COLUMBUS AND THE COAL COUNTRY RAILROADS

by James M. Cavanaugh, 2021, expanded 2024

Pennsylvania Railroad Class J1 2-10-4 No. 6478 in the lead, passing the Chase Avenue Yard with a coal drag heading to Logansport, Indiana on the Bradford Line. Photo from Ryan Hoover Collection.

Background: Coal, Railroads and Columbus Development

The post-Civil War industrial boom that made the United States a global power was led by availability of highly productive labor, expanding transportation infrastructure and low-cost energy sources, principally coal. While Columbus itself was not a mining center, coal transport and distribution in and through the City by rail, and the rise of local mining investment, equipment and technology enterprises in Columbus drove its emergence as a major commercial hub during this period.

Columbus railroads played a key role in this activity. Many of the 15 original Central Ohio rail lines saw coal haulage rise to more than half of their traffic and revenue bases at times from the late 1800s through the Great Depression, followed by a second surge of coal business during World War II and into the early 1950s. Most of these railroads were born on the prospects for coal transport. Not unexpectedly, some died a slow death once the coal they hauled was physically exhausted or no longer in demand.

This five-part article examines the connection between Columbus railroads and the coal industry, including coal traffic flowing through the Columbus rail network during this dynamic era.

The story of Columbus railroads and coal is difficult to tell railroad by railroad. But it seems most logical to narrate this history for each of the five big railroads that eventually emerged in Columbus, the Pennsylvania (with five lines converging in the City), the New York Central (four lines), the Chesapeake & Ohio (three lines), Baltimore & Ohio (two lines) and the Norfolk &

Western (only one line during the big coal era, but providing perhaps the steadiest stream of northbound coal over Columbus interchanges). These early railroads frequently went through realignments due to bankruptcies, corporate consolidations and government antitrust intervention. Interestingly, one line with only the most obscure traces now remaining, the Columbus, Sandusky & Hocking Railroad (CS&H), played a big part in the coal business of at least three of the five big railroads, with its fragments becoming ancestral parts of the PRR, NYC and N&W.

The Source - Ohio Coal Mines

The Congo Mine, Drakes, Ohio, on the Zanesville & Western Railway (c. 1910)

Coal was initially discovered in Ohio in Tuscarawas County in 1755. The first commercial shipments of Ohio coal flowed from Jefferson County around 1800. Some 25 of Ohio's 88 counties had substantial productive coal mines active from the mid-1800s up through the late 1900s; a smaller number continue to this day. These "Coal Counties" comprise the Appalachian portion of the State, bordering the Ohio River in a line running north-northeast approximately from Portsmouth in Scioto County to Millersburg in Holmes County, and then northeast to Youngstown in Mahoning County. Between 1880 and the end of World War II, this area was among the top producing deposits of bituminous coal[1] on the entire planet.

Cumulative Ohio coal production from the late 1800s to date has approached four billion tons. Annual Ohio coal volumes between 1900 and 1960 averaged about 25-30 million tons, with peaks over 40 million tons during World War I, a slump during the 1930s Depression years, and another peak during World War II. Most Ohio coal up through 1950 originated in deep mines, but from the postwar years onward surface

[1] References in this article to "coal" mined in Ohio and moving on Columbus railroads include only bituminous coal. The term "coal" generically includes four separate substances: Anthracite, or "hard coal" is only found in the U.S. in Eastern Pennsylvania; it has carbon content of 86-97%, and burns hotter and cleaner than other grades. All Ohio coal, and well over half of all U.S. coal production is bituminous and sub-bituminous coal, coal, often called "soft coal" or "steam coal." Bituminous coal has carbon content of 45-86% and sub-bituminous coal has 35-45% carbon; both bituminous grades include Sulphur and other material that make it burn "dirtier." Ohio historically produced only small amounts of sub-bituminous coal, and this grade is found predominantly in Wyoming and Montana. The fourth grade of coal, lignite, has lower carbon content, and is found mainly in North Dakota and Texas.

mining has gradually accounted for 60-70 percent of the total. The all-time peak year combined total deep mine and surface mine volume was 55 million tons in 1970.[2]

The Ohio counties yielding most coal transported to and through Columbus in this era were in the Hocking Valley Coal Field, including Perry, Muskingum, Athens and Hocking Counties, with contributions from neighboring Vinton and Morgan Counties. The dense Ohio coal deposits to the east, including Harrison and Jefferson County and northward, mainly fed nearby markets in northeast Ohio and Western Pennsylvania, although at times providing some traffic into Columbus. Historically, Ohio accounted for five to ten percent of U.S. bituminous coal produced during this period.[3]

A very substantial percentage of the coal moving through Columbus would eventually originate in the massive Pocahontas Coal Fields in Eastern Kentucky, Virginia and West Virginia, carried north on the C&O, N&W and the NYC's Toledo & Ohio Central (T&OC) line via an end-to-end connection with the Virginian Railroad.

[2] Douglas Crowell, *History of the Coal Mining Industry in Ohio*, Ohio Division of Geological Services, 1995. https://dam.assets.ohio.gov/image/upload/ohiodnr.gov/documents/geology/B72_Crowell_1995.pdf Crowell's 204-page study is fascinating and exhaustive but very readable resource for everything about the Ohio coal industry, including mining locations and techniques, miners and mine towns, with hundreds of photographs and detailed statewide and county-by-county statistical tables and references cited. Crowell's piece includes brief but interesting information about railroad coal haulage. See also *Coal Production in Ohio, 1800-1974*, complied by Horace R. Collins, Chief, Ohio Department of Natural Resources, Division of Geological Survey, Columbus 1976 https://dam.assets.ohio.gov/image/upload/ohiodnr.gov/documents/geology/IC44_Collins_1976.pdf

[3] U.S. bituminous coal production:

