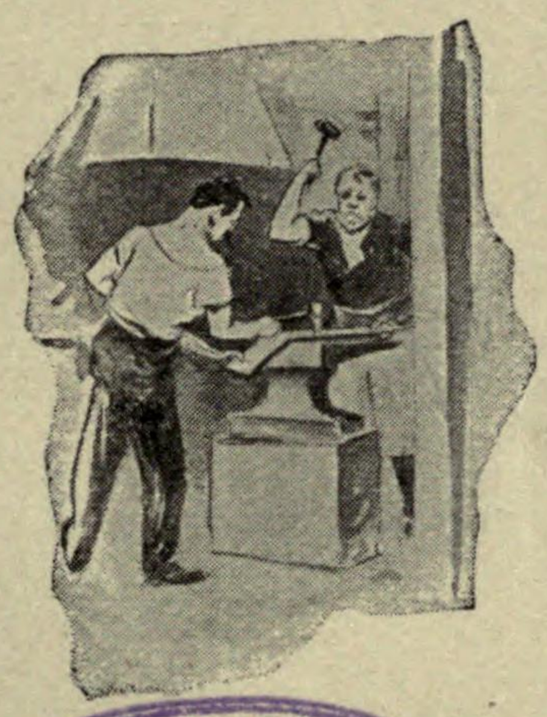
The Inside History
of the
Carnegie Steel Company

A Romance of Millions

By

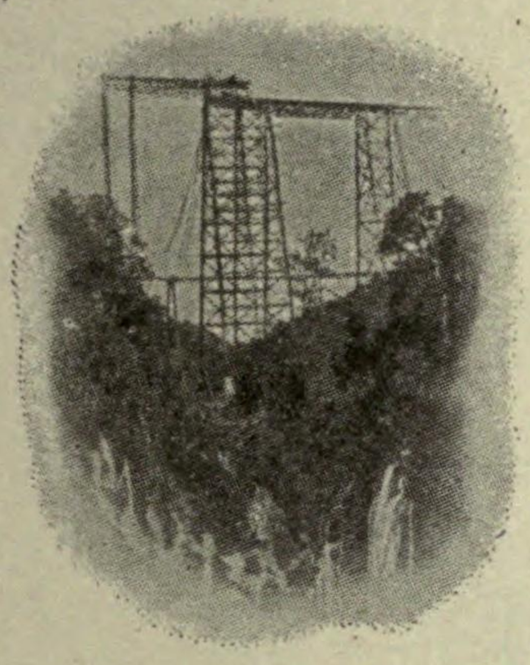
JAMES HOWARD BRIDGE



NEW YORK
THE ALDINE BOOK COMPANY
32-34 LAFAYETTE PLACE
1903

CHAPTER IV

IRON RAILWAY BRIDGES



THE Keystone Bridge Company, to which reference has been made, was formed on April 25th, 1865, with a capital of $300,000. The list of organizers included the names of Aaron G. Shiffler, J. L. Piper, Andrew Carnegie, Walter Katte, and James Stewart. Its purpose, as stated in its prospectus, was "the prosecution on an extensive scale" of the business of manufacturing and erecting patent iron bridges "for railways, canals, common roads, streets, &c., &c. Also wire suspension bridges, ornamental bridges for parks and cities, pivot and draw bridges for roads, canals and railways, . . . built according to plans and specifications, as may be desired."

The company is said further to have "purchased the extensive Bridge Works of Messrs. Piper and Shiffler, located in the Ninth Ward of the City of Pittsburgh, Pa., with the right for the United States to manufacture and erect the celebrated Iron Railway Bridges under the 'Linville & Piper' Patents, and 'Piper's Patent' Wooden Bridges and Roof Frames."

The works are described as having ample facilities "for the extensive contracts now in progress, and will be increased as rapidly as found expedient, in order to complete promptly the most extensive structures."

"The officers who superintend the manufacture and erection of all structures" are said to be "practical men, with extensive and varied experience, acquired in pursuing successfully, for many years, the business of constructing and erecting Iron and Wooden Railway Bridges, Roofs and Buildings.

