply of rails and other materials for these enterprises has been an important factor in maintaining the activity of several of our leading steel works. In January last the *New York Engineering News* gave complete statistics of the number of miles of all kinds of street railways in operation in the United States at the close of 1892, as follows: Horse, 4,460 miles; electric, 5,939 miles; cable, 646 miles; steam, 620 miles; total, 11,665 miles. It will be noticed that the mileage of electric railways exceeds that of all other street railways combined.

Our new tinplate industry made rapid progress in 1892, greatly exceeding the production of both tinplates and terne plates in 1891. Statistics of production for the first half of 1891 are, however, wanting. The new tinplate duty did not take effect until July 1st of that year. Statistics for the second half of 1891 and for the whole of 1892 have been compiled by the Treasury Department. In the second half of 1891 we produced 368,400 pounds of bright tinplates and 1,868,343 pounds of terne plates, and in the whole of 1892 we produced 13,921,296 pounds of bright tinplates and 28,197,896 pounds of terne plates. These figures ought to set at rest the idle tales of our industrial enemies that this country can not make tinplates. The McKinley tariff is entitled to the whole credit of establishing this new industry.

The activity in the building of a new navy which has prevailed for several years was continued in 1892 and still continues, creating a demand for large quantities of ship plates and structural shapes and for heavy armor plate and gun forgings. There has also been great activity in 1892 and thus far in 1893 in the building of iron and steel steamers on the great lakes, to be used

in carrying wheat, iron ore, coal, and other freight. The building of merchant vessels of iron and steel in Atlantic Coast shipyards has been fairly active for several years.

On May 10, 1892, an act of Congress was approved by the President admitting to American registry the celebrated British-built ships *City of New York* and *City of Paris*, owned chiefly in the United States, upon the condition that other ships of equal capacity and swiftness should be built in American shipyards. In accordance with the provisions of this act the American flag now floats at the mastheads of the two vessels mentioned, and their owners, the International Navigation Company, have contracted with the William Cramp and Sons' Ship and Engine Building Company, of Philadelphia, for the construction of five vessels to be their equal in all respects.

We are therefore not only building a new navy that will rank with the first navies of the world but we have taken an important step toward the establishment of a fleet of merchant vessels carrying the American flag which will soon restore our prestige on the high seas that was lost during the civil war.

#### WAGES AND LABOR TROUBLES.

During the year 1892 there occurred the most serious rebellion against employers of organized labor in the iron trade that has ever taken place in this country. The attention of the whole country was for months directed to an aggravated outbreak of lawlessness by the workmen of the Homestead Steel Works of the Carnegie Steel Company Limited, led by a few hundred well-paid members of the Amalgamated Association of Iron and Steel Workers. The Homestead strike and the Homestead riots, with the attendant loss of life, will not soon be forgotten. The strike was not only a wholly unjustifiable protest against a slight reduction in the wages of men some of whom had been receiving over \$200 per month, but it was to a very large extent an assertion of communistic sentiments and tendencies which had previously been almost unknown in strikes in this country. So-called sympathetic strikes at the other works of the Carnegie Company intensified and prolonged the Homestead trouble, which lasted from June 29, when the men were locked out because of their refusal to sign the company's scale, until November 20, when the strike was formally terminated by a vote of the members of the Amalgamated Association who had been employed at Homestead. In the meantime,

however, the company had successfully introduced non-union workmen at its Homestead works, and when the strike was officially declared to be ended all the departments of these works were in full operation. At the other works of the company at which sympathetic strikes had taken place the demands of the Amalgamated Association were successfully resisted and non-union labor was employed. All of the works of the Carnegie Company are now successfully running non-union.

During the progress of the Homestead strike nearly all of the union mills in the Pittsburgh district and in the West and South were idle for several weeks in July and August, pending the settlement of disputes between the workmen and their employers concerning the general wages scales of the Amalgamated Association which had just been revised. These disputes were happily settled without violence or any serious misunderstandings, an agreement to resume work having been reached on August 10. During the time lost in adjusting differences, however, a few mills which had previously been under union control were started up and have since been successfully operated non-union. In Philadelphia and elsewhere in the eastern part of Pennsylvania there were also several strikes of union workmen during the year against slight reductions in wages, and in every instance, with possibly one or two trifling exceptions, the strikes failed and the union was abandoned.

Notwithstanding the serious labor troubles in the iron trade in 1892 no great reduction in wages was anywhere proposed. Wages were maintained at a very high standard, especially when the low prices of iron and steel are considered. The great demand for iron and steel throughout the year also assured a steady demand for the labor of iron and steel workers. There has been no general movement in the early months of 1893 toward a further reduction in wages in the iron trade, but if prices do not materially improve at an early day a general reduction is inevitable.

#### AVERAGE MONTHLY PRICES OF IRON AND STEEL.

In the following table we give the average monthly prices of various leading articles of iron and steel in the Eastern markets in 1890, 1891, 1892, and the first four months of 1893. The prices named are per gross ton of 2,240 pounds, except for bar iron and nails, which are quoted by the pound and the keg respectively. The monthly averages are obtained from weekly quotations.

For most of the articles named in this table the prices given are the lowest that have ever been quoted in this country.

Months.	Old iron T rails, at Philadelphia.	No. 1 anthracite foundry pig iron, at Philadelphia.	Gray forge pig iron, at Philadelphia.	Gray forge pig iron, Lake ore, at Pittsburgh.	Bessemer pig iron, at Pittsburgh.	Steel rails, at mills in Pennsylvania.	Best refined bar iron, from store, Philadelphia.	All muck bar iron, at Pittsburgh.	Cut nails, car-load lots, at Wheeling.	Cut nails at Philadelphia, from store.
January, 1890.	\$27.50	\$19.90	\$17.90	\$18.00	\$23.60	\$35.25	2.20c.	1.90c.	\$2.40	\$2.20
February .....	27.25	19.50	17.38	18.00	22.55	35.00	2.20c.	1.90c.	2.35	2.15
March .....	25.25	19.25	17.00	17.00	20.25	34.00	2.10c.	1.85c.	2.25	2.10
April .....	23.85	18.25	16.10	15.35	17.85	33.50	2.10c.	1.85c.	2.00	2.00
May .....	23.25	18.00	15.65	15.25	17.55	31.35	2.10c.	1.75c.	1.90	2.00
June .....	24.50	18.00	15.50	15.25	19.00	31.50	2.00c.	1.80c.	1.95	1.90
July .....	25.00	18.00	15.25	15.25	18.62	31.50	1.90c.	1.80c.	1.90	1.90
August .....	25.00	18.00	15.10	15.25	18.10	31.25	1.95c.	1.85c.	1.85	1.90
September .....	25.50	18.00	15.00	15.25	18.00	30.50	2.00c.	1.85c.	1.85	1.90
October .....	25.50	18.00	15.00	15.00	17.35	30.00	2.00c.	1.85c.	1.85	2.00
November .....	25.10	18.00	15.00	15.00	17.00	29.00	2.00c.	1.85c.	1.80	2.00
December .....	24.50	18.00	15.00	14.75	16.60	28.50	2.00c.	1.85c.	1.80	2.00
January, 1891..	23.50	17.50	14.50	14.25	15.95	29.00	2.00c.	1.80c.	1.65	1.90
February .....	23.35	17.50	14.50	14.50	16.25	30.00	1.90c.	1.75c.	1.65	1.90
March .....	22.50	17.50	14.75	15.00	16.50	30.00	1.90c.	1.75c.	1.65	1.85
April .....	22.50	17.50	14.75	14.12	16.10	30.00	1.90c.	1.70c.	1.60	1.90
May .....	22.00	17.50	14.75	14.00	16.50	30.00	1.90c.	1.70c.	1.55	1.90
June .....	21.00	17.50	14.75	14.00	16.25	30.00	1.90c.	1.70c.	1.55	1.85
July .....	21.00	17.50	14.60	14.00	16.25	30.00	1.90c.	1.70c.	1.55	1.85
August .....	21.50	17.50	14.50	14.00	16.00	30.00	1.90c.	1.70c.	1.55	1.85
September .....	22.00	17.50	14.35	14.00	15.60	30.00	1.90c.	1.70c.	1.55	1.85
October .....	22.00	17.75	14.35	13.85	15.50	30.00	1.85c.	1.70c.	1.60	1.80
November .....	21.75	17.50	14.25	13.50	15.15	30.00	1.85c.	1.68c.	1.55	1.80
December .....	21.50	17.50	14.25	13.50	15.35	30.00	1.90c.	1.68c.	1.55	1.85
January, 1892..	21.00	17.50	14.25	13.50	15.65	30.00	1.85c.	1.70c.	1.55	1.75
February .....	20.50	17.00	14.25	13.25	15.25	30.00	1.85c.	1.68c.	1.55	1.80
March .....	20.25	16.50	14.00	13.00	14.75	30.00	1.85c.	1.62c.	1.50	1.80
April .....	20.00	16.00	14.00	13.00	14.50	30.00	1.90c.	1.60c.	1.50	1.80
May .....	19.90	15.95	13.75	12.94	14.36	30.00	1.90c.	1.58c.	1.48	1.85
June .....	19.50	15.69	13.50	12.75	14.10	30.00	1.90c.	1.60c.	1.47	1.85
July .....	19.17	15.06	13.00	12.75	14.00	30.00	1.90c.	1.70c.	1.49	1.85
August .....	19.00	15.00	13.00	12.50	14.00	30.00	1.90c.	1.68c.	1.49	1.90
September .....	19.00	15.00	13.00	12.50	13.96	30.00	1.85c.	1.64c.	1.52	1.90
October .....	19.00	15.00	13.25	12.50	13.90	30.00	1.85c.	1.67c.	1.50	1.90
November .....	18.40	15.17	13.25	12.50	14.03	30.00	1.85c.	1.64c.	1.48	1.80
December .....	18.00	15.12	13.25	12.50	13.90	30.00	1.80c.	1.60c.	1.44	1.75
January, 1893..	18.00	14.80	13.10	12.30	13.59	29.00	1.80c.	1.59c.	1.42	1.75
February .....	18.50	14.75	13.00	12.25	13.51	29.00	1.80c.	1.56c.	1.44	1.75
March .....	18.00	14.69	13.00	12.25	13.75	29.00	1.75c.	1.57c.	New classification.	
April 20th.....	18.00	14.58	13.00	12.25	13.94	29.00	1.75c.	1.57c.		



## AVERAGE YEARLY PRICES OF IRON AND STEEL.

The following table gives the average yearly prices of the articles mentioned in the preceding table for the years 1889, 1890, 1891, and 1892. These prices are obtained by averaging monthly quotations. The prices given are for the ton of 2,240 pounds, except for bar iron and nails, which are quoted by the 100 pounds and the keg respectively.

Articles.	1889.	1890.	1891.	1892.
Old iron T rails, at Philadelphia.....	\$24.19	\$25.18	\$22.05	\$19.48
No. 1 anthracite foundry pig iron, at Philada..	17.75	18.40	17.52	15.75
Gray forge pig iron, at Philadelphia.....	15.48	15.82	14.52	13.54
Gray forge pig iron, Lake ore, at Pittsburgh...	15.37	15.78	14.06	12.81
Bessemer pig iron, at Pittsburgh.....	18.00	18.85	15.95	14.37
Steel rails, at mills in Pennsylvania.....	29.25	31.75	29.92	30.00
Best refined bar iron, from store, Philadelphia.	1.94	2.05	1.90	1.87
All muck bar iron, at Pittsburgh.....	1.71	1.85	1.71	1.64
Cut nails at Wheeling.....	1.99	1.99	1.58	1.50
Cut nails at Philadelphia, from store.....	2.00	2.00	1.86	1.83

## MONTHLY PRICES OF WIRE NAILS AT CHICAGO.

The following table gives the average monthly prices of standard sizes of wire nails, per keg of 100 pounds, from the factory, free on board at Chicago from 1887 to 1892. In 1885 the standard wire nail first secured a foothold in the nail trade, but it was not until 1886 that regular quotations were made, in which year they were substantially the same as in the early months of 1887. The table has been prepared for us by the Western editor of the *Iron Age*.

Months.	1887.	1888.	1889.	1890.	1891.	1892.
January .....	\$3.50	\$2.70	\$2.55	\$2.90	\$2.22½	\$1.82½
February .....	3.65	2.60	2.40	2.95	2.27½	1.87½
March.....	3.65	2.65	2.35	2.75	2.22½	1.85
April.....	3.45	2.70	2.35	2.40	2.12½	1.75
May.....	3.20	2.60	2.30	2.30	2.05	1.70
June.....	3.00	2.50	2.30	2.40	2.02½	1.57½
July.....	2.95	2.35	2.30	2.40	2.07½	1.70
August .....	3.00	2.45	2.25	2.50	2.02½	1.70
September .....	3.00	2.55	2.35	2.55	2.00	1.67½
October.....	2.90	2.55	2.55	2.40	1.90	1.57½
November.....	2.75	2.55	3.15	2.30	1.85	1.60
December.....	2.75	2.40	3.00	2.25	1.80	1.60
Yearly average .....	\$3.15	\$2.55	\$2.49	\$2.51	\$2.05	\$1.70

## LOWEST PRICES OF IRON AND STEEL.

There have been three periods of particularly low prices for iron and steel in this country since the close of the civil war, the first occurring after the panic of 1873, the second in 1884 and 1885, and the third in 1891, 1892, and 1893. The lowest quoted prices in each of these periods are given in the following table. The quotations are per ton of 2,240 pounds, except for bar iron, which are for 100 pounds, and nails, which are by the keg.

Articles.	1873-79.	1884-85.	1891-93.
No. 1 anthracite foundry pig iron, at Phila...	\$16.50	\$17.50	\$14.50
Gray forge pig iron, Lake ore, at Pittsburgh...	16.00	14.00	12.25
Bessemer pig iron, at Pittsburgh.....	19.50	17.00	13.25
Old iron rails, at Philadelphia.....	18.00	16.50	18.00
Best bar iron, at Pittsburgh.....	1.60	1.50	1.55
Cut nails, at Wheeling, in carload lots.....	1.90	2.00	1.42½
Steel rails, at mills in Pennsylvania.....	40.00	26.00	29.00

The lowest quoted price for No. 1 anthracite foundry pig iron in the first period above mentioned, namely, \$16.50, was in November, 1878. At that time the iron trade of this country, in sympathy with the general depression following the panic of September 18, 1873, was in a state of complete prostration. But in 1892 the price of No. 1 anthracite pig iron fell to \$15, this quotation having been reached in July of that year. In the early part of 1893 the price had still further declined to \$14.50. Gray forge pig iron at Pittsburgh fell to \$12.50 in August, 1892, but early in 1893 it fell to \$12.25. The lowest quoted price for Bessemer pig iron at Pittsburgh after the panic of 1873, namely, \$19.50, was reached in May, 1878, but in October, 1892, the price fell to \$13.75, and early in 1893 it fell to \$13.25. Old iron rails at Philadelphia reached their lowest quoted price in the second period in our table. In December, 1884, the price was \$16.50. Best bar iron at Pittsburgh also reached a lower point in the second period than in either of the other two periods. In August, 1885, the price touched 1.5 cents per pound. Cut nails have fallen to the lowest point in the third period. During several months of 1892 sales were made at Wheeling below \$1.50 per keg, the lowest quotation being in December, when \$1.42½ was quoted. Cut nails have not been made at Pittsburgh since 1890, but Pittsburgh now makes wire nails in large quantities. Steel rails at Pennsylvania mills reached their lowest quoted price in the second period. In April, 1885, sales were made at \$26.

## PRICES OF LAKE SUPERIOR IRON ORE.

We give below the prices at which Lake Superior iron ore has been sold upon season contracts from 1888 to 1892, delivered at Cleveland and at neighboring ports on Lake Erie; also the prices at which sales have been made in March and April, 1893.

Grades.	1888.	1889.	1890.	1891.	1892.	1893.
Republic and Champion No. 1.....	\$5.75	\$5.50	\$6.50	\$5.50	\$5.50	\$4.50
Cleveland and Lake Superior spec- ular No. 1 non-Bessemer.....	5.25	5.00	6.00	5.00	5.00	4.00
Chapin .....	4.75	4.50	5.50	4.25	4.25	3.65
Soft hematites, No. 1 non-Bessemer..	4.00	3.75	4.50	3.75	3.75	3.25
Gogebic, Marquette, and Menominee No. 1 Bessemer hematites.....	4.75	5.00	6.00	4.75	4.50	4.00
Minnesota No. 1 Bessemer.....	5.75	5.50	6.50	5.50	5.65	.....
Minnesota No. 1 non-Bessemer.....	.....	.....	.....	.....	4.85	.....
Chandler, No. 1 Bessemer.....	.....	.....	.....	.....	4.85	.....
Lake Superior and Lake Angeline extra low-phosphorus Bessemer....	.....	.....	.....	.....	6.00	4.65

The prices above quoted are those which have governed contracts made in the spring of the year. Sales made in later seasons of the year have frequently been made at other figures than those quoted. This was particularly the case in 1892, the prices above quoted having been shaded an average of about 50 cents per ton. There is growing up among furnacemen a disposition to buy only as their wants require, and not upon season contracts.

## IMPORTS OF IRON AND STEEL.

The following table gives the foreign values of all our imports of iron and steel, including fire-arms, hardware, cutlery, anvils, chains, machinery, etc., for the calendar years from 1871 to 1892. The total foreign value of our imports in these twenty-two years was \$977,340,235.

Years.	Values.	Years.	Values.	Years.	Values.
1871.....	\$57,866,299	1879.....	\$33,331,569	1887.....	\$56,420,607
1872.....	75,617,677	1880.....	80,443,362	1888.....	42,311,689
1873.....	60,005,538	1881.....	61,555,077	1889.....	42,027,742
1874.....	37,652,192	1882.....	67,075,125	1890.....	44,540,413
1875.....	27,363,101	1883.....	47,506,306	1891.....	41,983,626
1876.....	20,016,603	1884.....	37,078,122	1892.....	33,882,447
1877.....	19,874,399	1885.....	31,144,552	.....	.....
1878.....	18,013,010	1886.....	41,630,779	.....	.....

The following table, compiled from the publications of the Bureau of Statistics of the Treasury Department, gives in detail in gross tons the quantities and values of our imports of iron and steel in the calendar years 1891 and 1892.

Articles—Gross tons.	1891.		1892.	
	Tons.	Values.	Tons.	Values.
Pig iron.....	67,179	\$1,432,455	70,125	\$1,604,806
Scrap iron and scrap steel.....	44,434	611,841	29,223	418,622
Bar iron.....	18,099	770,858	19,282	776,927
Iron and steel rails.....	253	8,405	347	10,607
Cotton-ties, hoops, etc.....	186	13,358	1,011	65,819
Hoop, band, and scroll iron or steel..	685	44,412	730	72,950
Steel ingots, billets, blooms, slabs, etc.	34,685	1,673,214	30,586	1,591,092
Sheet, plate, and taggers' iron or steel	11,882	723,787	26,943	1,400,980
Tinplates.....	327,882	25,900,305	268,472	17,102,487
Wire rods, of iron or steel.....	46,938	1,965,899	42,625	1,655,935
Wire and wire rope, of iron or steel..	4,398	591,388	3,831	577,853
Anvils.....	813	111,760	749	103,343
Chains.....	448	65,281	544	69,770
Cutlery.....	.....	1,002,478	.....	1,361,000
Files, file blanks, rasps, and floats...	.....	80,963	.....	82,714
Fire-arms.....	.....	707,719	.....	412,045
Machinery.....	.....	3,191,233	.....	3,077,714
Needles.....	.....	326,670	.....	360,288
All other.....	.....	2,761,600	.....	3,137,495
Total.....	557,882	\$41,983,626	494,468	\$33,882,447

Our imports of iron and steel in 1892 show a decrease of 63,414 tons and of \$8,101,179 in value as compared with 1891.

The following table gives the quantities in gross tons of our imports from 1882 to 1892 of the articles named in the above table which have been weighed by Government officials, and which have been the same from year to year. The weight of machinery, hardware, cutlery, fire-arms, and similar manufactured products is not included.

Years.	Gross tons.	Years.	Gross tons.	Years.	Gross tons.
1882.....	1,192,296	1886.....	1,098,565	1890.....	665,771
1883.....	694,330	1887.....	1,783,256	1891.....	557,882
1884.....	654,696	1888.....	914,940	1892.....	494,468
1885.....	578,478	1889.....	748,550	.....	.....

Of the pig iron imported in 1892 and 1893 much the larger part was spiegeleisen and ferro-manganese, which pay duty as pig

iron. The quantity of these articles entered at custom houses for consumption in the United States amounted to 101,167 gross tons in 1890, 41,449 tons in 1891, and 47,310 tons in 1892. There were also imported in 1892 as pig iron 158 tons of ferro-silicon.

## EXPORTS OF IRON AND STEEL.

The exports from this country to all countries of domestic iron and steel and manufactures thereof in 1892 were valued at \$27,-900,862, against \$30,736,507 in 1891, and \$27,000,134 in 1890. We are indebted to the Bureau of Statistics of the Treasury Department for the following details of the quantities and values of our exports of iron and steel in the calendar years 1891 and 1892.

Commodities.	1891.		1892.	
	Quantities.	Values.	Quantities.	Values.
Pig iron.....Gross tons.	14,946	\$258,000	15,427	\$282,290
Bar iron..... "	1,341	85,382	962	60,463
Band, hoop, scroll iron.. "	162	9,354	30	1,762
Car-wheels.....No.	14,227	116,179	9,566	88,004
Castings, not elsewhere specified. ....		876,121		540,523
Cutlery.....		141,228		131,324
Fire-arms.....		845,702		724,499
Steel ingots, bars, rods.....Tons.	538	36,877	205	18,316
Builders' hardware.....		2,123,153		2,575,847
Machinery.....		10,256,949		10,348,675
Cut nails and spikes.....Tons.	4,636	247,458	6,816	326,110
Horseshoe and wire nails... "	847	144,613	954	158,825
Iron plates and sheets..... "	344	24,665	260	19,900
Steel plates and sheets..... "	104	7,484	112	8,582
Printing presses, and parts of....		356,589		293,261
Iron rails.....Tons.	160	3,358	486	13,568
Steel rails..... "	11,079	360,130	7,496	242,757
Saws and tools.....		1,901,194		1,838,133
Scales and balances.....		313,652		359,253
Sewing machines, and parts of..		2,955,828		2,848,165
Fire engines.....No.	1	5,630	2	825
Locomotives..... "	357	3,274,825	141	1,139,096
Stationary engines..... "	338	250,923	343	223,951
Boilers and parts of engines.....		734,145		567,046
Stoves, and parts of.....		252,634		205,348
Wire.....Tons.	11,873	890,014	15,086	1,009,225
Other iron and steel manufactures		4,264,420		3,875,114
Total.....		\$30,736,507		\$27,900,862
Agricult. implements, additional..		\$3,310,183		\$4,210,684

Our exports of the articles named in the above table embrace

chiefly machinery, builders' hardware, sewing machines, saws, tools, locomotives, fire-arms, scales and balances, steel rails, wire, miscellaneous castings, and engines and boilers. The following table shows the total value of our export trade in iron and steel and manufactures thereof in the calendar years from 1871 to 1892.

Years.	Values.	Years.	Values.	Years.	Values.
1871.....	\$14,185,359	1879.....	\$14,223,646	1887.....	\$16,235,922
1872.....	12,595,539	1880.....	15,156,703	1888.....	19,578,489
1873.....	14,173,772	1881.....	18,216,121	1889.....	23,712,814
1874.....	17,312,239	1882.....	22,348,834	1890.....	27,000,134
1875.....	17,976,833	1883.....	22,716,040	1891.....	30,736,507
1876.....	13,641,724	1884.....	19,290,895	1892.....	27,900,862
1877.....	18,549,922	1885.....	16,622,511	.....	.....
1878.....	15,101,899	1886.....	14,865,087	.....	.....

#### OUR IMPORTS OF TINPLATES.

The following table, compiled from the publications of the Bureau of Statistics of the Treasury Department, shows the quantities of tinplates imported into the United States in each calendar year from 1871 to 1892, inclusive, with their foreign values.

Years.	Gross tons.	Values.	Years.	Gross tons.	Values.
1871.....	82,969	\$9,946,373	1882.....	213,987	\$17,975,161
1872.....	85,629	13,893,450	1883.....	221,233	18,156,773
1873.....	97,177	14,240,868	1884.....	216,181	16,858,650
1874.....	79,778	13,057,658	1885.....	228,596	15,991,152
1875.....	91,054	12,098,885	1886.....	257,822	17,504,976
1876.....	89,946	9,416,816	1887.....	283,836	18,699,145
1877.....	112,479	10,679,028	1888.....	298,238	19,762,961
1878.....	107,864	9,069,967	1889.....	331,311	21,726,707
1879.....	154,250	13,227,659	1890.....	329,435	23,670,158
1880.....	158,049	16,478,110	1891.....	327,882	25,900,305
1881.....	183,005	14,886,907	1892.....	268,472	17,102,487

The total quantity of tinplates imported into this country in these twenty-two years was 4,219,193 gross tons, and the total foreign value of these importations was \$350,344,196. In addition to this sum consumers paid freights and duties and importers' profits. The influence of the new tinplate duty in reducing importations in 1892 will be noticed in the figures for that year.

#### PRODUCTION OF IRON ORE.

The production of iron ore in the United States in the calendar year 1891 has been ascertained and published by the Divis-

ion of Mining Statistics of the United States Geological Survey, the statistics having been gathered by Mr. John Birkinbine. The production in the year named was 14,591,178 gross tons, against 16,036,043 tons in 1890, and 14,518,041 tons in 1889. The following table shows by States and Territories the quantities of the different kinds of iron ore produced in 1891.

