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THE SEMI-CENTENNIAL OF THE PENNSYLVANIA RAILROAD.

BY J. ELFRETH WATKINS, C. E.

On the 15th of April, fifty years ago, the Governor of the State of Pennsylvania, the Canal Commissioners and members of the Legislature embarked on a canal boat from Harrisburg bound for Columbia to take part on the morrow in the formal opening of the railroad from Philadelphia to Columbia—the first link in the great chain of the present Pennsylvania system. That was the humble beginning of what has grown to be the giant corporation of the world, whose lines tap thirteen States—whose main tracks would extend from its eastern terminus, across the Atlantic through Europe, to the boundary of the Chinese Empire; or westward, across the continent and the Pacific, almost to Japan; whose second track, sidings, etc., alone would reach across the continent and over 1,000 miles into the Pacific—whose cars and engines made up in a single train would reach from the western boundary of Pennsylvania, across New Jersey, to the Atlantic ocean; to replace the timber under whose main tracks and sidings (allowing three cross-ties to the stump) would consume a double row of trees ten feet apart on each side of the Missouri from its source down the Mississippi to the Gulf—whose employés, if placed side by side, would form a rank reaching from Philadelphia to Trenton, and the iron and steel contained in whose tracks, bridges and cars, etc., would make a shaft six inches in diameter and long enough to extend from pole to pole upon which the world could turn.

This is the growth of half a century of the road, whose gross receipts average nearly \$12,000 per hour—and whose net earnings would pay 2½ per cent. interest on the national debt.

It will be remembered that the Pennsylvania Railroad and Canal, from Philadelphia to Pittsburgh, was constructed and operated for about twenty-five years by the Commonwealth of Pennsylvania, remaining under the control of that State until 1857, when it was finally purchased by the present corporation.

The line from Philadelphia to Pittsburgh, as originally designed and constructed, was composed of

- 81.6 miles of railroad, from Philadelphia to Columbia;
- 172.0 miles of canal, Columbia to Holidaysburg;
- 36.7 miles of Portage Railroad, from Holidaysburg to Johnstown;
- 104.2 miles canal, from Johnstown to Pittsburgh;

- 394.5 miles in all.

EARLY HISTORY.

The industries of the State of Pennsylvania, which had, in common with the other Eastern States, slumbered during the war of 1812-15, began to revive soon after peace was declared, and the importance of better means of communication between the interior of the State and the seaboard became apparent.

As early as 1808 New York had taken the initiative steps by which that Commonwealth became the pioneer State of the Union in the construction of a great public work, the Legislature appointing a commission to consider the advisability of connecting the waters of the Hudson with those of Lake Erie.

At that time the railway for general purposes was an untried experiment in America, and in England only a few short colliery roads had been built. Nevertheless, the possibilities of the future had already dawned upon at least one American citizen, namely, John Stevens, of Hoboken, who opposed the construction of the Erie Canal and advocated a railroad, and, becoming involved in a discussion with the New York Commissioners, in 1812 published a pamphlet* containing his correspondence with them, in addition to a vigorous memorial which set forth "The advantages of a railway over canal communication." (About five years afterward Mr. Stevens memorialized the Legislature of New Jersey, advocating the construction of a railroad from New Brunswick to Trenton).

While there were some who believed that a railroad was practicable the vast majority regarded it as a wild and visionary scheme. Among the latter were the New York Commissioners, and work on the Erie Canal was formally commenced on the 4th of July, 1817, and the canal being completed and opened over its entire length of 363 miles, October, 1825. About the same time work on the "Union Canal" of Pennsylvania, which had been abandoned for several years, was renewed, this canal being completed and opened for use in 1824, and that of the Lehigh Navigation Company, from Easton to Mauch Chunk, shortly afterward.

Both of these canals did much to develop the trade in anthracite coal, which had been introduced only a short time before.

