

MONONGAHELA AND

DUQUESNE INCLINES



**NATIONAL HISTORIC
MECHANICAL ENGINEERING LANDMARKS**

Pittsburgh, Pennsylvania
May 11, 1977

The American Society of Mechanical Engineers

"The inclined plane has been around for ages. The ancient Egyptians knew its value, they used it to build pyramids; the ancient Greeks used it in their construction projects as well. In the Pittsburgh area this device has been put to a practical and very unusual use...hauling passengers and freight up steep hills."

-- "Pittsburgh Inclines"

INTRODUCTION

The story of the famous Pittsburgh inclines is one which typifies American ingenuity and which illustrates the most admired and well known inherent American quality: hope. That all things were possible in America, that the streets were paved with gold, that money and employment were here for the asking, were threads of a dream whispered from English coastlines, throughout Europe and on to Asia. The result: an overwhelming migration. And these early immigrants brought to the New World their ideas and knowledge, their talents and skills, making possible America's rapid economic independence and industrial growth.

In dedicating the two remaining inclines of Pittsburgh, we not only honor the engineering genius of John Endres and Samuel Diescher, we honor as well the vision and perseverance of these immigrants -- these pioneers of hope.

I. THE BEGINNINGS

"Just as the manufacture of Steel, Aluminum, and Glass have made Pittsburgh the "Work Shop of the World,"¹ inclines too have had a great deal to do with this phenomenal manufacturing achievement. Inclines, however, were the by-product of this epoch, for as this industrial complex developed it soon became apparent that additional labor was needed. To meet this demand our country threw open its doors to immigration. European laborers, hearing of this need, came in throngs to Pittsburgh, thus creating another problem: housing.

"Here in Pittsburgh the housing problem was unique because our mills and factories were located along the river beds, leaving very little land there available for housing. Therefore, for homes, they had to go to the tops of our hills. Mt. Washington, then Coal Hill, seemed to attract most of these migrants from Germany. Perhaps Pittsburgh's hills reminded them of their former homes. But at home they did not have the task of treading their hills by foot. There they had Inclines, or as they called them 'steilbahns'. Their daily task of going and coming to work brought many of them together, and more than often the conversation would lead to how the steilbahns would be an advantage here. These discussions generally concluded with the thought that they as immigrants did not have the necessary finances for such a development. Others, probably local people with money, would have to see this need before such a dream could come true. Perhaps they, with their knowledge of steilbahns, could be of help."¹

And obviously, the dream did come true -- but not without the usual trials and tribulations.

In the early 1850's eight Allegheny County men decided that an incline plane was sorely needed in the area they wished to develop. So, in 1852, they executed "An Act to Incorporate the South Pittsburg and Saw Mill Run Turnpike Road Company". The act stipulated that they could "at their discretion construct one or more inclined planes to run cars from any point or points on the river bank between the Monongahela Bridge and the mouth of Saw Mill Run to the brow of Coal Hill."

Proof that a coal incline was operating on Coal Hill in January 1854 is contained in a newspaper account as follows:

"ACCIDENT. A coal car was precipitated from the mouth of the pit on Coal Hill, above Sligo, yesterday afternoon. In its descent, it ran over two German boys, injuring one so badly that his life is despaired of." (The Daily Pittsburgh Gazette, January 11, 1854)

In February 1854, Pennsylvania approved "An Act to Incorporate the Mount Washington Inclined Plane Company" and the incorporators were granted the "power to construct one or more inclined planes, to run cars from any point or points on the river bank between the Monongahela Bridge and Jones' Ferry...to the brow of Coal Hill, in the neighborhood of High Street..."

The incorporators got busy, and by May 22, 1854 The Daily Pittsburgh Gazette reported the following:

"INCLINED PLANE RAILROAD. Workmen have commenced the preparatory work on the inclined plane railroad, running from the end of the Bridge to Mt. Washington, on the Summit of Coal Hill..."

¹P. G. Eizenhafer Pittsburgh History of Inclines. Monongahela Inclined Plane Company

But plans were disrupted and work delayed when Lyon, Shorb & Company obtained an injunction against the promoters. Said The Daily Pittsburgh Gazette, July 24, 1854:

"Lyon, Shorb & Co. vs. The Mount Washington Inclined Plane Co....in this case, complainants over whose land the road of respondents is to pass, applied for a special injunction to restrain them from proceeding, or to secure them," (the complainants) "from loss."

However, hopes were revived shortly thereafter, and The Daily Morning Post, July 26, 1854, reported:

"MOUNT WASHINGTON INCLINED PLANT. We understand that this work is so near completed that no doubt exists but it will be in operation sometime early in August. The contract for the building of the engines and cars has been given to a couple of firms in our own city, whose well known reputations will insure that they will be constructed in the best manner."

Obviously, they were too optimistic. Records show that the company had to borrow funds in 1856. By the beginning of the Civil War, hardly any progress had been made, finances were tight and the economic picture bleak -- yet the company still held meetings. By 1865, after the close of the war, things were looking up. New life was being added to the company, local business persons were attending the meetings and the financial picture too was developing. These new attendants were keenly interested in the dream of the immigrants: riding up and down the Pittsburgh hills. Some of the names included James M. Bailey, T. J. Bigham, C. S. Ream, Isaac Whittier and many others, now honored by Pittsburgh's landmarks. Other documents in later years bear signatures of Andrew H. Mellon, George Westinghouse and the steel barons, Carnegie and Jones.

Finally, after many such meetings during 1865 it was proposed and accepted that a company be incorporated to be known as the Monongahela Inclined Plane Co. Its purpose was "to build and operate a Passenger Plane between Monongahela Borough (now Carson St., Pittsburgh) and Coal Hill (now Mt. Washington)." The charter was granted in April of 1867. Rates for passenger and freight were specified. The moves that had to be made to bring the inclined plane into actual operation were made slowly and cautiously. The first shares of stock were sold and the list of subscribers was, in actuality, a "Who's Who" of Coal Hill people.

Mr. J. S. Kirk, civil engineer, was engaged to make a survey for the exact location of the Plane. He selected two sites: one called the Southern, near the Smithfield Street Bridge; the other the Western, near the point where the rivers meet. Since the Committee in charge felt the southern site had a broader access to the entire city, it was chosen. This decision proved a wise one -- today, after more than 100 years of operation, one-half million riders are transported annually, while all the other inclines, except the Duquesne, had to close for lack of passengers. (The western site later in the year 1877 was used for the Duquesne Heights Plane.)

By mid-September of 1869, the company's president reported that most of the contracts were awarded. About two months later, it was agreed "that the hours of the engineer and conductor at the lower station be from 6 a.m. to 11 p.m." and that "the Watchman and Fireman stand 15-hour watches subject to modification by the Executive." What a startling contrast to working conditions of today! Management also worked long hours and risked its capital in the venture.

Meanwhile another Mount Washington -- one in New Hampshire -- completed an incline in 1869. (Editor's Note: This was the first cog railway in the U.S. -- dedicated a joint mechanical and civil engineering landmark by ASME and ASCE in June 1976.)