States— Gross tons.	Red hematite.	Brown hematite.	Magnetite.	Car- bonate.	Total.
Michigan .....	5,445,371	457,507	224,123	.....	6,127,001
Alabama .....	1,524,783	462,047	.....	.....	1,986,830
Pennsylvania.....	162,683	363,894	727,299	19,052	1,272,928
New York.....	153,723	53,152	782,729	27,612	1,017,216
Minnesota .....	945,105	.....	.....	.....	945,105
Virginia.....	3,274	653,342	2,300	.....	658,916
Wisconsin .....	527,705	61,776	.....	.....	589,481
Tennessee.....	396,883	147,040	.....	.....	543,923
New Jersey .....	3,850	3,840	517,922	.....	525,612
Georgia.....	45,027	205,728	.....	.....	250,755
Colorado .....	6,940	99,253	4,749	.....	110,942
Missouri.....	99,518	7,431	.....	.....	106,949
Ohio.....	.....	.....	.....	104,487	104,487
Kentucky .....	.....	45,111	.....	19,978	65,089
Texas .....	.....	51,000	.....	.....	51,000
Massachusetts .....	.....	47,502	.....	.....	47,502
New Mexico.....	.....	1,000	38,776	.....	39,776
Maryland .....	.....	19,400	.....	17,979	37,379
Connecticut.....	.....	30,923	.....	.....	30,923
Oregon .....	.....	29,018	.....	.....	29,018
North Carolina.....	.....	.....	19,210	.....	19,210
Montana .....	8,536	4,000	.....	.....	12,536
Utah .....	4,000	8,000	.....	.....	12,000
West Virginia.....	.....	6,200	.....	.....	6,200
Idaho .....	.....	400	.....	.....	400
Total.....	9,327,398	2,757,564	2,317,108	189,108	14,591,178

Mr. Birkinbine says: "The quantity of red hematite produced during 1891, namely, 9,327,398 gross tons, was 63.92 per cent. of the total ore mined, indicating a decline from the output of 1890 (10,527,650 gross tons) of 1,200,252 gross tons, or of 11.40 per cent. The brown hematites, of which 2,757,564 tons were produced in 1891, or 18.90 per cent. of the total supply, exceeded the 1890 output of 2,559,938 tons by 197,626 tons, or 7.72 per cent. The magnetite mined in 1891 was 2,317,108 gross tons, or 15.88 per cent. of the total output of iron ore, against 2,570,838 tons in 1890, a decline of 253,730 gross tons, or 9.87 per



cent. But 189,108 tons of carbonate ore, or 1.30 per cent. of the total ore output, were produced in 1891, a falling off of 188,509 tons, or 49.92 per cent., from the 1890 output of 377,617 tons."

#### SHIPMENTS OF IRON ORE BY LEADING DISTRICTS.

The shipments of iron ore from the leading iron-ore districts of the country in the last two years, including the consumption by local furnaces, were as follows, in gross tons. With trifling exceptions our figures relate only to shipments from the mines, and do not represent the actual production of the mines for any one year, which may have been more or less than the shipments.

Shipments of iron ore from leading districts.	Gross tons.	
	1891.	1892.
Lake Superior mines of Michigan and Wisconsin.....	6,170,694	7,907,239
Vermilion Lake and Mesabi mines of Minnesota.....	891,539	1,162,317
Missouri mines.....	85,489	121,564
Cornwall mines, Pennsylvania.....	663,755	634,714
New Jersey mines.....	449,046	469,236
Chateaugay mines, on Lake Champlain.....	89,933	114,891
Crown Point mines, New York.....	51,543	32,497
Port Henry mines, New York.....	376,200	293,345
Other Lake Champlain mines, New York.....	21,457	9,574
Hudson River Ore and Iron Company.....	26,917	59,242
Tilly Foster mines, New York.....	77,880	70,039
Forest of Dean mines, New York.....	21,160	17,566
Salisbury region, Connecticut.....	30,923	30,355
Alleghany county, Virginia.....	184,829	146,534
Cranberry mines, North Carolina.....	20,284	18,439
Tennessee Coal, Iron, and Railroad Company's Inman mines in Tennessee.....	117,160	90,876
Tennessee Coal, Iron, and Railroad Company's mines in Alabama.....		1,010,077
Calhoun, Etowah, and Shelby counties, Alabama.....	253,229	248,631
Total of the above districts.....	9,532,038	12,437,136

The Lake Superior mines which produced the largest quantities of iron ore in 1892 were the following: Norrie, in the Gogebic range, 985,044 tons; Chapin, in the Menominee range, 660,052 tons; Buffalo, in the Marquette range, 379,719 tons; and Chandler, in the Vermilion range, 646,261 tons.

The following table gives the shipments of iron ore from the various mines of the Lake Superior region in the last five years. For the statistics for the first three years we are indebted to Mr. James Russell, the editor of the *Marquette Mining Journal*, and

for the figures for 1891 and 1892 we are indebted to Mr. George A. Newett, the editor of the *Ishpeming Iron Ore*. The figures given in the table include shipments to local furnaces and all shipments to other consumers by rail as well as by water.

Districts—Gross tons.	1888.	1889.	1890.	1891.	1892.
Marquette range, Mich.....	1,926,954	2,634,817	2,997,927	2,511,395	2,680,194
Menominee range, Michigan and Wisconsin .....	1,191,097	1,796,764	2,289,017	1,824,552	2,259,367
Gogebie range, Michigan and Wisconsin .....	1,433,689	2,016,391	2,845,171	1,834,747	2,967,678
Vermilion Lake, Minn.....	511,953	844,782	880,264	891,539	1,158,072
Mesabi range, Minnesota.....					4,245
Total .....	5,063,693	7,292,754	9,012,379	7,062,233	9,069,556

#### RECEIPTS OF IRON ORE AT LAKE ERIE PORTS.

The *Iron Trade Review*, of Cleveland, has published the statistics of the receipts of Lake Superior iron ore at Cleveland and other ports on Lake Erie, Buffalo and Erie included, in the last ten years, the principal receipts being at Ashtabula and Cleveland; also the quantity left on the docks at the close of navigation. From these statistics we compile the following summary of receipts at all Lake Erie ports.

Years.	Receipts. Gross tons.	On dock. Gross tons.	Years.	Receipts. Gross tons.	On dock. Gross tons.
1883.....	1,692,689	943,095	1888.....	3,783,659	1,848,555
1884.....	1,841,877	1,038,135	1889.....	5,856,344	2,607,106
1885.....	1,503,969	1,048,940	1890.....	6,874,664	3,893,487
1886.....	2,270,554	966,472	1891.....	4,939,684	3,508,489
1887.....	3,439,198	1,558,861	1892.....	6,660,734	4,149,451

The receipts of iron ore at the ports of Buffalo and Erie alone in the last five years have been as follows, in gross tons.

Ports—Gross tons.	1888.	1889.	1890.	1891.	1892.
Buffalo.....	240,000	298,000	548,000	410,000	197,000
Erie.....	240,338	373,595	487,493	393,759	645,230
Total.....	480,338	671,595	1,035,493	803,759	842,230

#### IMPORTS OF IRON ORE.

The following table, for which we are indebted to the Bureau of Statistics of the Treasury Department, shows the quantities

and values of iron ore imported into the United States during the calendar years 1890, 1891, and 1892, by customs districts.

Districts.	1890.		1891.		1892.	
	Gross tons.	Values.	Gross tons.	Values.	Gross tons.	Values.
Baltimore.....	481,250	\$1,015,093	453,373	\$1,219,015	328,326	\$758,033
Buffalo Creek..	82	185	114	342	1	3
Cuyahoga.....	4,675	15,460	.....	.....	.....	.....
Detroit.....	.....	.....	44	75	.....	.....
New York.....	38,717	101,908	25,809	87,335	23,433	61,260
Oswegatchie....	12,617	23,446	1,958	3,591	8,605	17,196
Perth Amboy..	25,524	50,984	14,089	42,087	4,428	8,153
Philadelphia...	683,665	1,641,654	416,846	1,098,992	438,920	940,783
Puget Sound...	.....	.....	588	2,189	2,568	9,597
Vermont.....	239	258	.....	.....	.....	.....
All other.....	61	5,130	35	280	304	619
Total.....	1,246,830	\$2,854,118	912,856	\$2,453,906	806,585	\$1,795,644

During 1892 the Juragua Iron Company Limited, an American company, with headquarters in Philadelphia, imported 322,527 gross tons of iron ore from its Cuban mines, which was an increase of 56,150 tons over its imports in 1891. Of the quantity imported by this company in 1892 there were received at Philadelphia 41 cargoes, containing 107,936 tons; at Baltimore 76 cargoes, containing 209,876 tons; and at Perth Amboy 2 cargoes, containing 4,715 tons. The total importations of this company from 1884 to 1892 amounted to 1,717,623 gross tons.

The Sigua Iron Company, with headquarters in Philadelphia, imported for the first time 7,830 tons of Cuban iron ore in 1892. The Spanish-American Iron Company, with headquarters in New York, expected to make shipments from its Cuban mines in 1892, but this expectation was not realized. It now expects to begin shipments in 1893. The ore of these companies, as well as of the Juragua company, is mainly of fine Bessemer quality.

In the following table we give the total imports of iron ore into the United States from 1879 to 1892, in gross tons.

Years.	Gross tons.	Years.	Gross tons.	Years.	Gross tons.
1879.....	284,141	1884.....	487,820	1889.....	853,573
1880.....	493,408	1885.....	390,786	1890.....	1,246,830
1881.....	782,887	1886.....	1,039,433	1891.....	912,856
1882.....	589,655	1887.....	1,194,301	1892.....	806,585
1883.....	490,875	1888.....	587,470	.....	.....

## CONSUMPTION OF IRON ORE.

We estimate our total consumption of iron ore in 1892 at 17,400,000 gross tons, against 15,740,000 tons in 1891, and 17,500,000 tons in 1890. Our imports of iron ore in 1892 amounted to 806,585 gross tons; this quantity subtracted from the quantity consumed leaves 16,593,415 tons as the probable consumption of domestic ore in that year, against 14,827,144 tons in 1891, and 16,253,170 tons in 1890. As factors in the foregoing estimates we include the quantity of pig iron produced, the quantity of iron-ore blooms produced, the probable consumption of iron ore for fettling purposes in rolling mills, and the probable consumption of iron ore in open-hearth furnaces.

## PRODUCTION OF PIG IRON.

Twenty-three States made pig iron in 1892, the same number as in 1891 and 1890. As there are 44 States in the Union it will be seen that only about one-half of the whole number make pig iron. Of the Territories yet remaining not one makes pig iron. It is a coincidence of some significance that the only blast furnace that has had an existence in Maine for half a century, namely, Katahdin, was out of blast in 1891 and was torn down in 1892, while the only blast furnace in Minnesota was in blast in both the years mentioned. Our pig-iron industry is going west as well as south, where the conditions of production are more favorable than in New England. Katahdin Furnace was sold early in 1892 to the Pictou Charcoal Iron Company Limited, of New Glasgow, Nova Scotia, which has used the machinery in the erection of a charcoal furnace at Bridgeville, near New Glasgow. There is not now a single blast furnace in either of the New England States of Maine, New Hampshire, Vermont, or Rhode Island.

The total production of pig iron in the United States in 1892 was 9,157,000 gross tons, against 8,279,870 tons in 1891, and 9,202,703 tons in 1890. The production in 1892 was only 45,703 tons less than in 1890, in which year our maximum production was attained. The production in the first half of 1892 was much larger than in the last half, the figures being as follows: First half, 4,769,683 tons; second half, 4,387,317 tons. The production in the first half of 1891 was, however, greatly exceeded in the last half, the figures being as follows: First half, 3,368,107 tons; second half, 4,911,763 tons. The extraordinary activity of the second half of 1891 was but slightly checked in the first half

of 1892, but in the second half of 1892 this decline in activity was much more marked. The production in the twelve months embraced in the last half of 1891 and the first half of 1892 reached the remarkable total of 9,681,446 gross tons. The production in each half of 1890, 1891, and 1892 has been as follows.

Years—Gross tons.	First half.	Second half.	Total.
1890.....	4,560,513	4,642,190	9,202,703
1891.....	3,368,107	4,911,763	8,279,870
1892.....	4,769,683	4,387,317	9,157,000

In 1890 this country first passed Great Britain in the production of pig iron. In 1892 Great Britain's production was only 72.2 per cent. of the production by the United States, the figures being as follows: Great Britain, 6,616,890 gross tons; the United States, 9,157,000 gross tons.

The following table shows the production of pig iron by States in 1891 and 1892, in the order of their prominence in 1892.

States—Gross tons.	1891.	1892.	States—Gross tons.	1891.	1892.
Pennsylvania.....	3,952,387	4,193,805	Kentucky.....	44,844	56,548
Ohio.....	1,035,013	1,221,913	Colorado.....	18,116	32,441
Illinois.....	669,202	949,450	Connecticut.....	21,811	17,107
Alabama.....	795,673	915,296	Minnesota.....	1,226	14,071
Virginia.....	295,292	342,847	Georgia.....	49,858	9,950
New York.....	315,112	310,395	Texas.....	18,662	8,613
Tennessee.....	291,738	300,081	Massachusetts....	8,990	7,946
Michigan.....	213,145	184,421	Indiana.....	7,729	7,700
Wisconsin.....	197,160	174,961	Oregon.....	9,295	7,628
West Virginia.....	86,283	154,793	North Carolina..	3,217	2,908
Maryland.....	123,398	99,131			
New Jersey.....	92,490	87,975			
Missouri.....	29,229	57,020	Total.....	8,279,870	9,157,000

Pennsylvania produced almost 46 per cent. of the total production of pig iron in 1892; Ohio over 13 per cent.; Illinois over 10 per cent.; and Alabama almost 10 per cent. Every other State fell below 4 per cent.

The States which increased their production of pig iron in 1892 were Pennsylvania, Virginia, Alabama, Ohio, Illinois, West Virginia, Kentucky, Tennessee, Missouri, Minnesota, and Colorado. The other States show a decrease.

The production of pig iron in 1892 according to the fuel used was as follows, compared with 1889, 1890, and 1891.

Fuel used—Gross tons.	1889.	1890.	1891.	1892.
Bituminous, chiefly coke.....	5,313,772	6,388,147	5,836,798	6,822,266
Anthracite and coke mixed.....	1,407,139	1,937,140	1,560,281	1,568,093
Anthracite alone.....	307,463	249,371	305,827	229,020
Charcoal.....	575,268	628,145	576,964	537,621
Total.....	7,603,642	9,202,703	8,279,870	9,157,000

The following table shows the production of bituminous pig iron by States in 1891 and 1892, in the order of their prominence.

States—Gross tons.	1891.	1892.	States—Gross tons.	1891.	1892.
Pennsylvania.....	2,369,887	2,701,063	Kentucky.....	41,456	53,349
Ohio.....	1,015,220	1,202,926	Colorado.....	18,116	32,441
Illinois.....	669,202	949,450	Missouri.....	14,829	28,968
Alabama.....	717,687	835,840	Minnesota.....	1,226	14,071
Virginia.....	292,056	341,118	Indiana.....	7,729	7,700
Tennessee.....	245,986	249,892	North Carolina..	2,750	2,598
West Virginia.....	86,283	154,793	Georgia.....	34,112	.....
Wisconsin.....	103,068	92,835			
Maryland.....	114,146	89,371			
New York.....	103,045	65,851	Total.....	5,836,798	6,822,266

The table below shows the production of anthracite and of mixed anthracite and bituminous pig iron by States in 1891 and 1892.

States—Gross tons.	1891.	1892.
Pennsylvania.....	1,571,947	1,480,932
New York.....	201,671	228,206
New Jersey.....	92,490	87,975
Total.....	1,866,108	1,797,113

The following table shows the production of charcoal pig iron by States in 1891 and 1892, according to their prominence.

States—Gross tons.	1891.	1892.	States—Gross tons.	1891.	1892.
Michigan.....	213,145	184,421	Maryland.....	9,252	9,760
Wisconsin.....	94,092	82,126	Texas.....	18,662	8,613
Alabama.....	77,986	79,456	Massachusetts....	8,990	7,946
Tennessee.....	45,752	50,189	Oregon.....	9,295	7,628
Missouri.....	14,400	28,052	Kentucky.....	3,388	3,199
Ohio.....	19,793	18,987	Virginia.....	3,236	1,729
Connecticut.....	21,811	17,107	North Carolina..	467	310
New York.....	10,396	16,338			
Pennsylvania.....	10,553	11,810			
Georgia.....	15,746	9,950	Total.....	576,964	537,621

The following table gives the production of Bessemer pig iron by States in 1892, compared with the five preceding years.

States—Gross tons.	1887.	1888.	1889.	1890.	1891.	1892.
Pennsylvania.....	1,645,044	1,580,843	1,979,418	2,355,236	2,077,805	2,489,730
Illinois.....	490,278	492,032	486,576	628,863	540,714	800,661
Ohio.....	295,664	300,674	404,148	492,060	453,978	639,183
New York.....	55,916	46,495	68,703	177,789	131,867	133,723
Maryland.....	16,494	.....	12,927	128,826	111,468	88,224
West Virginia ...	65,241	75,119	95,345	123,489	84,283	154,793
New Jersey.....	56,940	24,469	21,432	64,711	12,964	17,225
Missouri.....	109,576	68,321	65,933	62,013	26,632	44,950
Wisconsin.....	97,844	30,836	15,801	37,021	6,658	2,800
Colorado.....	20,799	14,325	1,131	19,083	8,430	31,416
North Carolina..	.....	.....	.....	2,105	3,217	2,908
Michigan.....	11,398	2,678	.....	1,147	4,544	.....
Alabama.....	.....	.....	.....	.....	625	.....
Kentucky.....	.....	.....	.....	.....	1,172	24,357
Texas.....	.....	.....	.....	.....	1,607	.....
Minnesota.....	.....	.....	.....	.....	1,226	14,071
Tennessee.....	10,268	2,067	.....	.....	.....	.....
Total.....	2,875,462	2,637,859	3,151,414	4,092,343	3,472,190	4,444,041

Of the total production of Bessemer pig iron in Pennsylvania in 1892 the Lehigh Valley produced 201,579 gross tons; the Schuylkill Valley, 90,240 tons; the Upper Susquehanna Valley, 105,136 tons; the Lower Susquehanna Valley, 373,709 tons; Allegheny county, 1,324,101 tons; the Shenango Valley, 176,205 tons; and the remainder of the State, 218,760 tons.

Of the total production of Bessemer pig iron in Ohio in 1892 the Mahoning Valley and the Hanging Rock bituminous district produced 183,740 gross tons; the Hocking Valley, 35,186 tons; and the remainder of the State, 420,257 tons.

The production of all kinds of pig iron in Pennsylvania by districts in 1892 was as follows, in gross tons: Lehigh Valley, 558,112 tons; Schuylkill Valley, 448,201 tons; Upper Susquehanna Valley, 141,037 tons; Lower Susquehanna Valley, 440,994 tons; Juniata Valley, 128,531 tons; Shenango Valley, 406,284 tons; Allegheny county, 1,775,257 tons; miscellaneous bituminous, 283,579 tons; charcoal, 11,810 tons. Allegheny county made over 42 per cent. of the total production of pig iron by Pennsylvania in 1892.

It is more difficult to divide Ohio into districts than Pennsylvania. The production of all kinds of pig iron in Ohio in 1892



by districts was as follows, in gross tons: Hanging Rock bituminous, 100,306 tons; Hanging Rock charcoal, 18,987 tons; Mahoning Valley, 477,201 tons; Hocking Valley, 49,857 tons; miscellaneous bituminous, 575,562 tons.

There was a great increase in the production of spiegeleisen in 1892, the production being 179,131 gross tons, against 127,766 tons in 1891, 133,180 tons in 1890, and 76,628 tons in 1889. The production of 1892 was confined to the States of New Jersey, Pennsylvania, Illinois, and Colorado.

#### PRODUCTION OF PIG IRON IN THE SOUTH AND WEST.

The aggregate production of pig iron in nine Southern States shows a large increase in 1892 as compared with 1891, as will be seen from the following table.

States—Gross tons.	1891.	1892.	States—Gross tons.	1891.	1892.
Alabama.....	795,673	915,296	Georgia.....	49,858	9,950
Virginia.....	295,292	342,847	Texas.....	18,662	8,613
Tennessee.....	291,738	300,081	North Carolina..	3,217	2,908
West Virginia.....	86,283	154,793			
Maryland.....	123,398	99,131			
Kentucky.....	44,844	56,548	Total.....	1,708,965	1,890,167

The production of pig iron in 1890 by the Southern States above mentioned was 1,744,160 gross tons. The production in 1892 was 181,202 gross tons larger than in 1891 and 146,007 tons larger than in 1890.

The production of pig iron by nine Western States, beginning with Ohio and extending to the Pacific Coast, greatly increased in 1892 as compared with 1891, as the following table will show.

States—Gross tons.	1891.	1892.	States—Gross tons.	1891.	1892.
Ohio.....	1,035,013	1,221,913	Minnesota.....	1,226	14,071
Indiana.....	7,729	7,700	Colorado.....	18,116	32,441
Illinois.....	669,202	949,450	Oregon.....	9,295	7,628
Michigan.....	213,145	184,421			
Wisconsin.....	197,160	174,961			
Missouri.....	29,229	57,020	Total.....	2,180,115	2,649,605

The production of pig iron in 1890 by the Western States above mentioned was 2,528,525 gross tons. The increased production in 1892 as compared with 1891 was 469,490 gross tons, and as compared with 1890 it was 121,080 tons.

## NUMBER OF FURNACES IN BLAST.

The whole number of furnaces in blast at the close of 1892 was 253, against 313 at the close of 1891. The following table shows the number in blast at the close of each year since 1873.

Years.	Furnaces.	Years.	Furnaces.	Years.	Furnaces.
1873.....	410	1880.....	446	1887.....	339
1874.....	365	1881.....	455	1888.....	332
1875.....	293	1882.....	417	1889.....	344
1876.....	236	1883.....	307	1890.....	311
1877.....	270	1884.....	236	1891.....	313
1878.....	265	1885.....	276	1892.....	253
1879.....	388	1886.....	331	.....	....

The following table shows the number of furnaces in blast at the close of each year since 1888, classified according to the fuel used.

Kind of fuel used.	1888.	1889.	1890.	1891.	1892.
Bituminous coal and coke.....	156	177	150	164	141
Anthracite and anthracite and coke.....	105	104	97	94	72
Charcoal.....	71	63	64	55	40
Total.....	332	344	311	313	253

At the close of 1892 the total number of furnaces in the United States which were active or likely to be some day active was 564, and 7 new furnaces were being erected.

## STOCKS OF UNSOLD PIG IRON.

Our statistics of stocks of unsold pig iron do not include pig iron sold and not removed from the furnace bank, nor pig iron in second hands or in the hands of creditors, nor pig iron manufactured by rolling-mill owners for their own use. Nor do they include the small stocks of foreign pig iron in bond.

The stocks of pig iron which were unsold in the hands of manufacturers or were under their control at the close of 1892, and which were not intended for their own consumption, amounted to 506,116 gross tons, against 596,333 tons at the close of 1891. At the close of 1892 the American Pig Iron Storage Warrant Company held in its yards 79,700 gross tons, of which 50,200 tons are included above as under control of the manufacturers, leaving 29,500 tons of warrant pig iron in other hands, which quantity should be added to the other unsold stocks, making a total of 535,616 tons of unsold pig iron at the close of 1892.

The following table shows the quantity of unsold pig iron in the hands of manufacturers or under their control and not intended for their own use at the close of each year since 1874.

Years.	Gross tons.	Per cent. of production.	Years.	Gross tons.	Per cent. of production.
1874.....	710,521	30.0	1884.....	529,464	13.0
1875.....	679,382	34.0	1885.....	371,886	9.0
1876.....	613,213	33.0	1886.....	225,629	4.0
1877.....	573,528	28.0	1887.....	301,913	4.7
1878.....	513,004	22.0	1888.....	300,144	4.6
1879.....	126,495	5.0	1889.....	247,679	3.2
1880.....	407,730	11.0	1890.....	608,921	6.6
1881.....	188,300	5.0	1891.....	596,333	7.2
1882.....	383,655	8.0	1892.....	506,116	5.5
1883.....	476,607	10.0	.....	.....	.....

The American Pig Iron Storage Warrant Company commenced operations in 1889 and has since regularly reported to us the total quantity of pig iron in its yards. We give its figures below.

Periods.	Gross tons.	Periods.	Gross tons.
December 31, 1889.....	36,200	March 31, 1892.....	62,600
June 30, 1890.....	63,500	June 30, 1892.....	72,900
December 31, 1890.....	64,200	September 30, 1892.....	84,200
June 30, 1891.....	49,800	December 31, 1892.....	79,700
December 31, 1891.....	51,900	March 31, 1893.....	77,900

#### CONSUMPTION OF PIG IRON.

Our consumption of pig iron in the last five years is approximately shown in the following table, in gross tons, the comparatively small quantity of foreign pig iron held in bonded warehouses and of domestic pig iron exported not being considered. The stocks of pig iron in storage warrant yards which were still under the control of the makers are included in stocks on hand.