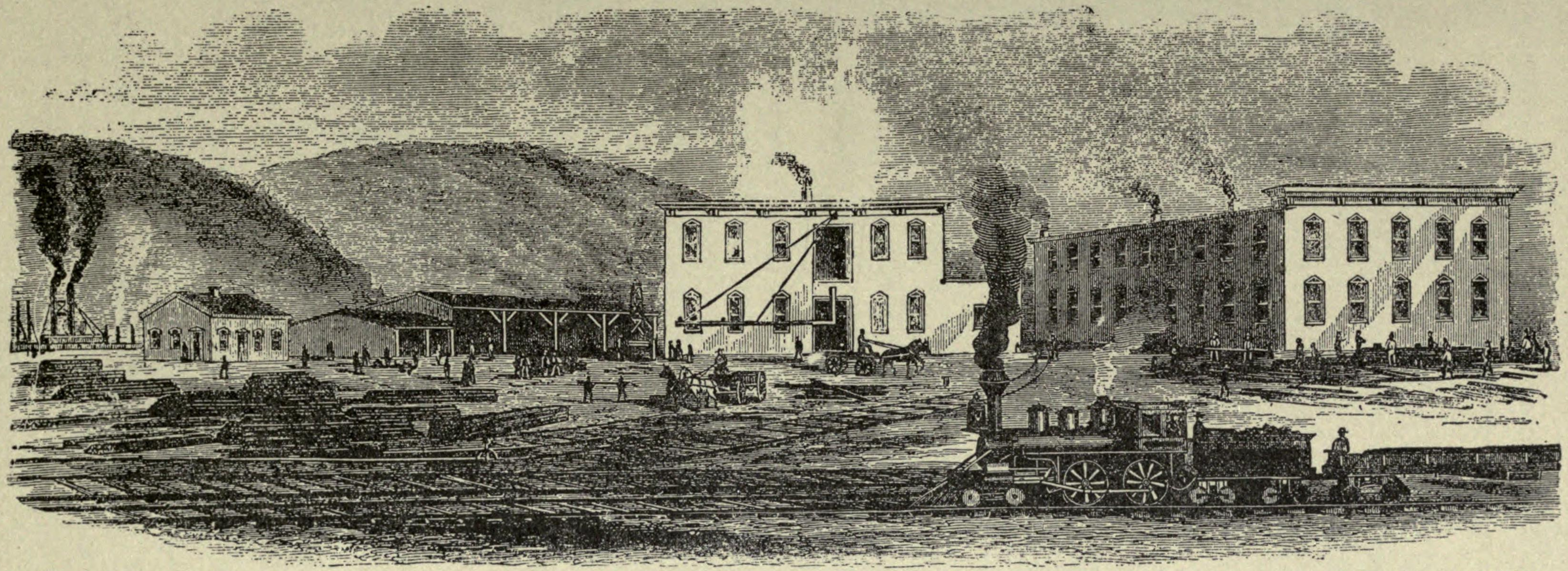
"These Iron Bridges have been in constant use on the Great Pennsylvania Central Rail Road and its dependencies and connections, for many years. The great Iron Railway Bridge over the Ohio River at Steubenville, Ohio, with spans varying from 210 feet to 320 feet was erected by this Bridge Company, in accordance with the prescribed plans and specifications. . . . .

"The success of the 'Linville & Piper' Patent Bridges has been unprecedented; for many years they have borne without visible defect or deterioration, the immense traffic of the Pennsylvania Central Rail Road, Philadelphia and Erie Rail Road, Northern Central Railway, Junction Rail Road, and others. Miles of wooden bridge superstructure have been replaced by permanent iron structures, by the superintending officers of this Company, without detention to the business of the roads. No single instance of failure, either in materials or workmanship, has yet been reported."

Mr. W. H. Wilson, chief engineer of the Pennsylvania Railroad, writing from Altoona on July 21st, 1865, says:

"Messrs. J. L. Piper and A. G. Shiffler have been engaged for the last eight years under my personal observation, and for some years previously, in erecting bridges for the Pennsylvania Rail Road Company. The wooden bridges have generally been on the 'Howe' plan; the iron bridges have been constructed in the shops of the Company, from plans prepared by the Engineer Department, some of them of boiler plate, but most of them on the 'Pratt' plan of truss, with modifications introduced at various times. All the work of raising and completing these bridges has been performed by Messrs. Piper and Shiffler in the most satisfactory manner. It affords me pleasure to recommend them as unsurpassed for promptness, energy and skill by any builders with whom I have had business relations."

It thus appears that Piper and Shiffler had been extensively engaged in building bridges of wood and iron for at least eight years prior to the formation of the Keystone Bridge Company. Andrew Carnegie, however, in his account of the business, speaks as though it originated with the Keystone Bridge Com-



From an old print.

THE PIPER & SHIFFLER BRIDGE WORKS,

At Twenty-ninth Street, Pittsburg, in 1863.
In 1865 they became the Keystone Bridge Works.

pany, which he represents as his personal creation. In a short biography which he recently published through the S. S. McClure Newspaper Syndicate, he says:

"There were so many delays on railroads in those days from burned or broken wooden bridges that I felt the day of wooden bridges must end soon, just as the day of wood-burning locomotives was ended. Cast iron bridges, I thought, ought to replace them, so I organized a company, principally from railroad men I knew to make these iron bridges, and we called it the Keystone Bridge Company. Development of this company required my time, so I resigned from the railroad service in 1867."

