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*THE JACKSON SHAFT COAL, AND THE WELLSTON
COAL OF JACKSON CO.*

BY ANDREW ROY.

The Jackson Shaft coal is the lower bed of the State series. It is not so persistent a seam as those lying above it, but it is widely and favorably known as a furnace coal of great value. It lies in basins or troughs of somewhat limited extent, which seem to have been scooped out of the conglomerate rock and underlying Cuyahoga shale anterior to the deposition of the carboniferous accumulation from which the coal is derived.

This coal is found in its best development in and around the

village of Jackson, 40 to 90 feet below the surface. It was discovered in 1863. A local shaft was put down to test the thickness and quality of the coal. It proved to be 4 feet thick, to belong to the dry-burning family of coals, and it soon attracted the attention of capitalists, among whom was the late Gov. David Tod, of Brier Hill, from whose farm the famous Brier Hill coal of the Mahoning Valley derives its name. Mr. A. S. Kyle, of Youngstown, was one of the first to pronounce favorably upon the iron-making qualities of this coal.

The Jackson Shaft coal extends through portions of Lick, Coal, Liberty, Sciota and Hamilton townships, in an irregular line, for a distance of 15 or 16 miles, its width varying from $\frac{1}{2}$ mile to 4 or 5 miles. It is disposed on a very irregular floor, and is frequently wanting where it is due. It is met above water level in each of the above townships, but is nowhere mined with vigor, except in the township of Lick, in and around the village of Jackson, the county seat.

There are 6 mines in operation in Jackson, all shafts or slopes, varying from 40 to 90 feet in depth. The coal varies from 3 to 4 feet in thickness, and is mainly used in the blast furnaces of the village. Four of the mines have blast furnaces erected in connection with the shafts, and the coal from two of these mines is delivered directly from the shaft into the furnace stock-house. Two mines rely exclusively on shipping for trade. The following are the names of the mines, together with the names of the operators of the same :

<i>Name of Mine.</i>	<i>Name of Company,</i>
Star Shaft.....	Star Furnace Co
Huron Shaft.....	Huron Furnace Co
Tropic Shaft.....	Tropic Iron Co
Globe Slope.....	Globe Iron Co
Kyle Slope.....	Kyle, Shotts & Co
Eureka Shaft.....	J A Long & Co

Four blast furnaces at Jackson, which draw their fuel from the Jackson Shaft coal, are :

- The Star Furnace, supplied from the Star shaft.
- The Huron Furnace, supplied from the Huron shaft.
- The Fulton Furnace, supplied from the Globe slope.
- The Tropic Furnace, supplied from the Tropic shaft.

The Kyle slope and Eureka shaft ship along the line of the Ohio Southern Railroad, reaching out to Toledo, Dayton, Springfield

and other markets. J. A. Long & Co. also send part of the product of their mine, the Eureka, to Ironton, for furnace use,

The first furnace built at Jackson, called the "Orange," was erected in 1863. This furnace has not been in blast during the past 10 years, but is still standing.

The Star Furnace, which was erected in 1866, is one of the most successful of the county. Last year it made a fraction less than 7,000 tons of metal, the daily product of the furnace, when running, being about 21 tons. The average amount of coal used daily was 1,460 bushels, or 58 and $\frac{19}{100}$ tons, besides about $\frac{1}{3}$ of Connellsville coke.

The Star shaft is 50 feet deep; the coal varies from 3 to 4 feet in height, receding below 3 feet on the hills in the mine. The coal is a homogeneous mass. The mine makes a little fire-damp, and has done so ever since it was opened.

Owing to the irregular floor of the coal seam, systematic mining cannot always be followed, the hills and hollows encountered perplexing the mining engineer. Four pumps are used in the Star mine to drain the workings of water, the aggregate capacity of which is 500 gallons per minute, and they are all run day and night. The size of the shaft is 8 x 16 feet, divided into three compartments, two for hoisting and one for pumping and for the ingress and egress of the miners in case of accident.