U.S. Bituminous Coal Production 1900-1971							
Year	***Tons (M)***	***Year***	***Tons (M)***	***Year***	***Tons (M)***	***Year***	***Tons (M)***
1900	212.3	1918	579.4	1936	439.1	1954	391.7
1901	225.8	1919	465.8	1937	445.5	1955	464.6
1902	260.2	1920	568.7	1938	348.5	1956	500.9
1903	282.7	1921	415.9	1939	394.9	1957	492.7
1904	278.6	1922	422.3	1940	460.8	1958	410.4
1905	315.0	1923	564.6	1941	514.1	1959	412.2
1906	342.8	1924	483.7	1942	582.7	1960	415.5
1907	394.8	1925	520.0	1943	590.2	1961	403.0
1908	332.6	1926	573.4	1944	619.6	1962	422.1
1909	379.7	1927	517.8	1945	577.6	1963	458.9
1910	417.1	1928	500.7	1946	533.9	1964	487.0
1911	405.9	1929	535.0	1947	630.6	1965	512.1
1912	450.1	1930	467.5	1948	599.5	1966	533.9
1913	478.4	1931	382.1	1949	437.9	1967	552.6
1914	422.7	1932	309.7	1950	516.3	1968	545.2
1915	442.6	1933	333.6	1951	533.7	1969	560.5
1916	502.5	1934	359.4	1952	466.8	1970	602.9
1917	551.8	1935	372.4	1953	457.3	1971	552.2

Source: https://nma.org/wp-content/uploads/2016/08/Historic-Bituminous-Coal-Production.pdf

Canal Coal Transport Gives Way to Rail

The earliest commercial movements of coal in Ohio, aside from local horse and wagon deliveries from mines to nearby consumers, were shipments on the Ohio River in the very early 1800s. River rafts and keelboats, powered by men using poles and oars, were too small for efficient carriage of heavy bulk cargo like coal. The *New Orleans*, the first steamboat on the Ohio, appeared in 1811, with a few others to follow between 1812 and 1820. These steam vessels did not reach Columbus, and were not designed for substantial coal carriage. Also, annual Ohio coal production was only an insignificant 10,000 to 25,000 tons during this period.[4]

Larger-volume commercial carriage of coal to Columbus began in 1832 with the completion of the Ohio & Erie Canal, which connected Cleveland with Portsmouth, including the 11.6-mile Columbus Feeder Canal between Lockbourne and the Scioto River in downtown Columbus built in 1827-31. A typical canal boat could carry up to 80 tons of coal a speed of about three to four miles per hour, at a cost per ton-mile of less than 20 percent of that of horse and wagon transport. Coal was already being mined in Summit, Tuscarawas and Muskingum Counties and several others along the route of the Canal when it was under construction, and production began in Holmes and other northern counties on the Canal by 1840. With canal boats available to move much greater tonnages of coal to urban markets economically, demand surged. Annual Ohio coal production reached 100,000 tons by 1840 and 450,000 tons by 1850.

While far superior to wagon haulage, canal boat transport of coal was slow, with loading and unloading all done by hand, and shoreside docks and facilities were limited. All this greatly restricted the throughput capacity of the Ohio canals for moving rapidly growing coal volumes. Although it was an engineering marvel of its time, the canal system also frequently suffered from lengthy service interruptions caused by floods, and was destroyed by the Great Flood of 1913.

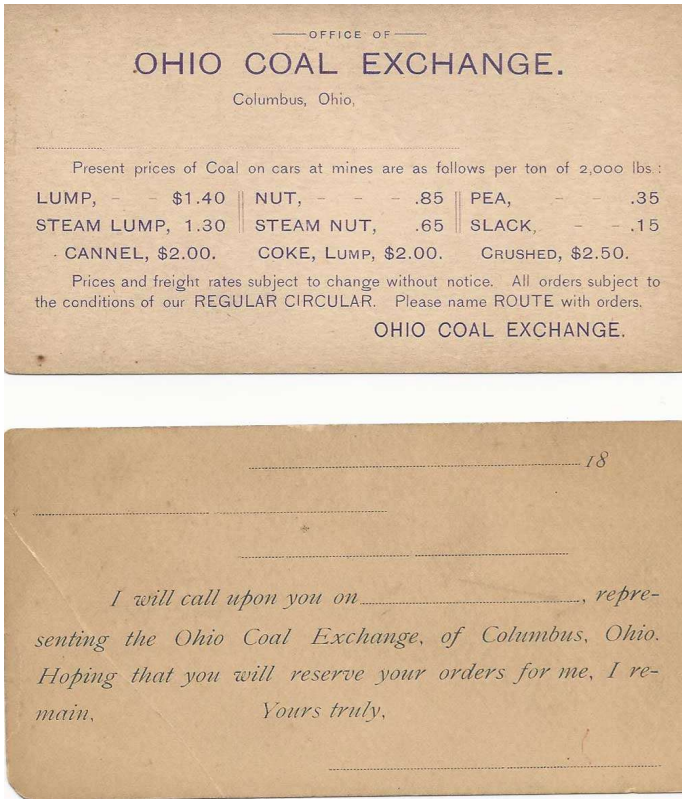
The arrival of railroads in Columbus, especially the Baltimore & Ohio, which connected the heart of Ohio's eastern county coal country with Columbus in 1853, quickly made the canals secondary and eventually obsolete as coal carriers. In spite of the small size and hand-loading and discharge limitations of early rail equipment, steam locomotion could move vastly greater quantities of coal far faster and more reliably directly from the point of production at the mine to the user's destination, without the need to transload multiple times between wagons and canal boats. By the end of the Civil War, when Ohio coal production had doubled again to over one million tons annually, the canals were entirely eclipsed by the railroads as a means of coal transport.

The Economics of Coal Haulage

The factors that determine pricing for coal at destination include the heat value per unit of weight (expressed in British Thermal Units or "BTUs"), moisture content (expressed as a percentage of water content by weight), Sulphur content, the size of the coal lumps, non-combustible content (i.e., how "clean" the coal is and what types of boilers can use it), and the cost and time of moving the coal from the mine mouth to the buyer's destination rail siding.