Pig iron—Gross tons.	1888.	1889.	1890.	1891.	1892.
Domestic production.....	6,489,738	7,603,642	9,202,703	8,279,870	9,157,000
Imported.....	197,237	148,759	134,955	67,179	70,125
Stocks on hand January 1..	301,913	300,144	283,879	661,858	627,233
Total supply.....	6,988,888	8,052,545	9,621,537	9,008,907	9,854,358
Deduct stocks December 31; also warrant yard stocks..	300,144	283,879	661,858	627,233	535,616
Approximate consumption	6,688,744	7,768,666	8,959,679	8,381,674	9,318,742

Our consumption of pig iron since 1874, calculated as above, with an allowance in some earlier years for foreign stocks and domestic exports, and counting stocks in warrant yards in the last four years, has been as follows, in gross tons.

Years.	Gross tons.	Years.	Gross tons.	Years.	Gross tons.
1874.....	2,500,000	1881.....	4,982,565	1888.....	6,688,744
1875.....	2,000,000	1882.....	4,963,278	1889.....	7,768,666
1876.....	1,900,000	1883.....	4,834,740	1890.....	8,959,679
1877.....	2,150,000	1884.....	4,229,280	1891.....	8,381,674
1878.....	2,500,000	1885.....	4,348,844	1892.....	9,318,742
1879.....	3,432,534	1886.....	6,191,354	.....	.....
1880.....	3,990,415	1887.....	6,808,386	.....	.....

#### PRODUCTION OF BESSEMER STEEL.

The production of Bessemer steel ingots in the United States in 1892 was 4,168,435 gross tons, against 3,247,417 tons in 1891, and 3,688,871 tons in 1890. There was an increase of 921,018 tons, or over 28 per cent., in 1892 over 1891. The production in 1892 was much the largest in our history. Direct castings are counted as ingots.

The following table shows the production by States of Bessemer steel ingots in the first half and second half of 1892, and the total production in 1892 compared with 1891. The production by the Clapp-Griffiths process is included in the figures for the periods mentioned, but we also add to the table a statement of the ingots produced by this process alone. The production of steel by the Robert-Bessemer works is also included in the totals.

States—Ingots.	First half 1892. Gross tons.	Second half 1892. Gross tons.	Total 1892. Gross tons.	Total 1891. Gross tons.
Pennsylvania.....	1,218,504	1,179,480	2,397,984	2,048,330
Illinois.....	437,067	442,885	879,952	605,921
Ohio.....	200,946	208,909	409,855	333,666
Other States.....	202,411	278,233	480,644	259,500
Total.....	2,058,928	2,109,507	4,168,435	3,247,417
Clapp-Griffiths only..	36,974	37,744	74,718	65,389

The number of completed standard Bessemer steel works in the United States at the close of 1892 was 45, with 96 converters, and two new plants, one in Allegheny county, with two converters, and one in Ohio, with two converters, were in course of

erection. Ten of the old plants made no steel in 1892. One new Bessemer plant, owned by the Shenango Valley Steel Company, at New Castle, Pennsylvania, was completed in 1892 and commenced making steel late in that year. The plant of the South Tredegar Iron Company, at Chattanooga, Tennessee, was abandoned and the works dismantled in 1892. The two 4-ton converters of the Worcester Steel Works, of Worcester, Massachusetts, were bought by the Premier Steel Company, of Indianapolis, Indiana, early in the year and removed to Indianapolis. They were not erected, however, in time to produce any steel last year. The 4-ton converter which the Sharon Steel Casting Company, of Sharon, Pennsylvania, commenced building in 1891 was not completed in 1892.

No Clapp-Griffiths steel plants have been built since 1889, the total number now being 5, with 9 converters. Only 3 of these works, however, were in operation in 1892. No Robert-Bessemer steel plants were built in 1892. Of the 4 plants in the country, with 6 converters, only two were in operation last year.

Bessemer steel, including the product of the Clapp-Griffiths and Robert-Bessemer converters, was made in 11 States in 1892, one more State than in 1891, namely, Massachusetts, New York, Pennsylvania, Maryland, West Virginia, Kentucky, Ohio, Illinois, Michigan, Wisconsin, and Colorado.

As the table already given shows, the three leading steel-producing States are Pennsylvania, Illinois, and Ohio. In 1892 Pennsylvania made over 57 per cent. of all the Bessemer steel produced, against 63 per cent. in 1891, 61 per cent. in 1890, and 60 per cent. in 1889. Illinois made over 21 per cent. in 1892, against 18 per cent. in 1891, over 20 per cent. in 1890, and 22 per cent. in both 1888 and 1889. Ohio made almost 10 per cent. in 1892, against 10 per cent. in 1891, over 9 per cent. in 1890, and 10 per cent. in 1889.

#### PRODUCTION OF OPEN-HEARTH STEEL.

Our statistics of the production of open-hearth steel in the United States include steel made in the open hearth by the basic process, which we have not undertaken to separately classify. Direct castings are counted as ingots.

The production of open-hearth steel ingots in the United States in 1892 was 669,889 gross tons, against 579,753 tons in 1891, and 513,232 tons in 1890. There was an increase of 90,136 tons, or

over 15 per cent., in 1892 as compared with 1891. The production of 1892 was much the largest yet attained in this country.

The production of open-hearth steel in 1892 in New England, New York, and New Jersey amounted to 38,131 gross tons; in Pennsylvania to 551,010 tons; in Ohio to 60,834 tons; and in the other Western, Pacific, and Southern States to 19,914 tons.

The open-hearth steel made in 1892 was produced by 63 works, located in twelve States—New Hampshire, Massachusetts, New York, New Jersey, Pennsylvania, Alabama, Ohio, Indiana, Illinois, Michigan, Missouri, and California. The total number of completed open-hearth steel works in the United States at the close of 1892 was 80, or nine more than at the close of 1891.

The quantity of open-hearth steel rails produced in 1892 was only 3,819 gross tons, nearly all being made in California.

#### PRODUCTION OF CRUCIBLE STEEL.

The production of crucible steel in the United States in 1892 amounted to 84,709 gross tons, against 72,586 tons in 1891, and 71,175 tons in 1890. There was an increase in 1892 of 12,123 gross tons over 1891, or over 16 per cent. The production of 1892 was made in twelve States—Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, Maryland, Tennessee, Ohio, Indiana, Illinois, Michigan, and Missouri.

Of the total production of 84,709 gross tons of crucible steel in 1892 New England contributed 3,003 tons; New York, 5,450 tons; New Jersey, 7,248 tons; Pennsylvania, 64,834 tons; the Western States, 4,054 tons; and the Southern States, 120 tons.

#### PRODUCTION OF MISCELLANEOUS STEEL.

The production of steel in the United States in 1892 by various minor processes amounted to 4,548 gross tons, against 4,484 tons in 1891, 3,793 tons in 1890, and 5,120 tons in 1889. Blister, puddled, and "patented" steel, including "patented" steel castings, are embraced in these figures. The miscellaneous steel produced in 1892 was made in Pennsylvania, Iowa, and California.

#### TOTAL PRODUCTION OF STEEL.

The production of all kinds of steel in the United States in 1892 closely approximated 5,000,000 gross tons, the details being as follows: Bessemer steel, 4,168,435 tons; open-hearth steel, 669,889 tons; crucible steel, 84,709 tons; all other steel, 4,548 tons; total, 4,927,581 tons, against 3,904,240 tons in 1891.

## TOTAL PRODUCTION OF ROLLED IRON AND STEEL.

In the following tables we give the production of the various forms of rolled products in late years, iron and steel being added together. By the phrase rolled iron and steel we include all iron and steel rolled into finished forms, as follows: (1) all sizes of iron and steel rails; (2) plate and sheet iron and steel; (3) iron and steel plates for cut nails and cut spikes; (4) wire rods; (5) iron and steel structural shapes, and bar, bolt, hoop, skelp, and rolled axles. We do not include hammered axles and other forgings.

The production of all iron and steel rolled into finished forms in the United States in 1892 was 6,165,814 gross tons, against 5,390,963 tons in 1891, an increase of 774,851 tons, or over 14 per cent. Twenty-nine States rolled either iron or steel or both iron and steel in 1892. The following table gives the aggregate production by States of iron and steel rolled into all kinds of finished forms in 1891 and 1892, in gross tons.

States—Gross tons.	1891.	1892.	States—Gross tons.	1891.	1892.
Maine.....	7,217	6,005	Texas.....		235
New Hampshire...	4,955	5,100	Ohio.....	783,575	888,793
Massachusetts.....	140,169	137,882	Indiana.....	112,129	150,596
Rhode Island.....	13,203	13,328	Illinois.....	590,327	748,635
Connecticut.....	28,434	31,574	Michigan.....	29,934	43,887
New York.....	118,352	134,069	Wisconsin.....	67,697	90,405
New Jersey.....	100,651	106,816	Minnesota.....	4,464	5,429
Pennsylvania.....	3,041,254	3,302,506	Missouri.....	24,121	30,156
Delaware.....	36,446	37,213	Iowa.....	2,768	2,829
Maryland.....	33,588	114,594	Colorado.....	13,138	34,079
Virginia.....	29,245	45,616	Oregon.....		1,310
West Virginia.....	79,207	87,955	Wyoming.....	3,571	7,446
Kentucky.....	45,215	51,282	California.....	38,907	38,840
Tennessee.....	9,229	13,016			
Georgia.....	2,790	2,902			
Alabama.....	30,377	33,316	Total.....	5,390,963	6,165,814

Pennsylvania made 53.5 per cent. of the total production of rolled iron and steel in 1892, 56.4 per cent. in 1891, 58.5 per cent. in 1890, 57.4 per cent. in 1889, and 55.7 per cent. in 1888; Ohio made 14.4 per cent. in 1892, 14.5 per cent. in 1891, 12.4 per cent. in 1890, 13.5 per cent. in 1889, and 13 per cent. in 1888; and Illinois made 12.1 per cent. in 1892, 10.9 per cent. in 1891, 12.4 per cent. in 1890 and in 1889, and 12.2 per cent. in 1888. No other State produced 3 per cent. in any year.



The total production of rolled iron and steel in the United States from 1888 to 1892 is given in detail in the following table.

Years—Gross tons.	Iron and steel rails.	Bars, hoops, skelp, and shapes.	Wire rods.	Plates and sheets, except nail plate.	Cut nails. Gross tons.	Total. Gross tons.
1888.....	1,403,700	2,034,162	279,769	609,827	289,891	4,617,349
1889.....	1,522,204	2,374,968	363,851	716,496	259,409	5,236,928
1890.....	1,885,307	2,618,660	457,099	809,981	251,828	6,022,875
1891.....	1,307,176	2,644,941	536,607	678,927	223,312	5,390,963
1892.....	1,551,844	3,033,439	627,829	751,460	201,242	6,165,814

#### PRODUCTION OF IRON AND STEEL RAILS.

The production of all kinds of rails, including light and heavy and street and mine rails, in the United States in 1892 was 1,551,844 gross tons, against 1,307,176 tons in 1891, an increase of 244,668 tons, or 18.7 per cent. The production of 1892 was composed of 1,458,732 tons of Bessemer steel rails rolled by the producers of domestic ingots; 78,856 tons of Bessemer steel rails rolled from purchased blooms and from old steel rails; 3,819 tons of open-hearth steel rails; and 10,437 tons of iron rails.

Of the total production of 1,537,588 gross tons of Bessemer steel rails in 1892 Pennsylvania made 961,987 gross tons, as compared with 901,159 tons in 1891; Illinois, 450,553 tons, against 364,725 tons in 1891; and the remainder of the country, 125,048 tons, against 27,169 tons in 1891.

Eleven States made rails in 1892, namely, Pennsylvania, Maryland, West Virginia, Tennessee, Alabama, Ohio, Indiana, Illinois, Wisconsin, Colorado, and California. Of these States eight made Bessemer steel rails, namely, Pennsylvania, Maryland, West Virginia, Ohio, Illinois, Wisconsin, Colorado, and California. The quantity of Bessemer steel rails made outside of Pennsylvania, Maryland, and Illinois was, however, very small. The open-hearth steel rails were nearly all made in California. The iron rails were made in Pennsylvania, Tennessee, Alabama, Ohio, Indiana, Illinois, and Colorado.

Of the total production of rails in 1892 Pennsylvania made over 62 per cent., against 69 per cent. in 1891 and 1890, 67 per cent. in 1889, 59 per cent. in 1888, 54 per cent. in 1887, and over 62 per cent. in 1886. Illinois made over 29 per cent. in 1892, against 28 per cent. in both 1891 and 1890, 30 per cent. in 1889, 31 per cent. in 1888, 30 per cent. in 1887, and 24 per

cent. in 1886. These two States made over 91 per cent. of all the rails rolled in 1892, against over 97 per cent. in 1891 and 1890, 97 per cent. in 1889, 90 per cent. in 1888, and 84 per cent. in 1887.

The rails reported to us which are definitely known to have been ordered and rolled for street railways amounted in 1892 to 111,580 gross tons, against 81,302 tons in 1891, and 98,529 tons in 1890, an increase in 1892 over 1891 of 30,278 tons. Nearly all street rails are now rolled from Bessemer steel.

The total production of all kinds of iron and steel rails in the United States from 1849 to 1892 has been as follows.

Years.	Gross tons.	Years.	Gross tons.	Years.	Gross tons.
1849.....	21,712	1864.....	299,437	1879.....	993,993
1850.....	39,360	1865.....	318,118	1880.....	1,305,212
1851.....	45,181	1866.....	384,623	1881.....	1,646,518
1852.....	55,784	1867.....	412,596	1882.....	1,507,851
1853.....	78,450	1868.....	452,423	1883.....	1,214,905
1854.....	96,443	1869.....	529,988	1884.....	1,022,188
1855.....	123,816	1870.....	553,571	1885.....	976,978
1856.....	160,730	1871.....	692,619	1886.....	1,600,537
1857.....	144,570	1872.....	892,857	1887.....	2,139,640
1858.....	146,171	1873.....	794,712	1888.....	1,403,700
1859.....	174,513	1874.....	651,262	1889.....	1,522,204
1860.....	183,070	1875.....	707,600	1890.....	1,885,307
1861.....	169,480	1876.....	785,383	1891.....	1,307,176
1862.....	190,993	1877.....	682,776	1892.....	1,551,844
1863.....	246,221	1878.....	788,112	.....	.....

#### PRODUCTION OF IRON AND STEEL STRUCTURAL SHAPES.

For the first time we have this year compiled the statistics of the production of iron and steel structural shapes, and the result for 1892 is given below. These statistics embrace the production of all iron and steel structural shapes, including beams, girders, tees, channels, and angles, but not including plates, which are provided for under other classifications. The production of iron and steel structural shapes in 1892 was as follows.

States.	Gross tons.	States.	Gross tons.
New England and New York	2,624	Indiana and Illinois.....	36,211
New Jersey.....	26,678	Michigan and Wisconsin...	4,580
Pennsylvania.....	342,644	Oregon and California.....	7,640
Alabama and Kentucky.....	10,365		
Ohio.....	23,215	Total.....	453,957

The magnitude of the structural branch of our iron and steel industries which is indicated by the above figures will surprise even those who are directly connected with the manufacture of structural shapes. Nearly all of the production of these shapes in 1892, as also in recent years, was of steel.

#### PRODUCTION OF PLATES AND SHEETS.

The production of plate and sheet iron and steel in 1892, excluding nail plate, amounted to 751,460 gross tons, against 678,927 tons in 1891, an increase of 72,533 tons. Many of the plate and sheet mills of the country, especially in Eastern and Central Pennsylvania, roll skelp iron and steel of various sizes, the production of which is not included in our tables with plates and sheets, but with other rolled material.

The following table gives the production of iron and steel plates and sheets, by States, not including nail plates, in 1891 and 1892, in gross tons.

States—Gross tons.	1891.	1892.	States—Gross tons.	1891.	1892.
New Hampshire..	6,437	7,035	Alabama.....	4,323	3,989
Massachusetts.....			Ohio.....	112,508	139,004
New York.....	9,239	12,179	Indiana.....	6,053	16,631
New Jersey.....			Illinois.....		
Pennsylvania.....	489,947	515,506	Michigan.....	7,682	17,775
Delaware.....	16,548	13,206	Wisconsin.....		
Maryland.....			Missouri.....		
West Virginia.....	26,190	26,135	Total.....	678,927	751,460
Kentucky.....					

Pennsylvania made 68.6 per cent. of the total production of plates and sheets in 1892, against 72 per cent. in 1891, 73 per cent. in each of the years 1890, 1889, and 1888; and Ohio made 18.4 per cent. in 1892, against 16.5 per cent. in 1891, 14.9 per cent. in 1890, 14.4 per cent. in 1889, and 13.4 per cent. in 1888.

#### PRODUCTION OF WIRE RODS.

The production of wire rods in 1892 amounted to 627,829 gross tons, against 536,607 tons in 1891, an increase of 91,222 tons. Nearly all wire rods are now made of steel. Pennsylvania made the largest quantity in 1892, with Ohio second, Massachusetts third, and Illinois fourth in production. The other States which rolled rods last year were New York, New Jersey, Indiana, and Connecticut. As the table on a preceding page shows, our pro-

duction of wire rods has increased greatly in late years. We made more tons of wire rods in 1892 than we did of Bessemer steel rails in 1879, and almost two-thirds as many tons as of Bessemer steel rails in each of the years 1884 and 1885.

#### PRODUCTION OF CUT NAILS.

Our statistics of the production of iron and steel cut nails and cut spikes in the United States do not embrace railroad and other spikes made from bar iron, wire nails of any size, nor machine-made horseshoe nails. Cut spikes are included with cut nails.

Our total production of cut nails in 1892 was 4,507,819 kegs of 100 pounds each, against 5,002,176 kegs in 1891, a decrease of 494,357 kegs, or almost 10 per cent. There has been a steady decline in the production of cut nails since 1886, in which year the maximum production of 8,160,973 kegs was reached. In 1892 our production of wire nails exceeded for the first time our production of cut nails.

Eleven States made cut nails in 1892, one more than in 1891. The following table shows the production of iron and steel cut nails by States from 1887 to 1892, in kegs of 100 pounds. We have added to the table the wire-nail production for these years. New York and Nebraska have not made any cut nails since 1886.

States—Kegs.	1887.	1888.	1889.	1890.	1891.	1892.
Pennsylvania.....	2,238,165	2,072,969	1,834,899	1,825,824	1,470,613	1,521,332
Ohio.....	1,672,128	1,522,951	1,546,928	1,418,621	1,408,449	1,261,813
West Virginia...	827,325	1,145,151	980,346	957,694	768,648	429,243
Illinois.....	275,072	241,981	204,438	130,806	97,400	128,700
Massachusetts...	267,453	280,301	239,903	191,573	353,292	297,888
New Jersey .....	346,117	275,591	252,067	260,367		
Indiana .....	399,040	175,397	138,200	229,964	383,445	370,729
California.....	258,193	240,000	242,000	220,000	164,000	145,000
Virginia.....	250,519	245,755	194,998	202,560	107,475	96,007
Alabama .....	54,000	.....	.....	.....	.....	.....
Wisconsin.....	78,940	41,715	11,435	3,883	.....	.....
Kentucky .....	159,720	206,783	165,000	194,654	248,854	247,107
Tennessee .....	36,473	.....	.....	.....	.....	.....
Colorado.....	45,725	44,997	544	.....	.....	.....
Missouri.....	.....	.....	.....	5,000	.....	.....
Wyoming .....	.....	.....	.....	.....	.....	10,000
Total cut nails..	6,908,870	6,493,591	5,810,758	5,640,946	5,002,176	4,507,819
Total wire nails.	1,250,000	1,500,000	2,435,000	3,135,911	4,114,385	4,719,524
Grand total.....	8,158,870	7,993,591	8,245,758	8,776,857	9,116,561	9,227,343

The Wheeling cut-nail district embraces the nail mills in Ohio and Marshall counties in West Virginia and in Belmont and Jefferson counties in Ohio. There were 1,180,213 kegs of cut nails made in this district in 1892, (about one-fourth of the total production,) against 1,609,933 kegs in 1891, 1,744,385 kegs in 1890, 1,825,956 kegs in 1889, 2,137,845 kegs in 1888, 1,848,116 kegs in 1887, and 1,858,551 kegs in 1886. It will be noticed that the production of cut nails in this district is declining rapidly. Large quantities of cut nails were once made in Allegheny county, Pennsylvania, but no cut nails have been made in this county since 1890, in which year only 52,536 kegs were made.

#### PRODUCTION OF WIRE NAILS.

The production of wire nails in the United States in 1886 was estimated at 600,000 kegs. Since that year the manufacture of wire nails of all sizes has rapidly increased. In 1887 the production was estimated at 1,250,000 kegs; in 1888 at 1,500,000 kegs; in 1889 direct reports from most of the works showed the production to be 2,435,000 kegs; in 1890 the production increased to 3,135,911 kegs; in 1891 to 4,114,385 kegs; and in 1892 it reached the large total of 4,719,524 kegs.

In the following table we give the production of wire nails in this country by districts in the last four years, in kegs of 100 pounds, as reported to us by the manufacturers.

Years—Kegs.	New England.	New York and New Jersey.	Pennsylvania.	Ohio.	Indiana and Illinois.	Other States.	Total Kegs.
1889.....	110,000	170,000	816,000	944,000	46,000	349,000	2,435,000
1890.....	167,135	168,460	1,061,639	1,115,320	47,507	575,850	3,135,911
1891.....	193,668	128,159	1,460,252	1,659,396	381,950	290,960	4,114,385
1892.....	107,477	91,470	1,676,684	1,800,742	796,406	246,745	4,719,524

The wire-nail production of 1892 was turned out by 39 works, and the production of 1891 by 46 works. There were 47 completed wire-nail works in the United States at the close of 1892 and several new works were in course of erection.

The "other States" referred to in the table as making wire nails in 1892 were Michigan, Missouri, California, and Washington.

#### PRODUCTION OF IRON BLOOMS AND BILLETS.

The quantity of iron blooms and billets produced in forges directly from the ore in 1892 was 2,182 gross tons, against 5,290

tons in 1891, 7,094 tons in 1890, and 11,078 tons in 1889. The production of wrought iron direct from the ore in forges is now confined to the Lake Champlain district of New York and to one primitive Catalan forge in North Carolina. The quantity of iron blooms produced in forges from pig and scrap iron in 1892, and which was for sale and not intended for the consumption of the makers, was 6,922 gross tons. Of the pig and scrap blooms made in 1892 Pennsylvania produced 3,726 tons, the remainder being made in New Jersey and Maryland.

#### PRODUCTION OF ALLEGHENY COUNTY, PENNSYLVANIA.

Allegheny county, in Pennsylvania, which includes the city of Pittsburgh within its limits, is well known as the leading iron and steel producing county in the United States. It has long occupied this position. The following table gives the number of blast furnaces, rolling mills, and steel works and the production in gross tons of pig iron, steel ingots, and rolled iron and steel in this county in 1891 and 1892.

Details.	1891.	1892.
Blast furnaces.....Number.	26	26
Production of pig iron.....Gross tons.	1,460,296	1,775,257
Rolling mills and steel works.....Number.	63	62
Production of crucible steel ingots.....Gross tons.	46,535	55,722
Production of all other kinds of steel, including Bessemer ingots.....Gross tons.	1,331,073	1,550,252
Total production of steel.....Gross tons.	1,377,608	1,605,974
Production of rails, bars, bolts, rods, shapes, hoops, and skelp.....Gross tons.	1,070,243	1,188,727
Production of sheets and plates.....Gross tons.	257,498	248,369
Total production of rolled iron and steel.....Gross tons.	1,327,741	1,437,096

#### IRON AND STEEL SHIPBUILDING.

Neither the number nor the tonnage of the iron and steel vessels built in the United States in the fiscal year 1892, which ended on the 30th of June, was as large as in the preceding fiscal year, but it is probable that there has been increased activity in American shipyards in the current fiscal year. In the fiscal year 1892 we built 55 iron and steel vessels, against 76 in the fiscal year 1891. The gross tonnage of the vessels built in the fiscal year 1892 was 51,374 tons, against 105,618 tons in the preceding fiscal year. With the exception of one schooner and four barges built at Marquette, Michigan, all the vessels built in 1892 were

built to use steam. The vessels launched in the fiscal year 1892 were built within the jurisdiction of the following ports, our authority being the Bureau of Navigation of the Treasury Department. Vessels for the United States navy are not included.

Ports.	Iron.		Steel.		Total.	
	No.	Gross tonnage.	No.	Gross tonnage.	No.	Gross tonnage.
Boston, Mass.....	1	233.03	...	.....	1	233.03
New York, N. Y.....	...	.....	3	2,547.00	3	2,547.00
Newark, N. J.....	...	.....	1	1,255.63	1	1,255.63
Philadelphia, Pa.....	9	2,336.18	4	6,374.67	13	8,710.85
Wilmington, Del.....	1	2,551.39	4	5,768.27	5	8,319.66
Baltimore, Md.....	3	957.24	1	25.64	4	982.88
New Orleans, La.....	...	.....	1	68.87	1	68.87
Louisville, Ky.....	1	73.65	...	.....	1	73.65
Rock Island, Ill.....	1	10.72	...	.....	1	10.72
Pittsburgh, Pa.....	1	313.15	...	.....	1	313.15
Buffalo, N. Y.....	2	132.82	...	.....	2	132.82
Cleveland, Ohio.....	...	.....	7	10,813.34	7	10,813.34
Detroit, Mich.....	...	.....	2	1,193.74	2	1,193.74
Port Huron, Mich.....	...	.....	1	340.65	1	340.65
Marquette, Mich.....	...	.....	11	15,978.25	11	15,978.25
San Francisco, Cal.....	...	.....	1	400.03	1	400.03
Total.....	19	6,608.18	36	44,766.09	55	51,374.27

#### PRODUCTION OF COAL.

We give below the official statistics of the production of coal in the United States in the census years 1870 and 1880, ending on the 31st day of May of each year; in the census year 1889, ending on the 31st day of December of that year; and in the calendar years 1890 and 1891, the statistics for the last two years having been compiled by Dr. David T. Day, chief of the Division of Mining Statistics of the United States Geological Survey.