By the end of November 1869, the engineer in charge of the Monongahela incline project, Mr. J. J. Endres, reported that the Engine House was nearly finished; that "the bricklayers would commence the Boiler House the next day, and that if the weather permitted the road would be ready in two or three weeks with the exception of the Iron Bridge."

Fares were decided upon on February 10, 1870, as was the signal system. It was agreed a little later that gas was to be used for lighting the road and buildings. The salary of the conductors was set at \$2.50 per day, and the men were required to give bond...in the amount of \$1,000.

On May 5, 1870 the directors ordered that on the "first day the road is ready for travel the cars be run free."

Management was able to announce "that the inclined plane would be opened for business on Saturday, May 28, at three o'clock."

The great day arrived, and to the delight of the company and the public, the incline functioned perfectly. The cars were put in motion at 3 p.m. and ran until 8 p.m.

The Monongahela Incline, which was probably the first passenger incline in Pennsylvania, made the grade to success that other had tried in vain to reach.

The Duquesne Incline was the third of Pittsburgh's 17 to be built. It was first discussed in August 1875, when young Kirk Q. Bigham met with John C. Shaler, Alfred Marland and others to consider "the construction of an inclined plane railway on Coal Hill opposite the new Point Bridge." Their deliberations and efforts resulted in the Duquesne Inclined Plane Company. A Charter was granted in January 1876, and the incline was opened for service in May 1877.

II. THE MEN BEHIND THE INCLINES

"Mr. John Endres, a Prussian engineer of prominence and a builder of machinery, was brought in from Cincinnati to design and construct the Monongahela Incline. He was assisted by a young engineer named Samuel Diescher, who was born in Budapest in 1839 and educated in the Karlsruhe Polytechnic College, Germany, and in the University of Zurich, Switzerland. For a number of years he traveled throughout European countries, and was engaged as mechanical designer in connection with various works, in 1866 coming to the United States and locating in Cincinnati, Ohio. For a year he was employed as designer at the Niles Tool Works, and then assumed charge of the construction of an inclined plane in that city.

"When Mr. Endres moved his family to Pittsburgh, he brought along his daughter Caroline. She too was a scholarly person, having received a formal education in Europe; with this knowledge, she helped considerably with the designing of the Plane. When the news broke out that a LADY was assisting with the project, it caused quite a stir around town, as this was considered quite an unusual occupation for a female at that time. This brought many curious people to the old Monongahela House, where the Endres' lived. Perhaps some of the young blades had other designs, but fate intervened, for with this close contact between young Sam and Caroline, a romance developed, and soon they married.

"This marriage proved a success in more than just raising a family, for with Caroline's help soon young Sam became one of Pittsburgh's greatest engineers. Not only did he assist in designing the Monongahela Incline, but on his own designed many others in the city, in the surrounding towns and elsewhere in the U. S., including in Pennsylvania the Duquesne, the Penn, Fort Pitt, Nunnery Hill (the first plane of any size to operate with curved track), the two Castle Shannon Planes, the Mount Oliver Passenger Plane, Troy Hill and Johnstown; and others in Duluth, Minnesota; Wheeling, West Virginia; Cincinnati, Ohio; and two in South America. He excelled in other fields as well, from the laying-out of many of the city's Electric Railways Franchises to the designing and building of a great deal of Pittsburgh's Steel Mill machinery. Soon he became known internationally and caught the eye of the great engineer Mr. G. W. G. Ferris, whom he assisted in designing and constructing the great Ferris Wheel for the Columbian World Exhibition in 1893.

"Diescher admitted his sons, educated and trained under his tutorship, to partnership with him under the firm name of S. Diescher & Sons in 1901. His work was continued by them, and through them the name of Diescher remained in honorable representation in the engineering profession.

"As an added note of interest, another great Pittsburgh engineer, John Roebling, designer of the Brooklyn Suspension Bridge, was contacted to specify the type of Pulling Cables for the first Incline Plane."²

² Ibid, and History of Pittsburgh and Environs, American Historical Society, Inc., New York and Chicago, 1922.

INCLINE FACT SHEET

	<u>Mongahela</u>	<u>Duquesne</u>
Length	640 ft.	793 ft.
Elevation	370 ft.	400 ft.
Grade	38°	30°
Gauge	5 ft.	5 ft.
Type of Car	3 compartments (one open)	1 compartment
Passenger Capacity	25	18 to 25
Opened	May 23, 1870	May 20, 1877
Rebuilt	1882 (with steel structure)	1888 (with steel structure)
Rebuilt	1935 (steam engine replaced with electrical equipment)	1932 (steam engine replaced with electrical equipment)
Speed	6 miles per hour	4.03 miles per hour
Annual Ridership (1975)	460,126	575,022

III. SOME STATISTICS

The Monongahela. The following description of the Monongahela Incline Plane was taken from the October 1891 issue of The Street Railway Journal Souvenir:

"The plane is 640 ft. long and is built on a grade of seventy-one and one-half per cent, with a total rise of 375 ft. About 350 ft. of the lower portion of the structure is built over the tracks of the 'Pan Handle' railroad, and this portion of the structure is built of five foot plate girders in spans of sixty feet. The remainder of the plane is constructed of fifteen inch I beams, the supports being both piers and posts. The gauge is five feet, and the track is laid with forty-five-pound steel T rails. The hoisting plant consists of two 12 x 20 ins. connected link motion engines, built by J. & J.B. Millholland, of Pittsburgh. Although one car ascends while the other descends, after the fashion of a gravity road, each car has a separate hoisting rope and drum. These drums are eight feet ten inches in diameter, made of cast iron with wooden lagging on the hoisting surface. This surface is plain with no grooves. The hoisting rope is one and one-quarter inches in diameter, made of crucible steel. The speed is about 600 ft. per minute, and the rope has an average life of five to seven years. This average fairly represents the life of cables on all of the inclines. There is a safety rope of the same size, which passes round a single large sheave at the top, from one car to the other. The cables are supported on the plane by rollers of gum wood. This incline is operated continuously at five minute intervals during the day, and fifteen minutes during the late and early hours. The passenger trade amounts to upwards of 1,000,000 per year. The cost of the original structure was about \$75,000 and about \$30,000 was spent in rebuilding."

The Western Pennsylvania Historical Magazine offers this description:

"The railway is placed at an angle of thirty-eight degrees, with a vertical height of three hundred and seventy feet, and laid most of the way on solid trestle work. The car, however, is the peculiar feature of the whole affair ...it is made to conform to the incline, so that each of its two apartments -- double seated and accomodating eight passengers -- has its floors on a perfect level. The ends of these cars are vertical. The floor of the second or upper compartment is 3 feet higher than the floor of the lower compartment. As the car stands at the lower station house, passengers enter either compartment at the side from stair platforms and in addition to the seats described, there is a seat with hinges at the front platform, constructed with a view to carrying packages of all descriptions, from a market basket to a barrel of flour.