The advantages and disadvantages of a railroad had been discussed for some time by the press of Pennsylvania and in the Legislature at Harrisburg, but no decided step was taken until 1823, when the Pennsylvania Legislature passed "an Act to incorporate a company to erect a railroad from Philadelphia to Columbia in Lancaster County," (approved March 31, 1823), which recites that it was enacted in consequence of a memorial by John Stevens. This act constituted John Conolly, Michael Baker, Horace Binney, Stephen Girard, Samuel Humphreys, Emmor Bradley, Amos Ellmaker, John Barber and William Wright, "the Presi-

* This pamphlet, originally published by T. & J. Swords, New York, has recently been reprinted by the *Railroad Gazette*.

dent and directors of the Pennsylvania Railroad Company : it provided for the location of the route under certain restrictions ; it must not be more than forty feet wide ; must not pass through any burial ground nor church, nor through any house without the owner's consent, nor be located on any turnpike road ; must in no part of it rise above an angle of two degrees with the plane of the horizon ;" and it expressly directed that when it was completed transportation over it should be conducted under the superintendence of John Stevens. The company was authorized to charge seven cents per ton per mile on freight carried westward, and three and a-half cents on that carried eastward.

Although Messrs. Stevens, Girard, Binney, *et al.*, had succeeded in getting their act passed they received no tangible encouragement either from the State or from capitalists, although earnest efforts were made in that direction.

John Stevens, who as early as January 5, 1821, had written an open letter to Robert Wharton, Mayor of Philadelphia, in regard to the matter, was particularly zealous in his labors, but the citizens of Pennsylvania could not be aroused to the importance of the scheme. Their failure to encourage the undertaking led to the publication and distribution of a public letter by Mr. Stevens later, in 1823, which, considering the fact that no railroad for general purposes was in existence anywhere, is a fit supplement to the Stevens pamphlet of 1812, and entitles its author to be held in grateful remembrance by those for whose interests he labored so earnestly.

The following is a copy of it :

“PHILADELPHIA, 1823.

“SIR : It is now generally admitted that a railroad is not a mere visionary project, but is actually practicable. An erroneous idea has, however, prevailed among its opponents that it is only practicable to short distances, and that the contemplated extension of a railroad to a distance of seventy-three miles is ridiculous.

“As the railroad will, throughout its course, be in its construction exactly similar, it is only in its deviations from a horizontal line that any difference in the progressive motion of carriages thereon can take place. The charter contains a provision that the railroad in its progress shall in no part rise above an angle of two degrees with the plane of the horizon.

“Now let us suppose that a section of the intended railroad be constructed in the immediate vicinity of the city, of one mile in extent, in the progress of which elevations of two degrees do actually occur. Should it, however, be practicable on such section of the intended railroad to cause loaded carriages to move forward and backward, without encountering any impediment or difficulty, would it not be fairly presumable that the effect would be precisely the same were a similar road to be extended ever so far? Such an experiment, then, would not fail to produce conviction in the minds of the most incredulous.

“As a further illustration of the practicability of the proposed railroad, it would be barely necessary to notice the rapid progress this important improvement has recently made in the Island of Great Britain. If in the narrow limits of twenty-one miles in length and twelve miles in breadth, in the immediate vicinity of Newcastle, no less than 450 miles of railroad have within a very short period of time been formed, why

should it not be practicable to erect one extending only seventy-three miles? The contemplated formation of a railroad from Manchester to Liverpool, between which large towns there now exists a spacious canal, demonstrates very forcibly its feasibility and great utility.

"The expense of the contemplated railroad is estimated at about \$5,000 per mile. One thousand shares, then, at five dollars each, would be sufficient for the construction of one mile of the road.

"An appeal is now therefore made to the enlightened patriotism and to the enterprising spirit of the good citizens of Philadelphia to step forward, and, by an advance of five dollars each, to place the contemplated improvement beyond all possibility of doubt or uncertainty.

"That the stock will, from the start, yield more than legal interest, there cannot be a shadow of a doubt. That it will ultimately, and at no distant period, yield 12 per cent. per annum is equally certain.

"The contemplated railroad will differ from turnpike roads in these very important particulars: The actual expense of transportation on the railroad will be reduced to one-quarter to what it now is on the existing turnpikes. But the most essential point of difference, as it regards stockholders, is that the whole of the emoluments to be derived from the transportation of commodities, and from the conveyance of passengers, will go to the railroad company, whereas the turnpike company receives only a toll. The expense of repairs will bear no proportion to that incurred on turnpike roads. The railroad, too, will be equally good at all seasons of the year. This circumstance gives to a railroad a decided superiority also over a canal, which continues for months, during the winter season, locked up by frost.