[4] https://dam.assets.ohio.gov/image/upload/ohiodnr.gov/documents/geology/B72_Crowell_1995.pdf , p. 13

The heat value of Ohio bituminous coal ranges from about 10,000 to 14,500 BTUs per pound, and Ohio "sub-bituminous" coal has values of 8,000 to 10,000 BTUs per pound. During the 19th Century, well before the advent of accurate scientific measurement, industrial users and even homeowners knew which coal grades and origins performed best, put out the most heat and left the least volume of corrosive ash after combustion.



OFFICE OF

OHIO COAL EXCHANGE.

Columbus, Ohio,

Present prices of Coal on cars at mines are as follows per ton of 2,000 lbs.:

LUMP, - - $1.40	NUT, - - - .85	PEA, - - .35
STEAM LUMP, 1.30	STEAM NUT, .65	SLACK, - - .15

CANNEL, $2.00. COKE, LUMP, $2.00. CRUSHED, $2.50.

Prices and freight rates subject to change without notice. All orders subject to the conditions of our REGULAR CIRCULAR. Please name ROUTE with orders.

OHIO COAL EXCHANGE.

.....18

I will call upon you on....., *representing the Ohio Coal Exchange, of Columbus, Ohio. Hoping that you will reserve your orders for me, I remain, Yours truly,*

Ohio Coal Exchange price list postcard, circa 1895. After the Sherman Antitrust Act was enacted in 1890, the federal and state governments kept a careful eye on price-fixing by coal producers.

The economics of rail transport are complex. Coal is heavy, needing rugged hopper cars, and is hard on rolling stock and track, requiring heavier-gauge rails, substantial maintenance and more frequent replacement of worn track and equipment. Although having the economic advantage of large volume, coal takes more manpower, horsepower and tractive effort to move over the road than similar quantities of mixed freight or most other bulk commodities. In the steam days, it usually took a helper engine or two to move coal trains up moderate to steep grades such as those facing the four heavy-haul railroads running northward and westward from Columbus. The biggest steam locomotives such as the C&O's H-8 2-6-6-6 Alleghenies, or the PRR's J1 class 2-10-4s, could only do so much. Once diesels arrived, four coupled EMD F7s or F9s, with an engine crew of two men and over 220,000 ft/lbs. of starting tractive effort, almost double that of an Allegheny or J1, could walk 8,000 tons up these grades without breaking a sweat.

Often the transport cost to destination exceeds the cost of mining, cleaning, sorting and loading coal at the mine. Even high-quality coal is not competitive if you have pay to carry it too far.

A railroad's pricing point for coal transport is based on competitive factors, more than costs. If a coal shipper has multiple routing options, as was the case in many Ohio Coal Counties, rail rates go down. Where coal moves to destination via several interchanging line haul railroads, they have to apportion the freight revenues, limiting the originating railroad's ability to exploit its monopoly pricing advantage from the mine to the nearest rail interchange point. From enactment of the Interstate Commerce Act in 1887 and the Sherman Antitrust Act in 1890 onward, government antitrust regulation also affected rail freight pricing. The railroad's economics are also heavily affected by the cost of balancing equipment, especially the need to deadhead empty hoppers back to the mines when no backhaul cargo is available, and payment of *per diem* fees to other railroads for their hopper cars remaining on the railroad's property after unloading.

In general, a railroad is economically motivated to continue to carry coal even at an overall loss, as long as the freight revenue fully covers all variable operating costs (labor, fuel, engine, car and track maintenance and repairs) plus at least some contribution to fixed costs.

Coal as Locomotive Fuel

In the steam days, railroads also purchased coal for their own use as locomotive fuel from on-line suppliers. The railroads loaded the tenders of steam locomotives from huge coaling towers, usually located at their main division points near roundhouse servicing facilities, as well as at strategic locations out along the line where engines tended to need refueling. The railroads operated some 456 of these towers throughout Ohio.[5]

Coaling Tower, West Columbus Yard, in repose after the end of steam on the New York Central in 1955. Photo from Galen Gonser Collection.

Railroads would bargain the price they paid for coal against more favorable freight rates for the mine. A railroad would be especially careful to adjust its rates to keep a big on-line mine supplying its fuel and originating 100 or more revenue cars a day "in the money," operating and paying freight, when other mines might be shutting down or cutting production due to poor economics.

[5] Crowell, *History of the Coal Mining Industry in Ohio*

The railroads' reported coal haulage volumes generally include only revenue loads, whereas a railroad's movement of fuel coal for its own account would not be included in its freight statistics. All the railroads serving Columbus had on-line coal mine shippers. The railroads could purchase coal at favorable prices on a free-on-board (FOB) basis at the mines' sidings, and furnish their own hopper cars and transportation to their locomotive fueling locations. Shipment of such coal from the mine to the railroad's coaling towers was on a "no-bill" basis, *i.e.*, the railroads did not issue a traditional rail waybill shipping document for their own loaded cars since they owned the cargo and no freight was due.

Coal was also a strategic commodity over which railroads needed to assert as much control as feasible, as they could not operate for long without a continuous supply. The Pennsylvania Railroad stockpiled enormous coal inventories just north of Pennor Yard in Columbus so as not to be caught short of fuel during mineworker strikes. Many railroads also purchased coal mines, coal properties or equity interests in them, in order to hedge their fuel costs and assure a reliable supply. The Columbus-based Toledo & Ohio Central acquired 12,500 acres of coal land and opened its own house mines at Sunday Creek, Corning, Rendville and Buckingham in Perry County.

The railroads' coal usage during the peak coal production era was enormous. U.S. railroads collectively consumed 128 million tons of coal in 1915, representing over 20 percent of all reported U.S. coal production during that year.[6] Locomotive coal consumption varies widely by season, due to lower thermal efficiency in colder months. Overall consumption rates on a coal quantity per ton mile and passenger mile gradually improved as locomotive boilers became bigger, trains became longer and heavier, and technologies such as compound working, feed water heating and steam superheaters became widespread. During March 1943, in the peak year for railroad coal use, U.S. Class I railroads burned 9.4 million tons of coal for freight operations and 2.8 million tons for passenger trains.[7] During the World War II years, with annual U.S. bituminous coal production hovering around 600 million tons, the railroads' coal usage reached as much as 30 percent of the overall available volume. With the surge of diesel locomotive deliveries after the war, the railroads' coal volumes dropped rapidly.