Years—Gross tons.	Pennsylvania anthracite.	Bituminous and all other.	Total.
Census year 1870.....	13,973,460	15,369,120	29,342,580
Census year 1880.....	25,572,160	38,250,670	63,822,830
Calendar year 1889.....	40,665,152	85,432,627	126,097,779
Calendar year 1890.....	41,489,858	99,392,871	140,882,729
Calendar year 1891.....	45,236,992	105,268,962	150,505,954

As has elsewhere been stated in this Report, the shipments of anthracite coal from the mines in Pennsylvania in 1892 were the largest ever made, amounting to 41,893,321 gross tons, against



40,448,337 tons in 1891. The figures of production of anthracite coal above given include local consumption at the mines.

The shipments of bituminous coal and coke from Southwestern Pennsylvania through the locks and pools of the Monongahela Navigation Company amounted to 97,419,850 bushels in 1892, against 107,719,200 bushels in 1891, 118,061,100 bushels in 1890, 81,162,500 bushels in 1889, 115,814,900 bushels in 1888, 78,912,900 bushels in 1887, and 113,099,147 bushels in 1886. The coal shipments in 1892 amounted to 96,818,350 bushels and the coke shipments to 601,500 bushels.

The shipments of bituminous coal from the Cumberland coal field of Western Maryland and West Virginia amounted to 4,029,564 gross tons in 1892, against 4,382,096 tons in 1891, 4,006,091 tons in 1890, 3,213,886 tons in 1889, 3,671,067 tons in 1888, 3,375,796 tons in 1887, and 2,592,467 tons in 1886.

The average yearly circular prices of hard white ash anthracite coal in the last four years, per gross ton, free on board at Philadelphia, for shipment beyond the Delaware capes, were as follows. The table shows that the prices of anthracite coal have been only slightly increased since the lease of connecting roads by the Philadelphia and Reading Railroad Company early in 1892.

Years—Average price.	Lump.	Broken.	Egg.	Stove.	Chestnut.
1889.....	\$4.04	\$3.78	\$3.95	\$4.12	\$3.92
1890.....	3.92½	3.74	3.92	4.05	3.73
1891.....	3.85	3.68	3.84	3.93	3.61
1892.....	3.97½	3.72	3.98	4.16	4.00

#### IMPORTS AND EXPORTS OF COAL AND COKE.

The following tables show the import and export trade of the United States in anthracite and bituminous coal in the calendar years from 1886 to 1891. These tables have been compiled by Dr. Day from official returns to the Bureau of Statistics of the Treasury Department. The exports consist both of anthracite and bituminous coal. They are made principally by rail over the international bridges and by lake and sea to the Canadian provinces. Exports are also made by sea to the West Indies, to Central and South America, and elsewhere. The imports are principally from Australia and British Columbia to San Francisco, from Great Britain to the Atlantic and Pacific coasts, and from Nova Scotia to Atlantic coast ports.

Imports—Calendar years.	Anthracite.		Bituminous.	
	Gross tons.	Value.	Gross tons.	Value.
1886.....	2,039	\$4,920	811,657	\$2,501,153
1887.....	14,181	42,983	819,242	2,609,311
1888.....	24,093	68,710	1,085,647	3,728,060
1889.....	20,652	117,434	1,001,374	3,425,347
1890.....	15,145	46,695	819,971	2,822,216
1891.....	37,607	112,722	1,362,387	4,557,932

  

Exports—Calendar years. †	Gross tons.		Value.	
	Gross tons.	Value.	Gross tons.	Value.
1886.....	667,076	\$2,718,143	544,768	\$1,440,631
1887.....	825,486	3,469,166	706,364	2,001,966
1888.....	969,542	4,325,126	860,462	2,529,472
1889.....	857,633	3,636,347	935,151	2,783,592
1890.....	794,335	3,272,697	1,280,930	4,004,995
1891.....	861,251	3,577,610	1,615,869	5,104,850

This country imports and exports very little coke. In the fiscal year ended June 30, 1892, our imports of coke amounted to 42,554 gross tons, valued at \$174,777, nearly all coming from England and most of the remainder from Belgium. In the same fiscal year our exports of coke amounted in value to \$112,006. The destination of the coke exported is not given by the Government statisticians, nor do they give the names of the ports at which our imports of coke have taken place.

#### STATISTICS OF IMMIGRATION.

The following statement shows the total number of immigrants who have arrived in the United States in the calendar years from 1870 to 1892, a period of twenty-three years, not counting immigrants from the British Possessions and Mexico since July 1, 1885.

Years.	Immi- grants.	Years.	Immi- grants.	Years.	Immi- grants.	Years.	Immi- grants.
1870.....	356,303	1876.....	157,440	1882.....	730,349	1888.....	525,019
1871.....	346,938	1877.....	130,502	1883.....	570,316	1889.....	431,935
1872.....	437,750	1878.....	153,207	1884.....	461,346	1890.....	495,021
1873.....	422,545	1879.....	250,565	1885.....	332,361	1891.....	595,251
1874.....	260,814	1880.....	593,703	1886.....	392,887	1892.....	547,060
1875.....	191,231	1881.....	720,045	1887.....	516,933	.....	.....

During the twenty-three years above mentioned the total number of immigrants who have arrived in the United States, with the exceptions already noted, has been 9,619,521.

The following table, for which we are indebted to the Bureau of Statistics of the Treasury Department, gives the total number of immigrants who have arrived in the United States in the calendar years 1887 to 1892, except from the British North American Possessions and Mexico. The immigrants from these countries since July 1, 1885, have been excluded from official tables of immigration because of the difficulty of obtaining accurate statistics.

Countries.	1887.	1888.	1889.	1890.	1891.	1892.
England and Wales.....	84,654	77,763	62,747	56,177	52,637	45,821
Ireland.....	72,888	71,966	60,492	53,418	55,947	50,522
Scotland.....	22,067	23,412	14,948	11,408	12,488	11,267
Total United Kingdom..	179,609	173,141	138,187	121,003	121,072	107,610
Germany.....	111,324	106,975	95,965	96,514	123,438	118,400
France.....	5,604	6,872	6,118	6,684	6,534	5,342
Bohemia and Hungary..	18,878	16,585	18,397	32,780	38,627	40,045
Other Austria.....	20,209	25,080	23,773	30,339	32,084	29,885
Russia, except Poland...	25,815	37,353	33,487	40,922	73,271	52,334
Poland.....	4,960	5,902	4,866	19,743	31,301	27,013
Sweden and Norway.....	69,558	66,023	42,451	43,322	52,445	55,724
Denmark.....	9,305	8,756	8,597	9,993	10,490	10,236
Netherlands.....	5,276	5,457	6,339	4,414	5,365	7,758
Italy.....	46,256	47,856	30,238	62,969	69,297	61,434
Switzerland.....	6,561	7,622	7,336	6,792	6,934	6,663
All other countries.....	13,578	17,397	16,181	19,546	24,393	24,616
Total.....	516,933	525,019	431,935	495,021	595,251	547,060

There was a slight decrease in the number of immigrants in 1892 as compared with 1891, which was due entirely to the strictness of our quarantine regulations in the presence of cholera. In 1892, as in other recent years, many of the immigrants came from Bohemia and Hungary and other Austrian provinces, and from Russia, Poland, and Italy. In the last six years we have received from these countries 1,001,699 immigrants. Of the whole number mentioned 165,312 came from Bohemia and Hungary, 161,370 from the other Austrian Provinces, 263,182 from Russia, 93,785 from Poland, and 318,050 from Italy. In 1892 these countries sent us 210,711 persons. Immigration is increasing from the south of Europe and decreasing from Great Britain.

#### OUR NEW TINPLATE INDUSTRY.

In our last Annual Report we noted the steps that had been taken to establish the tinplate industry in our country since the passage of the McKinley tariff in 1890, and in our "Twenty

Years of Progress in the Manufacture of Iron and Steel in the United States," published as a supplement to the present Report, we have given the statistics of our production of tinplates and terne plates in the fifteen months from July 1, 1891, when the new tinplate duty took effect, to September 30, 1892. We now give a fuller table of production to the close of 1892. The authority for this table is Colonel Ayer, special agent of the Treasury Department. We invite attention to its official character.

Production by quarters.	Tinplates. pounds.	Terne plates. pounds.	Total, pounds.
July 1, 1891, to September 30, 1891.....	152,489	674,433	826,922
October 1, 1891, to December 31, 1891.....	215,911	1,193,910	1,409,821
January 1, 1892, to March 31, 1892.....	1,099,656	2,109,569	3,209,225
April 1, 1892, to June 30, 1892.....	3,071,534	5,129,217	8,200,751
July 1, 1892, to September 30, 1892.....	3,611,367	7,341,358	10,952,725
October 1, 1892, to December 31, 1892.....	6,138,739	13,617,752	19,756,491
Total for first four quarters... ..	4,539,590	9,107,129	13,646,719
Total for last two quarters.....	9,750,106	20,959,110	30,709,216
Total for six quarters.....	14,289,696	30,066,239	44,355,935

Newspapers published in England and English newspapers published in our own country may speak lightly and even contemptuously of the progress made by our tinplate industry in less than two years, or since the new tinplate duty took effect on July 1, 1891, but candid observers, and especially patriotic citizens of the United States who feel a manly pride in the prosperity of any worthy American industry, will read the above statistics with far different conclusions. They tell a story of creditable and really wonderful progress in building up a new industry in a brief time. No other American manufacturing industry, even with the stimulus of protective duties, has ever made greater progress in the same time. And this progress of our tinplate industry has been made with the threat constantly impending over the heads of our tinplate manufacturers, and most forcibly expressed in the elections of 1890 and 1892, that a great political party in our country would repeal the new tinplate duty as soon as it would come into power. The editor or the politician who says, with all the facts before him, that our tinplate industry has not justified the expectations and the promises of its friends when the new duty was imposed is simply making public exhibition of his own phenomenal ability to deal in conspicuously inexact statements.

But it is said that our tinplate industry is not entitled to serious consideration because a large part of our product of bright tinplates and terne plates has been made from imported black plates. This is true, but the enemies of American industry who dwell upon this fact are again conspicuously uncandid in ignoring the other fact that we have had in large part to provide in less than two years the facilities for rolling in American mills the black plates, or, more properly, the sheets which our tinplate manufacturers would require. The ample supply of black sheets of domestic manufacture to meet the demand created by the establishment of a tinplate industry which had no existence whatever down to the passage of the McKinley tariff must necessarily be a work of at least two or three years, and only those who are willfully blind will refuse to recognize this fact. The statistics presented by Colonel Ayer show that we have made as creditable progress in the production of black sheets as in the production of tinplates themselves. Of the production of 19,756,491 pounds of tin and terne plates during the last quarter covered by the table already given 8,043,449 pounds, or more than 40 per cent., were made from American black plates, against 5,920,082 pounds used during the previous quarter. The consumption of American plates in the production of tinplates and terne plates during the last two quarters of 1892 was 13,963,531 pounds, or 316,812 pounds more than the total production of tinplates and terne plates during the preceding four quarters. Of the thirty-two firms who submitted their sworn returns for the last quarter in 1892 nine made and used their own black plates exclusively; four others used only American plates; nine used both American and foreign plates; and ten used only foreign plates. These exact and official statements are a complete answer to the false charge that American tinplate manufacturers only "dip" foreign plates.

We dismiss this subject with the following significant extract from the circular letter of Wm. Fallows & Co., iron merchants, of Liverpool, dated January 11, 1893: "The success of the Democratic party at the last Presidential election has given good ground for the expectation that the McKinley tariff will be considerably modified, and should the duty be restored to the old rate of one cent per pound it is anticipated that the manufacture of tinplates in the United States *may be effectively checked*"—of course for the benefit of the Welsh tinplate manufacturers.

## PRICES OF TINPLATES.

In the following table we give the highest and lowest yearly prices of I. C. coke tinplates, per box of about 108 pounds, at Liverpool, from 1863 to 1892, as reported by Wm. Fallows & Co.

Years.	Lowest price.			Highest price.			Years.	Lowest price.			Highest price.		
	£	s.	d.	£	s.	d.		£	s.	d.	£	s.	d.
1863.....	1	02	03	1	05	06	1878.....	0	13	00	0	16	09
1864.....	1	04	00	1	06	00	1879.....	0	14	06	1	03	00
1865.....	1	02	00	1	05	06	1880.....	0	14	06	1	10	00
1866.....	1	04	06	1	06	06	1881.....	0	14	06	0	17	09
1867.....	1	01	06	1	04	06	1882.....	0	15	00	0	18	00
1868.....	1	01	06	1	04	00	1883.....	0	15	06	0	16	03
1869.....	1	03	06	1	04	00	1884.....	0	14	00	0	15	06
1870.....	1	03	00	1	04	06	1885.....	0	12	06	0	15	00
1871.....	1	04	06	1	08	06	1886.....	0	12	03	0	14	00
1872.....	1	08	06	2	02	00	1887.....	0	12	09	0	15	00
1873.....	1	10	00	1	17	00	1888.....	0	13	03	0	15	06
1874.....	1	09	00	1	12	06	1889.....	0	12	09	0	15	09
1875.....	1	01	00	1	11	00	1890.....	0	13	06	0	18	00
1876.....	0	19	06	1	01	00	1891.....	0	12	06	0	17	06
1877.....	0	17	00	0	18	09	1892.....	0	12	00	0	12	09

From weekly quotations in the *New York Iron Age* we have ourselves compiled the following table of average monthly prices of I. C. coke Bessemer tinplates, per box, free on board at Liverpool, from January, 1890, to April, 1893.

Months.	Price.		Months.	Price.		Months.	Price.	
	s.	d.		s.	d.		s.	d.
January, 1890.....	16	05	March.....	17	09	May.....	12	04
February.....	16	03	April.....	17	03	June.....	12	06
March.....	15	01	May.....	16	02	July.....	12	05
April.....	14	10	June.....	14	10	August.....	12	02
May.....	13	10	July.....	14	00	September.....	12	00
June.....	14	00	August.....	13	09	October.....	12	00
July.....	14	02	September.....	13	07	November.....	12	01
August.....	14	11	October.....	13	08	December.....	12	02
September.....	15	10	November.....	13	03	January, 1893..	12	00
October.....	17	02	December.....	12	08	February.....	12	00
November.....	17	08	January, 1892..	12	10	March.....	12	00
December.....	17	03	February.....	12	06	April.....	12	00
January, 1891.....	17	10	March.....	12	06	.....	.....	.....
February.....	18	00	April.....	12	03	.....	.....	.....

In the following table we have compiled from quotations in the *Iron Age* the wholesale prices, per box, of coke Bessemer tinplates, I. C., 14 by 20, at New York, from 1890 to April, 1893.

Months.	Price.	Months.	Price.	Months.	Price.
January, 1890.....	\$4 72	March.....	\$5 36	May.....	\$5 30
February.....	4 61	April.....	5 26	June.....	5 29
March.....	4 46	May.....	5 17	July.....	5 25
April.....	4 42	June.....	5 35	August.....	5 21
May.....	4 42	July.....	5 28	September.....	5 20
June.....	4 43	August.....	5 39	October.....	5 27
July.....	4 49	September.....	5 43	November.....	5 45
August.....	4 66	October.....	5 37	December.....	5 49
September.....	5 17	November.....	5 31	January, 1893..	5 35
October.....	5 49	December.....	5 30	February.....	5 35
November.....	5 44	January, 1892..	5 30	March.....	5 44
December.....	5 24	February.....	5 30	April.....	5 50
January, 1891....	5 35	March.....	5 30	.....	.....
February.....	5 47	April.....	5 30	.....	.....

## RAILROAD STATISTICS.

The following is Mr. H. V. Poor's table of the annual increase in the railroad mileage of the United States from 1830 to 1892, allowance being made for abandoned mileage. The figures given in this table denote only the length of the railroad lines, without regard to the number of tracks or miles of sidings. The figures are for calendar years. For 1892 they are subject to revision.

Years.	Miles in operation.	Net increase.	Years.	Miles in operation.	Net increase.	Years.	Miles in operation.	Net increase.
1830...	23	.....	1851...	10,982	1,961	1872...	66,171	5,878
1831...	95	72	1852...	12,908	1,926	1873...	70,268	4,097
1832...	229	134	1853...	15,360	2,452	1874...	72,385	2,117
1833...	380	151	1854...	16,720	1,360	1875...	74,096	1,711
1834...	633	253	1855...	18,374	1,654	1876...	76,808	2,712
1835...	1,098	465	1856...	22,016	3,642	1877...	79,088	2,280
1836...	1,273	175	1857...	24,503	2,487	1878...	81,767	2,679
1837...	1,497	224	1858...	26,968	2,465	1879...	86,584	4,817
1838...	1,913	416	1859...	28,789	1,821	1880...	93,296	6,712
1839...	2,302	389	1860...	30,626	1,837	1881...	103,143	9,847
1840...	2,818	516	1861...	31,286	660	1882...	114,712	11,569
1841...	3,535	717	1862...	32,120	834	1883...	121,455	6,743
1842...	4,026	491	1863...	33,170	1,050	1884...	125,379	3,924
1843...	4,185	159	1864...	33,908	738	1885...	128,361	2,982
1844...	4,377	192	1865...	35,085	1,177	1886...	136,379	8,018
1845...	4,633	256	1866...	36,801	1,716	1887...	149,257	12,878
1846...	4,930	297	1867...	39,250	2,449	1888...	156,169	6,912
1847...	5,598	668	1868...	42,229	2,979	1889...	161,353	5,184
1848...	5,996	398	1869...	46,844	4,615	1890...	166,702	5,349
1849...	7,365	1,369	1870...	52,922	6,078	1891...	170,601	3,899
1850...	9,021	1,656	1871...	60,293	7,379	1892...	175,068	4,467



## SUMMARY OF THE FOREGOING STATISTICS FOR 1891 AND 1892.

Subjects.	1891.	1892.
Production of Pig Iron, gross tons.....	8,279,870	9,157,000
Production of Spiegeleisen, included in Pig Iron, gross tons.....	127,766	179,131
Production of Bar, Rod, Hoop, Skelp, and Shaped Iron and Steel, gross tons.....	3,181,548	3,661,268
Production of Iron and Steel Wire Rods, included above, gross tons.....	536,607	627,829
Production of Plate and Sheet Iron and Steel, except Nail Plate, gross tons.....	678,927	751,460
Production of Iron and Steel Cut Nails, kegs of 100 pounds.....	5,002,176	4,507,819
Production of Iron and Steel Wire Nails, kegs of 100 pounds.....	4,114,385	4,719,524
Production of all Rolled Iron and Steel, including Nails and excluding Rails, gross tons.....	4,083,787	4,613,970
Production of Bessemer Steel Rails, gross tons. ....	1,293,053	1,537,588
Production of Open-hearth Steel Rails, gross tons.....	5,883	3,819
Production of Iron Rails, gross tons.....	8,240	10,437
Total production of Rails, gross tons.....	1,307,176	1,551,844
Production of Street Rails, included above, gross tons.	81,302	111,580
Production of Bessemer Steel Ingots, gross tons.....	3,247,417	4,168,435
Production of Open-hearth Steel Ingots, gross tons...	579,753	669,889
Production of Crucible Steel Ingots, gross tons.....	72,586	84,709
Production of Blister and "Patented" Steel, gross tons.	4,484	4,548
Production of all kinds of Crude Steel, gross tons....	3,904,240	4,927,581
Production of ore, pig, and scrap Blooms for sale, gross tons.....		9,104
Value of Imports of Iron and Steel.....	\$41,983,626	\$33,882,447
Value of Exports of Iron and Steel.....	\$30,736,507	\$27,900,862
Production of Iron Ore, gross tons.....	14,591,178	.....
Imports of Iron Ore, gross tons.....	912,856	806,585
Total Consumption of Iron Ore, gross tons.....	15,740,000	17,400,000
Shipments of Anthracite Coal from the Mines in Pennsylvania, gross tons.....	40,448,337	41,893,321
Imports of Anthracite and Bituminous Coal, gross tons.....	1,399,994	.....
Exports of Anthracite and Bituminous Coal, gross tons.	2,477,120	.....
Total Domestic Production of Coal, gross tons.....	150,505,954	.....
Iron and Steel Ships built in the year ended June 30.	76	55
Miles of new Railroad completed.....	4,471	4,467
Total number of Miles of Railroad, December 31 ....	170,601	175,068
Immigrants in the year ended December 31, not in- cluding immigrants from Canada and Mexico.....	595,251	547,060

# PRODUCTION OF ALL KINDS OF PIG IRON IN THE UNITED STATES IN 1891 AND 1892, BY STATES.

*Statistics collected directly from the manufacturers by The American Iron and Steel Association.*

## TOTAL PRODUCTION OF PIG IRON.

States.	Gross tons of 2,240 pounds.	
	1891.	1892.
Massachusetts .....	8,990	7,946
Connecticut .....	21,811	17,107
New York .....	315,112	310,395
New Jersey .....	92,490	87,975
Pennsylvania .....	3,952,387	4,193,805
Maryland .....	123,398	99,131
Virginia .....	295,292	342,847
North Carolina .....	3,217	2,908
Georgia .....	49,858	9,950
Alabama .....	795,673	915,296
Texas .....	18,662	8,613
West Virginia .....	86,283	154,793
Kentucky .....	44,844	56,548
Tennessee .....	291,738	300,081
Ohio .....	1,035,013	1,221,913
Indiana .....	7,729	7,700
Illinois .....	669,202	949,450
Michigan .....	213,145	184,421
Wisconsin .....	197,160	174,961
Missouri .....	29,229	57,020
Minnesota .....	1,226	14,071
Colorado .....	18,116	32,441
Oregon .....	9,295	7,628
Total .....	8,279,870	9,157,000

## ANTHRACITE AND MIXED ANTHRACITE AND COKE PIG IRON.

States.	Gross tons of 2,240 pounds.	
	1891.	1892.
New York .....	201,671	228,206
New Jersey .....	92,490	87,975
Pennsylvania .....	1,571,947	1,480,932
Total .....	1,866,108	1,797,113

## PRODUCTION OF PIG IRON.—(CONTINUED.)

## CHARCOAL PIG IRON.

States.	Gross tons of 2,240 pounds.	
	1891.	1892.
Massachusetts .....	8,990	7,946
Connecticut .....	21,811	17,107
New York .....	10,396	16,338
Pennsylvania .....	10,553	11,810
Maryland .....	9,252	9,760
Virginia .....	3,236	1,729
North Carolina .....	467	310
Georgia .....	15,746	9,950
Alabama .....	77,986	79,456
Texas .....	18,662	8,613
Kentucky .....	3,388	3,199
Tennessee .....	45,752	50,189
Ohio .....	19,793	18,987
Michigan .....	213,145	184,421
Wisconsin .....	94,092	82,126
Missouri .....	14,400	28,052
Oregon .....	9,295	7,628
Total .....	576,964	537,621

## BITUMINOUS COAL AND COKE PIG IRON.

States.	Gross tons of 2,240 pounds.	
	1891.	1892.
New York .....	103,045	65,851
Pennsylvania .....	2,369,887	2,701,063
Maryland .....	114,146	89,371
Virginia .....	292,056	341,118
North Carolina .....	2,750	2,598
Georgia .....	34,112	.....
Alabama .....	717,687	835,840
West Virginia .....	86,283	154,793
Kentucky .....	41,456	53,349
Tennessee .....	245,986	249,892
Ohio .....	1,015,220	1,202,926
Indiana .....	7,729	7,700
Illinois .....	669,202	949,450
Wisconsin .....	103,068	92,835
Minnesota .....	1,226	14,071
Missouri .....	14,829	28,968
Colorado .....	18,116	32,441
Total .....	5,836,798	6,822,266

# STOCKS OF ALL KINDS OF PIG IRON UNSOLD AT THE CLOSE OF 1891 AND 1892.

These statistics represent only unsold stocks in the hands of makers or their agents, including stocks controlled by the manufacturers in warrant yards, and do not include stocks in the hands of consumers, brokers, creditors, or speculators, nor pig iron made for the use of the makers, nor foreign pig iron held in bond.