Mr. Carnegie has an excellent verbal memory; but he is especially prone to error when recalling events. He is, in fact, constantly mistaking impressions for occurrences, as in this case. That it is his memory which is here at fault is shown by a further error in the same biography. Speaking of his entry upon the manufacture of Bessemer steel he says:

"On my return from England [he is speaking of the year 1868] I built at Pittsburg a plant for the Bessemer process of steel-making, which had not until then been operated in this country, and started in to make steel rails for American railroads."

First noting that the construction of the first Carnegie Bessemer steel plant was not commenced until April, 1873, and was not in operation until the end of August, 1875, it may be seen by reference to any cyclopedia that the first Bessemer steel produced in America was made at Wyandotte, Michigan, in 1864, and that the first Bessemer steel rails made in America were rolled at the North Chicago Rolling Mill in presence of the American Iron and Steel Institute in May, 1865, from ingots made at Wyandotte. Some of these rails were laid in the track of one of the railroads running out of Chicago; and were still in use ten years afterwards when the Carnegie firm made its first Bessemer steel. Even if Mr. Carnegie's recollection had been correct as to the date of this visit to England, it would still be at fault in respect to the beginnings of Bessemer steel

rails in America; for there were produced no less than 7,225 tons of such rails in America in 1868. The prosaic fact is that the earliest of the Carnegie steel enterprises was the eleventh in America instead of the first to use the Bessemer process.

In themselves these discrepancies are of little moment. It is probable that not one reader in a hundred would notice them; but the author deems it his duty to the exceptional reader to set forth the facts as he finds them.*

The Keystone Bridge Company, then, was simply the incorporated business of Messrs. Piper and Shiffler. Carnegie, through his official position on the railroad, had long been familiar with their work; and he had known Piper since 1858, when the latter was employed for a time in the car shops at Altoona, where Carnegie then lived.

Piper was a mechanical genius who was always inventing

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*The author has taken such pains, by reference to original documents, to establish the dates of every salient event in the history of the Carnegie Steel Company, that he ventures, even at the risk of being thought unduly insistent, to point out a further error of fact into which Mr. Carnegie has fallen through overconfidence in his memory. In itself the matter is trivial; but it may have a value in the determination of other questions of fact which may arise.

In the same biography Mr. Carnegie says: "For my father, who had been naturalized as an American citizen in 1853, had died soon afterwards. . . . At the age of sixteen I was the family mainstay."

The facts, as shown by the Allegheny county records on file in the Pittsburg Court House, are as follows:—On September 14th, 1855, the father of Andrew Carnegie made a will, bequeathing a house and lot in Allegheny City to Margaret Carnegie, his wife. Andrew was then within ten weeks of being twenty years of age. This will was recorded on March 30th, 1858, when Andrew was in his twenty-third year.