"The cars are raised and lowered with a wire cable an inch and a half in diameter, composed of seven strands, with nineteen wires to the strand, the strands making one turn to ten and a half inches. The cable will sustain thirty-five tons vertical lift; but as the weight of the loaded cars, with the greatest weight of cable attached at an angle of thirty-five degrees, will never exceed three tons, it will be seen that the cable may be rated at twelve times the security required for service. But to 'render assurance doubly sure,' an additional cable one an a quarter inches in diameter, capable of sustaining twenty-seven tons

vertical lift, is held in reserve, and playing idly, accomodates itself to the movement of the cars. In case the working cable should part, the reserve cable would assume the functions of the working cable. Both cables are supported by small wooden rollers, placed at stated intervals along the track. The iron employed in the structure is the best Sligo boiler plate iron, and the construction was entrusted to skillful hands, with an experience extending over a quarter of a century. The magic power of the plane is to be found in wire. Wire cables lift and lower the cars in safety. Wire is employed for signalling. The system of signals adopted is similar to that employed in fire alarms. The signal bells are eight inches in diameter.

"The cars ascend to the station house on the top of the hill quietly, smoothly, rapidly and without vibration, requiring about a minute.

"The engines are two, in line with the track, and so constructed that a reverse movement can be obtained in the twinkling of an eye, and the huge and massive drums (with brake attached) around which the cables are rolled, obedient to the touch of the engineer's hand, turn either backward or forward, precisely as the wheels of a locomotive are operated by the reversing lever. Away up there in his glass-framed cab, overlooking the whole length of the plane, sits the watchful engineer. The whistle, throttle and signal wire are at his right. His hand grasps the lever attached to the rod connected with, and operating the 'links'. His foot is on the brake-step; a pressure of his finger sets the engine in motion, and the car descends; a pressure from his foot and it pauses in its descent, and thus, at will, he regulates its movements until it touches the buffer at the lower station.

"There are various adjuncts for securing safety, lessening friction, preventing jar, controlling motion, etc., which we have not space to explain. Suffice it to say, the road is perfectly safe, the fare moderate... and the entire road admirably managed. The whole enterprise reflects the very highest credit on projectors, directors, constructors and managers. It is the pioneer of numerous similar enterprises, which will enable the denizens of our overcrowded and pentup city to spread themselves over and beyond our beautiful hills and charming valleys, giving 'room and verge' enough for several cities like Pittsburgh. We look soon to see a continuous street along the crest of Coal Hill from the Birmingham Monastery down to Saw Mill Run."

The Duquesne. An 1891 description of the Duquesne Incline in The Street Railway Journal Souvenir reads:

"The first structure was part wood and part iron, but it was rebuilt entirely of iron in 1888. The total length is 780 feet, the grade is fifty-eight and one-half per cent and the total rise is 400 feet. Like the Monongahela, the Duquesne crosses the Pan Handle tracks and the lower 300 ft. is built of five-foot riveted girders in spans of sixty feet... the remaining portion being constructed of twenty-four inch riveted girders in thirty-foot spans. The gauge is five feet, and the rails are forty-five pound steel T. There is one hoisting and one safety rope, each one and one-quarter inches in diameter. The engines are a pair of Millholland engines, with cylinders 14 x 25 ins. A novelty of this incline is the location of the hoisting machinery at

right angles with the plane, this method being adopted in order to save the purchase of an expensive piece of real estate at the head of the incline. With this arrangement a single drum suffices as the spacing of the cables can be effected by the guide pulleys at the head of the incline. The one drum is all cast iron with grooved circumference. The cars carry forty passengers at one trip. The entire cost of the plant was about \$55,000."

The following article from The Post, May 21, 1877, depicts opening day of the Duquesne Incline, but could just as well be a description of today's rush hour on a New York City subway:

"THE NEW INCLINE. Immense Traffic -- False Reports. The new Duquesne Incline Plane did an immense business yesterday and last night. From early morning until a late hour in the night the cars were literally jammed with passengers, while hundred were turned away without accomodation. Many of those who did make the trip were compelled to wait an hour for their turn. The officers scarcely anticipated such a rush and the facilities for gathering in the nickles (sic) were entirely too limited. As it was, a number of persons secured free passage, simply from the inability to lift their fares. The conductors worked nobly, but there was too much for them to do. Even if the facilities had been ample in this particular, probably four tracks would have been necessary to accomodate the patrons. The machinery worked admirably, and all the passengers felt satisfied with the safety of the new enterprise.

"Some mischievous persons circulated a report that there had been three accidents, for the purpose of frightening away the crowds, and as many persons grew tired of waiting and left the place, some were led to believe the reports. There was no truth in them however, and the statements, though unlikely to injure the plane, were made more through 'waggishness' than maliciousness. The view from the summit of the hill was magnificent, and was duly enjoyed by the hundreds of passengers, as was also the beer, which flowed freely."

Safety. The most common question from anyone riding an incline for the first time is: "What would happen if those cables should break?" Well, the cables have never snapped, and no human passengers have ever been killed in accidents. A couple of horses didn't do so well, though. Shortly after the opening of the vehicular plane (not the Monongahela or Duquesne Inclines), there was a spectacular accident, and the following description is by Samuel Diescher:

"As one of the cars was approaching the upper landing, the engineer, whose attention was apparently distracted from his duties, failed to close the throttle, and the car continued in its ascension until it hit the landing and lifted the floor, which was not very substantially constructed, and with this also the engineer's cabin. At this juncture the motion of the engine was reversed. Whether this was brought about by the action of the engineer or through the lifting of the floor was never satisfactorily ascertained. However, the east car went down with extraordinary speed. The engineer left his cabin through the window. He became incapable of intelligent action through sheer fright. When the west car, carrying two men and a two horse team, arrived at the upper landing, it was drawn up to a point where the hitching screws projected beyond the head sheaves, and being thus subjected to

transverse strains, they snapped. At this instant the two men jumped from the car to the ground, a distance of about fifteen feet. None was hurt. The car became entirely disconnected, and it flew down upon a grade of 72 percentum; the team was thrown off and the animals killed. As this car arrived in the pit it was completely demolished and its debris went in all directions.

"After all the rope from the east car was uncoiled from the drum, it began to wind up in the opposite direction, thereby starting this car upon another ascension, but as it reached a point about 40 feet from the pit it collided with some fragments from the other car, and in its already damaged condition it broke loose also and dropped back into the pit. The machinery was still running, with the ropes coiled upon the drums, their loose ends flying about like whips in the air, until the engineer of the passenger incline belonging to the same corporation ran into the boiler house and there shut off the steam."

Today such a mishap would be impossible, with all the safety devices installed on the present equipment. If the motors should start running too fast, ball governors automatically cut in series resistors to the power source and reduce speed to a safe figure. And as either car approaches the upper station, it actuates six slow-down switches, which introduce increasing amounts of series resistance, so that even without an operator the cars would come to a smooth safe stop.