The Tropic mine of the Tropic Iron Co. was formerly located alongside the blast furnace, but in December, 1879, the workings were inundated with water, the roof having given way in a room driven directly under Salt Creek. The water was pumped out, and the fallen area filled with clay and furnace cinder. In 1880 the roof again gave way under Salt Creek, and the workings were again filled up. The mine was a second time pumped dry, and the course of the creek changed, but the proprietors, dreading accident, abandoned the workings altogether in 1882, and located a new shaft $\frac{3}{4}$ of a mile east from dangerous excavation. The Tropic Iron Co., in thus voluntarily abandoning a dangerous mine rather than run the risk of sacrificing human life by an inundation of water, is deserving of special mention. Such disinterestedness is rare indeed.

This new shaft is 93 feet deep. The workings make fire-damp, though not copiously. The coal is of the same quality and thick-

ness as that of the Star mine, and the floor promises to be equally irregular.

A switch has been built to the new shaft from the Horse Creek branch of the Ohio Southern Railroad, and the mine and furnace are thus connected by railway.

Raw coal is used in the Tropic Furnace in the reduction of ore, 4 tons of coal being required on an average for every ton of iron made. This mine produces coal for the use of the furnace only, the daily product of the mine being 70 tons on the average.

The Fulton Furnace, erected in 1868, is owned by the Globe Iron Company, and receives its supply of coal from the Globe slope, situate half a mile distant. This slope, which was sunk in 1865, had a blast furnace built in connection with the mine, but in 1879 the furnace was burned down and was never rebuilt, and the output of the mine has ever since been used for the supply of the Fulton furnace. The coal is hauled from the mine to the furnace by teams. None of the coal is shipped.

The workings of the Globe mine are irregularly laid out, owing to the depressions and hills which forbid the adoption of symmetrical or systematic plans. The coal falls below three feet on the hills, and swells to four feet in the swamp of the mine.

The Huron shaft, which was sunk in 1875, supplies the Huron furnace with fuel. The furnace and shaft were finished at the same time; the depth of the shaft is 70 feet; the coal is of the same general quality and thickness as the mines already mentioned. No coal is shipped from this mine, it being used exclusively in the furnace.

The two shipping mines, the Eureka shaft and the Kyle slope, do not rely on any of the blast furnaces of the county for a market. The capacity of these mines is about 150 tons per day, but they could be readily raised to a capacity of 250 or 300 tons if the necessities of the coal trade required it. The coal in each mine is good, of the average thickness of the district; it mines in larger masses; it is of inviting appearance, and as a furnace fuel, of good quality, but as a shipping coal the demand for this seam is limited. It contains too large a per cent. of ash to make it a favorite for house fuel or for the generation of steam so long as the finer grade of the Wellston or Coalton bed can be had at the same price.

Along the line of the Ohio Southern Railroad, two and one-half

miles west of Jackson, several mines have been opened in this coal for shipping purposes, but they have been at best but feebly operated. Its average thickness is a little over three feet.

The composition of the Shaft coal in Kyle, Shotts & Co.'s mine is shown in the accompanying analysis, made for the Survey by Professor Lord. The samples were taken by Mr. C. N. Brown from the loaded cars at the mine.

Jackson Shaft Coal (Lord).

Moisture.....	8.57
Volatile combustable matter.....	32.70
Fixed carbon.....	55.43
Ash.....	3.30
Total.....	100.00
Sulphur.....	0.47

These figures represent the seam at its best, and mark a coal of the highest grade. The only drawback consists in the high percentage of water, which is one of the characteristics of the coal.

The Wellston or Coalton coal was discovered in 1872 by the Hon. H. S. Bundy, of Wellston. He was drilling for the Jackson Shaft coal at the time, and was under the impression that it was this seam he had discovered, a view shared by all the practical men of the region. This coal is present in the hills surrounding the village of Jackson, but is quite thin, measuring from 20 to 30 inches. In its progress north and east, it gains in thickness, till at Wellston, 7 miles north-east of Jackson, it rises to 4 feet. It proved, like the Jackson Shaft coal, to belong to the same family, being dry and open-burning, and adapted for furnace use as it comes from the miner's pick. So well assured were the practical furnace men of this region in regard to the quality and open-burning character of this coal, that the Milton Furnace and Coal Company erected their stone coal furnace at Wellston before any practical test of the coal was made.