At the end of World War II, the New York Central's T&OC was dispatching 3,925 monthly trains over its 800-mile line. The principal T&OC road power was its H8 and H10 Mikados, which had tender capacity for 18-22 tons of coal. Assuming only one-third of this capacity was consumed on each called train, that would amount to about 325,000 tons of fuel coal annually for the T&OC, a relatively small railroad. Yard jobs and helper locomotives, dispatched in substantial numbers on the T&OC with its "up and down" profile, would have added more fuel demand. In addition to its own proprietary mines, the T&OC had access to on-line coal at more than 50 mines on its Western Branch and Zanesville & Western Branch in Perry and Muskingum Counties, and on its Southern Branch in Athens and Meigs Counties, and another 50 mines in West Virginia via its Southern Branch, Hitop Branch and connections with other railroads in West Virginia.

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[6] Railroad fuel consumption quantities as percentages of overall U.S. coal production are somewhat confusing because they include both bituminous coal and anthracite. Eastern U.S. railroads such as the Erie Lackawanna and Delaware Lackawanna and Western that principally hauled anthracite used this higher grade of coal as fuel. Anthracite production peaked at 99.7 million tons in 1917, representing about 15% of all U.S. coal grades mined at that time, and peaked again at 63 million tons during World War II, but rapidly fell to below 5 million tons by the end of the steam haulage days in the 1950s and 1960s.

[7] https://fred.stlouisfed.org/tags/series?t=coal%3Bnber%3Brailroad&ob=pv&od=desc

The PRR's Panhandle Line running between Columbus and Pittsburgh had big-volume coal available from Harrison County at Cadiz Junction, and near Trinway in Muskingum and Coshocton Counties to supply its terminal coaling points in Columbus. The PRR also occasionally accumulated excess loaded hoppers of coal they had purchased, and then sold it to other customers if spot rates in the coal markets rose high enough.

The B&O served numerous mines on its various Subdivisions from Zanesville eastward and southward, as well as its 44-mile Rock Run Branch connecting Newark with high-production Perry County mines in and near Shawnee. The C&O's Athens Subdivision and connecting Straitsville and Monday Creek Subdivisions and Sugar Creek Branch which honeycombed the coalfields of Hocking, Athens and Perry Counties, as well as its Pomeroy Subdivision connecting Logan with the Ohio River via Vinton, Jackson and Gallia Counties, were major coal gatherers and haulers. The N&W had some small on-line coal sources in Lawrence and Scioto Counties, more noted for iron ore and other minerals, and the N&W's more distant southern reaches covered the massive Pocahontas and other coal fields in Kentucky, West Virginia and Virginia.

Coal Consumption in Columbus

The history of coal moving to and through Columbus suggests a significant majority of volume during the peak periods was moving through the City to other points to the north and west, rather than being used locally. Columbus was never predominantly a "smokestack industry" town. Nevertheless, Columbus railroads' rights-of-way were lined with some 600 factories as of 1910, military, academic and health care institutions, light and power utilities and other facilities that used coal for their boilers. Many industries clustered in the City's industrial areas such as the Neilston track complex and along the South Columbus industrial track used coal for steam and power, and some used coal for industrial chemical processes. Big institutions such as the Columbus State Hospital and the state handicapped development school at Hilltop had long spurs for their coal deliveries. The Defense Supply Center, originally built as the Columbus Quartermaster Depot in 1918, had its own big power station and was a substantial coal consumer in its early years.

Commencing in 1903, Columbus Railway Power & Light Company and several other privately-owned electric utilities began coal-fired generation at various Columbus sites. The company's Picway power plant began operations west of Lockbourne with two units with 60 megawatts of combined capacity in September 1926, followed by a 60 MW expansion in 1943-49, and another 100 MW in 1955[8]. Columbus Railway Power & Light Company was a forerunner of American Electric Power (AEP). These early utilities' coal-fired generators were modest in size, supporting mainly street lighting. Industrial sites of any size as well as most streetcar and interurban lines operated their own electric generating plants, and the concept of distribution of electric power to residences emerged later. However, the combined utilities coal consumption in Columbus in the late 1800s, while difficult to estimate with precision today, must have been substantial.

McCracken power plant on the Ohio State University campus, originally built in 1918 to replace an earlier coal-fired generator and later expanded three times, produced electric power, steam and

[8] https://en.wikipedia.org/wiki/Picway_Power_Plant

hot water for heating the massive OSU campus. McCracken received coal and shipped out its post-combustion ash via the C&O Hocking Valley Line, over a 2.5-mile spur built in 1909 with a steel through girder bridge over the Olentangy River. Later this bridge was replaced by a track recessed in the pavement of what is now the Woody Hayes Drive highway bridge opposite Ohio Stadium. Rail coal deliveries continued there until 1957.

McCracken Power Plant, 1930s

Other very significant Columbus consumers during the peak railroad coal years were distributors of coal for home heating and cooking. From the Civil War onward into the 1920s, when gas utilities began to reach urban Ohio, virtually every house, small business, public building, church or school bought coal for heating in hundredweight retail lots, usually delivered by horse and wagon to coal chutes through a basement wall opening. Every few miles on each of the rail lines fanning out from Columbus, next to the grain elevator and house track, there was a team track or separate coal siding where coal dealers picked up daily shipments with wagons and trucks.

In their earliest stages, Ohio's urban gas utilities also relied on coal as their feedstock, consuming large quantities at very dirty coal gasification plants to supply their distribution systems. Residues from toxic coal gas conversion processes have long been among the most problematic environmental remediation challenges, with numerous "Superfund" locations in the Midwest.