IV. RENOVATIONS AND THE INCLINES TODAY

Each incline underwent two renovations, the Monongahela in 1882 and 1935, and the Duquesne in 1988 and 1932. In 1935 the original steam engine on the passenger plane of the Monongahela Incline was replaced by \$34,720 worth of new Otis electricap equipment, consisting of two 50 HP motors running on 120 volts driving one cable, with braking accomplished automatically on this cable when the power is shut off. Emergency braking can be applied to a second cable by air brakes operating on a 12" diameter drum. The cables are 1½" in diameter and are woven steel over a hemp core. The work cable is replaced about every two years, and the safety cable at about six-year intervals, depending on wear. The electric power is furnished by Duquesne Light Company through a 75 KW motor-generator set running at 1200 RPM, supplying 240 volts DC to the two motors in series.

The passenger cars weigh 7 tons each and will each carry about a three-ton load, with a practical limit of about 25 passengers per car, sitting and standing. Incidentally, unlike most of the other Pittsburgh vehicular planes, the Monongahela Vehicular Plane never had a passenger compartment, because of the proximity of the adjacent passenger plane.

The two present cars are the original pieces of rolling stock, with wooden bodies on steel underframes. Each car has three step-like levels, each level containing a separate passenger compartment with two wooden benches the full width of the car. The bottom two levels are fully closed, but the top has only screened slide windows and an iron grillwork at the upper end; none of the compartments is heated, however. Each red car rolls on four 16" diameter wheels on the 5' gauge tracks, laid with 50 lb. rail on creosoted white oak ties.

Duquesne saved. The salvation of the Duquesne Incline is one of the city's more interesting stories. In the early 1960's plans were afoot to close this incline because of a rapidly declining patronage, due to more popular means of transportation being available and the incline's decaying state. A group of concerned citizens immediately came to its rescue -- most were residents of Mt. Washington. They formed the Society for the Preservation of the Duquesne Heights Incline, sold stock, held benefits and raised \$15,000. Money was one thing needed to keep the Incline operating; hard work was even more important. Volunteers appeared "out of the woodwork". Everyone from skilled craftsmen to secretaries to young messengers pitched in to help. In a heartwarming display of public spirit, the Society set about restoring the cars.

The first order of business was to return them to their original splendor. Volunteer craftsmen donated thousands of hours to refurbish the beautiful and priceless handcarved cherry panels with maple trim, amber glass transoms and the handsome old hardware. Mechanics and engineers overhauled the machinery, including the cable drum and the unique wooden-toothed drive gear, which has been in perfect operating condition since 1877. Waiting rooms at the bottom and top of the incline were refurbished, and a thriving souvenir stand was added. Today, the Duquesne Incline survives. Any proceeds go to the Society, which rents the incline for \$1.00 a year from PAT (Port Authority of Allegheny County).

Day or night, the view from the Observation Deck at the Upper Station is spectacular. The city spreads out from the original fort at the Point to the hills of the horizon. The constant activity on the three rivers is always fascinating. The historic Gateway to the West has become a redeveloping and

dynamic modern city.

EPILOG

While Pittsburgh once had 17 inclined planes, the Monongahela and Duquesne Heights Inclines are the only remaining two in everyday operation. Both have been owned since 1964 by the Port Authority of Allegheny County. However, the Duquesne Incline is leased to the Society for the Preservation of the Duquesne Heights Incline, headed by David H. Miller, President. This incline was designated an historic landmark by the Pittsburgh History & Landmarks Foundation in 1969. It is also included in the National Register of Historic Places.

BIBLIOGRAPHY

Monongahela Incline Plane - History from Charter Through 1965 (Notes from board meetings and newspaper clippings).

Bothwell, Margaret. "Incline Planes and People, "Western Pennsylvania Historical Magazine, October 1963, Volume 46, Number 4.

Eizenhafer, P.G., Superintendent, Monongahela Incline Plane Co. 100-Year History of Pittsburgh Inclines - 1863 to 1963.

History of Pittsburgh and Environs, American Historical Society, Inc., New York and Chicago, 1922

Pittsburgh Monongahela Incline (News Release), Port Authority of Allegheny County (PAT), May 8, 1970.

Pittsburgh's Remaining Incline Planes - Historical Transportation Landmarks (Fact Sheet), Port Authority of Allegheny County (PAT), March 4, 1976.

Pittsburgh's Inclines, Electric Railroaders' Association, Vol. 18, Number 4, April 1956.

Pittsburgh's Inclines (comprehensive history with many photographs), designed, produced as a hobby by Samuel R. Ohler, 1968 to 1972.

The Duquesne Incline, published by the Society for the Preservation of the Duquesne Heights Incline.

The Duquesne Incline - A Working Museum (Flyer), published by the Society for the Preservation of the Duquesne Heights Incline.

Eizenhafer, P.G. 100-Year History of Pittsburgh Inclines (Reprint).

"Mount Washington Incline Plane" (Monongahela Incline), People's Monthly, June 1871.

"Modern Hill Climbing" (Duquesne Incline - reprint), Scientific American, front page, Sept. 18, 1880.

"Pittsburgh's Inclines - A View from the Top," The Perspective Duquesne Light Company's Quarterly on People and Energy, Winter 1976, p. 15.

"The Incline Planes, "The Street Railway Journal Souvenir, October 1891.

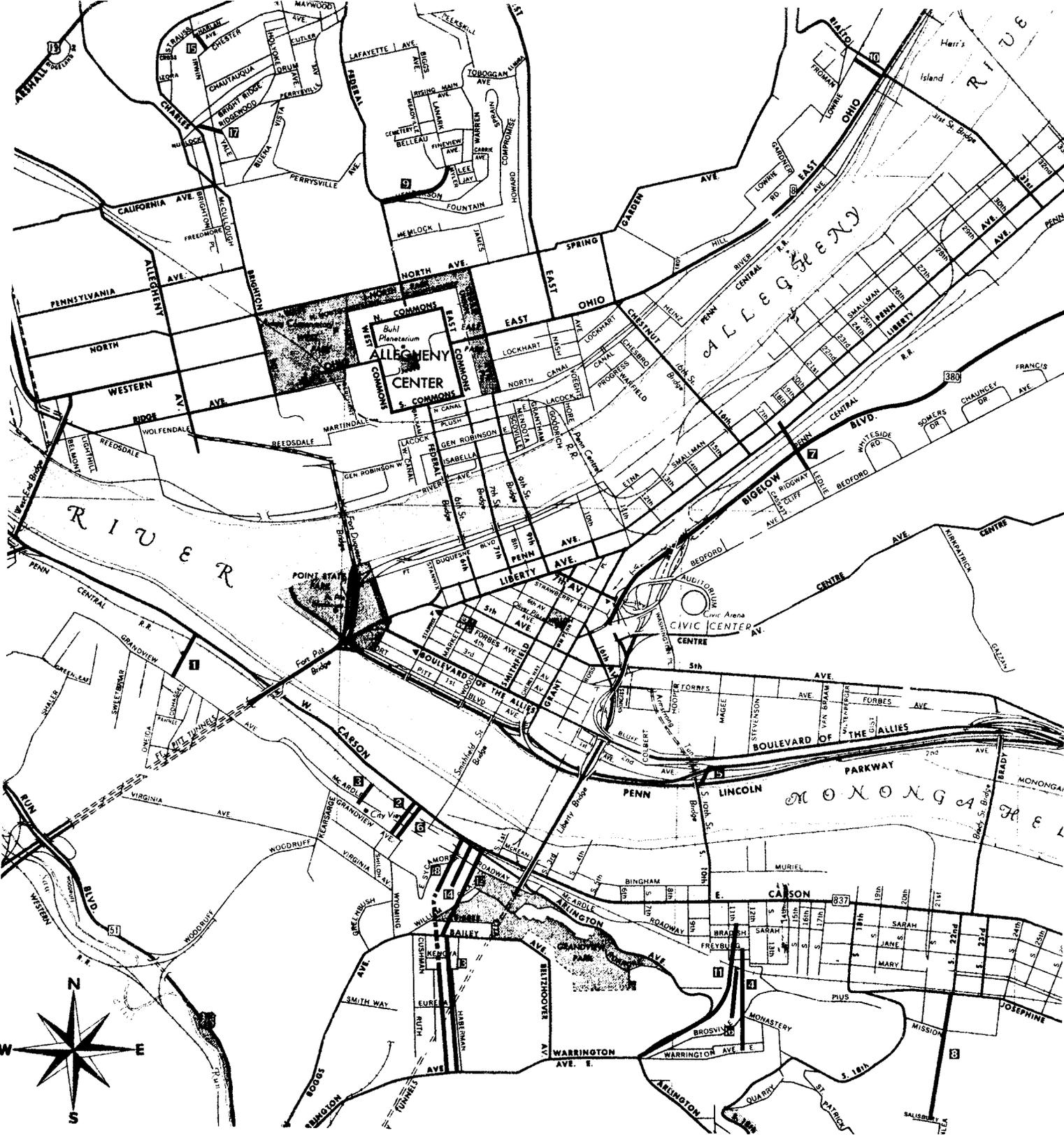
"Cable Car Line is Alive and Well," Men & Steel, Jones & Laughlin Steel Corporation, January 1970, p. 7.