The Wellston seam extends through the same townships as the Jackson Shaft coal, but covers a greatly larger area, though it is not always met of mineable thickness. The floor of the seam is comparatively level, though arches are occasionally encountered in mining which rise to 25 and 30 feet in height. The coal gradually loses in thickness in ascending these subterranean hills, but it bravely holds on and dips to its normal level without break or want in its continuity.

A branch of the Ohio Southern Railroad, known as the Horse Creek branch, extends from Jackson to Wellston, passing up Horse Creek to Coalton in a northerly course, thence changing to the east along Pigeon Creek. The Toledo, Cincinnati and St. Louis Railway intersects the Ohio Southern at Coalton, thence runs alongside of the Ohio Southern to Glen Roy, two miles east of Coalton. At Glen Roy, the roads diverge, the T. C. & St. L. curving southward. They again converge a mile south of Wellston on the Portsmouth branch of the Cincinnati, Washington and Baltimore Railroad. A branch of the T. C. & St. L. extends from the Wellston to Buckeye Furnace and to the cannel coal mines on Coal Run, in Milton township.

The seat of the coal mining industry of Jackson county is located on the Horse Creek branch of the Ohio Southern Railroad, between Jackson and Wellston, and on the Toledo, Cincinnati and St. Louis road between Coalton and Wellston.

On the Horse Creek road between Jackson and Coalton, there are five different branches or switches on which mines are opened on the Coalton coal, namely, the Price branch, the Springfield branch, and the eagle branch, situate on the west side of the road, and the Chapman branch and Ada branch, on the east side of the road. These branch roads extend up the ravines which open into Horse Creek, and range from 300 yards to one mile in length. The following are the mines and names of operators of the same on the respective branches :

West Side—Price Branch—3 Mines.

<i>Name of Mine.</i>	<i>Name of Operator.</i>
Newport Mine.....	Newport Coal Co.
Price Mine.....	Price Bros.
Carr Mine.....	Jas. S. Carr.

Springfield Branch—4 Mines.

Lively Mine.....	John C. Evans.
Warth Mine.....	Mohler & Kissinger.
Springfield Mine	Springfield Coal Co.
Forest Mine.....	H. L. Chapman.
*Chapman's Mine.....	H. L. Chapman.

Eagle Branch—1 Mine.

Eagle Mine.....	Eagle Coal Co.
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East Side—Chapman Branch—1 Mine.

Chapman Mine.....	H. L. Chapman.
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Ada Branch—6 Mines.

Ada Mine.....	Hall Coal Co.
Slope Mine.....	Mohler & Kissinger.
Wilson Slope.....	Hurd Coal Co.
Indiana Mine.....	Drew & Wasson.
McKitrick Slope.....	McKitrick Bros.
Hurd Shaft.....	Hurd Coal Co.

All the mines opened in the Price, Springfield, Eagle and Chapman branches are drift or level-free mines. On the Ada branch the Ada mine only is level-free. Of the other 5 mines 4 are slopes, and one, the Hurd, is a perpendicular shaft.

The coal is nowhere on this branch more than 30 feet below the surface where the mines are opened.

The average thickness of the coal on these branches is about 33 inches; the thinnest coal being found, as a rule, to the south and west of the belt. As the coal loses in height it seems to gain in quality.

At Coalton, the point where the Ohio Southern and Toledo, Cincinnati and St. Louis railroads meet, nine different firms are mining coal, some of whom have two or three openings in operation. South and west of the village the coal is above drainage, but half a mile west on Pigeon Creek, it plunges under the valley where the old Hamden road crosses the railroad. East of this point all the mines opened in the Coalton or Wellston coal in the county are reached by shaft mining.

The following are the names of mines and operators in the Coalton district :

*This mine is on the main branch

Coalton Mines.

Wilson's Mine	John Hippel.
Hall's No. 1 and 2.....	John Hall.
Morgan & Jones, Nos. 1, 2 and 3.....	Morgan & Jones.
Kelley Mine.....	Kelley Coal Co.
Western.....	Western Coal Co.
Sterling	Sterling Coal Co.
Southern Ohio, 1 and 2.....	S. O. C. & I. Co.
Garfield Mine.....	Garfield Coal Co.
Cannel Bank.....	Adam Scott.

The cannel mine as its name indicates, is opened in cannel coal.