Many such Columbus coal-burning institutional facilities are long gone; virtually all stopped using coal for multiple reasons by the latter third of the 20th Century. Until the recent advent of fracking, coal continued to be substantially more economical than gas on a per-BTU basis for big thermal power generating facilities. But air quality issues, environmental compliance costs and at times coal supply instability due to labor-management conflicts made coal less and less viable for many users. Ultimately climate concerns added further pressure. After "clean coal" technologies failed to perform as hoped, and fracking led to plunging natural gas prices, coal was finally out of the money economically for electric utilities and most industries.

Interchange of Coal Hoppers in Columbus

During the peak coal haulage era, once railroads settled disputes and adopted the four feet eight and one-half inch U.S. standard gauge, lines began to interchange cars to allow direct delivery of goods to destination over multiple rail lines rather than costly and slow transloading at interconnection points. These arrangements evolved into a nationwide uniform practice among all lines, now regulated by federal statutes and detailed Association of American Railroads

Interchange Rules. These rules specify how multiple railroads over which a car may run from origin to destination receive and transport each other's cars, responsibility for maintenance and running repairs, and how they allocate the freight money paid by the shipper based on which line provides switching, loading, terminal and weighing services, and line haul miles on each participating road. The rules also require the railroad on which a foreign line's car is located as of midnight to pay a *per diem* amount to the owner of that car for its use. For this reason, you would often see a big sign on the wall in yard offices reading "Get Foreign Cars Off the Line by Midnight."

Through these interchange practices, coal moving through Columbus on any given railroad was often hauled in hopper cars bearing the livery of other lines. The economics of rail interchange arrangements favored coal country railroads delivering their own cars to mines for loading when possible, rather than dispatching an empty hopper from another railroad to load. The railroads were also under constant pressure to have adequate empties at the mines, ready to load. Railroads facing sudden traffic surges would sometimes lease hundreds of hoppers from another railroad which had excess rolling stock.

Accordingly, a high percentage of hoppers seen in Columbus on any given day might be from the Appalachian roads such as the Norfolk & Western and Chesapeake & Ohio or from coal origin lines such as the Virginian, Clinchfield or Louisville & Nashville (L&N) that interchanged coal onto the railroads serving Columbus. From the 1950s onward, large coal producers such as Peabody and Consol operated their own car fleets. Peabody's bright yellow liveried 100-ton "bathtub" gondolas were especially easy to spot rolling through Columbus on the T&OC or C&O.

Interline relationships also drove coal hopper allocation practices. From 1909 onward, the New York Central's Toledo & Ohio Central and Kanawha & Michigan line which ran deep into West Virginia had a major interchange with the western end of the Virginian Railroad at Deepwater, West Virginia, and after 1920, an end-to-end connection at Swiss, West Virginia with the Nicholas, Fayette & Greenbrier Railroad, a joint venture company owned by the NYC and C&O. The NF&G shared engine and car fleets of the two lines, and received northbound coal off the latter. The N&W terminated in Columbus until 1964, but was built for easy interchange with the Pennsylvania lines to Lake Erie and Chicago. Thus, it was common to see a PRR Sandusky Branch coal drag consisting of all N&W cars, or an NYC Western Branch northbound laboring uphill past Mounds with all Virginian hoppers.

Great Lakes Coal Moving through Columbus

A sizable portion of coal moving through Columbus by rail was destined for loading to steamships at various Lake Erie ports, for water transport to steel mills and electric utilities at ports in the Upper Midwest and Ontario. From the 1890s forward, some 14 large coal loading dock facilities were spread along the Lake Erie shoreline from Conneaut to Toledo. Each of these featured docks thousands of feet long for berthing the ships, big supporting rail yards, acres of storage area with piles of coal awaiting loading for shipment by water. Thousand foot long narrow-beamed coal-carrying steamships (generally called "boats" in the Lakes maritime industry parlance in spite of their substantial size) were limited to about 25,000 deadweight tons due to beam and depth restrictions on the Sault Ste. Marie locks between Lakes Superior and Huron, and the Welland Ship Canal on the Canadian side between Lakes Erie and Ontario. These same "boats" also carried

iron ore from the Mesabi Range in Minnesota and Upper Peninsula of Michigan south to steel mills in Ohio and Kentucky, and transported cargoes of grain down from the Upper Midwest.

Double-heading ATSF 5011 class 2-10-4 locomotives northbound with Chesapeake & Ohio hoppers on the PRR Sandusky Branch at Worthington, August 1956. Photo by J. Parker Lamb.

Ohio's Lake Erie Coal Docks	***Principal Affiliated Railroads***
Toledo Lakefront Dock	NYC (T&OC), C&O (Hocking Valley), B&O
Sandusky Docks 1, 2 and 3	PRR (Sandusky Short Line), B&O, NYC (Big Four)
Lorain Coal Dock	B&O
Huron Dock	Wheeling & Lake Erie
Cleveland - Coal Dock 24, also Docks 1,2,3 and 6 and Whiskey Island	PRR, NYC (Big Four), Erie, B&O
Fairport Harbor Coal Dock	B&O
Ashtabula	N&W, B&O, PRR
Conneaut	N&W

From the early stages of the railroads providing end-to-end transshipment of bulk cargoes and passengers to and from Lakes vessels, a number of railroads and the powerful investment trusts that controlled them also bought up shipping lines. This enabled the owners to exert monopoly pricing power on transport over a greater portion of commerce routes from origin to destination. With enactment of the Panama Canal Act of 1912, Congress prohibited railroads or their investors from owning or controlling any interests in ocean or Lakes shipping, and gave the Interstate Commerce Commission the power to enforce this ban on integrated control.

On to the Columbus Coal Country Railroads

The following sections of this article cover the coal haulage histories of the five major railroads in Columbus. As noted above, these companies emerged from a complex and often contentious sequence of corporate mergers, acquisitions and bankruptcies. Many of these rail reorganizations and consolidations occurred in the several years following the stock market "Panic of 1893," during the 1910s when the federal government began to enforce the antitrust laws more aggressively, forcing railroad holding companies to divest some of their lines, and again following World War I, during which the government had taken over operation of the major rail lines. Some individual lines running to and from the Columbus changed hands three, four or even five times during the peak coal hauling period.