The Post, May 21, 1877, False report of accident.

"Mt. Washington on Monday," Pittsburgh Evening Chronicle, May 21, 1877.

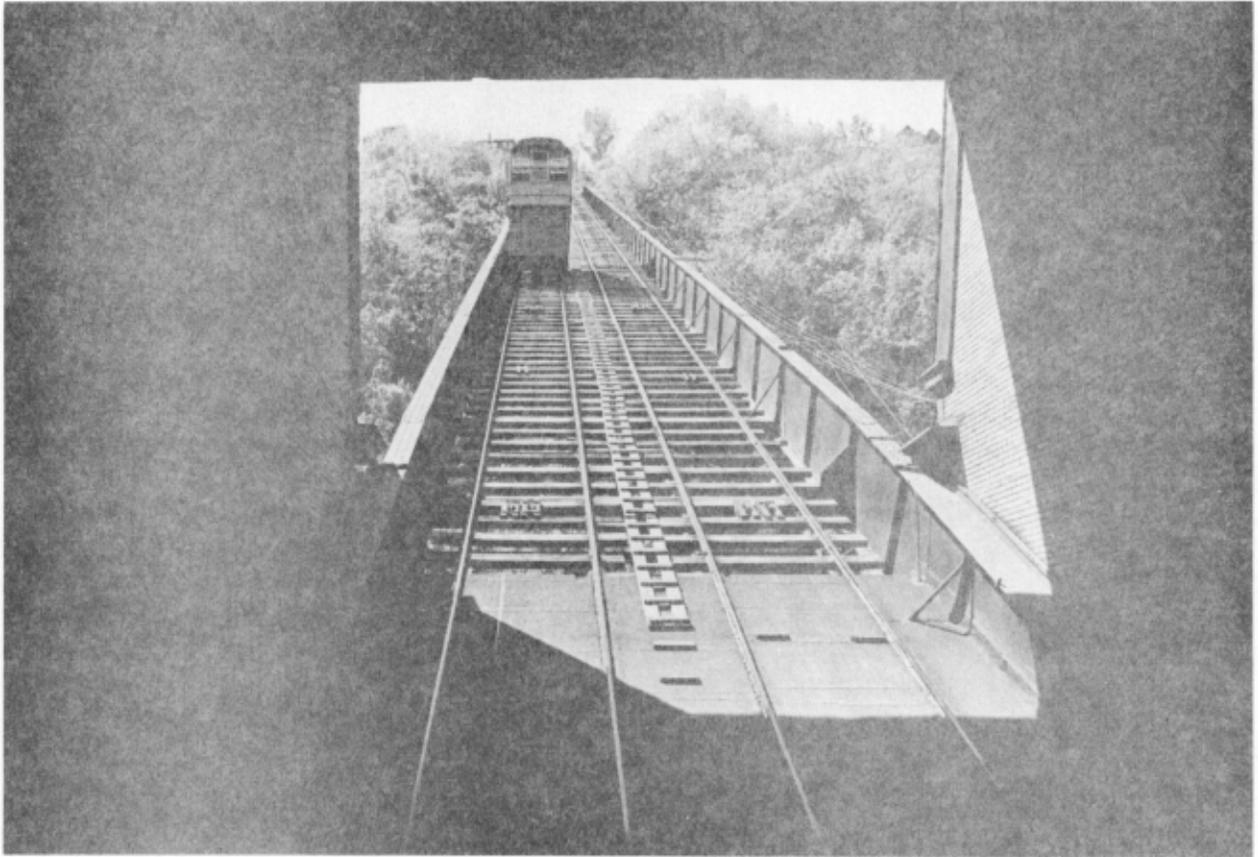
"1877 Incline Saved in Pittsburgh," Preservation News, July 1973.