The cannel appears here as a local deposit of only a few acres in extent. It is the Coalton seam, locally replaced by a formation of cannel. Sometimes the whole seam appears as cannel, but gener-

ally the lower part of the bed retains its bituminous character, about one-half being cannel and one-half ordinary Coalton coal. On the opposite side of Pigeon Creek and in the mines opened above and below the cannel bank, the cannel is absent.

A mile north-east, however, the cannel comes in again and spreads, itself over an area of several square miles, but it is, so far as known, of very inferior quality, being in fact nothing more than bituminous shale. A foot of the lower part of the seam is, however, bituminous coal of good quality.

The average thickness of the Coalton mines is a little less than 3 feet; occasionally the seam swells to 4 feet, and sometimes it recedes considerably below 3 feet.

At Glen Roy, two miles east of Coalton, the point where the two railroads diverge, 4 mines are opened. The mines now in operation are:

Glen Roy.....	Glen Roy Coal Co.
Standard.....	Standard Coal Co.
Emma.....	Emma Coal Co.
Acorn.....	Jones Coal Co.

These are all shafts varying from 50 to 90 feet in depth. The height of seam in the Glen Roy mines varies from 3 to 3½ feet.

The coal is well under cover in this field, and is nowhere cut out by ravines.

Two miles north of Glen Roy the seam runs into a bastard cannel or bituminous shale, and two or three miles south it seems to be replaced by the same material near the village of Berlin. A mile or so south of Berlin, it recovers itself again, having been found of good mineable height in a hole bored on the lands of Samuel McGhee on the Ironton branch of the T. C. & St. L. R'y. It is here 117 feet below the surface, and was reported to exceed 4 feet in height.

There are 10 mines in the Wellston district, viz.:

<i>Name of Mine.</i>	<i>Name of Operator.</i>
Wellston, No. 1.....	Wellston Coal & Iron Co.
Wellston, No. 2.....	Wellston Coal & Iron Co.
Milton.....	Milton Furnace & Coal Co.
Eliza.....	Eliza Furnace Co.
No. 3.....	Southern Ohio Coal & Iron Co.
Fluhart's.....	Theo. Fluhart & Co.
Meadow Run.....	Meadow Run Coal Co.
Comet.....	Cin. Consol. Coal Mining Co.
Center Valley.....	Drew & Wasson.
Murphin's.....	Murphin & Co.

The above are all shaft mines, varying from 50 to 100 feet in depth. The coal is of an average thickness of three feet nine inches, occasionally falling to three and one-half feet and rising to four and one-half feet. The most easterly mines contain the thickest coal.

The Wellston Coal and Iron Co., the Milton Furnace and Coal Co., and the Eliza Furnace Co. have blast furnaces along side of their mines, which receive their supply of coal from this seam. The Wellston Coal and Iron Co. have two blast furnaces, both located at their No. 1 shaft. These mines in addition to furnishing coal for their respective furnaces, ship considerable coal over the Ohio Southern and the Cincinnati, Toledo and St Louis Railroads. All the other mines of the district rely exclusively upon shipping.

All the coal of the Wellston or Coalton district, in which there are 41 mines in operation, is drawn from the same vein. The coal is remarkably uniform in character and thickness. As will be observed, in following the line of mines from Jackson to Wellston, the seam gradually gains in height, rising from $2\frac{1}{2}$ at Jackson to 4 feet at Wellston. At the south-west end of the region the coal is noted for the small amount of ash it contains—frequently less than 2 per cent. of the whole. To the north and east, as the coal thickens, the amount of ash increases to 5 and 6 per cent.

The seam is a homogeneous mass, and is met under a firm cover of blue shale which forms an excellent roof, and is underlain with a soft, fire-clay floor. West of Wellston the roof shale is replaced by a massive bed of sandstone over a considerable area; and at the Murphin mine the sandrock has cut down into the coal, forming a horseback. With the exception of this fault, which is merely local, no other mining trouble has yet been encountered in the region.