States and Districts.	Gross tons of 2,240 pounds.	
	1891.	1892.
New England.....	15,779	14,093
New York .....	62,167	45,627
New Jersey.....	20,481	23,083
Lehigh Valley.....	27,595	49,244
Schuylkill Valley.....	16,375	9,897
Upper Susquehanna Valley.....	3,630	3,059
Lower Susquehanna Valley.....	10,736	5,530
Juniata Valley.....	12,417	4,885
Shenango Valley.....	22,462	16,205
Allegheny county.....	18,090	10,154
Miscellaneous bituminous.....	17,803	3,802
Charcoal.....	7,121	10,339
Total for Pennsylvania.....	136,229	113,115
Maryland .....	3,496	3,404
Virginia.....	45,126	43,877
Georgia, Texas, and North Carolina.....	28,586	15,016
Alabama.....	48,532	68,318
West Virginia .....	3,393	5,230
Kentucky.....	8,024	6,321
Tennessee.....	13,191	25,818
Hanging Rock .....	36,856	30,098
Mahoning Valley .....	25,295	22,424
Hocking Valley and miscellaneous.....	12,502	9,854
Total for Ohio .....	74,653	62,376
Michigan and Indiana.....	65,034	30,263
Illinois and Wisconsin .....	49,348	16,353
Missouri and Colorado .....	16,996	31,322
Pacific States.....	5,298	1,900
Grand total.....	596,333	506,116

## STOCKS ACCORDING TO FUEL USED.

Bituminous .....	258,678	213,615
Anthracite and anthracite and coke mixed.....	124,370	119,015
Charcoal.....	213,285	173,486
Total .....	596,333	506,116

### THE MANUFACTURE OF ROLLED IRON AND STEEL IN PENNSYLVANIA IN 1891 AND 1892, BY DISTRICTS.

In the following table the Philadelphia district covers Philadelphia county and the Pencoyd Iron Works; Eastern Pennsylvania comprises the eastern counties outside of the Philadelphia district as far west as the limits of Chester, Berks, Schuylkill, and Carbon counties; Central Pennsylvania comprises the counties west of those just named, extending to the western limits of Bedford, Blair, Centre, and Clinton counties; Western Pennsylvania comprises all counties west of those just named, except Allegheny.

#### IRON AND STEEL BARS, RODS, BOLTS, HOOPS, SKELP, SHAPES, AND ROLLED AXLES.

Districts.	Gross tons of 2,240 pounds.	
	1891.	1892.
Philadelphia.....	91,534	93,846
Eastern Pennsylvania.....	245,562	258,893
Central Pennsylvania.....	225,561	286,976
Allegheny county.....	784,146	849,836
Western Pennsylvania.....	235,734	265,168
Total.....	1,582,537	1,754,719

#### IRON AND STEEL PLATES AND SHEETS, EXCEPT NAIL PLATE.

Philadelphia.....	9,476	8,565
Eastern Pennsylvania.....	139,330	158,931
Central Pennsylvania.....	25,422	30,521
Allegheny county.....	257,498	248,369
Western Pennsylvania.....	58,220	69,120
Total.....	489,946	515,506

#### IRON AND STEEL CUT NAILS AND CUT SPIKES.

Eastern Pennsylvania.....	25,391	29,082
Central Pennsylvania.....	36,125	35,927
Western Pennsylvania.....	4,137	2,908
Total.....	65,653	67,917

#### IRON AND STEEL RAILS.

Eastern Pennsylvania.....	114,792	129,205
Central Pennsylvania.....	378,824	333,581
Allegheny county.....	286,097	338,891
Western Pennsylvania.....	123,405	162,687
Total.....	903,118	964,364

#### TOTAL ROLLED IRON AND STEEL.

Philadelphia.....	101,010	102,411
Eastern Pennsylvania.....	525,075	576,111
Central Pennsylvania.....	665,932	687,005
Allegheny county.....	1,327,741	1,437,096
Western Pennsylvania.....	421,496	499,883
Total.....	3,041,254	3,302,506

**THE MANUFACTURE OF ROLLED IRON AND STEEL IN  
OHIO IN 1891 AND 1892, BY DISTRICTS.**

In the following table the Lake counties are those bordering on Lake Erie; the Mahoning Valley comprises the counties in the northeastern part of Ohio; the interior counties are the counties south and west of the two first-named districts, except the counties along the Ohio river, which are classed in a district by themselves.

**IRON AND STEEL BARS, RODS, BOLTS, HOOPS, SKELP, SHAPES, AND ROLLED AXLES.**

Districts.	Gross tons of 2,240 pounds.	
	1891.	1892.
Lake counties.....	239,051	284,949
Mahoning Valley.....	269,860	292,690
Interior counties.....	66,130	64,537
Ohio River counties.....	30,935	51,033
Total.....	605,976	693,209

**IRON AND STEEL PLATES AND SHEETS, EXCEPT NAIL PLATE.**

Lake counties.....	37,520	38,023
Mahoning Valley.....	16,647	16,171
Interior counties.....	21,375	26,665
Ohio River counties.....	36,966	58,145
Total.....	112,508	139,004

**IRON AND STEEL CUT NAILS AND CUT SPIKES.**

Lake counties.....	.....	.....
Mahoning Valley.....	3,761	4,725
Interior counties.....	.....	.....
Ohio River counties.....	59,116	51,606
Total.....	62,877	56,331

**IRON AND STEEL RAILS.**

Lake counties.....	.....	.....
Mahoning Valley.....	.....	.....
Interior counties.....	159	249
Ohio River counties.....	2,055	.....
Total.....	2,214	249

**TOTAL ROLLED IRON AND STEEL.**

Lake counties.....	276,571	322,972
Mahoning Valley.....	290,268	313,586
Interior counties.....	87,664	91,451
Ohio River counties.....	129,072	160,784
Total.....	783,575	888,793





# STATISTICS OF THE FOREIGN IRON TRADE FOR 1892.

---

SUMMARY FOR 1892 AND FOR THE FIRST QUARTER OF 1893.

SINCE the Baring panic of November, 1890, following the wild speculation of that year and of the preceding year, there has been a distinct check to the industrial activity of most European countries and a notable fall in the prices of manufactured products. All through the year 1892, as in 1891, the iron and steel industries of Great Britain and the Continent suffered from low prices, and in Great Britain particularly there was also a greatly restricted demand for iron and steel for exportation. Of all the countries referred to there was in 1892 the greatest depression in the iron and steel industries of Great Britain and Belgium, these always active countries, as we have heretofore explained, depending largely for the prosperity of these and other industries upon foreign consumers, some of which have been financially unable to buy iron and steel since the Baring crisis. The growth of protective tariff legislation in many countries, as we have also heretofore explained, has also greatly restricted the demand for British and Belgian iron and steel, particularly since 1890.

At the present moment there does not appear to be any prospect of an early change in the industrial situation across the Atlantic. As in our own country, there is a large home consumption of iron and steel, even in Great Britain, at low prices. The hope of an increased demand for iron and steel from markets outside of Europe does not, however, exist, except such hope as is based on an expected reduction in the tariff of the United States. South America has not yet recovered from the shock which had been given to its credit by the bursting of the Argentine and other speculative bubbles, while the continued stringency in European financial centres makes it more and more difficult to secure funds for the promotion in Asia, Africa, and Australia of railroad and other enterprises requiring iron and steel. The recent failure of several Australian banks has further unsettled the previously shaken confidence in Australian investments and checked the flow of money to all British colonies.

The depression in the trade of Great Britain since 1890 has been so great that an investigation of its causes, its extent, and probable duration has recently been undertaken by the managers of the *London Fortnightly Review*, and in its issue for March last the results of this investigation are given in detail. The leading causes assigned are those which we have already indicated. Other causes embrace the free entry into British markets of Continental goods produced at a less labor cost than in Great Britain, the strength of trades unions in resisting reductions in wages, and the appreciation of gold as an influence in reducing prices. With regard to the probable duration of the existing depression in the trade of Great Britain the correspondents of the *Review* generally agree in the opinion that its end is not yet in sight.

The extent of the depression in British trade has also been made the subject of an extended inquiry by the Labor Department of the British Board of Trade. From this inquiry it appears that there was a great decrease in the general trade of the United Kingdom in January, 1893, as compared with January, 1892, although the month last mentioned was one of less than average activity. In January last 23 trades unions reported that 26,624 persons, out of a membership of 280,000, or 9 per cent., were in receipt of out-of-work pay. In the counties of Cambridge, Suffolk, and Essex about 5,000 agricultural laborers were recently out of work. In January of the present year the *Iron Trade Circular*, of Birmingham, stated that "the wages in the steel trade in the West of Scotland have reached the lowest point ever known in the district." In reviewing the state of trade in Great Britain in 1892 the *London Economist* said last February:

For the first time for a number of years the pauper roll showed in 1892 an increase not only in actual numbers but also in proportion to population, and as, to their credit, our working population will suffer a great deal before they will stoop to what they deem the degradation of accepting poor relief, there can be no doubt that the condition of the working classes, as a whole, underwent last year a change for the worse. It is clear that last year the necessity for economizing in all but necessary expenditure made itself widely felt. And it would have made itself felt much more distinctly if the masses had not enjoyed the benefit of exceptionally cheap food supplies.

Other evidences of the present depression in British trade may be found in idle ships in many ports, idle collieries, idle iron

and steel works, the great Durham coal strike, lasting three months, the great Lancashire cotton spinners' strike, lasting five months, the recent strike of the dock laborers at Hull, which was only suppressed with bloodshed, threatened reductions in wages in the shipbuilding districts, and continually receding exports.

We quote as follows from *Iron*, of London, for January 6, 1893, its remarks applying to the iron trade of Great Britain.

The depression which settled upon the iron trade in 1891 deepened and broadened in 1892, and was unrelieved by a single gleam of improvement throughout the whole course of the year. The trade may have passed through more acute crises, such as followed the railway mania of the forties or the American boom of 1872, but, so far as our experience goes, it has never encountered one during which there was such an utter stagnation of business. In former times it has been possible to give at least a temporary fillip to trade by a reduction of prices; but last year the low range to which they had fallen completely failed to impart any stimulus to business.

Almost the only event which broke the monotony of the year was the strike of the Durham colliers, which stopped the manufacture of iron in the Cleveland district and seriously affected the Cumberland furnaces for the best part of three months; but so great was the general stagnation that even that serious interruption had little effect on prices. Cleveland warrants, which were at 38s. per ton at the opening of the year, lost some 3s. during the course of the first two months. With the commencement of the strike in March the price naturally hardened, but it never rose above 39s. 3d. during the continuance of the stoppage, notwithstanding the large quantities which were taken out of stock.

Very little need be said about the condition of the finished iron and steel trades during 1892, which was one of utter prostration. The steel-rail industry suffered from the great absence of foreign demand, and the price of heavy sections was little more than £4 per ton throughout the year, whilst, towards the close, the competition for the few orders which came upon the market was so keen that good contracts could be placed at some shillings below that figure.

The coal trade of the past year was disturbed by labor troubles, the most important of which was the Durham strike. The men did not carry their point, viz., the maintenance of wages, and had to submit to a reduction of 10 per cent. after a struggle extending over thirteen weeks. The coal trade business was quiet throughout the year, but prices generally were well maintained.

Concerning the course of the iron trade on the Continent in 1892 the same paper, and there is no higher authority, says:

The words with which, on January 1, 1892, we opened our review of the Continental iron trade during the year 1891 are equally appli-

cable to that of the twelvemonth which has just passed away. General depression was the characteristic of the markets of our foreign neighbors. Both in Germany and Belgium, our two principal competitors, as also in Austria-Hungary and Sweden, prices during the year 1892, as in 1891, experienced a more or less marked decline, and, with the exception of the operations of Austria-Hungary, business gradually and materially worsened as the year approached its close. France, being like the last-named country, highly protected, has with that State suffered least from the sluggishness and weakness which have been the predominant features in Great Britain, Germany, Belgium, and Sweden.

Touching fuel, the dullness of the iron and allied trades unfavorably reacted, as a matter of course, on the Continental coal trades. Both Germany and Belgium have dispatched an inferior tonnage abroad, and actual selling rates have been, as a rule, weak.

We now give as full statistics as we have received of the progress of the iron and steel and coal industries of foreign countries in 1892 or immediately preceding years.

#### PRODUCTION OF BASIC STEEL.

In the following table we give the official statistics of the production of basic steel by countries from 1890 to 1892.

Countries—Gross tons.	1890.	1891.	1892.
Great Britain .....	503,400	436,261	406,839
Germany and Luxemburg .....	1,493,157	1,779,779	2,013,484
Austria .....	202,315	221,212	288,122
France .....	240,638	255,401	287,528
Belgium, Russia, and the United States.....	163,573	187,882	206,667
Total .....	2,603,083	2,880,535	3,202,640

#### GREAT BRITAIN.

*Coal.*—The production of coal in Great Britain and Ireland in 1892 amounted to 181,786,871 gross tons, against 185,479,126 tons in 1891, 181,614,288 tons in 1890, 176,916,724 tons in 1889, and 169,935,219 tons in 1888.

*Iron Ore.*—The production of iron ore in Great Britain and Ireland in 1891 was 12,777,689 gross tons, against 13,780,767 tons in 1890, 14,546,105 tons in 1889, 14,590,713 tons in 1888, and 13,098,041 tons in 1887. The production in 1892 has not yet been published, but it was less than in 1891. The quantity of iron ore imported in 1892 amounted to 3,780,503 gross tons, against 3,180,543 tons in 1891, 4,471,790 tons in 1890, 4,031,265 tons in 1889, 3,562,071 tons in 1888, and 3,765,788 tons in 1887.

More than five-sixths of all the iron ore imported into Great Britain comes from Spain.

*Pig Iron.*—The production of pig iron in Great Britain in 1892, as ascertained by the British Iron Trade Association, amounted to 6,616,890 gross tons, against 7,406,064 tons in 1891, as ascertained by Her Majesty's Inspectors of Mines, 7,904,214 tons in 1890, and 8,322,824 tons in 1889. The production of pig iron in Great Britain in 1892 was the lowest since 1879, in which year the production was 5,995,337 gross tons, but it was also less than in 1871, when the production was 6,627,179 tons, so that twenty-one years ago Great Britain made more pig iron than it did in 1892.

*Blast Furnaces.*—The total number of blast furnaces in Great Britain at the close of 1892 was 751, of which 359 were then in blast. At the close of 1891 there were 774 furnaces, of which 386 were in blast.

*Pig Iron Stocks.*—The stocks of pig iron in makers' hands and in warrant stores in Great Britain at the close of 1892 amounted to 872,095 gross tons, against 1,292,277 tons at the close of 1891, 1,393,041 tons at the close of 1890, 1,951,443 tons at the close of 1889, 2,588,708 tons at the close of 1888, and 2,616,366 tons at the close of 1887. The stocks at the close of 1887 were the largest in the history of the British iron trade, and the stocks at the close of 1892 were the smallest for many years.

*Bessemer Steel.*—The production of Bessemer steel ingots in Great Britain in 1892 was 1,500,810 gross tons, against 1,642,005 tons in 1891, and 2,014,843 tons in 1890. Of the production in 1892 there were made by the acid process 1,202,027 tons and by the basic process 298,783 tons, against 1,306,229 tons and 335,776 tons respectively in 1891. The total production of Bessemer steel ingots in 1892 was the smallest since 1885, in which year the production was 1,304,127 gross tons, and it was less than the production in 1882, ten years ago, which amounted to 1,673,649 tons.

*Bessemer Steel Rails.*—The production of Bessemer steel rails in Great Britain in 1892 was 535,836 gross tons, against 662,676 tons in 1891, 1,019,606 tons in 1890, 943,048 tons in 1889, 979,083 tons in 1888, and 1,021,847 tons in 1887. The production in 1892 was the smallest since 1879, thirteen years ago, when it amounted to 520,231 tons.

*Open Hearth Steel.*—The production of open-hearth steel ingots in Great Britain in 1892 was 1,418,830 gross tons, against

1,514,538 tons in 1891, and 1,564,200 tons in 1890. Of the production in 1892 there were made by the acid process 1,310,774 tons and by the basic process 108,056 tons. The production in 1890 was the largest that has yet been attained. The decline in production in 1892 was not nearly so great relatively as the decline in the production of pig iron, Bessemer steel, or Bessemer steel rails. The production of Bessemer steel in Great Britain in 1892 was less than that of open-hearth steel in either 1890 or 1891. In the United States the production of Bessemer steel in 1892 was more than six times that of open-hearth steel.

*Shipbuilding.*—In 1892 there were launched in the United Kingdom, not including war ships, 681 steam and sailing vessels, registering 1,109,950 gross tons. The war ships launched at both government and private yards were 30 in number, aggregating 151,157 gross tons. The total number of vessels launched during 1892 was, therefore, 711, registering 1,261,107 gross tons. Not counting war vessels the number and tonnage of steam and sailing vessels launched in Great Britain during the last five years have been as follows :

Years.	Steam.		Sailing.		Total.	
	No.	Tonnage.	No.	Tonnage.	No.	Tonnage.
1888 .....	458	757,081	81	80,959	539	838,040
1889 .....	595	1,083,793	95	125,568	690	1,209,361
1890 .....	651	1,061,619	92	133,086	743	1,194,705
1891 .....	641	878,353	181	252,463	822	1,130,816
1892 .....	512	841,356	169	268,594	681	1,109,950

Commenting upon the above figures for 1892 Lloyd's *Register* says : "As regards the material employed for the construction of the vessels included in the United Kingdom returns for 1892 it is found that of the steam tonnage 97.74 per cent. has been built of steel and 2.2 per cent. of iron. Of the sailing tonnage 97.45 per cent. has been built of steel and 1.7 per cent. of iron."

The number of vessels under construction in British shipyards at the close of 1892 was the smallest since the close of 1887, aggregating 306 vessels, measuring 570,741 gross tons, against 494 vessels at the close of 1891, measuring 793,913 gross tons.

*Exports of Iron and Steel.*—The exports of iron and steel from Great Britain in 1892 amounted to 2,740,217 gross tons, against 3,240,146 tons in 1891, 4,001,430 tons in 1890, 4,186,182 tons in 1889, 3,966,563 tons in 1888, and 4,143,028 tons in 1887.

The decrease in 1892 as compared with 1889 was over 34 per cent. The falling off in the quantity of railroad iron of all sorts exported in 1892 was very great, the total exports amounting to 467,986 tons, against 702,247 tons in 1891, and 1,035,431 tons in 1890. The exports of pig iron in 1892 amounted to 767,367 tons, against 840,055 tons in 1891, and 1,145,268 tons in 1890. The exports of iron and steel of all kinds to the United States alone fell from 524,934 tons in 1890 to 384,788 tons in 1892.

There was as large a proportionate decrease in the value of the exports of iron and steel in 1892 as compared with 1891 and 1890 as in the aggregate quantity exported. The total value in 1892 was £21,763,190, against £26,877,000 in 1891, and £31,565,337 in 1890.

*Imports of Iron and Steel.*—The imports of iron and steel into Great Britain in 1892 amounted to 301,362 gross tons, against 314,931 tons in 1891, and 323,840 tons in 1890. In 1892 Great Britain imported more than three-fifths as much iron and steel as the United States.

*Exports of Tinplates.*—The exports of tinplates from Great Britain to all countries in 1892 amounted to 395,580 gross tons, against 448,379 tons in 1891, and 421,797 tons in 1890. Of the total exports the United States took 278,479 tons in 1892, 325,143 tons in 1891, and 321,109 tons in 1890.

*Imports and Exports of Tin.*—The imports of tin in blocks into Great Britain in 1892 amounted to 29,468 tons, against 28,157 tons in 1891, and 27,038 tons in 1890. The exports of tin unwrought in 1892 amounted to 5,648 tons, against 5,165 tons in 1891, and 5,132 tons in 1890. In addition to its imports of block tin Great Britain annually imports a few thousand tons of tin ore.

*Production of Tin.*—From the official "Mineral Statistics of the United Kingdom of Great Britain and Ireland," prepared by Her Majesty's Inspectors of Mines, we learn that the quantity of block tin obtained in Great Britain from the smelting of domestic tin ore in 1891 amounted to 9,353 gross tons, against 9,602 tons similarly obtained in 1890. The statistics for 1892 are not yet available, but the figures will not vary greatly from those for 1890 and 1891.

After making due allowance for exports it will be seen from the figures above presented that Great Britain annually consumes about two and a half times as much block tin as she produces.



## GERMANY.

*Coal.*—The production of coal and brown coal in Germany in 1891 was 94,252,278 metric tons, against 89,290,834 tons in 1890, and 84,973,230 tons in 1889. The production of coal in 1891 was 73,715,653 tons, and the production of brown coal was 20,536,625 tons.

*Iron Ore.*—The production of iron ore in Germany and Luxemburg in 1891 was 10,657,521 metric tons, against 11,406,132 tons in 1890, 11,002,187 tons in 1889, and 10,664,307 tons in 1888. The imports of iron ore into Germany and Luxemburg in 1892 amounted to 1,655,843 metric tons, against 1,408,025 tons in 1891, and the exports in 1892 amounted to 2,276,155 tons, against 1,984,428 tons in 1891.

*Pig Iron.*—The production of pig iron in Germany and Luxemburg in 1892 amounted to 4,793,003 metric tons, against 4,641,217 tons in 1891, 4,658,451 tons in 1890, 4,524,558 tons in 1889, and 4,337,421 tons in 1888. The remarkable uniformity in the production of pig iron in Germany and Luxemburg in the last five years will not escape notice. As compared with 1891 and immediately preceding years, however, there was an increase in production in 1892.

*Steel.*—The production of steel of all kinds in Germany in 1891 was 2,352,074 metric tons, against 2,161,821 tons in 1890, and 2,022,472 tons in 1889.

## FRANCE.

*Coal.*—The production of coal and lignite in France in 1892 was 26,548,860 metric tons, against 26,024,893 tons in 1891, and 26,083,118 tons in 1890.

*Pig Iron.*—The production of pig iron in France in 1892 was 2,022,989 metric tons, against 1,897,387 tons in 1891, 1,962,196 tons in 1890, and 1,722,480 tons in 1889.

*Steel.*—The production of steel of all kinds in France in 1892 was 814,977 metric tons, against 840,221 tons in 1891.

## BELGIUM.

*Coal.*—The production of coal in Belgium in 1892 was 19,591,908 metric tons, against 19,675,644 tons in 1891, and 20,365,960 tons in 1890.

*Pig Iron.*—The production of pig iron in Belgium in 1892 was 768,321 metric tons, against 684,126 tons in 1891, and 787,836 tons in 1890.

*Steel.*—The production of steel ingots and castings in Belgium in 1892 was 259,428 metric tons, against 243,913 tons in 1891, and 221,296 tons in 1890.

*Note.*—The London *Iron* for March 24th, 1893, says: "The Société de Thy-le-Château's works are to be stopped altogether, and the company will perhaps have to be wound up. These works have for a long time been the second in importance in Belgium, coming immediately after the Cockerill Company, with five blast furnaces, iron works, rolling mills, and a complete Bessemer steel plant, two converters, and a large rail mill."

#### SWEDEN.

*Iron Ore and Iron and Steel.*—The following official statistics of the iron and steel industries of Sweden from 1888 to 1891 have been sent to us by Professor Richard Åkerman, of Stockholm.

Articles—Metric tons.	1888.	1889.	1890.	1891.
Iron ore .....	959,540	985,904	941,241	987,405
Pig iron, all made with charcoal.....	457,052	420,665	456,102	490,913
Blooms from pig iron.....	238,132	226,071	225,631	224,651
Iron and steel bars and rods.....	253,090	274,734	281,832	280,430
Bessemer iron and steel ingots.....	68,620	80,324	94,247	92,985
Martin iron and steel ingots .....	44,712	55,487	72,984	78,197
Other kinds of steel.....	1,205	2,010	2,055	1,592
Plates.....	19,701	27,389	28,928	26,531
Nails.....	10,683	12,072	12,142	11,418
Number of furnaces in blast .....	162	150	154	155
Total time for all furnaces in blast, days	39,840	35,859	37,892	40,099
Average daily product per furnace, tons	11.47	11.73	12.04	12.24
Average time per furnace in blast, days	246	239	246	259

*Coal.*—Sweden is slowly developing a coal industry which may attain to considerable importance. The production in 1890 was 2,343,895 metric tons.

#### ITALY.

*Coal.*—The production of coal in Italy in 1891 was 289,286 metric tons, against 376,326 tons in 1890, and 390,320 tons in 1889.

*Iron Ore.*—The production of iron ore in Italy in 1891 was 216,486 metric tons, against 220,702 tons in 1890, and 173,489 tons in 1889.

*Pig Iron.*—The production of pig iron in Italy in 1891 was 11,930 metric tons, against 14,346 tons in 1890, and 13,473 tons in 1889.

*Finished Iron.*—The production of finished iron in Italy in 1891 was 152,668 metric tons, against 176,374 tons in 1890, and 181,623 tons in 1889.

*Steel.*—The production of steel in Italy in 1891 was 75,925 metric tons, against 107,676 tons in 1890, and 157,899 tons in 1889.

For the foregoing official statistics we are indebted to the courtesy of N. Pellati, one of the Government Inspectors of Mines.

#### SPAIN.

*Iron Ore.*—The total quantity of iron ore produced in Spain in 1890 amounted to 5,788,743 metric tons. The total exports of iron ore from Spain in 1892 amounted to 4,773,827 tons, against 4,343,884 tons in 1891. The exports of iron ore from the port of Bilbao alone amounted to 3,350,000 tons in 1891, against 4,272,918 tons in 1890. In 1892 Great Britain received 3,423,191 gross tons of Spanish iron ore, and in 1891 it received 2,886,278 gross tons.

*Coal.*—The production of coal in Spain in 1891 was 1,286,000 metric tons, against 1,179,779 tons in 1890. The production of lignite in 1891 was 28,147 metric tons, against 30,303 tons in 1890. Coal is mined chiefly in the provinces of Oviedo and Cordova, and lignite chiefly in the provinces of Guipúzcoa, Barcelona, Lérida, and Baleares.

*Iron and Steel Products.*—The total quantity of pig iron produced in Spain in 1890 was 179,433 metric tons; of malleable iron, 63,933 tons; and of steel, 63,011 tons. Spain exported 43,412 tons of pig iron in 1892, 66,657 tons in 1891, 67,446 tons in 1890, and 65,471 tons in 1889.