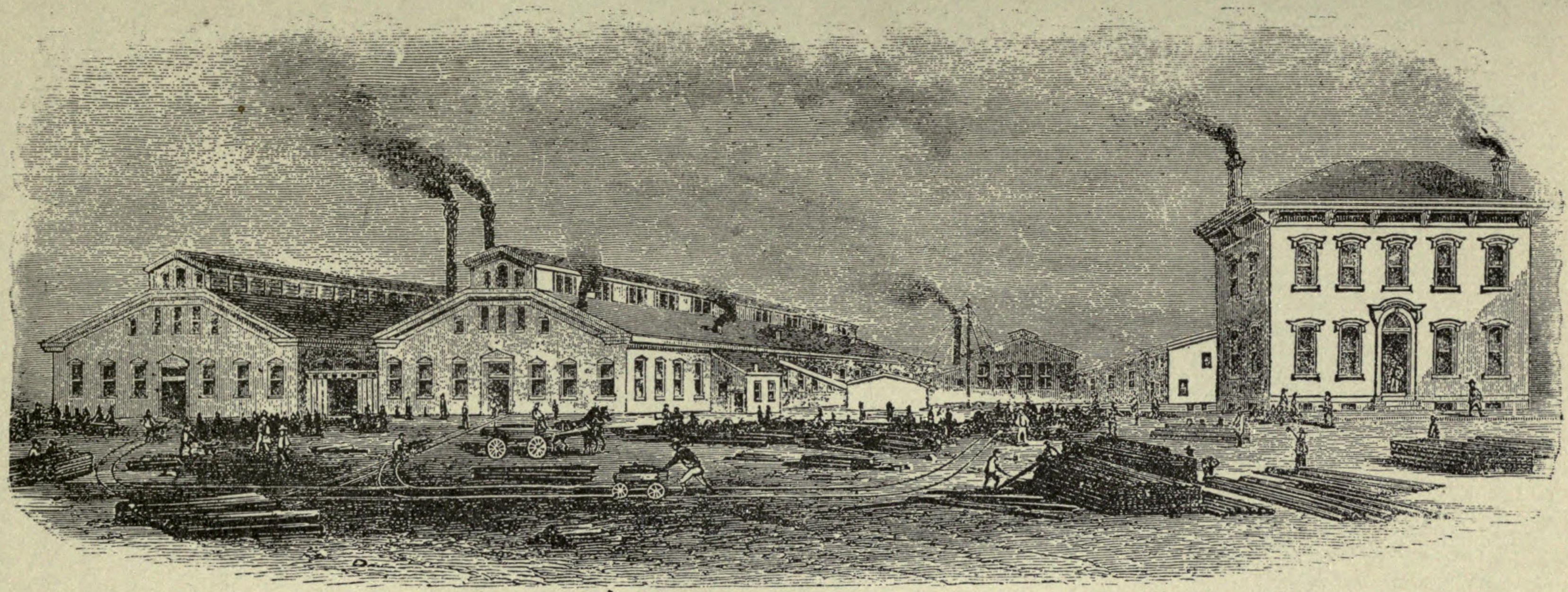
As regards "the family mainstay," the facts are as follows: During the first of young Andy's working years, his wages were $1.20 a week, or $62.40 for the year. At Lacock's he got $3 a week, or $156 for the year. Next he earned $3.50, or $182 a year. Thus, at sixteen years of age, his total earnings had amounted to about $400, or one-quarter as much as his father had invested in the little home at the time of his death.

But the elder Carnegie did not die until Andrew had almost reached his twenty-first birthday; and he worked until within a few weeks of his death. In the year of his father's death Andrew Carnegie's salary was $35 a month; but he lived away from home and had hardly more than sufficed for his own necessities. Even after this his mother kept a railway lodging-house near Twenty-Eighth Street, Pittsburg, where Robert Pitcairn, his successor on the Pennsylvania Railroad, was one of her lodgers.

things. One of his patents, still remembered by his associates of that day, was a turn-table for locomotives; and he afterwards embodied some of the ideas it contained in a drawbridge. He also devised an improved bridge-post which was extensively used; and there were other things invented in conjunction with Linville, who was bridge engineer for the Pennsylvania Railroad, and later became president of the Keystone Bridge Company. He was a man of impressive appearance, a physical giant, and earnest and convincing in manner. At the same time he was of singular trustfulness. One of the stories still current of Tom Carnegie's ready wit bears on this trait of Piper's.

The Keystone Bridge Company enjoyed certain rebates or discounts from the card rates of the Union Iron Mills Company, from which it bought most of its material. One time when the price of iron had risen, the discounts were omitted from the bill rendered to the Keystone Company, and the word "net" appeared in their place. "What does that mean, Tom?" asked Piper as he indicated the word "net." Piper, like most simple characters, loved a bargain; and Tom, knowing this, hesitated to mention the withdrawal of discounts. So he answered with his characteristic readiness, "Oh that? That's 'nit.' It means that there's nothing to be added!" The reply satisfied Piper, and he made no objection to the payment of the bill.

Shiffler, the other founder of the business, had worked with Piper in a contractor's gang under the firm of Stone, Quigley & Co. on the Pennsylvania lines prior to 1857. This was the period referred to by Chief Engineer Wilson, when he said he had known them "for some years" prior to 1857 while "erecting bridges for the Pennsylvania Rail Road." Here they got the experience which made their firm so successful, and qualified them for the direction of the Keystone Bridge Company when that was formed. But neither of them originated the use of iron in bridges; for this material had been so used from the earliest days.