This coal is of a rather tender nature and is not fitted to bear a heavy burden in the furnace. In the process of mining, fully two-fifths of the coal is converted into nut and slack. This large per cent. of nut and slack, however, is not all made by reason of the tender nature of the coal, part of it being the result of the unskillful manner in which the seam is mined. The operators of the region exercise no concern in regard to the practical skill of their miners, in employing them, as the nut coal for which the miner is paid nothing, is of nearly equal value in market to the lump coal. It

is to the miner's interest to make as much round or lump coal as possible, as he is paid for lump only, but unskillful workmen never succeed in turning out as large round coal as the trained miner, accustomed to underground life from early boyhood. Of late years the art of digging coal has degenerated in Ohio, more reliance being placed upon blasting-powder than formerly. Coal is often blasted out of the solid and shattered into small pieces, in a reckless and shameless manner, without any excuse save that of the carelessness of the miner.

The aggregate annual capacity of the mines of the county is 1,200,000 tons; the product of the mines for 1883 has been estimated at a little over 400,000 tons. During the summer months there is a great falling off in the trade.

This coal has been rapidly finding a market in competition with our best Ohio and Pennsylvania coals in all the great coalless regions west and north. Last year it was successfully introduced on the lake (Erie) as a steam coal, 30,000 tons being used for this purpose; during the present year the lake trade will double that of 1883.

At several of the mines three grades of coal are made, viz., lump, nut and pea. The size of the screens is: for lump coal, $1\frac{1}{4}$ inches space between screen bars; for nut coal, $\frac{1}{2}$ inch between screen bars; the pea coal is made by screening the refuse or slack, which is raised into a revolving circular screen by a self-loading elevator and sifted of fine or dust coal, the fine coal falling back to the ground, whence it is hauled away as refuse.

As the coal seam is remarkably free from impurities of every kind, the nut and pea coal of this county has no superior and perhaps no equal in Ohio or adjoining States.

The composition of the Wellston coal is shown in the following analysis made for the Survey by Professor Lord. The sampling was done in all instances by Mr. C. N. Brown:

Analysis of Wellston or Coalton Coal (Lord).

1. Wellston Coal and Iron Co., shaft No. 2.
2. Southern Ohio Coal and Iron Co., Coalton.
3. H. L. Chapman's New Mine, Section 9, Lick township.

	1.	2.	3.
Moisture.....	8.57	7.46	8.89
Volatile combustible matter	36.40	36.40	34.03
Fixed Carbon.....	51.39	54.97	52.60
Ash.....	3.64	1.17	4.48
Total.....	100.00	100.00	100.00
Sulphur	0.61	0.68	0.96

It will be seen that the high reputation of the Wellston coal is fully justified by the results of chemical analysis.

The Manner of Mining.

The mine shafts of the county are rectangular in shape; they are generally made 8x16 feet. None of the shafts exceed 100 feet in depth; the cost of sinking does not usually exceed twelve dollars per foot. The drift or clay material down to rock or shale is timbered with plank three to six inches thick, laid skin-tight. The underlying walls of rock or shale stand in place without support.

The horse-gin is generally used for hoisting the debris of the shaft; little water is encountered, and with three good workmen in the pit at once, in shifts of eight hours, an average of three feet in twenty-four hours can be excavated. Greater headway is made in slate than in sandrock, as the former blasts better, and the sides of the shaft are more easily dressed. After the coal is reached, subterranean work is suspended until the hoisting machinery is raised. The shaft frame is made of 10-inch timbers, 32 to 36 feet in height; it consists of four timbers, planted one at each corner of the shaft; the landing for delivery of the loaded cars is made 22 to 23 feet above the mouth of the pit; the pulley wheels are placed on top of the frame; the tibble is 27 to 35 feet from the landing; the hoisting engine is usually set on the side of the shaft opposite the tibble within 10 feet of the shaft mouth; sometimes it is located at the end of the shaft.

A great variety of hoisting engines are used. Double engines are preferred to single ones. Crane Brothers' hoist and safety cage is, perhaps, the best and safest. A single flue boiler suffices for the generation of steam to do the hoisting and pumping. All the pits

have double hoisting compartments; a loaded car being raised on one side as an empty one is lowered on the other side. The hoisting compartments occupy 12 feet of breadth, leaving 4 feet, which is set apart for pumping water and frequently for an upcast ventilating compartment, the exhaust steam from the steam pump at the bottom of the shaft rarefying and giving motion to the upward current. The engine house, shaft and dump house are enclosed under one building. A hopper set of weigh scales is placed at the end of the screen, and the lump coal in passing over the screen is caught in the hopper and weighed before it is delivered into the railway flats.