"But when, in the progress of improvement, the power of steam shall be substituted for that of horses, transportation will most assuredly be afforded at much less than on a canal. However extraordinary this opinion may appear, by a recurrence to calculation it is, nevertheless, capable of demonstrative proof. And when this great improvement in transportation shall have been extended to Pittsburgh, and thence into the heart of the extensive and fertile State of Ohio, and also to the great western lakes, Philadelphia may then become the grand emporium of the western country.

"Should the subscription for the shares be speedily filled, the road from Philadelphia to Columbia may with ease be finished before the next winter, and thus the stockholders will derive an immediate interest on their stock.

"I am, sir, your obedient servant,

"JOHN STEVENS."

No comment is needed upon this remarkable paper, which is a fitting supplement to the pamphlet issued eleven years before.

Colonel Stevens' efforts in this direction shared the same fate in Pennsylvania as in New York, and although he made diligent efforts to excite popular opinion in favor of his project during 1824 and 1825, he was unable to raise funds even to build one single mile of road as an experiment, although only \$5,000 were required. The Legislature of 1826 repealed the charter, although the seed then sown was to bring forth good fruit.

Had Colonel Stevens been able to carry out his plans the Pennsylvania Railroad would have been the pioneer railroad on this side of the Atlantic.

The success of canals abroad and of the Erie Canal, a portion of which was then in operation, led the Legislature to pass an act on the 27th of March, 1824, "Providing for the appointment of a Board of Commissioners for the purpose of promoting the internal improvement of the State."

This Commission met with the same difficulty in obtaining the services of a competent engineer as was afterward experienced by the Baltimore and Ohio and other railroads, for at a subsequent meeting in May the president reported to the board, "That he had made most diligent search and anxious inquiry after an engineer," without success. The work was, however, carried on without a "competent engineer," the board in one of their subsequent reports stating, "We have found by observation and experience that purchasing the proper instruments, and encouraging active men who have some general acquaintance with science to use them, is the most effectual method for the State to get a proper corps of civil engineers."

On the 11th of April, 1825, an act was passed repealing former acts and providing for the appointment of five Canal Commissioners, "to consider and adopt such measures as they shall think requisite and proper, preparatory to the establishment of a navigable communication between the eastern and the western waters of the State and Lake Erie," and several routes of all *water* communication were surveyed.

The discussion between the advocates of the railroad and canal in Pennsylvania continued, and the general subject of intercommunication became to be regarded of such importance that "The Pennsylvania Society for the Promotion of Internal Improvement" was organized in November, 1824, with a membership of forty-eight public-minded citizens, who paid an initiation fee of \$100 and annual dues of \$10 each. Among the objects for which the society was organized was "To open an entire and complete communication from the Susquehanna to the Allegheny and Ohio rivers, and from the Allegheny to Lake Erie."

The society, impressed with the importance of the subject, went actively to work, and at a meeting held on the 19th of January, 1825, decided to "send an agent to Europe to collect information of all the valuable improvements in canals, roads, railways, bridges and all other information calculated to promote the objects of the society."

At a meeting of the society held February 3, 1825, William Strickland, of Philadelphia, with Samuel Kneass (his pupil) were assigned by the society to the important mission, and on the 20th of the following month they sailed.

In addition the attention of the society was directed to the publication of papers showing the usefulness of canals and railroads. These labors were immediately successful—their papers were read with interest—and through the efforts of Gerard Ralston, their corresponding secretary, the attention of distinguished men in all parts of the East was called to the importance of a liberal and extended encouragement of public works.

On the 16th of June Mr. Strickland completed his first report on railways and locomotive engines, and forwarded it. This report was followed on the 28th of July by a report on canals, and on the 3d of August by a paper on turnpikes.

As Mr. Strickland's reports were published and widely read by those interested, their influence upon the minds of those who were about to engage in canal and railroad construction cannot be estimated.