Part I – The Pennsylvania Railroad

Part II – The New York Central Railroad

Part III – The Baltimore & Ohio Railroad

Part IV – The Chesapeake & Ohio Railroad

Part V – The Norfolk & Western Railway

Appendices

Included below in this Introduction are two Appendices briefly summarizing the significant role of Columbus innovators and businesses in development and manufacture of steel coal hopper rail cars and mechanized coal mining equipment. Without the simultaneous advance of high-volume coal extraction and handling machinery, and especially use of electric locomotives, equipment and lighting underground, Ohio coal mines would not have been able to increase production to meet rapidly growing demand in the last quarter of the 19th Century. The advent of vastly more efficient bottom-discharge steel hoppers in the 1890s enabled the railroads to move this surging volume of coal to Columbus markets and on to the north and west.

Appendix I covers the evolution of steel hopper cars, principally between 1895 and 1910, and the role of the Ralston Steel Car Company which operated in East Columbus from 1906-53.

Appendix II focuses on advances in mechanical mining equipment and underground handling and transport of coal, and electrification of mines. The premiere enterprise in this industry for many decades was Jeffrey Manufacturing Co., which grew to be the largest employer in Columbus, and also advanced standards for employee safety and benefits, and became a model for corporate leadership and contribution to the common good of the municipal community. Other substantial Columbus industrial shops that played notable roles in supporting the growth of mining and rail transport included Kilbourne and Jacobs Manufacturing, Buckeye Steel Castings, Timken Roller Bearing and Fritz-Rumer-Cooke.

Appendix I – Evolution of Coal Hopper Cars on Columbus Railroads

The history of coal hopper car fleets on the five major Columbus railroads is set forth in more detail in the individual sections on these rail lines below. From a humble beginning in the 1860s with just a few dozens of primitive wooden gondola cars ill-suited to the task, the Columbus railroads' system-wide fleets of modern steel hoppers eventually reached a combined 250,000 cars during the peak coal haulage era. The rapid evolution of the hopper car, and production of them in mass quantities, was a critical element of the railroads' ability to move vast tonnages of this commodity. Columbus manufacturers were among the key industrialists who met this challenge.

In the early days of railroading, coal was carried in open-top gondola cars. Unloading was slow and labor intensive, generally accomplished by workers with shovels, buckets and wheelbarrows, aided by small trackside cranes. The wooden sides and decks of these cars did not stand up well to constant contact with rough cargo, so car useful life was short. As iron and steel cars began to be built in the 1880s, the design did not immediately change, likely because the volumes of coal shipped did not expand rapidly until the advent of mechanized mining a decade later.

The first significant innovation was installation of hatches on the bottoms of gondola cars to permit gravity discharge in place of manual unloading. Early C&O steel cars had flat bottoms with horizontal discharge doors, and the N&W stuck with this arrangement up through World War I.

50-ton two-bay steel hopper built by Schoen Pressed Steel Car Co., McKees Rocks, PA, in 1898, https://explorepahistory.com/displayimage.php?imgId=1-2-68C

By the mid-1890s, surging coal volumes mandated far more productive car discharge systems.[9] In 1895, the Pennsylvania Railroad built 35-ton wooden class GG cars with featuring "sawtooth" bays with sloping ends and chutes with angled discharge doors at the bottoms. This basic design was transferred to steel and improved with PRR's GLa class hoppers first delivered in 1902. This "twin hopper" arrangement enabled the load to be dumped efficiently between the rails into a receiving bin or conveyor belt feed hopper below. This quickly became the universal hopper design going forward. By 1905, most new hoppers delivered had capacities of 40-50 tons, with two bays. This was followed by three-bay 70-ton cars on the PRR in 1909, and by 90-120 ton, six-axle "battleship gons" on the Virginian and N&W in 1914-17. The latter were not hoppers at

[9] For an excellent short read on the evolution of hopper cars, see David Thompson, "A Brief History of Coal Hopper Cars" (1999) https://appalachianrailroadmodeling.com/a-brief-history-of-coal-hoppers/

all, just big gondolas with no discharge chutes which had to be dumped by being rotated sideways with specialized machinery.

Columbus did its part on the hopper car supply front through Ralston Steel Car Company. In 1906 Ralston took over the former Rarig Steel works located along the B&O right-of-way between Cassady Avenue and of its sharp-angled East Columbus junction with the former Columbus Sandusky & Hocking Railroad (by then the Zanesville & Western). Ralston had patents for a 50-ton "drop-bottom" gondola car with bottom pans which could be gravity-discharged to the side. When the Ralston works reached full capacity, the company routinely delivered 25-30 completed cars per day, but when demand surged, Ralston could produce over 40 cars per day.[10]

A 1907 Ralston drop bottom gondola built for the Z&W

As the 40 and 50-ton sawtooth two-bay hopper quickly became the standard rail industry design, Ralston produced these models in considerable numbers. By the end of World War I, Ralston's hopper orders for numerous railroads and industrial shippers converged on the more typical sawtooth design. The company produced 50, 55, 57.5 and 70-ton hoppers up through its very last years after World War II. Ralston also built a wide array of other hopper designs, including so-called "Vanderbilt" models with external frames and inward-sloping side walls, as well as boxcars, flatcars and many other types of standard American rolling stock.

[10] The Columbus Railroads website has a comprehensive section on Ralston, with many excellent photos and articles. http://www.columbusrailroads.com/new/?menu=06Industry&submenu=10Ralston_Steel_Car_Co

Ralston 50-ton twin hopper delivered in 1908.
Note multiple drop-bottom discharge doors.

Ralston, well-located and always well-managed and financed, prospered with peaks in car orders during both World Wars, and survived the Great Depression. However, due to the flood tide of hopper deliveries to support the war effort demand in the early 1940s, railroads had a surplus of relatively new cars going into the 1950s, and new orders declined. Also several major lines, especially the N&W's Roanoke Shops and PRR's Altoona Works,[11] expanded their own in-house capacities to build standard coal hoppers and proprietary designs. The Roanoke Shops could turn out a hopper every 34 minutes. By 1953, Ralston was no longer economically viable, and shuttered its plant.