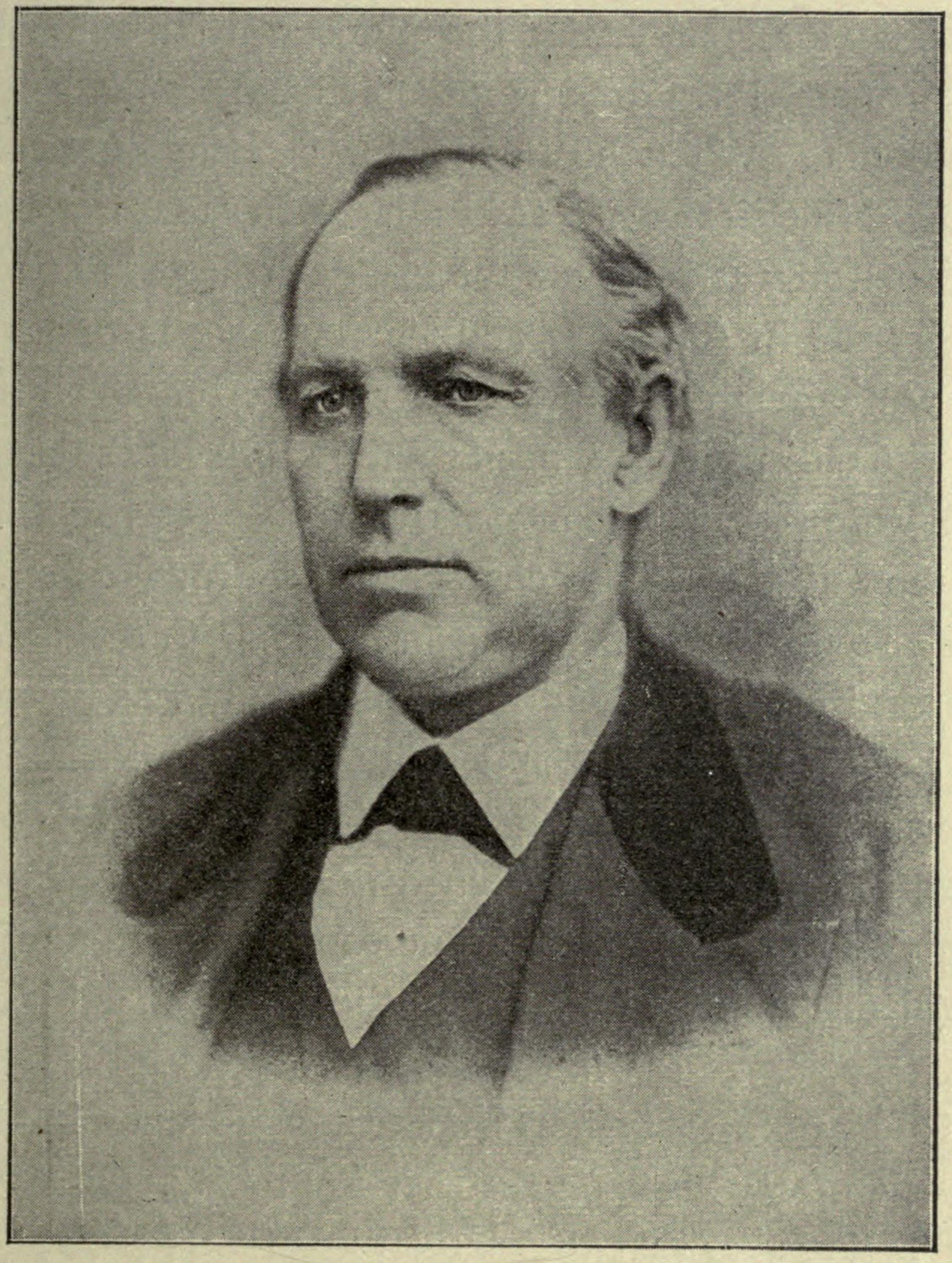
From an old print.

THE KEYSTONE BRIDGE WORKS,
At Fifty-first Street, Pittsburg, in 1866.

The first iron bridge ever attempted was at Lyons, France, in 1755. It was to have been an arch; but the work was abandoned, after a portion of the iron had been made, because of its great cost. In 1777–79 the first iron bridge was built by Abraham Darby, over the Severn near Colebrookdale, in Shropshire, the place taking the name Ironbridge. Its form is that of an arch of 120-foot span and 45-foot rise. The next iron bridge was built at Wearmouth in Devonshire. It was in the form of a segmental arch of no less than 236-foot span; and it cost £27,000. In Sunderland, also in England, a bridge was built in 1796, of large segments of cast iron. It was justly considered a wonderful achievement. Affixed to it was the motto *Nil desperandum auspice Deo;* and Sir Lowthian Bell says that every traveller to the north of England considered himself bound to visit what then was regarded as a most daring example of metallic engineering. In France the iron foot-bridge across the Seine near the Louvre was built in 1803; and during the ensuing fifty years many other iron bridges were constructed in Europe.