None of the shaft mines, except the Corse slope of the Southern Ohio Coal and Iron Co., have costly or elaborate machinery or other arrangements for lifting and dumping coal. Ten thousand (10,000) dollars will fully equip a shaft mine, including the cost of sinking, as mines are operated in Jackson county.

The weight of loads raised through the shaft is from 1,000 to 1,800 pounds. Three hundred tons per day, at the best regulated shaft mines, constitute the shipping capacity of lump coal.

The slope mine of the Southern Ohio Coal and Iron Co., which has very costly and elaborate arrangements for handling coal, has a capacity of 600 tons per day.

Two plans are followed in working the mine, one by driving double entries, and the other by driving single entries. Only those mines in which the height of coal reaches four feet, work by the double entry plan, and not all of them do so. The new mine of the Wellston Coal and Iron Co., the Corse mine of the S. O. C. & I. Co., Fluhart's mine, the Center Valley mine and part of the workings of the Milton Furnace mine, all in the Wellston district, work by double entries. The parallel entries, each 8 feet wide, have a pillar 3 to 4 yards in width left between them, which is cut through every 40 yards or less for air. The rooms are driven 70 to 80 yards, and extend both north and south, meeting in the middle. They are made 8 yards wide, a pillar of 3 to 4 yards being left between them for the support of the superincumbent strata. Break-throughs are made between rooms at intervals of 25 to 30 yards.

In the Cqalton district, instead of driving double entries, one wide entry is made, and the material which is shot out of the roof

to make height for the hauling roads, is built up on one side of the track, leaving a hollow space next the pillar to serve as an air-course. By this plan a saving is had in entry driving, and the air is made to play along the entry face at all times. As a temporary expedient this plan does very well, but after a few months the loose building of shale begins to settle and the air to leak.

Where single entries are driven, doors are placed at the mouths of rooms and break-throughs are made between rooms as soon as they are turned, for the purpose of getting forward air. These doors are never air-tight at best; they are frequently left open by the carelessness of the miners themselves, and bad air is found at the working faces of the mine.

The system of working with double entries, if systematic perfection in ventilation be desired, is greatly to be preferred over single entry work; but the latter method is cheaper than the former, and economy in mining has too often the first claim upon the managers of mines, as against the health and comfort of the miners.

In the majority of the mines of Jackson county, the undermining or holing is made on top of the coal. This part of the seam is tender and friable, and is more rapidly cut than the bottom part of the bed, which in many of the miners' working places is a hard, unyielding bone coal. The undermining is made four to five feet deep, and powder does the rest; powder, in fact, is too often used to do the undermining also; though always unwisely. Three shots are ordinarily required to a room of eight yards in width—one center and two rib shots.

In the four-foot coal mines mules enter the rooms and haul away the coal. Where the seam is less than four feet, pushers, consisting of active young men, are employed to push the loaded cars from the room faces to the hauling roads, on the entries. These hauling roads are made four-and-a-half to five feet in height above the rail, a foot or so of the roof being blasted out for this purpose. The roof in the rooms is never ripped, no matter how low the coal may be. A mule takes four to six loaded cars with ease along a well laid and properly graded track. One of these animals, four-and-a-half feet high, will haul 20 tons per day over roads a mile in length. A pusher will push 12 to 15 tons, the amount of coal moved depending on the distance from the working faces of the miners to the hauling roads of the mules.

The main roads of mines are laid with "T" Iron, 8 and 12 pounds to the yard, the 8-pound rail being chiefly used in the yard coal mines and the 12-pound rail in the four-foot mines. Wooden rails are used in all the rooms; they are often made of scantling, 2x4 inches, laid flat ways and nailed down on cross-ties, 1x6 inches, made of oak plank.

The width of the track varies from 2 feet 8 inches to 3 feet 3 inches, according to the taste of managers.

The miners in the coalton district are paid 5 cents per ton more for digging than in the Wellston district and at Jackson, the price in the latter districts being the same as that of the great iron region of the Hocking Valley. The prices ruling during the past two years at Wellston were 80 cents in winter and 70 cents in summer. An average of 22 cents per ton in addition to the price of digging is required for the payment of day men, that is, haulers, pushers, tracklayers, dumpers, weighmaster, etc., etc.