The battle between the friends of the railroad and the canal was waged with much earnestness during the early part of Mr. Strickland's absence, as the following extract from the correspondence between the Pennsylvania Society for Internal Improvement and its agents will show.

"Extract from a letter addressed to William Strickland, Esq., on September 19, 1825 :

"*Canals and railways* present the most important of all subjects for your attention. Upon every matter connected with both you will be expected to be well informed; and if you shall have to decide between them you must be able to furnish the facts and circumstances by which the decision shall be produced. Much excitement prevails in this State upon the question whether railways are superior to canals, and the inquiries that are in progress in relation to them are in the hands of men of ingenuity and well disposed to the cause of internal improvement. It is, however, feared by many that the question between canals and railways will have an injurious influence in Pennsylvania, as it will divide the friends of the cause of improvement, and thus postpone, if not prevent, the commencement of the work. The importance of correct information in relation to them is thus greatly increased."

Mr. Strickland shortly afterward returned to Philadelphia, and in 1826 his "Reports," profusely illustrated by large and handsome plates, were issued. In March, 1826, he was appointed Engineer of the proposed canal from Middletown to Holidaysburg, and he prepared a general map and estimate of its cost. Ground was broken for it July 4, 1826, and the work was soon put under contract. Previously the project of connecting this canal by a railroad with the Delaware river had not been thought feasible; and in the spring of 1827 surveys were completed for a canal, which was put under contract October 13 of that year, and work was begun at Bristol and Easton. De Witt Clinton, Jr., of New York, was appointed engineer of the Western or Juniata section, and Major John Wilson, who had been an officer of the Corps of Topographical Engineers, U. S. A., and "Chief Civil and Military Engineer of the State of South Carolina," was assigned to the surveys between the Delaware and the Susquehanna. He made careful surveys, beginning at Valley Forge on the Schuylkill, nineteen miles above Philadelphia, through the Chester Valley, Downingtown and Coatesville to the gap at the summit of Mue Ridge. Having decided that this route was impracticable for a canal, in accordance with his instructions he began to make surveys and estimates for a railroad from Philadelphia through Chester and Lancaster counties to connect with the Eastern Division of the Pennsylvania Canal. These were completed November 29, and he presented his reports to the

board December 17, 1827, and an approximate estimate January 12, following.

March 24, 1828, just five years after John Stevens had succeeded in getting his act passed, the Legislature passed an act "to provide for the commencement of a railroad" to be built by the State, and in April Major Wilson began the location of the Philadelphia and Columbia Railroad, with a corps of twelve men,* at Columbia. A report on the twenty-nine miles from Columbia to the summit of Mine Ridge was made August 15, and one on the remainder of the line December 1. In April, 1829, the work was put under contract.

THE PHILADELPHIA AND COLUMBIA RAILROAD.

The eastern terminus of this road was at the corner of Broad and Vine streets in the city of Philadelphia, whence the road extended in a straight line to Callowhill street; here the road curved to the northwest and passed on to the old "Pratt's Garden," where it entered a cut seventy feet deep, excavated for a canal in 1792, and afterward abandoned; the line then followed the bed of this old canal slightly altered, and crossed the Schuylkill river below Peter's Island on a wooden bridge 1,045 feet long, seven spans, the abutments and piers of solid masonry.

On the west bank of the river was the foot of an inclined plane 2,805 feet long, rising 187 feet straight and uniform in grade; the line then continued up the dividing ridge for some distance, thence descending into the valley of Chester county and through Downingtown and Coatesville to Lancaster, thence to the head of the inclined plane at Columbia, descending ninety feet in a length of 1,720, thence along the Susquehanna to the basin at the termination of the Pennsylvania Canal, the total length of the road being 81.6 miles.

There are thirty-one viaducts and seventy-three stone culverts on the line.

The contract for bridging and grading forty miles of the road (twenty miles at each end) was given out in April, 1829, and by January 1, 1830, a large portion of the work was completed. The Legislature of 1829-30 made no appropriation for the further prosecution of the work, and during 1830 everything came to a standstill except the completion of what remained unfinished of the contract given out. This condition of affairs continued until March, 1831, when a large appropriation was made by the State, and the work was resumed, the contracts being awarded in May for grading and bridging the remaining forty-one miles. Track-laying was proceeded with as fast as the grading was ready.