Appendix II - Mining Equipment Suppliers in Columbus

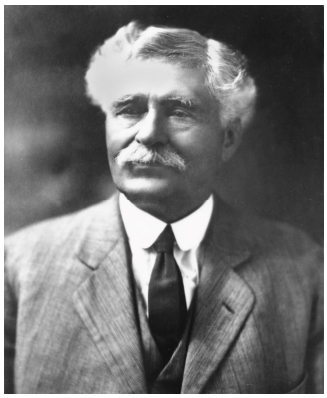
In the decades following the Civil War, being located close to Ohio's coal counties, with excellent rail connections both to mining areas and component and raw materials suppliers to the east and north, and with good banking resources, innovative entrepreneurs and a reliable workforce, Columbus quicky became a manufacturing center for supply and support of the coal mining industry and rail haulage of coal.

The largest mining machinery and technology supply enterprises that emerged in Columbus were Jeffrey Manufacturing Company and Kilbourne and Jacobs Manufacturing. Jeffrey did the most to enable the metamorphosis of Ohio coal mines in the late 19th Century from small local pits with hand-digging and mule-cart transport into massive, mechanized businesses with yearly outputs in the tens of millions of tons.

Through the 1870s, coal mining was a hazardous manual labor process, with miners working tediously for hours to undercut the coal in the seam, following which they would blast and cut out the overhanging coal to be hauled away in carts pushed by men or pulled by draft animals. In 1876, Columbus resident Francis Lechner invented a device powered by compressed air (the electric motor not yet having become available in a form that could be safely used underground)

[11] http://npshistory.com/publications/aih-sw-pa/pa-railroad-shops-works.pdf

to perform this undercutting process mechanically. His Lechner Mining Machine Company displayed a model of this apparatus in a storefront window on High Street, hoping to publicize the concept to attract financial backers. There it was seen by Joseph A. Jeffrey (1836-1928), a junior partner in Sessions Bank (a predecessor to City National Bank) while taking a stroll on his lunch break. Jeffrey, who owned a small share of a Perry County coal mine, was immediately persuaded on the potential for the device, and convinced Sessions Bank to invest.

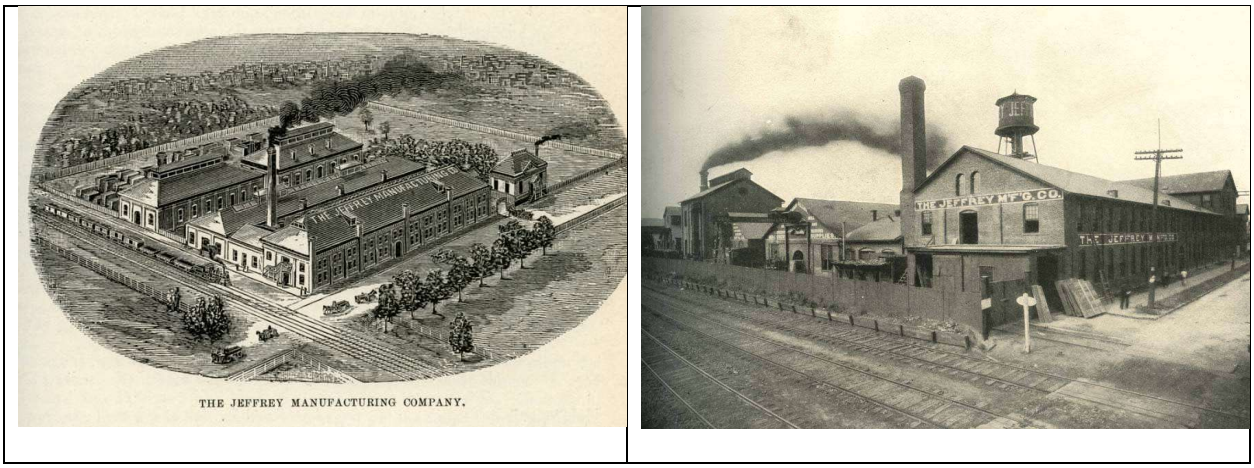


Joseph A. Jeffrey, https://columbusfoundation.org/stories-of-impact/a-beautiful-legacy

Initial trials of the first full-scale working model of Lechner's device at Central Mining Co. in New Straitsville proved unsuccessful, if not outright dangerous. The company's early years during which the awkward cutting machine was refined and improved were challenging, and the enterprise neared insolvency at times. However, by 1887 Jeffrey achieved some steady success, buying out Lechner and changing the company name to Jeffrey Manufacturing Company.

Soon the company had established its manufacturing works on a four-acre site at 274 East First Avenue. By the late 1940s, Jeffrey had grown to 48 acres with 40 buildings, becoming for a time the largest employer in Columbus, with the payroll eventually topping 7,500 workers. The Jeffrey works had its own telephone system and water plant, a cafeteria, grocery and clothing store, an infirmary for workers, and established a building & loan association and disability insurance cooperative for employees. Joseph Jeffrey's sons organized an Ohio National Guard unit for the U.S. effort to pursue Mexican war lord Pancho Villa in 1916, and a Jeffrey employees artillery unit, Battery B of the 37th Division, fought with distinction in France in 1917-18.

Jeffrey's equipment offerings included the first so-called "universal cutting machine" introduced in 1936, which became the coal industry standard for more than a decade. The company designed and built coal crushing machines, and conveyor belt systems for moving coal in mines. Jeffrey also produced materials handling equipment for a variety of other industries including agriculture, lumber mills, food processors and amusement park rides.