#### AUSTRIA-HUNGARY AND RUSSIA.

We have been unable to obtain any later statistics of the production of coal, iron ore, pig iron, and steel in the Austria-Hungarian Empire and in Russia than are contained on page 31 of the supplement to this Report, to which the reader is referred.

#### ALGERIA.

*Iron Ore.*—The production of iron ore in Algeria in 1890 is reported to have been 474,632 metric tons. Iron ore is mined at Beni Saf, Ain Mokra, and El-M'Kimen. The first locality produced 345,000 tons of red ore, and the other places produced 129,632 tons of magnetic ore.

## INDIA.

*Coal.*—In 1889 the production of coal in all India was 2,045,359 gross tons, and of this quantity Bengal contributed 1,641,354 tons and Assam 116,676 tons; the Central Provinces, 144,465 tons, and the Nizam's territory, 59,646 tons. Thus Bengal supplied four-fifths of the total output, its increase in production since 1880 amounting to about 100 per cent. In that year the total production was 1,019,793 tons, almost wholly in Bengal; in 1883 it was 1,315,976 tons; in 1886, 1,388,487 tons; and in 1888, 1,708,848 tons. In 1890 the production of coal in India was 2,168,521 tons, and in 1891 it was 2,229,400 tons.

## CHINA.

*Iron ore and coal* are both mined in China, but authentic statistics of production are wanting. Two large blast furnaces, a Bessemer steel works, and a large rolling mill are reported to have recently been erected on the Hamyang hills, opposite Hankow, but concerning this enterprise we are without exact information.

## JAPAN.

*Coal.*—The production of coal in Japan in 1889 is reported to have amounted to 3,488,929,064 Japanese pounds, the pound of Japan equaling  $3\frac{1}{2}$  pounds avoirdupois. These figures give 5,451,452 gross tons as the production of 1889.

## AUSTRALIA.

*Coal.*—The production of coal in New South Wales in 1891 is officially reported to have amounted to 4,037,920 gross tons, against 3,060,876 tons in 1890. The production of coal in New Zealand in 1890 is reported to have amounted to 637,397 tons. The production of coal in Queensland in 1891 was 271,603 tons.

*Iron Ore.*—It is reported that "an iron mountain is in course of being worked in South Australia. It is situated forty miles from Port Augusta, Spencer's Gulf, and is an immense deposit of iron, rising some 800 feet above the level of the plain. It has been named the Iron Monarch, and will doubtless eventually prove to be the largest iron mine or quarry in the world."

## CANADA.

*Coal.*—The production of coal in Nova Scotia in 1891 was 2,044,784 gross tons, against 1,984,001 tons in 1890, 1,756,279 tons in 1889, and 1,776,128 tons in 1888. The production of

coke in Nova Scotia in 1891 was 34,148 gross tons, against 36,738 tons in 1890, 35,505 tons in 1889, and 29,808 tons in 1888.

The development of the coal mines of Vancouver Island, in British Columbia, has been very rapid during the last few years. The production in 1891 was 1,029,097 gross tons, against 678,140 tons in 1890. The production of the Vancouver mines in 1874 was 81,000 tons, and in 1875 it was 110,000 tons. The following table gives their production since 1876, in gross tons.

Years.	Tons.	Years.	Tons.	Years.	Tons.	Years.	Tons.
1876.....	139,000	1880.....	268,000	1884.....	394,070	1888.....	489,300
1877.....	154,000	1881.....	228,000	1885.....	365,000	1889.....	579,830
1878.....	171,000	1882.....	282,000	1886.....	326,636	1890.....	678,140
1879.....	241,000	1883.....	213,000	1887.....	413,360	1891.....	1,029,097

A communication in a recent issue of the *London Colliery-Guardian* says that "the markets for British Columbian coal are very important, viz., the markets of the North Pacific Coast of America." California imported 641,011 tons of coal from Vancouver Island in 1891. The production of coal in the three Pacific Coast States of Washington, Oregon, and California in the census year 1889 was 1,214,757 net tons, or 1,084,604 gross tons, nearly all of which was produced in the State of Washington, which is separated from Vancouver Island by the Strait of San Juan de Fuca.

*Iron Ore.*—The production of iron ore in Nova Scotia in 1891 was 57,311 net tons, against 55,191 tons in 1890, 45,907 tons in 1889, and 41,611 tons in 1888. The production of iron ore in the whole of Canada in 1891 amounted to 68,979 net tons.

*Pig Iron.*—The total production of pig iron in the Dominion in 1891 is reported to have been 23,891 net tons. The pig iron industry of Nova Scotia was greatly developed in 1892. In 1891 the Londonderry Iron Company rebuilt one of its furnaces and raised it to a height of 75 feet, and in 1892 the New Glasgow Iron, Coal, and Railway Company put in operation at Ferona a large new furnace, 70 by 15 feet. Much has also been done in Nova Scotia during the two years mentioned to develop its iron-ore resources and to improve the quality and increase the quantity of Nova Scotia coke.

# TWENTY YEARS OF PROGRESS IN THE MANUFACTURE OF IRON AND STEEL IN THE UNITED STATES.

---

By JAMES M. SWANK,  
GENERAL MANAGER OF THE AMERICAN IRON AND STEEL ASSOCIATION.

---

THIS paper was contributed to the report on the Mineral Resources of the United States, made in 1893 by David T. Day, Chief of the Division of Mining Statistics and Technology of the United States Geological Survey, Department of the Interior.

IN the present paper will be presented a summary of the progress made by the United States in the development of its iron and steel industries in the twenty years extending from 1872 to 1891. The changes of these twenty years in the processes of iron and steel manufacture in our country, in the uses to which these products have been applied, in the quantities which have been produced, and in the prices at which they have been sold have been in the main important, remarkable, phenomenal, and marvelous. In no other period of the world's history and in no other country could they have been possible. The statistical and other details which will be cited are chiefly derived from the records of the American Iron and Steel Association.

## TWENTY YEARS OF IRON ORE DEVELOPMENT.

The production of iron ore in the United States in the census year 1870 was 3,031,891 gross tons; in the census year 1880 it was 7,120,362 tons; in the calendar year 1889 it was 14,518,041 tons; in the calendar year 1890 it was 16,036,043 tons; and in the calendar year 1891 it was 14,591,178 tons. The production in 1870 was very much less than one-fifth the production of 1890. Statistics of the production of iron ore in 1872, just twenty years ago, are not in existence. The statistics above given for 1889 were gathered by Mr. John Birkinbine for the Census Office, and for 1890 and 1891 they were gathered by the same gentleman for the Division of Mining Statistics of the United States Geological Survey.

The United States is a larger producer of iron ore than any other country, having in late years passed Great Britain, our only rival as an iron-ore producer, as it has also passed her as a producer of pig iron and steel. This prominence as an iron-ore producer is not, as might at first sight be supposed, a natural sequence of the fact that the United States is the largest producer of pig iron in the world, as many countries which produce pig iron in large quantities are large importers of iron ore. It may also be said that Spain and Italy annually export much more iron ore than they consume, while Algeria and Cuba are also large exporters of iron ore but consume none. The United States is itself an importer of iron ore in considerable quantities, but not in as large quantities as either Germany or France, and to a very much less degree than Great Britain.

*Comparative Production of Iron Ore.*—As has already been stated, the production of iron ore in the United States in 1889 was 14,518,041 tons, in 1890 it was 16,036,043 tons, and in 1891 it was 14,591,178 tons. The production of iron ore by Great Britain in 1889 amounted to 14,546,105 tons; in 1890 it was 13,780,767 tons; and in 1891 it was 12,777,689 tons. These figures for Great Britain show a steady decline in production since 1889. Both Germany and France annually produce much less iron ore than either the United States or Great Britain. In 1890 Germany and Luxemburg produced 11,406,132 tons, and in 1887 France produced 2,579,465 tons. Although producing much less pig iron than France, Spain is a much larger producer of iron ore, its production in 1890 amounting to 5,788,743 tons.

*Comparative Imports of Iron Ore.*—Of all ironmaking countries Great Britain is the largest importer of iron ore. Her imports in recent years have been as follows: 3,765,788 tons in 1887, 3,562,071 tons in 1888, 4,031,265 tons in 1889, 4,471,790 tons in 1890, and 3,180,543 tons in 1891. Great Britain also imports annually several hundred thousand tons of "purple ore," which are used in her blast furnaces. The imports of iron ore into Germany and Luxemburg amounted to 1,036,217 tons in 1887, 1,163,373 tons in 1888, 1,234,789 tons in 1889, 1,522,501 tons in 1890, and 1,408,025 tons in 1891. The imports of iron ore into France amounted to 1,154,405 tons in 1887, 1,310,695 tons in 1888, 1,545,363 tons in 1889, 1,610,244 tons in 1890, and 1,437,527 tons in 1891. The imports into the United States in the five years mentioned have been less than the imports into



any one of the other countries named above in the same time, and in the last thirteen years, from 1879 to 1891, inclusive, they have averaged a little over 719,500 tons annually. The years of largest importations were 1886, 1887, and 1890, when we imported 1,039,433 tons, 1,194,301 tons, and 1,246,830 tons respectively. In no year prior to 1879 did the imports amount to 100,000 tons.

From the statistics which have been presented it plainly appears that no other leading ironmaking country is so independent of foreign sources of iron-ore supply as the United States. To this statement it may be added that new iron-ore fields in our country are constantly being discovered and developed, so that our supply of iron ore for the future promises to be practically inexhaustible. It is, however, true that there is a scarcity of Bessemer iron ores on the Atlantic Coast and of all iron ores on the Pacific Coast. The three interior States of Michigan, Wisconsin, and Minnesota now annually produce more than one-half of our total production of iron ore. Our imports of iron ore are chiefly to supply the wants of blast furnaces on the Atlantic Coast, and particularly of those furnaces which produce Bessemer pig iron.

*Leading Iron Ore Districts in the United States.*—Of all the iron-ore producing districts of the United States those embraced in the Lake Superior region are not only the most important but they have been the most recently developed. In 1872, twenty years ago, the total shipments of iron ore from the region mentioned, including shipments to local furnaces, aggregated only 900,901 tons, but in 1890, the year of largest production, the shipments aggregated 9,012,379 tons, or ten times as much as in 1872. In the twenty years from 1872 to 1891 the shipments of iron ore from the Lake Superior region aggregated 59,617,497 tons, while the shipments in all preceding years aggregated only 4,593,818 tons.

The first experimental shipment of iron ore from the Marquette district of the Lake Superior region, the first to be developed, was made in 1850, but shipments from this district for commercial purposes did not begin until 1853. The next Lake Superior iron-ore district to be developed was the Menominee district, from which the first shipments were made in 1877, aggregating 10,405 tons. In 1884 the first shipments were made from the Vermilion district, aggregating 62,124 tons. Next followed

the development of the Gogebic district, from which the first shipments were also made in 1884, aggregating 1,022 tons. In 1892 the development of the promising Mesabi iron-ore district in the Lake Superior region was also undertaken, and the first shipments were made late in that year.

The rapidity with which the Menominee, Gogebic, and Vermilion districts have been developed is seen in the statistics of their shipments of iron ore in 1890. In that year the Menominee district shipped 2,289,017 tons; the Gogebic district, 2,845,171 tons; and the Vermilion district, 880,264 tons. The Marquette district shipped in the same year 2,997,927 tons. The grand total for the year was 9,012,379 tons, or over 56 per cent. of the total production of iron ore in the United States in that year.

The next most productive iron-ore district in the United States is the Cornwall district in Pennsylvania, and this district has also made extraordinary strides in development during the past twenty years, although the first ore was taken from its mines in the first half of the last century. In 1872 the shipments of iron ore from the Cornwall mines was 193,317 tons, but in 1889 the shipments from these mines, when the maximum was attained, amounted to 769,020 tons. From the beginning of their development in 1740 to the close of 1891 the Cornwall iron-ore mines have produced 11,514,995 tons of iron ore, of which 7,600,221 tons were produced in the twenty years from 1872 to 1891.

*Changes in the Use of Domestic Iron Ores.*—The introduction of the Bessemer process into the United States called for the use of domestic iron ores of different character from those which had previously been in general use. Ores low in phosphorus were absolutely necessary for the manufacture of Bessemer pig iron. It is just twenty-five years since Bessemer steel rails were first made in our country in commercial quantities, and for many years afterwards the search for ores of suitable quality for the production of Bessemer pig iron was industriously prosecuted, and many failures occurred in using domestic pig iron that was unsuited for conversion into steel. Large quantities of Bessemer pig iron were for many years imported because of the difficulty in obtaining domestic pig iron of equally good quality, or because it was made at such remote distances from points of consumption that it could not compete in price with its foreign rival. More thorough knowledge of the character of the Lake Superior iron-ore

deposits, cheaper rates of transportation for the ores of that region, the more general use of Connellsville coke, and, lastly, the ease with which foreign Bessemer ores could be imported were influences which between 1870 and 1880 gradually rendered our Bessemer steel manufacturers independent of foreign Bessemer pig-iron makers, and since 1880 we have imported very little pig iron of this quality. We do, however, as we have always done, import a part of our supply of spiegeleisen and ferro-manganese, although if compelled to rely upon our own manganese resources we could certainly make all the spiegeleisen and ferro-manganese that we need.

By the development of our Bessemer steel industry and also of our open-hearth industry we have not only created a demand for iron ores which had not previously been much sought after, but we have also, by the substitution of steel for iron, as well as by the growing economic necessity of using the purest and richest ores for all purposes, displaced ores of inferior quality which were once in general use. This has been the case most conspicuously in the great ironmaking and steelmaking State of Pennsylvania, which at one time within the memory of the present generation relied almost entirely on its own sources of iron-ore supply, but now largely neglects its own ores and imports from sister States and from foreign countries fully three-fourths of all the ores that it consumes. In the census year 1870 it produced 978,113 tons of iron ore, or over 32 per cent. of the total production of the country in that year; in the census year 1880 it produced 1,951,495 tons, or over 27 per cent. of the total production; in 1889 it produced 1,560,234 tons, or less than 11 per cent. of the total production. Beginning with 1889 the State of Alabama has annually produced more iron ore than Pennsylvania, although Pennsylvania has since annually produced more than five times as much pig iron as Alabama.

Twenty years ago Lake Champlain iron ores were very popular for fettling in puddling furnaces as far west as Pittsburgh, but their use for this purpose is now chiefly confined to eastern rolling mills. It was in 1872 that Lake Champlain ores were first used for fettling at Pittsburgh. From June to December of that year 20,580 tons of these ores were received in that city. Lake Superior and Missouri ores soon superseded Lake Champlain ores at Pittsburgh for the purpose mentioned. Twenty years ago it was also supposed that the iron made in the forges of the Lake

Champlain district would be largely used in the production of crucible steel, and many tons were annually used for this purpose at Pittsburgh and elsewhere, but the presence of phosphorus beyond the prescribed limits in some of the Champlain ores and the high cost of producing Champlain iron in charcoal forges have combined to reduce the demand by crucible-steel manufacturers for the iron of this district. Some of the recently developed Champlain ores are, however, very low in phosphorus.

The iron ores of Missouri received at one time a great deal of attention from our iron and steel manufacturers, but in late years they have been overshadowed by the richer and more easily mined ores of other localities, and their production has declined. Some of the iron-ore mines of the State have also been practically exhausted. The best-known ore mines are located at Iron Mountain and Pilot Knob. The former have been operated since 1845 and the latter since 1847. Iron Mountain alone has produced over 3,000,000 tons of ore, and Pilot Knob has produced over 1,000,000 tons. In 1872 there were mined and shipped from Iron Mountain alone 269,480 tons. A large part of the production of Iron Mountain and Pilot Knob has been taken to points on the Ohio river, but in recent years shipments have been mainly to nearer localities, and have been inconsiderable in quantity. The receipts of Missouri iron ore at St. Louis in 1873, chiefly for shipment to other places, amounted to 349,357 tons. Of the total receipts in that year 113,327 tons were shipped by river and 63,717 tons by rail. In those days Pittsburgh was the principal purchaser of Missouri ores, her furnaces and rolling mills taking 35,440 tons in 1871, 68,420 tons in 1872, and 113,069 tons in 1873. The production of iron ore by all the mines of Missouri in the census year 1870 amounted to 159,680 tons; in the census year 1880 to 344,819 tons; and in the calendar year 1889 to 265,718 tons. The production has since declined.

*Shipments of Southern Iron Ores to Northern Markets.*—In late years shipments of Southern pig iron to Northern and Western markets have constituted a leading feature of the home iron trade, but twenty years ago these shipments were almost unknown, and Southern men were looking to the North for a market for their iron ores. This was in 1872, 1873, and 1874, in which years considerable quantities of iron ore from Tennessee, Alabama, and Georgia were shipped to furnaces in Indiana and on the Ohio river. The trade began in 1872, reached its culmination in

1873, and came to an end in 1874. In 1873 Mr. George H. Hull, of Louisville, shipped northward about 25,000 tons of Alabama brown hematite iron ore, mined on the Selma, Rome, and Dalton Railroad, and about the same number of tons of red fossiliferous iron ore, mined near Birmingham. A considerable part of these ores was shipped to Brazil, Knightsville, Terre Haute, and Harmony in Indiana, and to Mingo Junction and Steubenville in Ohio. These ores when delivered cost from \$7.75 to \$9.25 per ton, and two tons were required to make one ton of pig iron.

#### TWENTY YEARS OF PIG IRON PRODUCTION.

The total production of pig iron in the United States in 1872 was 2,548,713 gross tons, and the total production in 1890, the year of largest production, was 9,202,703 gross tons, an increase in annual production in nineteen years of 6,653,990 tons. In 1891, owing to a worldwide financial reaction originating in England at the close of 1890, the production fell to 8,279,870 tons. The production of pig iron in Great Britain and in the United States from 1872 to 1891 is compared in the following table.

Years.	Great Britain. Gross tons.	United States. Gross tons.	Years.	Great Britain. Gross tons.	United States. Gross tons.
1872.....	6,741,929	2,548,713	1882.....	8,586,680	4,623,323
1873.....	6,566,451	2,560,963	1883.....	8,529,300	4,595,510
1874.....	5,991,408	2,401,262	1884.....	7,811,727	4,097,868
1875.....	6,365,462	2,023,733	1885.....	7,415,469	4,044,526
1876.....	6,555,997	1,868,961	1886.....	7,009,754	5,683,329
1877.....	6,608,664	2,066,594	1887.....	7,559,518	6,417,148
1878.....	6,381,051	2,301,215	1888.....	7,998,969	6,489,738
1879.....	5,995,337	2,741,853	1889.....	8,322,824	7,603,642
1880.....	7,749,233	3,835,191	1890.....	7,904,214	9,202,703
1881.....	8,144,449	4,144,254	1891.....	7,406,064	8,279,870

This table shows not only the wonderful growth of the pig-iron industry of the United States in the last twenty years but also its rapid growth in that period as compared with the slower growth of the pig-iron industry of our great industrial and commercial rival, Great Britain, which reached its maximum of production in 1882 but remained the world's largest producer of pig iron until 1890, when its place was taken by the United States. The years 1873 to 1879 were years of financial depression in this country, during which our pig-iron industry made no progress but really retrograded in some years, but the pig-iron industry of Great Britain also retrograded during the same period.

*Production of Pig Iron by Sections.*—In accompanying tables is presented a comparative statement of the production of pig iron in the last twenty years by the Eastern, Western, and Southern States, each group regarded as a geographical division, omitting only the trifling production of Minnesota by one furnace and the production of the few Rocky Mountain and Pacific Coast furnaces. These tables show that the East, the West, and the South have all made giant strides in building up their pig-iron industry during the period mentioned. The figures given are in net tons. They exhibit some curious as well as interesting results.

New England made a smaller quantity of pig iron in 1891 than in 1872, her product being 41,770 tons in 1872 and 34,497 tons in 1891. New York made more pig iron in 1882 than she has made since or had previously made, namely, 416,156 tons. New Jersey made almost exactly the same quantity of pig iron in 1872 that she made in 1891, namely, 103,858 tons in 1872 and 103,589 tons in 1891. Her highest production was in 1890, when she made 177,788 tons. Pennsylvania increased her production from 1,401,497 tons in 1872 to a maximum of 4,945,169 tons in 1890.

The pig-iron industry of the six Western States of Ohio, Indiana, Illinois, Michigan, Wisconsin, and Missouri has had an unequal development since 1872. The production of Ohio increased from 399,743 tons in that year to a maximum of 1,389,170 tons in 1890; that of Illinois increased from 78,627 tons in 1872 to a maximum of 785,239 tons in 1890, or almost exactly tenfold; that of Michigan increased from 100,222 tons in 1872 to a maximum of 258,461 tons in 1890; and that of Wisconsin increased from 65,036 tons in 1872 to a maximum of 246,237 tons in 1890. Upon the other hand, Indiana, which had a promising pig-iron industry in 1872, having built eight furnaces after 1867 to use its block coal, now makes far less pig iron than it did then, its production having steadily fallen from 39,221 tons in 1872 to 8,657 tons in 1891. The pig-iron industry of Missouri, also promising at one time, has made no progress in the last twenty years, its production being 101,158 tons in 1872 and reaching a maximum of 138,643 tons in 1887, since which year it has declined to figures greatly below those of 1872. The aggregate production of the six Western States mentioned was 784,007 tons in 1872 and 2,796,055 tons in 1890, the year of greatest production.

The nine Southern States of Alabama, Tennessee, Virginia, West Virginia, Kentucky, Georgia, Maryland, North Carolina, and Texas have shown as a whole a much more rapid growth in the production of pig iron in the last twenty years than any other section of the country. All the States mentioned except Kentucky have greatly increased their production during this period. The production of Kentucky, commencing with 67,396 tons in 1872, attained a maximum of 69,889 tons in 1873, and amounted to 50,225 tons in 1891. In the twenty years referred to Tennessee has increased her production from 42,454 tons in 1872 to 326,747 tons in 1891; Virginia, from 21,445 tons in 1872 to 330,727 tons in 1891; and Maryland, from 63,031 tons in 1872 to a maximum of 165,559 tons in 1890. West Virginia, Georgia, and Texas have all made good progress since 1872 in building up their pig-iron industry, while North Carolina has made but little progress. But of all the Southern States which produce pig iron Alabama has made the greatest progress. No other State has ever made such progress in the manufacture of pig iron as has been made by this State since 1872. In that year it produced only 12,512 tons of pig iron, all made with charcoal, while in 1890 it produced 914,940 tons, nearly all of which was made with coke. The aggregate production of the nine Southern States mentioned was 232,271 tons in 1872 and 1,953,459 tons in 1890.

During the twenty years from 1872 to 1891 Vermont and Utah Territory dropped out of the list of pig-iron producing States and Territories. Minnesota made its first pig iron in 1880, and California and Washington Territory made their first pig iron in 1881. The first pig iron made in Colorado by the Colorado Coal and Iron Company was made in the same year. If we may except the extraordinary growth in the pig-iron industry of Alabama, the habitat, or home, of the pig-iron industry of the whole country has not greatly changed during the last twenty years.