Locations of Pittsburgh's Best Known Inclines

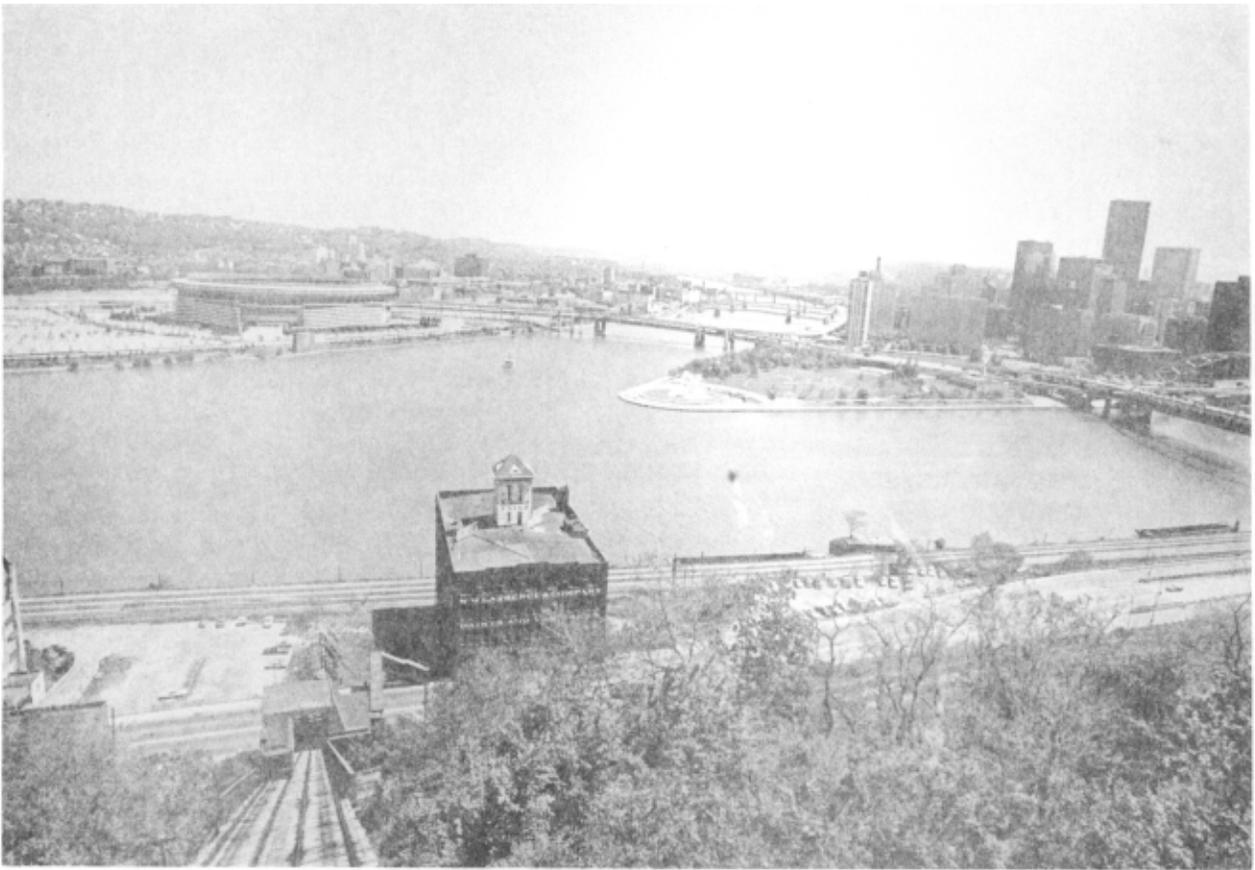


- 1** DUQUESNE HEIGHTS
 - 2** MONONGAHELA
 - 3** Kirk Lewis*
 - 4** Mt. Oliver
 - 5** Ft. Pitt
 - 6** Monongahela Freight
 - 7** Penn
 - 8** St. Clair
 - 9** Nunnery Hill
 - 10** Troy Hill
 - 11** Knoxville
 - 12** Castle Shannon
 - 13** Castle Shannon South
 - 14** Castle Shannon Coal
 - 15** Clifton*
 - 16** Keeling Coal
 - 17** Ridgewood
 - 18** Castle Shannon R.R.
- Bellevue (not Shown)
Norwood (not Shown)

*Approximate Locations



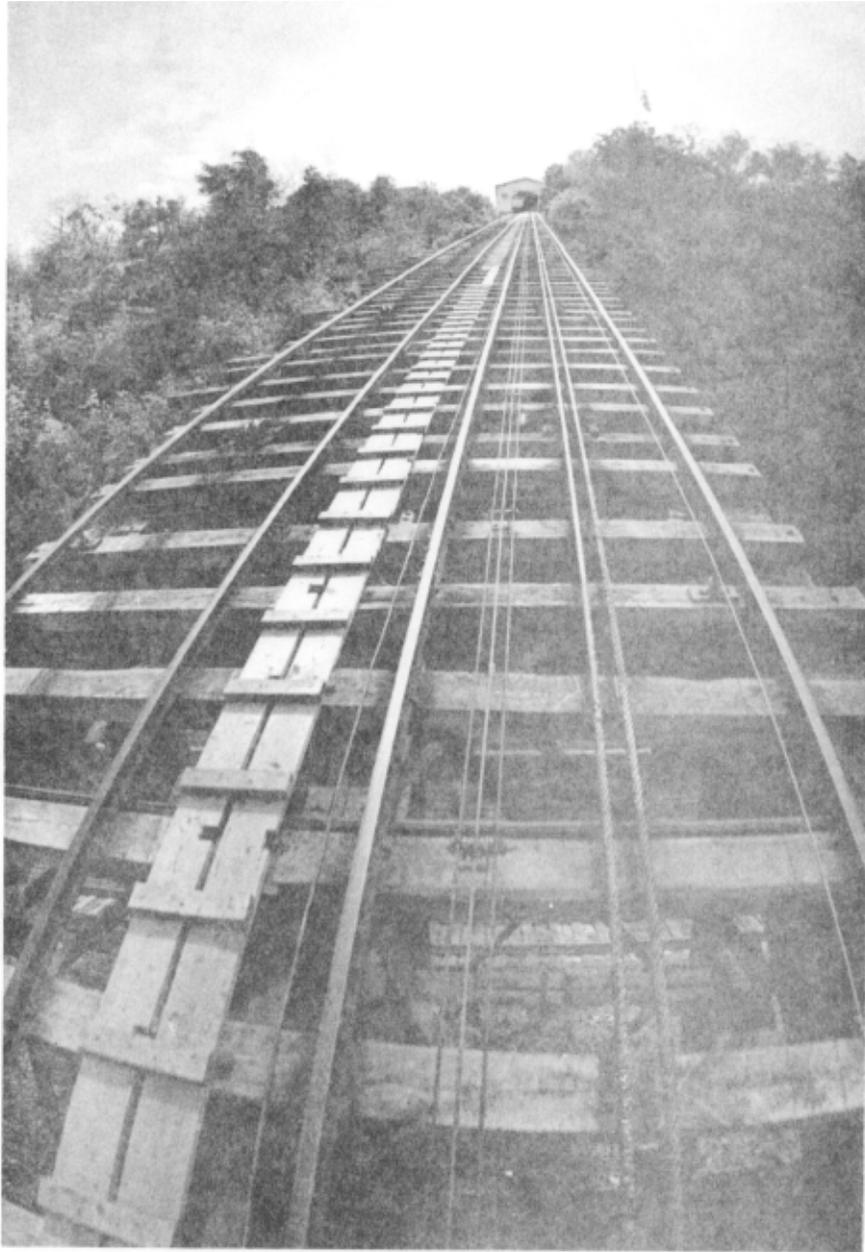
Monongahela Incline -- Passenger Car and Track