With these examples before them it is not surprising that American engineers adopted iron for railroad bridges early in the history of steam transportation. As early as 1841 Squire Whipple, called the father of American iron railroad bridges, patented an iron truss-bridge; though even he was not the first in the field. It is said that Tom Paine built an iron truss-bridge. Be this as it may, there were iron bridges spanning the Erie canal as early as 1840; and by 1847 a company—the New York Iron Bridge Company—had been formed for the exclusive manufacture of such structures. A bridge built by this company on the Harlem Railroad is described in the *American Railroad Journal* for November 27th, 1847; and an iron Howe railroad bridge was already in existence on the North Adams branch of the Boston and Albany Railroad, a few miles north of Pittsfield, in April, 1847, where it was examined by Squire Whipple. In 1848 Whipple built two iron bridges on the Erie

Railroad; in 1849 he built two more near the Chester junction of the Newburgh branch of the Erie. In 1852–53 the first iron railroad bridge of considerable span, being 150 feet to centre of bearings, was erected on the Albany Northern Railroad at the crossing of the Erie canal between the cities of Troy and



J. L. PIPER,

Who, with Aaron G. Shiffler, founded the Keystone Bridge Works.

Cohoes. It stood for thirty years, and was removed in good condition to make way for a double-track bridge. A bridge of the same description was built in 1854 for the Black River and Utica Railroad at Utica. In 1855 one was built for the same road at Boonville, Oneida County. During the decade between 1850 and 1860, which brings us to the time of Piper and

Shiffler, the firm of S. & J. M. Whipple alone built over a hundred iron bridges of all kinds and shapes. In 1863 the Detroit Iron Bridge Works was organized into a joint stock company; and its prospectus states that its manager had "for some years previous been engaged in the construction of iron bridges for railways."

Thus, so far from being the pioneer in the iron railroad bridge business, Mr. Carnegie occupied a position a long way down the list. When he finally did become interested with Piper and Shiffler it was not, as he alleges, in "cast-iron bridges." When cast iron was in vogue for bridge structures in England, wood was used in America; and when wood was replaced with iron it was wrought iron, and later Bessemer steel, that was used. The only parts of Piper & Shiffler's bridges that were of cast iron were Piper's patent posts; and these were a very small part of the whole, which, of course, was of wrought iron.

It is also worthy of mention that Andrew Carnegie's principal interest in the Keystone Bridge Company was given to him in return for services rendered in its promotion. He paid no cash for any of his shares; but desiring to have a larger holding than that gratuitously assigned to him, he gave his note to the company in payment of the increased interest, and the first four dividends sufficed to liquidate the debt.

It is possible that the standards of commercial morality were as high forty years ago as they are to-day. Business men of that period aver that they were higher. It is none the less certain that the ethics of railroad management in early days were formed after other standards than those of modern times; else had there been more general condemnation of the fault which Andrew Carnegie discovered in Miller's "clandestine arangement with Klowman while acting as agent of the Fort Wayne Road." Such arrangements, not always clandestine, seem to have been the rule in those days, and the early history of the Carnegie enterprises affords many examples. Despite

the fact that the principal business of the most important of these enterprises was the manufacture of rails, railway structures, and railway material of various kinds, it was from the salaried officials of railways that much of their first financial support was received. Miller did not sever his connection with the Fort Wayne road when he built the Cyclops Mill; nor did Andrew Carnegie resign from the Pennsylvania when he joined him. Indeed, it was not an uncommon thing for the president and vice-president of a railroad to own shares in a corporation which obtained most of its business from such road. No doubt the business was contracted for by faithful subordinates, and was honestly and properly carried out by the contracting companies; and while it is possible that no question of morals is involved in the dual allegiance of such important officials, modern opinion would unhesitatingly condemn it as a breach of propriety and good taste.

In the formation of the Keystone Bridge Company this infraction of modern standards was especially conspicuous; although the matter-of-fact way in which Mr. Carnegie speaks of organizing a company "principally from railroad men" shows that he, at least, had no idea that the propriety of such a proceeding might be questioned. President J. Edgar Thomson, however, had his interest appear on the company's books in the name of his wife. Besides Colonel Scott, vice-president, the Pennsylvania Railroad officials who became stockholders in the Keystone Bridge Company included the chief engineer, the assistant general superintendent, the superintendent of motive power and machinery, and Andrew Carnegie, the superintendent of the Pittsburg division of the line. There were also the president of another road, two chief engineers, and a general superintendent. Carnegie says he did not resign his position on the Pennsylvania Railroad until 1867, two years after the formation of the Keystone Bridge Company;* and Mr. Pitcairn,

* Another error. He left the Pennsylvania Railroad in 1865, in his thirtieth year.

his successor on the railway, afterwards joined the Keystone board of directors.