*There were some men who afterward became eminent in this corps, which were: Joshua Scott, principal assistant; Robert Pettit and John Edgar Thompson, assistant engineers; John P. Baily, Samuel W. Mifflin, Wm. Hasell Wilson, J. Brinton Moore, rod-men; Wm. J. Lewis, Wm. W. Torbert, John G. Davis and James Moore, chammen.

SUPERSTRUCTURE.

The combination of the strap-iron rail and granite stringer in use on the Baltimore and Ohio Railroad, and which was thought to possess great merit, was adopted at first for a few miles by the engineers of the Philadelphia and Columbia road.

About six miles of track were laid with it before its demerits were fully understood. The strap-iron rail two and one-half inches by five-eighths of an inch was, however, placed nearer the middle of the stringer than on the Baltimore and Ohio.

The stone stringers were from three to twelve feet long, twelve inches deep and twelve inches wide, and rested upon a layer of broken stone laid in a longitudinal trench two feet wide and cut ten inches below the bottom of the sill. The spikes which held the rail were driven into locust plugs, which were put in holes five-eighths of an inch in diameter and three and one-half inches deep. The bars were fifteen feet long, and a horse-path of gravel and broken stones six inches deep was made between the tracks.

On the remainder of the line rolled "edge rails" were adopted. They were in lengths of fifteen feet, being three and one-half inches high, and weighed about forty-one and one-quarter pounds to the yard, costing \$50.50 per ton delivered at Philadelphia. The chairs weighed fifteen pounds each, and each wedge about ten ounces. All the track material was imported from England, where it cost £6 17s. 6d. per ton. These chairs were either supported by stone blocks twenty inches by twelve inches or twelve inches, or stone stringers twelve inches deep, or upon wooden cross-ties laid on longitudinal sleepers.

* The length of the single track, exclusive of sidings and crossings, was 163.2 miles, of which six miles were laid with granite sills plated with strap-iron; eighteen miles with wooden stringers similarly plated; and the remainder was stone blocks and edge rails, having cross-ties at intervals of fifteen feet. On two miles the cross-ties were of stone and on the remaining distance of wood.

Different portions of the road were operated as fast as built for construction purposes. On the 20th of September, 1832, a single track about twenty miles long, from the head of the incline plane on the Schuylkill to the junction of the West Chester Railroad beyond Paoli, was opened for travel. The whole road from Philadelphia to Columbia was formally opened in the presence of the Governor and members of the Legislature April 16, 1834.

EARLY LOCOMOTIVES.

Although the original design in making horse-paths was generally carried out, in 1832 Col. Stephen H. Long of the U. S. Topographical Engineers, who, in March, 1830, had been appointed by the Board of

Canal Commissioners to make a survey and examination of the different routes for crossing the Allegheny Mountains, having concluded his labors in that direction, was residing in Philadelphia, and became interested in experiments with locomotives, William Norris being associated with him.

In 1833 they constructed the first engine that ran on the road. It was called the "Green Hawk," and from what can be learned was not very successful. Their second engine, the "Black Hawk," was some improvement over the first, and they then constructed the third, which had no name, but was dubbed by the workmen the "Tomahawk."

These engines were frequently experimented with near the eastern terminus of the road. They were regarded as great curiosities, and invitations to accompany the inventors on the trial trips were eagerly accepted; but as it had been decided at that time to use horse-power on the road, no locomotives were purchased by the State previous to 1834.

Messrs. Long and Norris afterward established a locomotive manufactory at Bush Hill, and built engines for several of the roads in the neighborhood. Shortly after the road was opened, Mr. Baldwin's successor with the "Ironsides" on the Germantown road, and the "Miller," built for the Charleston and Hamburg road of South Carolina, led the Commissioners to order a locomotive, and in June 1834 the "Lancaster," weighing 17,000 pounds and having six wheels, was completed and delivered to the road for service. This was the first engine that went into regular service on the Pennsylvania Railroad.