*Production of Pig Iron by Fuels.*—In 1872 the total production of pig iron in this country was distributed among the different fuels used as follows, in net tons: Anthracite and mixed anthracite and coke, 1,407,058 tons; bituminous coal and coke, 946,913 tons; charcoal, 500,587 tons. In 1890 the figures were as follows: Anthracite and mixed anthracite and coke, 2,448,781 tons; bituminous coal and coke, 7,154,725 tons; charcoal, 703,522 tons. In 1872 but little coke was mixed with anthracite, the production of pig iron with mixed anthracite and coke being 37,246 tons, but



*Production of Pig Iron in the United States by Sections from 1872 to 1891.*

States—Net tons.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.
NEW ENGLAND, NEW YORK, NEW JERSEY, AND PENNSYLVANIA.										
New England.....	41,770	51,993	47,020	36,581	18,752	19,517	19,081	24,028	46,978	53,997
New York.....	291,155	296,818	326,721	266,431	181,620	230,442	247,698	239,056	395,361	359,519
New Jersey.....	103,858	102,341	90,150	64,009	25,349	52,909	70,958	96,908	170,049	171,672
Pennsylvania.....	1,409,497	1,389,573	1,213,133	960,884	1,009,613	1,153,356	1,342,633	1,607,763	2,083,121	2,190,786
Total.....	1,838,280	1,840,725	1,677,624	1,327,965	1,235,334	1,456,224	1,680,370	1,967,755	2,693,509	2,775,974
SIX WESTERN STATES.										
Ohio.....	399,743	406,029	425,001	415,893	403,277	400,398	420,991	447,701	674,207	710,546
Indiana.....	39,221	32,486	13,732	22,081	14,547	15,400	.....	11,303	12,500	7,300
Illinois.....	78,627	55,796	37,946	49,762	54,168	61,308	76,455	78,143	150,556	251,781
Michigan.....	100,222	123,506	136,662	114,805	95,177	82,216	70,853	101,539	154,424	187,043
Wisconsin.....	65,036	74,148	50,792	62,139	51,261	22,205	49,887	89,522	96,842	102,029
Missouri.....	101,158	85,552	75,817	59,717	68,223	73,565	47,499	84,637	105,555	109,799
Total.....	784,007	777,517	739,950	724,397	686,653	655,202	667,685	812,895	1,194,084	1,368,498
NINE SOUTHERN STATES.										
Alabama.....	12,512	22,283	32,863	25,108	24,732	41,241	41,482	49,841	77,190	98,081
Tennessee.....	42,454	43,134	48,770	28,311	24,585	25,940	28,347	41,475	70,873	87,406
Virginia.....	21,445	26,475	29,451	29,985	15,046	12,454	16,928	18,873	29,324	83,711
West Virginia.....	20,796	23,036	30,134	25,277	41,165	34,905	50,667	70,801	70,338	66,409
Kentucky.....	67,396	69,889	61,227	48,339	34,686	47,607	50,182	48,725	57,708	45,973
Georgia.....	2,945	7,501	9,786	16,508	10,518	13,223	16,363	20,373	27,321	37,404
Maryland.....	63,031	55,986	54,556	38,741	19,876	26,959	24,027	37,237	61,437	48,756
Texas.....	619	280	1,012	.....	426	525	.....	400	2,500	3,000
North Carolina.....	1,073	1,452	1,340	800	400	325	.....	.....	.....	800
Total.....	232,271	250,036	269,139	213,069	169,434	203,159	227,996	287,725	397,301	471,540

## Production of Pig Iron in the United States by Sections from 1872 to 1891.—(Continued.)

States—Net tons.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1891.
NEW ENGLAND, NEW YORK, NEW JERSEY, AND PENNSYLVANIA.										
New England .....	39,987	35,136	19,076	18,809	32,574	37,252	40,466	37,094	29,283	34,497
New York.....	416,156	331,964	299,486	160,157	233,618	296,572	257,180	297,247	369,381	352,925
New Jersey.....	176,805	138,773	82,965	73,667	157,886	172,554	101,882	125,693	177,788	103,589
Pennsylvania.....	2,449,256	2,638,891	2,385,402	2,445,496	3,293,269	3,684,618	3,589,186	4,181,242	4,945,169	4,426,673
Total .....	3,082,204	3,144,764	2,726,899	2,698,129	3,717,367	4,190,996	3,988,714	4,641,276	5,521,621	4,917,684
SIX WESTERN STATES.										
Ohio.....	698,900	679,643	567,113	553,963	908,094	975,539	1,103,818	1,215,572	1,389,170	1,159,215
Indiana .....	10,000	9,950	2,568	6,634	16,600	13,211	15,260	9,839	16,398	8,657
Illinois .....	360,407	237,657	327,568	327,977	501,705	565,453	579,307	601,035	785,239	749,506
Michigan .....	210,195	173,185	172,834	143,121	190,794	213,543	213,251	214,556	238,461	238,722
Wisconsin .....	85,859	51,893	52,815	24,632	65,963	133,608	116,037	138,634	246,257	220,819
Missouri .....	113,644	103,296	69,043	51,408	74,523	138,613	91,783	86,190	100,550	32,736
Total.....	1,479,005	1,255,624	1,182,941	1,107,735	1,757,739	2,030,897	2,119,456	2,285,626	2,796,055	2,409,655
NINE SOUTHERN STATES.										
Alabama .....	112,765	172,465	180,604	227,438	283,859	292,762	449,492	791,425	914,940	891,154
Tennessee .....	137,692	133,963	134,597	161,199	199,166	250,344	267,931	291,655	299,741	326,747
Virginia.....	87,731	152,907	167,483	163,782	156,250	175,715	197,396	251,356	327,912	330,727
West Virginia.....	73,229	88,398	55,231	69,007	98,618	82,311	95,259	117,900	144,970	96,637
Kentucky.....	66,522	54,629	45,032	37,553	54,844	41,967	56,790	42,518	53,604	50,225
Georgia.....	42,440	45,394	42,655	32,924	46,490	49,347	39,397	27,559	32,687	55,841
Maryland.....	54,524	49,153	27,342	17,299	30,502	37,427	17,606	33,847	165,559	138,206
Texas.....	1,321	2,381	5,140	1,843	3,250	4,983	6,587	4,544	10,865	20,902
North Carolina .....	1,150	.....	485	1,790	2,290	3,640	2,400	2,898	3,181	3,603
Total.....	577,275	699,260	657,599	712,835	875,179	929,436	1,132,858	1,366,702	1,933,459	1,914,042

in 1890 only 279,184 tons were produced with anthracite alone. During the twenty years under consideration, therefore, bituminous coal, almost entirely in the form of coke, has become the leading fuel used in this country in the manufacture of pig iron. In the total production of 10,307,028 net tons of pig iron in 1890 only 982,706 tons were made without the use of bituminous fuel, or less than one-tenth of the whole. Michigan now annually produces more than one-third of our charcoal pig iron, Wisconsin, Alabama, and Tennessee being the next most productive States. All the pig iron made in New England has for many years been made with charcoal alone.

*Production of Bessemer Pig Iron.*—Statistics of the production of Bessemer pig iron in the United States prior to 1887 have not been preserved. In that year the production was 3,220,517 net tons, the total production of pig iron being 7,187,206 tons. In 1890 the production of Bessemer pig iron was 4,583,424 tons, the total production of pig iron for the year being 10,307,028 tons. These figures show how greatly our pig-iron industry has been benefited by the building up of our Bessemer steel industry.

*Production of Spiegeleisen.*—The following table gives in net tons the production of spiegeleisen and ferro-manganese in the United States in the twenty years from 1872 to 1891. This production is included in that of pig iron already given.

Years.	Net tons.	Years.	Net tons.	Years.	Net tons.
1872.....	4,561	1879.....	13,931	1886.....	47,982
1873.....	4,402	1880.....	19,603	1887.....	47,598
1874.....	4,558	1881.....	21,086	1888.....	54,769
1875.....	7,832	1882.....	21,963	1889.....	85,823
1876.....	6,616	1883.....	24,574	1890.....	149,162
1877.....	8,845	1884.....	33,893	1891.....	143,098
1878.....	10,674	1885.....	34,671	.....	.....

In the first three years mentioned in the above table all the spiegeleisen produced in this country was made by the New Jersey Zinc Company, of Newark, New Jersey, from zinc residuum. In August, 1875, the Bethlehem Iron Company commenced the manufacture of spiegeleisen, and soon afterwards the Cambria Iron Company also began its manufacture—Bethlehem importing manganiferous iron ores from Palomares, and Cambria from Carthage. In 1876 W. P. Ward, of Cartersville, Georgia, made 100 net tons of ferro-manganese from local ores. We need not give further attention to the early stages of the manufacture of

spiegeleisen and ferro-manganese in this country. Both foreign and domestic ores are used in their production.

*Causes of the Rapid Growth of our Pig Iron Industry.*—The great progress that has been made in the development of the pig-iron industry of this country during the past twenty years has been due to many causes, among which is prominent, of course, the increased use of iron and steel in all forms. Most notable has been the great extension of our railroad system, which has rapidly stimulated the development of our steel-rail industry, which, in turn, has created a large demand for Bessemer pig iron. There has also been a notably large increase in the demand for structural iron and steel and for cast-iron pipe, this demand supplying a market for large quantities of pig iron. In the cast-iron pipe works alone in 1890 there were consumed 591,258 net tons of pig iron. Another leading cause of the rapid growth of our pig-iron industry has been the cheapening of the cost of production of pig iron through the more general use of good ores and good coke, the steady improvement in blast-furnace machinery, and the equally steady improvement in the skill of blast-furnace engineers. Still another leading cause has been the maintenance during these twenty years of protective duties on pig iron and on other iron and steel products, through which the supply of all these products to the home market has been left chiefly in the hands of the home producers.

#### TWENTY YEARS OF PROGRESS IN THE MANUFACTURE OF STEEL.

*Total Production of Steel in the United States.*—The following table gives the production of all kinds of steel in the United States from 1860 to 1891, in gross tons. The figures for 1860 are for the census year, but for all the other years they are for calendar years. They embrace Bessemer, open-hearth, and crucible steel; also blister and other kinds of steel.

Years.	Gross tons.	Years.	Gross tons.	Years.	Gross tons.
1860.....	11,838	1872.....	142,954	1882.....	1,736,692
1863.....	8,075	1873.....	198,796	1883.....	1,673,535
1864.....	9,358	1874.....	215,727	1884.....	1,550,879
1865.....	13,627	1875.....	339,799	1885.....	1,711,920
1866.....	16,940	1876.....	533,191	1886.....	2,562,503
1867.....	19,643	1877.....	569,618	1887.....	3,339,071
1868.....	26,786	1878.....	731,977	1888.....	2,899,440
1869.....	31,250	1879.....	935,273	1889.....	3,385,732
1870.....	68,750	1880.....	1,247,335	1890.....	4,277,071
1871.....	73,214	1881.....	1,588,314	1891.....	3,904,240

Bessemer steel appears for the first time in 1867 in the totals above given, in which year 2,679 tons of ingots were produced. Open-hearth steel appears for the first time in 1869, in which year 893 tons of ingots were produced. Prior to the introduction of the Bessemer and open-hearth processes into the United States our production of steel, all of which was crucible and blister steel, was, as our table shows, only nominal. With the introduction of these two new methods our steel industry may almost be said to have had its beginning.

As will be noticed, it was just twenty years ago, in 1872, when our production of steel began to make a respectable showing in our industrial statistics, the production of that year being almost double that of the preceding year. Yet how insignificant was the production of 142,954 tons in 1872 compared with that of 4,277,071 tons in 1890. In the intervening years our steel industry had become the first in the world.

*Production of each kind of Steel in the United States.*—The following table gives in net tons of 2,000 pounds the production of each kind of steel in the United States in the twenty years from 1872 to 1891.

Years.	Bessemer steel. Net tons.	Open-hearth steel. Net tons.	Crucible steel. Net tons.	Other steel. Net tons.	Total. Net tons.
1872.....	120,108	3,000	29,260	7,740	160,108
1873.....	170,652	3,500	34,786	13,714	222,652
1874.....	191,933	7,000	36,328	6,353	241,614
1875.....	375,517	9,050	39,401	12,607	436,575
1876.....	525,996	21,490	39,382	10,306	597,174
1877.....	560,587	25,031	40,430	11,924	637,972
1878.....	732,226	36,126	42,906	8,556	819,814
1879.....	928,972	56,290	56,780	5,464	1,047,506
1880.....	1,203,173	112,953	72,424	8,465	1,397,015
1881.....	1,539,157	146,946	89,762	3,047	1,778,912
1882.....	1,696,450	160,542	85,089	3,014	1,945,095
1883.....	1,654,627	133,679	80,455	5,598	1,874,359
1884.....	1,540,595	131,617	59,662	5,111	1,736,985
1885.....	1,701,762	149,381	64,511	1,696	1,917,350
1886.....	2,541,493	245,250	80,609	2,651	2,870,003
1887.....	3,288,357	360,717	84,421	6,265	3,739,760
1888.....	2,812,500	352,036	78,713	4,124	3,247,373
1889.....	3,281,829	419,488	84,969	5,734	3,792,020
1890.....	4,131,535	574,820	79,716	4,248	4,790,319
1891.....	3,637,107	649,323	81,297	5,022	4,372,749

The production of crucible steel in this country has been stationary for many years, the greatly increased demand for steel for tools, agricultural implements, carriage and other springs, etc., in the last decade having been largely supplied by the cheaper

products of the Bessemer and open-hearth processes. Our annual production of miscellaneous steel is of trifling importance.

*Production of Steel by the United States and Great Britain.*—The following table gives the production of Bessemer, open-hearth, crucible, and all other kinds of steel by the United States and Great Britain from 1878 to 1891, in gross tons.

Years.	United States. Gross tons.	Great Britain. Gross tons.	Years.	United States. Gross tons.	Great Britain. Gross tons.
1878.....	731,977	1,063,027	1885.....	1,711,920	1,968,045
1879.....	935,273	1,089,511	1886.....	2,562,503	2,344,670
1880.....	1,247,335	1,375,382	1887.....	3,339,071	3,150,507
1881.....	1,588,314	1,859,719	1888.....	2,899,440	3,405,536
1882.....	1,736,692	2,189,649	1889.....	3,385,732	3,669,960
1883.....	1,673,535	2,088,880	1890.....	4,277,071	3,679,043
1884.....	1,550,879	1,854,926	1891.....	3,904,240	3,256,543

It will be observed that a very active rivalry in the production of steel has existed between the United States and Great Britain since 1879. In 1886 and 1887 our total production for the first time exceeded that of our rival, but in 1888 and 1889 we fell to the second place. In 1890 and 1891 we again took the first place.

In late years the prominence of Great Britain as a steel producer has been largely due to the growth of her open-hearth steel industry. In the production of Bessemer steel alone she was long ago surpassed by the United States. The following table shows in gross tons the production of Bessemer steel ingots and Bessemer steel rails in the United States and in Great Britain from 1877 to 1891.

Years.	United States—Gross tons.		Great Britain—Gross tons.	
	Ingots.	Rails.	Ingots.	Rails.
1877.....	500,524	385,865	750,000	508,400
1878.....	653,773	491,427	807,527	622,390
1879.....	829,439	610,682	834,511	520,231
1880.....	1,074,262	802,196	1,044,382	732,910
1881.....	1,374,247	1,187,770	1,441,719	1,023,740
1882.....	1,514,687	1,284,067	1,673,649	1,235,785
1883.....	1,477,345	1,148,709	1,553,380	1,097,174
1884.....	1,375,531	996,983	1,299,676	784,968
1885.....	1,519,430	959,471	1,304,127	706,583
1886.....	2,269,190	1,574,703	1,570,520	730,343
1887.....	2,936,033	2,101,904	2,089,403	1,021,847
1888.....	2,511,161	1,886,277	2,032,794	979,083
1889.....	2,930,204	1,510,057	2,140,791	943,048
1890.....	3,688,871	1,867,837	2,014,843	1,019,606
1891.....	3,247,417	1,293,053	1,642,005	662,676

It will be seen from this table that the United States passed Great Britain in the production of Bessemer steel ingots in 1880 but fell to the second place in each of the next three years. In 1884 the United States again took the first place, which it has since steadily retained. In 1891 our production of Bessemer steel ingots was almost double that of Great Britain. In the production of Bessemer steel rails the United States passed Great Britain in 1879, and it has since steadily kept the first place. In 1886 and 1887 our production of Bessemer steel rails was a little more than double that of Great Britain.

Great Britain is the largest producer of open-hearth steel in the world, and in this branch of the steel industry the United States is still a long distance behind its great rival. The following table gives in gross tons the production of open-hearth steel in the United States and Great Britain from 1878 to 1891.

Years.	United States. Gross tons.	Great Britain. Gross tons.	Years.	United States. Gross tons.	Great Britain. Gross tons.
1878.....	32,255	175,500	1885.....	133,376	583,918
1879.....	50,259	175,000	1886.....	218,973	694,150
1880.....	100,851	251,000	1887.....	322,009	981,104
1881.....	131,202	338,000	1888.....	314,318	1,292,742
1882.....	143,341	436,000	1889.....	374,543	1,429,169
1883.....	119,356	455,500	1890.....	513,232	1,564,200
1884.....	117,515	475,250	1891.....	579,753	1,514,538

It will be noticed that in 1891 the production of open-hearth steel by Great Britain very nearly equaled that of Bessemer steel, and that, bad as the year was for Bessemer steel, the open-hearth industry nearly held its own as compared with 1890. Apparently it will be many years before the United States will equal Great Britain in the production of open-hearth steel. Great Britain's production of crucible and miscellaneous steel has for many years been about 100,000 tons annually.

*Summary.*—In preceding pages we have shown the marvelous growth of the pig-iron industry of the United States in the last twenty years, but the above tables show that our steel industry has had a yet more remarkable growth. It has also grown much more rapidly than that of Great Britain. It seems almost incredible that as late as 1860 this country should have produced only 11,838 tons of all kinds of steel; yet these are the official Government statistics. Our magnificent steel industry is virtually, therefore, the creation of the present generation.



## TWENTY YEARS OF ROLLING MILL DEVELOPMENT.

Since the practical abandonment of the manufacture of hammered bar iron in this country about 1844 and the beginning of our manufacture of iron rails in that year the development of our rolling-mill industry has kept steady pace with the growth of our pig-iron industry, and latterly with the growth of our steel industry. Our manufacturers have not only met all the country's wants for rolled iron and steel, but they have met these wants promptly and with a skill that has been nowhere surpassed.

Our earliest rolling-mill statistics are for the year 1856, in which we produced a total of 557,850 net tons of rolled iron, including nail plate and railroad bars. Of this total New England rolled 78,989 tons; the old Middle States, 366,542 tons; the Southern States, 70,601 tons; and the Western States, 41,718 tons. Of the whole quantity rolled 159,662 net tons were railroad bars. The quantity of cut nails produced was 1,824,749 kegs of 100 pounds, representing 91,237 net tons of nail plate. The total quantity of steel rolled in 1856 could not have exceeded a thousand tons.

From 1856 to 1872 the production of all kinds of rolled iron in this country increased rapidly, owing chiefly to the increased demand for iron rails. In 1872 the total production of rolled iron amounted to 1,847,922 net tons. In 1873 the total production was 1,837,430 tons. The production of iron rails amounted to 905,930 net tons in 1872 and to 761,062 tons in 1873. In addition to the rolled iron produced in these two years there were also rolled 94,070 tons of Bessemer steel rails in 1872 and 129,015 tons in 1873, making the total production of rolled iron and steel, if we except a few thousand tons of other rolled steel which are not a matter of exact record, 1,941,992 tons in 1872 and 1,966,445 tons in 1873. Nearly all the Bessemer steel that was produced in these two years was rolled into rails. The total production of steel other than Bessemer was 40,000 net tons in 1872 and 52,000 tons in 1873, not all of which was rolled. It is entirely safe to assume that the total quantity of iron and steel in all forms that was rolled in this country in 1872 and 1873 did not materially exceed 2,000,000 net tons in either year.

*Production of all Rolled Iron and Steel by States.*—The following table gives the production of all rolled iron and steel in each of the States in 1873, with the exceptions already noted, in net tons. Full details of the statistics for 1872 were not preserved.

States—Net tons.	1873.	States—Net tons.	1873.
Maine.....	21,210	Alabama.....	500
New Hampshire.....	300	West Virginia.....	51,796
Vermont.....	6,088	Kentucky.....	37,955
Massachusetts.....	118,669	Tennessee.....	16,561
Rhode Island.....	11,662	Ohio.....	272,066
Connecticut.....	11,409	Indiana.....	36,006
New York.....	154,782	Illinois.....	143,017
New Jersey.....	77,688	Michigan.....	8,542
Pennsylvania.....	835,584	Wisconsin.....	39,495
Delaware.....	11,617	Missouri.....	22,621
Maryland.....	58,025	California.....	7,420
Virginia.....	12,808		
Georgia.....	10,624	Total.....	1,966,445

During the twenty years from 1872 to 1891 our rolling-mill industry has more than trebled its production, the aggregate production of all our rolling mills in 1890, the year of largest production, being 6,745,620 net tons. No other country has in any one year produced so large a quantity of rolled iron and steel. The following table gives in net tons the production of rolled iron and steel in each of the States in 1890 and 1891.

State—Net tons.	1890.	1891.	States—Net tons.	1890.	1891.
Maine.....	10,588	8,083	Alabama.....	42,691	34,022
New Hampshire.....	6,300	5,550	Ohio.....	839,592	877,604
Massachusetts.....	147,379	156,989	Indiana.....	103,137	125,584
Rhode Island.....	14,618	14,787	Illinois.....	838,129	661,166
Connecticut.....	29,121	31,846	Michigan.....	37,186	33,526
New York.....	132,378	132,554	Wisconsin.....	74,695	75,821
New Jersey.....	113,975	112,729	Minnesota.....	2,565	5,000
Pennsylvania.....	3,951,390	3,406,205	Missouri.....	26,040	27,016
Delaware.....	51,659	40,820	Iowa.....		3,100
Maryland.....	16,132	37,618	Colorado.....	37,012	14,714
Virginia.....	57,396	32,754	Wyoming.....	10,287	4,000
West Virginia.....	93,461	88,712	California.....	45,236	43,576
Kentucky.....	41,086	50,641			
Tennessee.....	22,067	10,336	Total.....	6,745,620	6,037,878
Georgia.....	1,500	3,125			

There are a few small rolling mills in Texas, but they did not roll any iron or steel in 1890 or 1891. The table shows that Alabama and some other Southern States which now make large quantities of pig iron are producers of very small quantities of rolled iron and steel, some of these States rolling smaller quantities now than in 1873.

The following table gives in net tons the production of all rolled iron and steel products in the United States in 1888, 1889, and 1890, separately classified.

Articles—Net tons.	1888.		1889.		1890.	
	Iron.	Steel.	Iron.	Steel.	Iron.	Steel.
Rails.....	14,252	1,557,892	10,258	1,694,610	15,548	2,095,996
Cut nails.....	108,505	216,174	88,904	201,634	90,307	191,740
Plates and sheets.....	469,312	213,694	471,193	331,283	505,642	401,537
Wire rods.....	14,571	298,770	14,460	393,053	19,798	492,153
Other rolled products.....	1,805,014	473,247	2,001,570	658,394	2,189,082	743,817
Total.....	2,411,654	2,759,777	2,586,385	3,278,974	2,820,377	3,925,243

In these three years our production of rolled steel exceeded that of iron in a constantly increasing proportion. Of the total production in the last year mentioned in the table 42 per cent. was iron and 58 per cent. was steel. But our production of rolled steel was also greater than that of iron in the years immediately preceding 1888. This was certainly the case in 1886 and 1887. Exact statistics of all forms of rolled steel for these two years are wanting, but enough is known to justify the conclusion that we rolled more steel than iron in both these years. In 1885 the two products were very close together, and for the first time, the difference being very slight either way.

#### TWENTY YEARS OF CHANGES IN THE MANUFACTURE OF IRON AND STEEL RAILS.

In the preceding tables of rolled iron and steel produced from 1872 to 1891 we have included our production of both iron and steel rails, as has already been explained.

*Production of Iron Rails.*—The history of our iron-rail industry from the earliest period for which statistics are available to 1891 is told in net tons in the following table of yearly production.

Years.	Net tons.	Years.	Net tons.	Years.	Net tons.	Years.	Net tons.
1849.....	24,318	1860.....	205,038	1871.....	737,483	1882.....	227,874
1850.....	44,083	1861.....	189,818	1872.....	905,930	1883.....	64,954
1851.....	50,603	1862.....	213,912	1873.....	761,062	1884.....	25,560
1852.....	62,478	1863.....	275,768	1874.....	584,469	1885.....	14,815
1853.....	87,864	1864.....	335,369	1875.....	501,649	1886.....	23,679
1854.....	108,016	1865.....	356,292	1876.....	467,168	1887.....	23,062
1855.....	138,674	1866.....	430,778	1877.....	332,540	1888.....	14,252
1856.....	180,018	1867.....	459,558	1878.....	322,890	1889.....	10,258
1857.....	161,918	1868.....	499,489	1879.....	420,160	1890.....	15,548
1858.....	163,712	1869.....	583,936	1880.....	493,762	1891.....	9,229
1859.....	195,454	1870.....	586,000	1881.....	488,581	.....	.....

Since the beginning of 1883 the manufacture of iron rails has been almost entirely superseded by the manufacture of steel rails.

Such iron rails as have since been made have been chiefly street rails and light rails for mines, logging camps, and similar uses.

It will be seen from the table that the largest annual production of iron rails was in 1872 and the smallest in 1891. At the beginning of this period of twenty years our iron-rail industry had attained the highest point of productiveness in its history, and at its close it was practically an extinct industry. In the same period our steel-rail industry grew from a stage that was still experimental to be one of the world's industrial wonders.

*Production of Steel Rails.*—We now turn to the statistics of our production of Bessemer steel rails from 1867 to 1891, exactly twenty-five years, which we give in the following table in net tons.

Years.	Net tons.	Years.	Net tons.	Years.	Net tons.	Years.	Net tons.
1867.....	2,550	1874.....	144,944	1881.....	1,330,302	1888.....	1,552,631
1868.....	7,225	1875.....	290,863	1882.....	1,438,155	1889.....	1,691,264
1869.....	9,650	1876.....	412,461	1883.....	1,286,554	1890.....	2,091,978
1870.....	34,000	1877.....	432,169	1884.....	1,116,621	1891.....	1,448,219
1871.....	38,250	1878.....	550,398	1885.....	1,074,607	.....	.....
1872.....	94,070	1879.....	683,964	1886.....	1,763,667	.....	.....
1873.....	129,015	1880.....	954,460	1887.....	2,354,132	.....	.....

The largest annual production of Bessemer steel rails was in 1887, and the next largest annual production was in 1890. Since 1887 the building of new railroads in this country has declined.

In addition to our production of Bessemer steel rails we annually make a small quantity of open-hearth steel rails, California producing the most of them. The following table gives in net tons our production of open-hearth steel rails from 1878 to 1891.

Years.	Net tons.	Years.	Net tons.	Years.	Net tons.	Years.	Net tons.
1878.....	9,397	1882.....	22,765	1886.....	5,255	1890.....	4,018
1879.....	9,149	1883.....	9,186	1887.....	19,203	1891.....	6,589
1880.....	13,615	1884.....	2,670	1888.....	5,251	.....	.....
1881.....	25,217	1885.....	4,793	1889.....	3,346	.....	.....

*Street Rails.*—The rapid extension of street railroads in late years has called for a constantly increasing supply of street rails. Nearly all of the street rails that have been made in late years have been made of Bessemer steel. In 1887 the quantity of street rails rolled was 57,362 net tons; in 1888 it was 50,345 tons; in 1889 it was 78,534 tons; in 1890 it was at least 110,353 tons, and in 1891 it was at least 91,058 tons, with the probability that a few thousand tons additional were made in each of these

two years which were classified by the manufacturers in their reports as having been made of standard sections for steam railroads. The following table gives in net tons the ascertained production of street rails from 1874 to 1891.