It is deserving of notice that most of these gentlemen wrote letters of recommendation to the Keystone Bridge Company, in which the work of Piper and Shiffler was spoken of in the most flattering terms; and these were published by the company as an advertisement. Here for example are those from Mr. J. Edgar Thomson and Colonel Scott:

PENNSYLVANIA RAIL ROAD COMPANY
President's Office
Philadelphia, Sept. 25th, 1865.

Messrs. Piper and Shiffler, who will hereafter conduct their business of Bridge Builders under the name of the "Keystone Bridge Company," have for many years been engaged, both as employees and contractors, in erecting bridges of wood and iron on the Pennsylvania Rail Road and its connections. From the uniform success that has attended their plans, and the character of the work executed, I have no hesitation in recommending them to the patronage of the officers of rail road companies, for the erection of these structures, either upon the well tested plans they have been building, or upon such as may be prepared for them. Their facilities at Pittsburgh for building bridges will enable them to execute work with dispatch.

J. EDGAR THOMSON,
President.

PENNSYLVANIA RAIL ROAD COMPANY
Office of the Vice President
Philadelphia, July 28th, 1865.

The Keystone Bridge Company for several years past have been engaged in erecting iron and wooden bridges, &c., for the Pennsylvania Rail Road Company and its connecting roads.

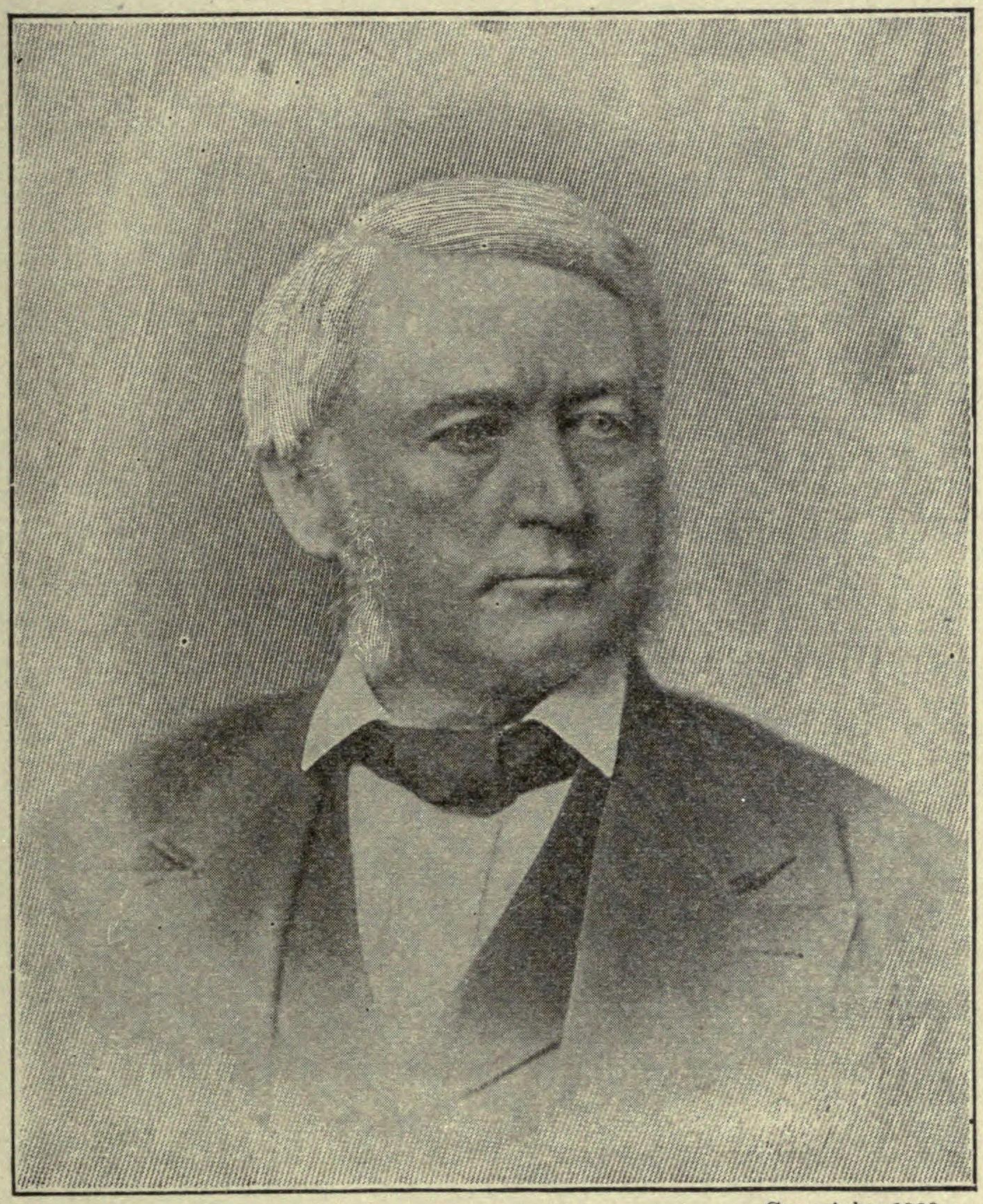
I have had ample opportunities for observing the character of their structures, and can cheerfully testify to the responsibility and skill of the Company. I consider the iron rail road bridges as constructed at their extensive works, in Pittsburgh, Penn'a., the best that I am acquainted with.