The *American Railroad Journal* of March 21, 1835, speaking of this engine, says:

"The passenger cars on the Columbia Railroad are propelled by a locomotive engine. The trip from Philadelphia to Columbia, eighty-two miles, is made in about six hours, and it is believed that it will soon be made in four hours."

The experiments with this engine were so gratifying to the State Board of Commissioners that they decided to use steam locomotives, and by June 1, 1835, nine engines were at work on the road.

The following is from the *American Railroad Journal* of June 20, 1835:

"There are seven of these Baldwin engines at work on the Pennsylvania State Road, on which they also have two English engines from the workshop of the most celebrated maker, R. Stephenson. The engineer who had charge of the locomotive department on this road informs me that the power of the American engines is 35 per cent. greater than that of the English.

"The Pennsylvania Road is almost a continuous series of curves, varying from 500* to 700 feet radius, and so severe is it upon the wheels of an engine that one of the English engines, the other having been out of repair most of the time, has, within two months, used up a part of the wheels on both engines."

* The minimum radius of curvature when the road was constructed (for horse cars) was 631 feet.

By the end of the year 1835 the company had purchased seventeen locomotives, four of which were constructed in England by Stephenson & Co.

When the road was first opened it was operated as a public highway. Individuals and transporting firms owned the horses and cars. The latter were made of every conceivable size and shape, their capacity being from three to four tons. The drivers were rough fellows, and often gave great trouble through their stubbornness. No time-tables were then in force, and while only a single track of the road was being operated they often gave much annoyance.

The right of way was determined by the following rule: Half-way between the turnouts, which were one and one-half miles apart, a large post (called the center post) was set up, and when the drivers on single track met between turnouts, the one who had passed the center post had the right to go on and the other was compelled to go back.

As the road was so crooked that the drivers could not see far ahead, each would drive slowly after leaving the turnout, for fear he might have to be turned back. As he approached the center post he accelerated his speed, hoping to get beyond it before his rival reached it. Many exciting races and not a few accidents resulted from the eagerness of these drivers to gain their point. Soon after the road was opened it became evident to the managers that in order to operate the road successfully it was desirable that the State should own all the motive power. This was bitterly opposed by those living along the line of railroad, on the ground that, as the people were taxed to build and maintain the railroad, the farmers along the line should have the right to drive their own horses and cars to and from the Philadelphia market, the same as on the turnpike. Among those that took this ground was the late Thaddeus Stevens, who was the leader of his party at that time in the Legislature. After considerable opposition a bill was finally passed, and it was decided that the motive power should all be owned and managed by the State.

The following is condensed from an article descriptive of the Philadelphia and Columbia Railroad, written for the *Journal of the Franklin Institute* of May, 1840, by W. Hasell Wilson, now Consulting Engineer of the Pennsylvania Railroad:

"The rates of toll for the use of road vary from six mills to four cents per ton (of 2,000 pounds) per mile. There are twelve different rates, the average of which would be two cents per ton per mile. The lowest rates are for coal, stone, iron ore, vegetables, lime, manure and timber, and the highest are for dry goods, drugs, medicines, steel and furs.

"On the United States mail the toll is one mill per mile for every ten pounds. On every passenger, one cent per mile. In addition to these rates a toll is levied of one cent per mile on each burthen car, two cents per mile on each baggage car, and on every passenger car one cent per mile for each pair of wheels.

"The motive power toll is: for each car having four wheels, one cent per mile; for each additional pair of wheels, five mills; for each passenger, one cent per mile, and for all other kinds of loading twelve mills per ton (of 2,000 pounds). The owners of cars now charge \$3.25 for every

passenger, and \$7.50 for every ton of merchandise conveyed the whole length of the road, they paying all tolls, which is at the rate of four cents per mile for passengers, and 9.14 cents per mile for a ton of goods. Taking the length of the road at eighty-two miles, the average number of passengers to an eight-wheel car at thirty, and the load of a four-wheel burthen car at three tons, we have the following results :

“ Road toll on an eight-wheel car, four cents per mile.

Road toll on thirty passengers, thirty cents per mile.

Motive power toll on car, two cents per mile.

Motive power toll on thirty passengers, thirty cents per mile.