Years.	Net tons.	Years.	Net tons.	Years.	Net tons.
1874.....	6,739	1880.....	16,894	1886.....	48,009
1875.....	16,340	1881.....	21,554	1887.....	57,362
1876.....	13,086	1882.....	22,286	1888.....	50,345
1877.....	7,015	1883.....	19,440	1889.....	78,534
1878.....	9,229	1884.....	31,357	1890.....	110,353
1879.....	8,646	1885.....	35,990	1891.....	91,058

In *Poor's Manual of American Street Railways* for 1892 the number of miles of street railroads in the United States in 1891 is stated to have been 9,662, and the number in Canada is said to have been 213.

*Mileage of Iron and Steel Rails.*—*Poor's Manual of the Railroads of the United States* for 1892 gives the number of miles of steam railroad track in the United States from 1880 to the end of 1891 which had been laid with steel rails and iron rails as follows:

Years.	Miles of steel rails.	Miles of iron rails.	Total miles.	Percentage of steel rails.
1880.....	33,680	81,967	115,647	29.1
1881.....	49,063	81,473	130,536	37.5
1882.....	66,691	74,269	140,960	47.3
1883.....	78,491	70,692	149,183	52.7
1884.....	90,243	66,254	156,497	57.6
1885.....	98,102	62,495	160,597	61.0
1886.....	105,724	62,324	168,048	62.9
1887.....	125,459	59,588	185,047	67.7
1888.....	138,516	52,981	191,497	72.3
1889.....	151,723	50,513	202,236	75.0
1890.....	167,606	40,697	208,303	80.4
1891.....	174,931	39,756	214,687	81.5

In the above figures all tracks of steam railroads are included, and also the tracks of elevated railroads. In the period covered by the table the mileage of iron rails had decreased over 50 per cent., while that of steel rails had increased over 400 per cent.

An important change in the equipment of American railroads which has taken place during the last twenty years is the general substitution of rails of heavier weight for those that were in use at the beginning of this period. Twenty years ago the rail section that was most in use weighed 56 pounds to the yard, and rails weighing 60 pounds and upwards were not more frequently

called for than rails weighing 50 pounds, and even 45 and 40 pounds. In time heavier rails largely displaced the 56-pound rails. In very recent years rails weighing 70 pounds and 85 pounds have been in common use. The standard section of the Pennsylvania Railroad is now an 85-pound rail. Rails weighing 90 pounds have recently been made for a New England railroad. The New York Central Railroad now has five miles of 100-pound rails in use, and a lot of 100-pound rails has just been ordered for the Pennsylvania Railroad. The average weight per yard of all the rails made by the Illinois Steel Company during the last four years which weighed 50 pounds and upwards has been as follows: 1889, (from May 1st,) 63.75 pounds; 1890, 66.80 pounds; 1891, 66.95 pounds; 1892, (to October 1st,) 68.10 pounds.

It may be mentioned as a historical fact worthy of preservation that in 1858 the Pennsylvania Railroad Company ordered a large quantity of iron rails weighing 83 pounds to the yard, to be laid down on the mountain division of its main line. The experiment was not, however, regarded as so signally successful from an economical standpoint as to justify a continuance of the use of rails of this weight.

*Narrow Gauge Railroads.*—Another change which has taken place in the equipment of American railroads in the past twenty years is the virtual abandonment of the narrow gauge, for which so much was claimed at the beginning of this period. There are now very few miles of narrow-gauge railroad in the United States which are devoted to general traffic. At the close of 1874 there were 1,758 miles, of which 619 miles were built in that year. In the same year 260 miles of narrow-gauge railroad were built in Canada. On May 1, 1878, there were 3,082 miles of narrow-gauge railroad in 32 States and Territories of the United States, and the whole number of narrow-gauge railroads was 133. In the whole of 1878 there were built in the United States 990 miles of narrow-gauge railroad, bringing the total mileage in this country up to over 4,000 miles. Mining roads are not included in this total. After 1878 the popularity of narrow-gauge railroads in this country and in Canada rapidly declined, and the tracks of many of these roads were changed to the standard gauge. The Toronto and Nipissing Railway in Canada, which laid its first rail in 1869, was the first narrow-gauge railroad in America. The first in the United States was the Denver and Rio Grande Railroad, which laid its first rail in 1871.

---

 TWENTY YEARS OF PROGRESS IN THE MANUFACTURE OF NAILS.
 

---

*Cut Nails.*—The production of iron and steel cut nails in the United States, not including wire nails, which will be noticed hereafter, has been as follows from 1856 to 1891, in kegs of 100 pounds.

Years.	Kegs.	Years.	Kegs.	Years.	Kegs.
1856.....	1,824,749	1878.....	4,396,130	1885.....	6,696,815
1872.....	4,065,322	1879.....	5,011,021	1886.....	8,160,973
1873.....	4,024,704	1880.....	5,370,512	1887.....	6,908,870
1874.....	4,912,180	1881.....	5,794,206	1888.....	6,493,591
1875.....	4,726,881	1882.....	6,147,097	1889.....	5,810,758
1876.....	4,157,814	1883.....	7,762,737	1890.....	5,640,946
1877.....	4,828,918	1884.....	7,581,379	1891.....	5,002,176

Down to 1883 all the cut nails manufactured in this country in commercial quantities were made of iron, but in that year cut nails were made of Bessemer steel and others were made of combined iron and steel. In 1884 the production of steel cut nails, including 500 kegs of combined iron and steel nails, was 393,482 kegs, or 5 per cent. of the total production. The maximum production of all cut nails down to the present time was reached in 1886, with 8,160,973 kegs, and the maximum production of steel cut nails alone was reached in 1888, with 4,323,484 kegs. In 1889 and 1890 over two-thirds of the total production of cut nails were made of steel, and in 1891 about three-fourths of the total production were made of the same material.

*Wire Nails.*—The first wire nails manufactured in this country were made at New York in 1851 or 1852 by William Hassall from iron or brass wire. They were of small sizes, escutcheon and upholsterer's nails being specialties. The wire nail as a substitute for the cut nail did not, however, come into notice in this country until a few years ago, in 1883 or 1884. The American Wire Nail Company, whose works are now located at Anderson, Indiana, was the first company to give the wire nail a start in American markets as a competitor of the cut nail. The origin of this company dates back as far as 1871, when a few German residents of Covington, Kentucky, contributed to a fund for importing three German wire-nail machines. In 1886 the production of wire nails was estimated to have amounted to 600,000 kegs of 100 pounds, made by 27 wire-nail works; in 1887 the production was estimated to have been 1,250,000 kegs, made by 47 works; in 1888 it was estimated to have been 1,500,000 kegs; in 1889 it was estimated to have been 2,435,000 kegs. The ac-



tual production in 1890 was 3,135,911 kegs, made by 47 works, nearly all the nails being made of steel. In 1891 the production was 4,114,385 kegs.

*Total Production.*—The total production of cut and wire nails in the United States during the last six years has been as follows:

Kegs of 100 pounds.	1886.	1887.	1888.	1889.	1890.	1891.
Cut nails.....	8,160,973	6,908,870	6,493,591	5,810,758	5,640,946	5,002,176
Wire nails.....	600,000	1,250,000	1,500,000	2,435,000	3,135,911	4,114,385
Total.....	8,760,973	8,158,870	7,993,591	8,245,758	8,776,857	9,116,561

The production of wire nails promises to overtake that of cut nails at a very early day. It exceeded the production of steel cut nails in 1891.

#### PROGRESS IN IRON AND STEEL BRIDGE-BUILDING.

We have already briefly referred to the large demand in this country during the last twenty years for iron and steel for structural purposes. These virtually new uses for iron and steel embrace rolled plates, angles, channels, beams, etc., for bridge-building and shipbuilding, and for warehouses, depots, public halls, and public buildings of all kinds; also for general engineering work. Rolled forms of iron and steel are also used in the construction of private dwellings. Much cast iron is also used for architectural and other structural purposes, but the quantity so used is small compared with the quantity of iron and steel, but chiefly steel, that is rolled for the same purposes.

Great progress has been made during the last twenty years in the substitution of iron and steel bridges for wooden bridges and in the erection of iron and steel bridges where bridges of any kind had not previously existed. Where stone arches or viaducts are not used it is now the rule for our railroad companies to use either iron or steel bridges. Many streams which are crossed by "country roads" are now spanned by these bridges, and in cities and large towns which have streams to be crossed, either within their borders or to connect one city or town with another, wooden bridges are no longer thought of.

It is worthy of mention that some of the world's industrial wonders—some of the greatest engineering achievements—are in the form of iron and steel bridges. In this country our most notable bridge is the Brooklyn suspension bridge, built of wire cables made of American steel, which was planned by John A.

Roebing and completed under the direction of his son, W. A. Roebing. Since its completion over ten years ago the still more celebrated steel cantilever railroad bridge over the Firth of Forth in Scotland has been undertaken and completed under the engineering direction of Sir John Fowler and Mr. Benjamin Baker. The recently-constructed steel cantilever bridge over the Mississippi at Memphis; the steel-arched Washington bridge over the Harlem river at 181st street, New York; the new steel cantilever bridge over the Hudson river at Poughkeepsie; and some other new steel bridges spanning the Mississippi, the Missouri, and other rivers are monuments of American engineering skill and creditable to the skill of American steel manufacturers.

It must not be supposed, however, that this country had not made creditable and even remarkable progress in the building of iron and steel bridges twenty years ago. We had built many iron and a few steel bridges of large size and involving difficult engineering problems before 1872, but still larger iron and steel bridges and more difficult engineering feats were undertaken after that year, and there was also manifested thereafter a constantly increasing faith in the wisdom of building both iron and steel bridges. In the last few years the tendency has been almost entirely to use steel in bridge construction, whereas twenty years ago iron and not steel was the popular metal. The bridge over the Mississippi at St. Louis, which was undertaken in 1868 and formally opened to the public on July 4, 1874, is in many respects the most notable bridge in this country to-day next to the Brooklyn bridge. The arches between its piers are composed of four series of steel tubes.

We are not aware of the existence of any statistical records which will show the quantity of iron and steel that annually enters into the construction of American bridges. It is a constantly increasing quantity. Our railroad system alone will always maintain an active demand for iron and steel bridges.

#### TWENTY YEARS OF IRON AND STEEL SHIPBUILDING.

The following table gives the number and gross tonnage of all iron and steel vessels, except those for the navy, which have been built in the United States in the fiscal years from 1872 to 1892. Nearly all were steam vessels. Since 1883 we have built many vessels of steel, and the tendency now is to use steel in constantly increasing quantities in the construction of both merchant and

naval vessels. This table has been compiled from the reports of the Bureau of Navigation of the Treasury Department.

Years.	No.	Tons.	Years.	No.	Tons.	Years.	No.	Tons.
1872.....	20	12,766	1879.....	24	22,008	1886.....	26	14,908
1873.....	26	26,548	1880.....	31	25,582	1887.....	29	34,354
1874.....	23	33,097	1881.....	42	28,392	1888.....	43	36,719
1875.....	20	21,632	1882.....	43	40,097	1889.....	48	53,513
1876.....	25	21,346	1883.....	35	39,646	1890.....	63	80,378
1877.....	7	5,927	1884.....	34	35,631	1891.....	76	105,618
1878.....	32	26,960	1885.....	48	44,028	1892.....	55	51,374

The increase in these twenty-one years has been from 20 vessels to 76 vessels, and from 12,766 tons to 105,618 tons. The whole number of iron and steel vessels built from 1872 to 1891 was 695, of which 16 were sailing vessels and 679 were steam vessels. The whole number built since 1872, including those built in 1892, was 750. Such shipbuilding records as are accessible go back only to 1867, when iron vessels aggregating about 2,000 tons were built, and to 1868, when five iron and steel ships were built, with an aggregate of 2,801 gross tons. The building of the new American navy has added greatly during the last few years to the number and tonnage of the iron and steel vessels above mentioned.

The first iron steamships to attract attention which were built in this country for Transatlantic service were the four vessels of the American Steamship Company's line, the *Pennsylvania*, *Ohio*, *Indiana*, and *Illinois*, all built at Philadelphia in 1871, 1872, and 1873 by W. Cramp & Sons, and still running regularly between that port and European ports. Their tonnage capacity was originally 3,100 tons each. In 1874 John Roach & Son built at Chester, Pennsylvania, for the Pacific Mail Steamship Company, two iron steamships of large size and superior equipment, the *City of Peking* and the *City of Tokio*, which fully equaled in all respects the best British-built iron steamers. Their registered tonnage was 5,000 tons each. The whole of our magnificent fleet of steel vessels on the great lakes has been built within the last few years. With scarcely an exception wooden vessels were used on these lakes twenty years ago.

*The New Navy.*—The work of building a new American navy of American steel has been wholly undertaken during the last twenty years, indeed during the last ten years. Our activity in this patriotic work must be added to the above achievements in iron and steel shipbuilding during the twenty years mentioned.

We have obtained from the Navy Department the following details of the first steps that were taken to establish the new navy.

It is a matter of official record in Washington that the new navy received its first start in 1881, when, under the direction of W. H. Hunt, then Secretary of the Navy, the first Naval Advisory Board was appointed to report upon the pressing needs of appropriate vessels required to replace the old wooden vessels. In November, 1881, the board submitted a report, upon which was based the construction of the first lot of steel vessels. An act of Congress of August 5, 1882, and another of March 5, 1883, authorized the construction of the steel cruisers *Atlanta*, *Boston*, *Chicago*, and *Dolphin*, the A, B, C, and D of the new navy. The contracts to build them were awarded in July, 1883, and the first of the vessels, the *Dolphin*, was launched on April 12, 1884, and finished in November of the same year. The *Atlanta* was launched on October 9, 1884; the *Boston* on December 4, 1884; and the *Chicago* on December 5, 1885.

In his annual report, dated December 3, 1891, the Secretary of the Navy gives the cost of the new navy as follows: "The cost of building the new ships of the navy, excluding tugs, from beginning to final completion, covering operations from the fiscal year 1883-4 to 1894-5, aggregates, during the twelve years, a total of \$69,993,382, or considerably less than \$6,000,000 a year. The vessels included in this statement are 40 in number, with an aggregate tonnage of 155,820 tons."

The number of guns required to equip the main batteries of all the vessels authorized down to December, 1891, was 347, all to be of American manufacture, and some to be of very large calibre.

Our present extensive iron and steel shipbuilding industry has been greatly aided by the readiness with which our iron and steel manufacturers have responded to all the requirements of our iron and steel shipbuilders. Even in the production of armor plate our manufacturers have within the last three years exceeded the best achievements of European skill.

#### EFFORTS TO ESTABLISH THE TINPLATE INDUSTRY.

The manufacture of tinplates in the United States, in which phrase we include terne plates, was undertaken in 1873 at Wells-ville, Ohio, and at Leechburg, Pennsylvania. In 1875 it was also undertaken at Demmler, near Pittsburgh. Owing, however, to the low duty which was imposed on foreign tinplates domestic tinplates ceased in 1878 to be made at the three places mentioned, and no further attempts to establish the tinplate industry in this country

were made until about the time of the passage of the tariff act of October 1, 1890, in which the previously existing duty on tinplates was more than doubled. Since that date many works for the manufacture of tinplates have been established in the United States, while the building of several others has been commenced.

*Statistics of Production.*—The United States Government has made provision for the collection of the statistics of our production of tinplates, and the task of collecting these statistics has been confided to Col. Ira Ayer, a special agent of the Treasury Department. The statistics which he has already collected and published cover the first five quarters which have elapsed since the new duty on tinplates went into effect, namely, on July 1, 1891. In the following table is given the production of tinplates and terne plates from July 1, 1891, to September 30, 1892.

Quarters.	Tinplates. Pounds.	Terne plates. Pounds.	Total. Pounds.
July 1, 1891, to September 30, 1891.....	152,489	674,433	826,922
September 30, 1891, to December 31, 1891.....	215,911	1,193,910	1,409,821
January 1, 1892, to March 31, 1892.....	1,099,656	2,109,569	3,209,225
April 1, 1892, to June 30, 1892.....	3,071,534	5,129,217	8,200,751
July 1, 1892, to September 30, 1892.....	3,611,367	7,341,358	10,952,725
Total.....	8,150,957	16,448,487	24,599,444

Col. Ayer says that during the quarter ended September 30, 1892, thirty-two firms produced 10,952,725 pounds of tin and terne plates, against 826,922 pounds produced by five firms during the same quarter of 1891. The production of the fiscal year beginning with July 1, 1891, and ending with June 30, 1892, was 13,646,719 pounds. Of the total production for the quarter ending with September 30, 1892, 5,920,082 pounds, or more than 54 per cent., were made from American black plates; 3,611,367 pounds, or about one-third of the whole, were bright tinplates, of which 3,337,036 pounds, or more than 92 per cent., were of the lighter class of plates named in the new tariff, weighing less than 63 pounds per 100 square feet; 7,341,358 pounds were terne plates, of which more than 93 per cent. belonged to the lighter class named in the law. Compared with the first quarter after the new duty went into effect the number of firms engaged in the manufacture of tin and terne plates in the quarter ending with September 30, 1892, was more than six times as many; the quantity of tin and terne plates made was more than thirteen

times as large; and the quantity of American black plates used in their manufacture was about eight times as large.

It will be seen that our new tinplate industry has made remarkable progress since the new duty went into effect. What its future will be can be only a subject of conjecture at this time.

#### A BRANCH OF THE IRON INDUSTRY WHICH HAS DECLINED.

The production of blooms, billets, and bars direct from the ore in primitive Catalan forges in various States and in the improved Catalan forges in New York was an important if not a prominent branch of the iron trade of this country at the beginning of the period of twenty years under consideration. This branch of our iron industry has since greatly declined. The use of the primitive Catalan forge has indeed almost wholly ceased.

The earliest statistics which exist of the production of blooms and bars in forges direct from the ore are for the year 1856, in which year 32,069 net tons of these products were made in 204 forges, or bloomary forges, as they were generally called. Of the whole number of these active forges in the year mentioned 5 were in Vermont, 42 in New York, 48 in New Jersey, 36 in North Carolina, 2 in South Carolina, 4 in Georgia, 14 in Alabama, 50 in Tennessee, and 3 in Michigan. Nearly all of these forges and others which have since been built have been abandoned. In February, 1892, only 11 forges were left, 9 of which were in New York, 1 was in New Jersey, and 1 was in North Carolina.

In the following table we give in net tons the production of blooms, billets, and bars by the bloomary forges above mentioned from 1856 to 1891.

Years.	Net tons.	Years.	Net tons.	Years.	Net tons.	Years.	Net tons.
1856.....	32,069	1877.....	24,227	1882.....	48,354	1887.....	15,088
1873.....	32,863	1878.....	24,139	1883.....	35,237	1888.....	14,088
1874.....	36,450	1879.....	30,282	1884.....	29,789	1889.....	12,407
1875.....	24,416	1880.....	40,652	1885.....	19,887	1890.....	7,945
1876.....	20,784	1881.....	45,369	1886.....	15,878	1891.....	5,925

The production of wrought iron direct from the ore in forges is now virtually confined to the Lake Champlain district of New York, where the total tonnage of 1891 was made.

The production of blooms by other forges from pig iron and scrap iron is another declining branch of our iron industry, but the statistics of this branch possess no special significance.

## PRICES OF IRON AND STEEL FOR TWENTY YEARS.

In preceding tables we have given the production of leading articles of iron and steel in the twenty years from 1872 to 1891. The figures presented show a marvelous development of all the leading branches of these industries. We now present a table, compiled from the records of the American Iron and Steel Association, which shows the average annual prices of five leading iron and steel products during the twenty years mentioned. These prices are yearly averages of monthly quotations for No. 1 anthracite foundry pig iron, best refined bar iron, and iron rails, per gross ton, at Philadelphia; steel rails, per gross ton, at Pennsylvania mills; and cut nails, per keg, wholesale, at Philadelphia.

Years.	No. 1 anthracite foundry pig iron.	Best refined bar iron.	Iron rails.	Steel rails.	Cut nails, per keg.
1872 .....	\$48.88	\$97.63	\$85.13	\$112.00	\$5.46
1873 .....	42.75	86.43	76.67	120.50	4.90
1874 .....	30.25	67.95	58.75	94.25	3.99
1875 .....	25.50	60.85	47.75	68.75	3.42
1876 .....	22.25	52.08	41.25	59.25	2.98
1877 .....	18.88	45.55	35.25	45.50	2.57
1878 .....	17.63	44.24	33.75	42.25	2.31
1879 .....	21.50	51.85	41.25	48.25	2.69
1880 .....	28.50	60.38	49.25	67.50	3.68
1881 .....	25.12	58.05	47.13	61.13	3.09
1882 .....	25.75	61.41	45.50	48.50	3.47
1883 .....	22.38	50.30	.....	37.75	3.06
1884 .....	19.88	44.05	.....	30.75	2.39
1885 .....	18.00	40.32	.....	28.50	2.33
1886 .....	18.71	43.12	.....	34.50	2.27
1887 .....	20.92	49.37	.....	37.08	2.30
1888 .....	18.88	44.99	.....	29.83	2.03
1889 .....	17.75	43.40	.....	29.25	2.00
1890 .....	18.40	45.92	.....	31.75	2.00
1891 .....	17.52	42.56	.....	29.92	1.86

Quotations for iron rails after 1882 are not given, as the manufacture of standard sections of iron rails virtually came to an end at the close of that year. Such iron rails as have since been manufactured have been almost entirely of light sections.

## THE UNITED STATES NOW THE FIRST OF ALL IRON AND STEEL MANUFACTURING COUNTRIES.

We can not better close this review of the progress of our country in the manufacture of iron and steel in the twenty years from 1872 to 1891 than by reproducing, in part from the second edition of our *History of the Manufacture of Iron in All Ages*, the following tables giving the production of iron ore, coal, pig iron,



and steel in all countries in 1890 or in immediately preceding years. The figures are generally for the years of largest production in each country. Tons of 2,240 pounds are used in giving the production of the United States, Great Britain, Canada, and "other countries," and metric tons of 2,204 pounds are used for all the Continental countries of Europe. It has not seemed to be necessary to reduce all tons in the table to a common standard.

Countries.	Iron ore.		Coal.	
	Years.	Tons.	Years.	Tons.
United States.....	1890.....	16,036,043	1890.....	140,882,729
Great Britain.....	1890.....	13,780,767	1890.....	181,614,288
Germany and Luxemburg.....	1890.....	11,406,132	1890.....	89,290,834
France.....	1887.....	2,579,465	1890.....	26,083,118
Belgium.....	1889.....	202,431	1890.....	20,365,960
Austria and Hungary.....	1890.....	2,200,000	1889.....	25,326,417
Russia.....	1890.....	1,768,097	1889.....	6,118,550
Sweden.....	1891.....	987,405	1890.....	258,000
Spain.....	1890.....	5,788,743	1890.....	1,210,082
Italy.....	1890.....	220,702	1890.....	376,326
Canada.....	1890.....	68,313	1890.....	2,783,626
Other countries.....	1890.....	2,000,000	1890.....	12,000,000
Total.....		57,038,098		506,309,930
Percentage of the United States.....		28.1		27.8

Countries.	Pig iron.		Steel.	
	Years.	Tons.	Years.	Tons.
United States.....	1890.....	9,202,703	1890.....	4,277,071
Great Britain.....	1890.....	7,904,214	1890.....	3,679,043
Germany and Luxemburg.....	1890.....	4,658,451	1890.....	2,161,821
France.....	1890.....	1,962,196	1890.....	717,975
Belgium.....	1890.....	787,836	1890.....	221,296
Austria and Hungary.....	1890.....	925,308	1890.....	499,600
Russia.....	1890.....	912,290	1890.....	372,625
Sweden.....	1891.....	490,913	1891.....	172,774
Spain.....	1890.....	179,433	1890.....	63,011
Italy.....	1890.....	14,346	1890.....	107,676
Canada.....	1890.....	19,439	1889.....	24,887
Other countries.....	1890.....	80,000	1890.....	5,000
Total.....		27,137,129		12,302,779
Percentage of the United States.....		33.9		34.7

The percentage of iron ore produced by the United States is seen by these tables to have been 28.1; of coal, 27.8; of pig iron, 33.9; and of steel, 34.7.

## COMPARATIVE EXHIBIT OF THE FOREGOING STATISTICAL STATEMENTS.

Calendar years.	Gross tons.	Production.
1870.....	3,031,891	IRON ORE.
1890.....	16,036,043	
1872.....	2,548,713	PIG IRON.
1890.....	9,202,703	
1872.....	142,954	ALL KINDS OF STEEL.
1890.....	4,277,071	
1872.....	1,738,921	ALL ROLLED IRON AND STEEL.
1890.....	6,022,875	
Fiscal years.	Gross tonnage.	Iron and steel ships, not including vessels for the Navy.
1872.....	12,766	
1891.....	103,618	
Calendar years.	Per gross ton.	Prices.
1872.....	\$48.88	NO. 1 ANTHRACITE FOUNDRY PIG IRON AT PHILADELPHIA.
1891.....	17.52	
1872.....	97.63	BEST REFINED BAR IRON AT PHILADELPHIA.
1891.....	42.56	
1872.....	112.00	STEEL RAILS AT MILLS IN PENNSYLVANIA.
1891.....	29.92	
1872.....	\$5.46 per keg.	CUT NAILS, WHOLESALE, AT PHILADELPHIA.
1891.....	1.86 per keg.	



CARNEGIE LIBRARY OF PITTSBURGH



3 1812 03268 6231