THOMAS A. SCOTT,
Vice President Penn'a. R. R. Co.

With such powerful backing the Keystone Bridge Company soon became one of the most important factors in the business

of bridge-building in the country. The extent of the work it accomplished was officially set forth in 1883, when it was stated that the bridges built by it, if placed end to end, would measure over thirty miles in length, and that their cost exceeded $23,000,000.

The most prominent of these structures, containing in each



THOMAS A. SCOTT,

Who gave Andrew Carnegie his start and many a subsequent lift.

case the longest span of its kind then in existence, are the following:

Steel Arch.—The Mississippi River bridge at St. Louis, Mo.; one span of 520 feet and two spans of 502 feet. Double-track and double deck railway and highway bridge.

Steel Truss.—The Missouri River bridge at Plattsmouth, Neb.; two spans of 402 feet each. Single-track railway bridge for the Burlington and Missouri River Railway. Also, the Ohio River bridge at Point Pleasant, W. Va., 3,805

feet long; channel span, 420 feet. Single-track railway bridge for the Ohio Central Railway.

Iron Truss.—The Ohio River bridge at Cincinnati, O.; channel span, 519 feet. Single-track railway bridge for the Cincinnati Southern Railway.

Iron Swing Bridge.—One span of 472 feet, over Raritan Bay. Single-track railway bridge for the New York and Long Branch Railway.

A description of the Keystone Bridge Works published by the company at this time shows that they "are exclusively devoted to the manufacture of bridge and structural material, finished ready for erection. The shop buildings are fireproof, and cover more than three acres of ground, and the capital invested exceeds $1,000,000. The company employs over six hundred men at these works and over three hundred and fifty in the field, engaged in the erection of bridges, so that the total number of men on its pay rolls is about one thousand. The works are equipped in the most comprehensive manner with special machines and tools of the most approved type, among which may be mentioned hydraulic, pneumatic and power riveting machines, a 150-foot multiple punch, shears, planers, lathes, steam hammers, drilling and boring mills, rivet and bolt making machines, and a 300-ton hydraulic testing machine. The works are operated day and night, being lighted by the electric light after dark. The company has lately made extensive and costly additions to its plant, designed solely for the successful and economical working of steel, it having become evident that this material, in the near future, is destined altogether to take the place of iron. These additions consist in a gas heating furnace and [Kloman's] upsetting machine for the manufacture of steel eye-bars, a gas annealing furnace 54 feet long, the only furnace of this kind so far built, and a multiple reaming machine."

The growth of the plant is thus seen to have been great, though not phenomenal. The position of the company at the

beginning of 1885 is shown in the following abstract from its balance sheet:

Resources.

Real Estate		$100,650.00
Shop Equipment account		272,267.36
Construction account		345,942.43
Sharpsburg and Lawrence Br. stock		1,100.00
		$719,959.79
Available accounts	$229,724.39	
Overdue account (Pt. Pleasant Br.)	152,752.61	
Doubtful accounts	2,964.48	
Amount Inventory account	299,098.33	
Cash	24,947.08	
		$709,486.89
Total Effects		$1,429,446.68

Liabilities.

Due Maury Heirs on Mortgage	$50,000.00	
" Union Iron Mills (C. Bros. & Co)	409,129.11	
" Sundry accounts	134,423.37	
Stock account	$447,200.00	
Profit and Loss a/c	388,694.20	
	835,894.20	
		$1,429,446.68

Fourteen years later, just before the Keystone Bridge Company became part of the United States Steel Corporation, its balance sheet for 1899 showed a loss of over $67,000 on contracts. Its principal gains came from castings and rivets; and, by a skilful manipulation of its "inventory adjustment," the statement was made to show a slight profit.

Although one of the most talked-about branches of the Carnegie business, the Keystone Bridge Works was one of the least profitable, and, when stripped of its false character as a pioneer, the least interesting of them all.