Jeffrey Manufacturing Co., 274 East First Ave., Columbus, along the Big Four tracks, looking Southeast, 1901, Columbus Metropolitan Library Collection

Perhaps most importantly from a safety and efficiency perspective, Jeffrey pioneered the first practical electric motor driven cutting machines and locomotives for use in underground mines. Early electric motors produced sparks that could trigger deadly mine explosions. Jeffrey Manufacturing inventor Henry Beecher Dierdorff (1851-1935) developed a method for packing insulation around motors to eliminate the explosion hazard. This quickly led to Jeffrey's introduction of the first safe electric-powered coal seam cutting tool, branded as the Congo Coal Cutter, eponymous of the Congo Mine near Corning, Ohio where it was field tested. Jeffrey quickly followed with electric mine locomotives. Dierdorff eventually was issued 35 patents between 1885 and 1909, mainly focused on spark suppression which enabled mines to be safely electrified and illuminated for the first time.

As Jeffrey expanded, it acquired a number of other companies, including the Ohio Malleable Iron Company (securing a house supply of castings for the Jeffrey business), the Diamond Coal Cutter Company (an English company), and road construction equipment manufacturer Galion Iron Works. Based on Jeffrey's prominence in the mining industry, the first trade show of CONEXPO, the mining and construction industries' largest annual Western Hemisphere event, was held in Columbus in 1909.

Jeffrey Mine Locomotive, Bridgeport Ohio 1922, photo from Ohio Memory Collection

Jeffrey continued to be a major U.S. and international supplier of mining machinery, introducing several lines of big continuous coal loaders up into the 1960s. However, Jeffrey eventually lost market share to more innovative competitors, eventually being eclipsed by Joy Manufacturing. After several slumps and comebacks, Jeffrey was eventually acquired by Dresser Industries in 1974. Ironically, Joe Joy (1883-1957), who founded Joy Manufacturing, was a mechanical engineer with Jeffrey in 1913, but left the company because Jeffrey was not interested in his ideas for designing lighter and more versatile coal loaders which did not require rail track to move and operate. Joy's technology later dominated the field.

Alongside Jeffrey, the pre-eminent industrial concern in Columbus equipment for coal mining and railroads a century ago supplying was Kilbourne and Jacobs Manufacturing Company, established in 1881. Located just south of Jeffrey along the Big Four line but closer to Union Station, this company became the largest manufacturer of earth-moving equipment in the United States in the 1890s and early 1900s. The Ohio State Journal reported in 1890 that the company made some 150,000 hand trucks per year, employing up to 600 workers.

The company's main customer was the New York Central Railroad. Kilbourne and Jacobs was also a major supplier to the U.S. military, especially during World War I. Kilbourne and Jacobs became bankrupt in the 1920s and was bought up by Jeffrey.

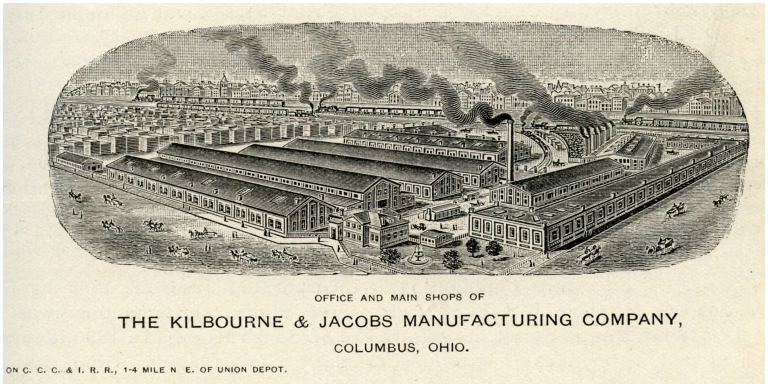


Illustration of the Kilbourne and Jacobs Works, 1892, drawing by Alfred Emory Lee

Kilbourne and Jacobs "V Skip" wagon awaiting delivery to the U.S. Army, 1917 (photo made available by Creative Commons

Other Columbus businesses supplying the coal mining industry in the late 19th and early 20th Centuries were Gill Car Works, Buckeye Steel Castings, Timken Roller Bearing, and Fritz-Rumer-Cooke.

Buckeye Steel Castings was originally founded in 1881 as the Murray-Hayden Foundry at 2211 Parsons Avenue in South Columbus, but changed its name to the Buckeye Automatic Car Coupler Company in 1891, and later to Buckeye Steel Castings. Buckeye became the largest single-site steel foundry in North America, specializing in castings for railway couplers, industrial and mining equipment. It was controlled by Rockefeller family interests from the 1890s until 1908. From 1901-1928, Samuel Prescott Bush, grandfather and great grandfather, respectively of U.S. Presidents George H.W. Bush and George W. Bush, served as general manager and then president of the company. Buckeye was later acquired by Worthington Industries, went through a bankruptcy and emerged in 2002 as Columbus Steel Castings, but was finally shuttered in 2016 following another bankruptcy.

Timken Roller Bearing, which supplied tapered steel bearings and axles for railways and heavy-haulage industrial equipment, opened its works at Cleveland and Fifth Avenues in the Milo-Grogan area of Columbus in 1920. The company was founded in St. Louis 1899 by German immigrant Henry Timken (1831-1909). Timken began his career working for a carriage maker in Missouri and then as a miner in Colorado. He gathered and perfected ideas for improved wheel and axle bearings for wide use in many industries, which he incorporated in an application for a patent awarded in 1898. Timken moved its operations to Canton, Ohio in 1901, to be closer to its principal customers and suppliers, and to make its own steel. The Columbus location was its second major facility, and Timken expanded its shops at the site in 1958. The Timken Columbus plant became a major source for bearings for railroads, mines and other heavy industries vehicles and machines as well as military equipment. Frequently beset by labor conflicts, the Timken Milo-Grogan plant substantially reduced operations in 1986-89, laying off 450 workers, and ceased all operations in 2001. However, the Timken Company has grown into a prosperous global operation with some 17,000 workers, managed by Henry Timken's great grandson.

Fritz-Rumer-Cooke, with its heavy rail construction equipment yard on the T&OC's South Columbus Industrial Track at 635 E. Woodrow, contracted to build track and infrastructure for

railroads, mines and other industries. Originally established in 1879, Fritz-Rumer-Cooke is still in existence as a family-owned business, actively contracting with railroads for inspection, maintenance and construction services. It is among the oldest continuously operating businesses in Central Ohio.