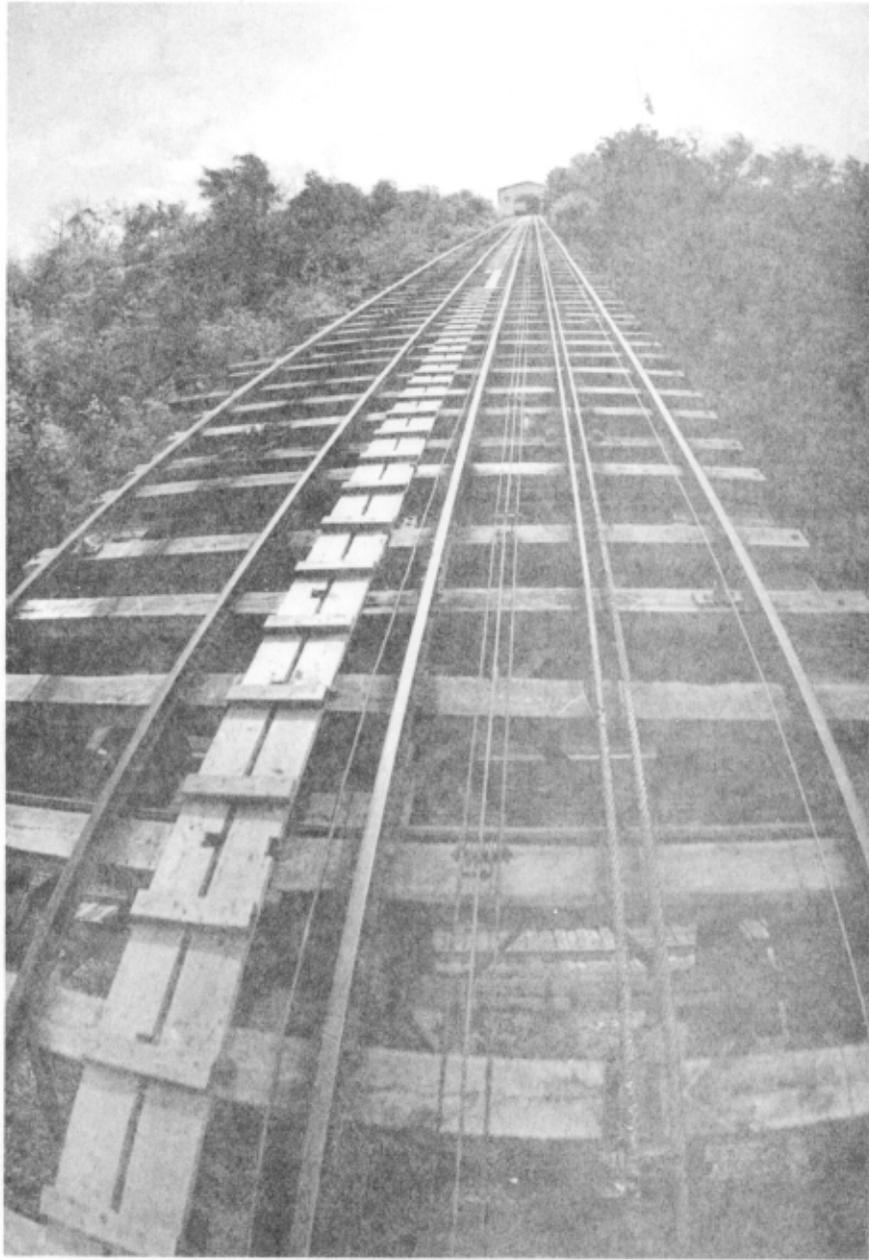
View of Pittsburgh From Top of Incline



Monongahela Incline -- Passenger Car



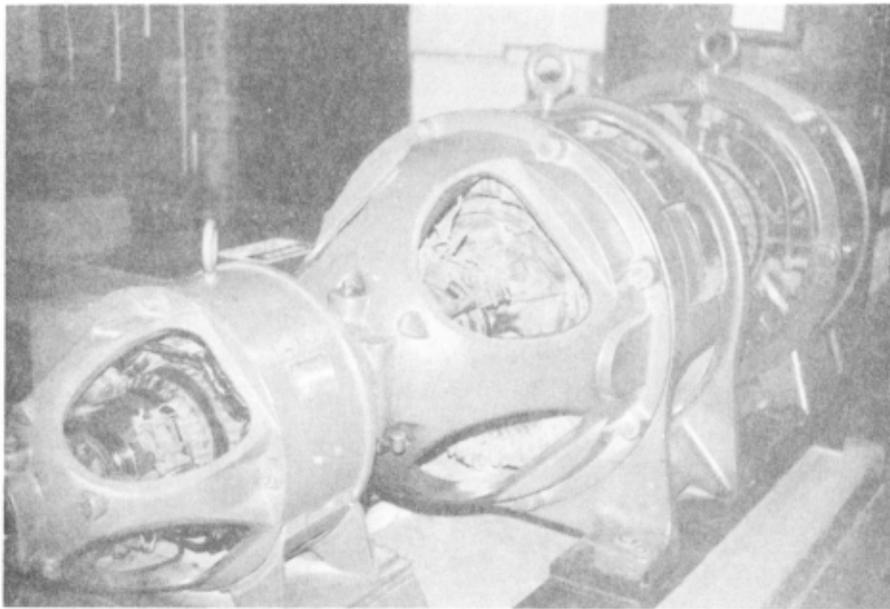
Monongahela Incline -- Close-up of Track



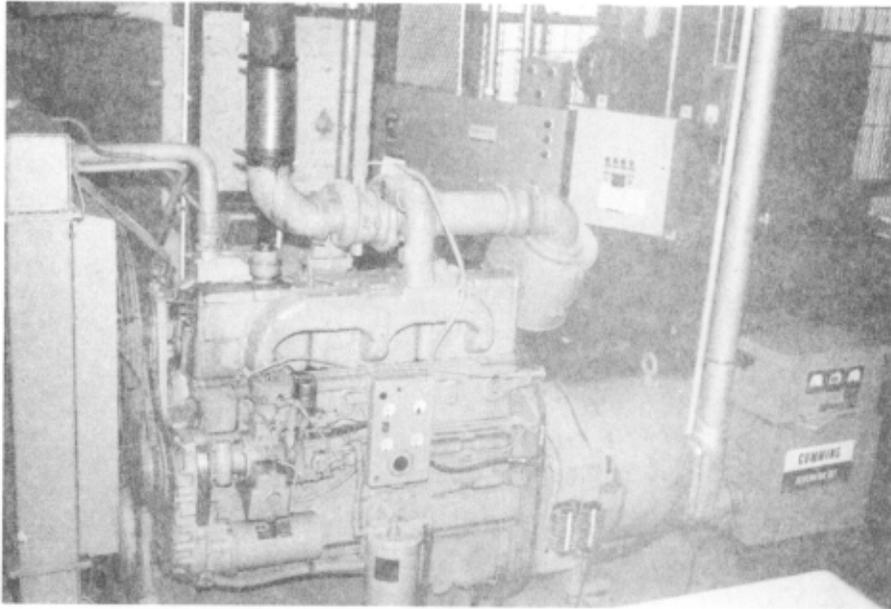
Monongahela Incline -- Close-up of Track