Total toll for thirty passengers, sixty-six cents per mile, or two and two-tenths cents per mile for each passenger, leaving one and eight-tenths cents per mile to the owners of the car for every passenger.

Road toll on a four-wheel burthen car, one cent per mile.

Road toll on three tons of dry goods, twelve cents per mile.

Motive power toll on car, one cent per mile.

Motive power toll on three tons of dry goods, three and six-tenths cents per mile.

Total toll on three tons of dry goods, seventeen and six-tenths cents per mile, or 5.86 cents per mile per ton to the owner of the car.

At that time the—

Superintendent of motive power received \$4 per day.

Agents for passenger trains (now called conductors), \$2 per day.

Agents for burthen trains (now called conductors), \$1.50 per day.

Conductors of State cars, \$1.25 per day.

Master machinist, \$4 per day.

Foreman of workshops, \$2 per day.

Signalmen and assistants, \$1.25 per day.

Engineers of locomotives, \$2 per day.

Firemen of locomotives, \$1.25 per day.”

The Philadelphia and Columbia Railroad suffered the same inconvenience as the other railroads of the early times from the difficulty of obtaining competent mechanics to repair their locomotives and capable engineers to run them. Men who understood the construction of the locomotive and its working were in great demand, and were permitted to do pretty much as they pleased. They started when they were ready, ran at whatever speed they wanted to, and managed the train as they desired. They were masters of the situation and were a law unto themselves. This condition of affairs became so unsatisfactory to the patrons of the road that a committee was appointed by the Legislature “to examine into and report upon the present state of the motive power of the Philadelphia and Columbia Railroad.” The report which it made shows a frightful lack of order and system in the working of the road.

The Allegheny Portage Railroad, by which the canal between Columbia and Holidaysburg was connected with the canal west of the mountains, which completed the line to Pittsburgh, was begun in 1831, and opened for traffic March 18, 1834. It was thirty-six and two-thirds miles long, from Holidaysburg to Johnstown. Sylvester Welch, brother of the late Ashbel Welch, was chief engineer. From Johnstown to the summit, 26.59 miles, the ascent was 1,172 feet; from Holidaysburg to the summit, 10.1 miles, it was 1,399 feet. There were five incline planes on each side

of the summit. A tunnel 901 feet long, near Johnstown, was the first railroad tunnel built in America. During the first winter the working of the road was suspended after the canals were closed. During 1835 more than 50,000 tons of freight and 20,000 passengers were carried over the road.

The rails on this road, imported from England at a cost of \$48.05 per ton in Philadelphia, weighed forty pounds per yard.

They rested in cast-iron chairs, weighing thirteen pounds each, which were fastened to stone blocks of about three and one-half cubic feet, each placed three feet from center to center and imbedded in broken stone. On the inclined planes, and on some other parts of the road, flat rails were used on longitudinal timbers. The stationary engines at the top of each plane were of thirty-five horse-power, and raised and lowered trains of four cars with a net load of 7,000 pounds, which they were able to do from six to ten times an hour. On the long level of thirteen miles four locomotives were used. Up to January 1, 1836, the road had cost about \$1,700,000.

The Western Division of the canal was opened as early as 1830.

The entire line from Philadelphia to Pittsburgh, when first opened, was composed as follows :

	Miles.	Cost.
Philadelphia and Columbia Railroad.....	81.6	\$5,277,278
Eastern Division Canal.....	172.0	5,313,251
Portage Railroad.....	36.7	1,860,753
Western Division Canal.....	105.0	3,173,432
	395.3	\$15,624,714

This line was the predecessor, rather than the beginning, of the Pennsylvania Railroad as it exists to-day between Philadelphia and Pittsburgh, only the Philadelphia and Columbia Railroad, and that greatly modified in location, forming a part of the present road, which, however, follows the line of the canal for a considerable distance. It is interesting to note that the present railroad, only 354 miles between Philadelphia and Pittsburgh, taking the place of the pioneer route that cost \$15,624,714, earned during the year of 1883 no less than \$26,720,293 gross and \$12,318,055 net—thus magnificently justifying the high hopes of the pioneers who planned the route before the locomotive had demonstrated its efficiency to the world.

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