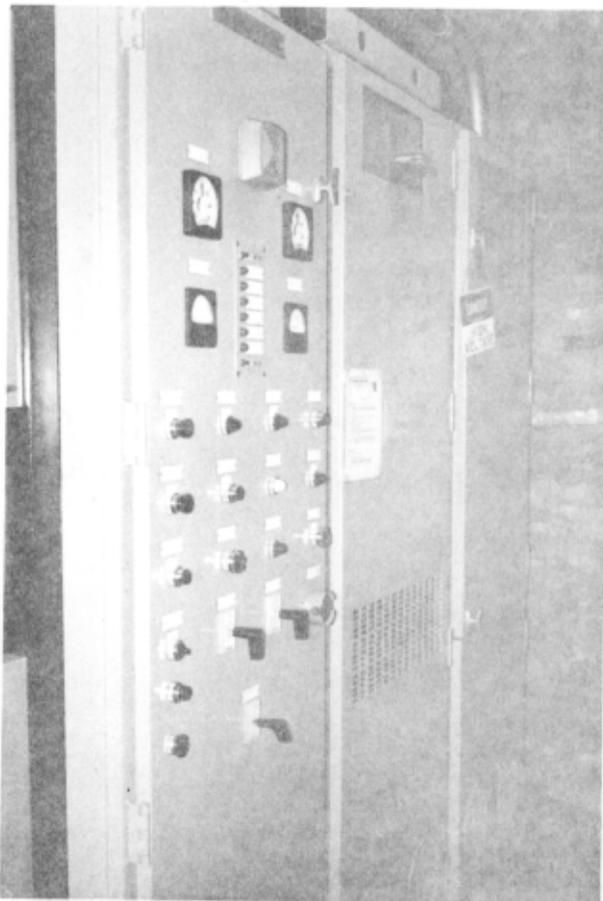
Old DC generator now on standby at Duquesne Incline



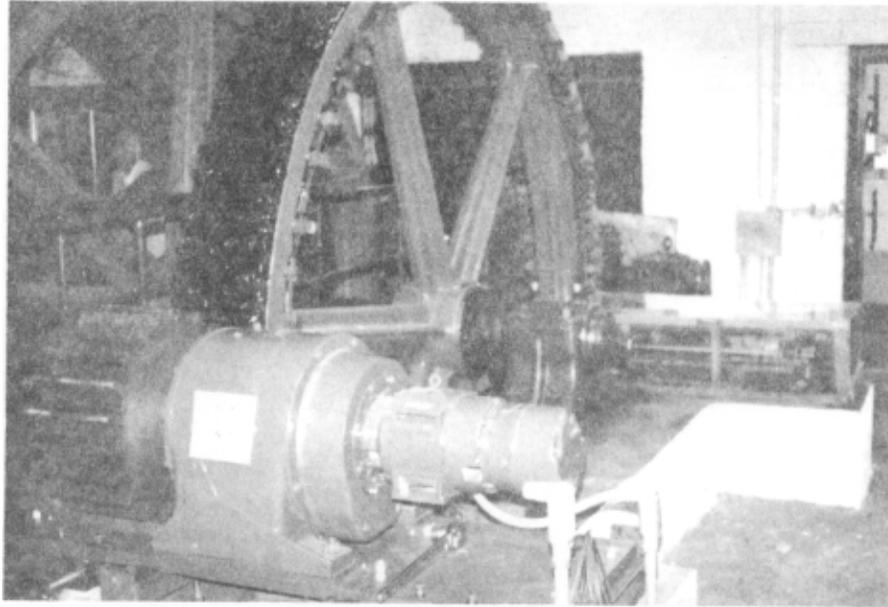
Close-up of old DC generator



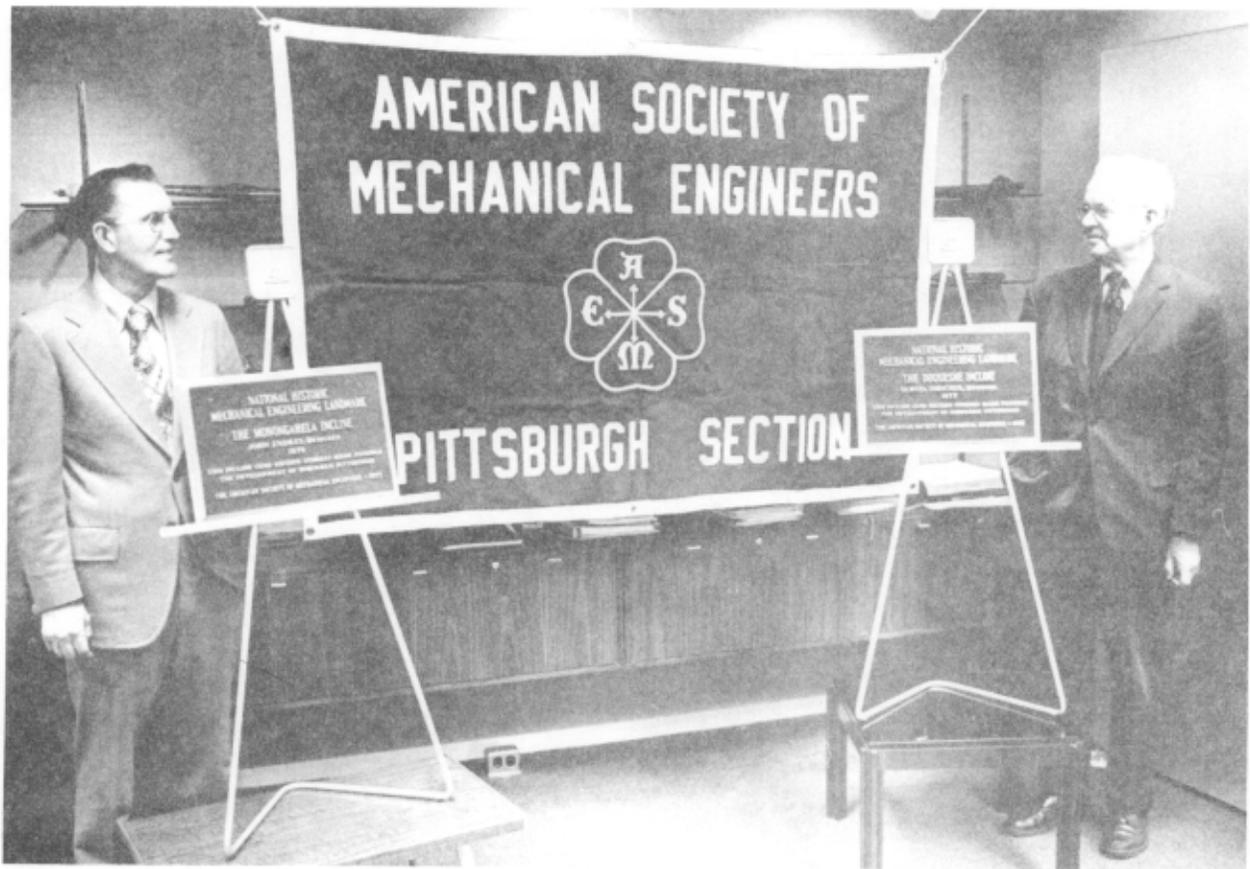
Diesel Auxiliary Power Supply
Duquesne Incline



New Westinghouse Rectifier
Duquesne Incline



Wooden toothed drive gear with cable drum (left)
and traveling-nut limit switch (right)
Duquesne Incline



Eugene W. Starr (left), Chairman, and James C. Glascock (right), History & Beritage Chairman, of ASME's Pittsburgh Section, with the plaques