

THE BROADWAY CABLE RAILWAY.

The spacious and handsome cable cars, as they now move up and down Broadway, are in marked contrast with the former horse cars, and when the old days of the Broadway stages are remembered, the transformation seems wonderful. Where there are no horses, no trolleys, no storage batteries, no visible means of propulsion, it becomes a question of interest as to where the power is generated, how it is transmitted, and how it is used in the propulsion of the cars.

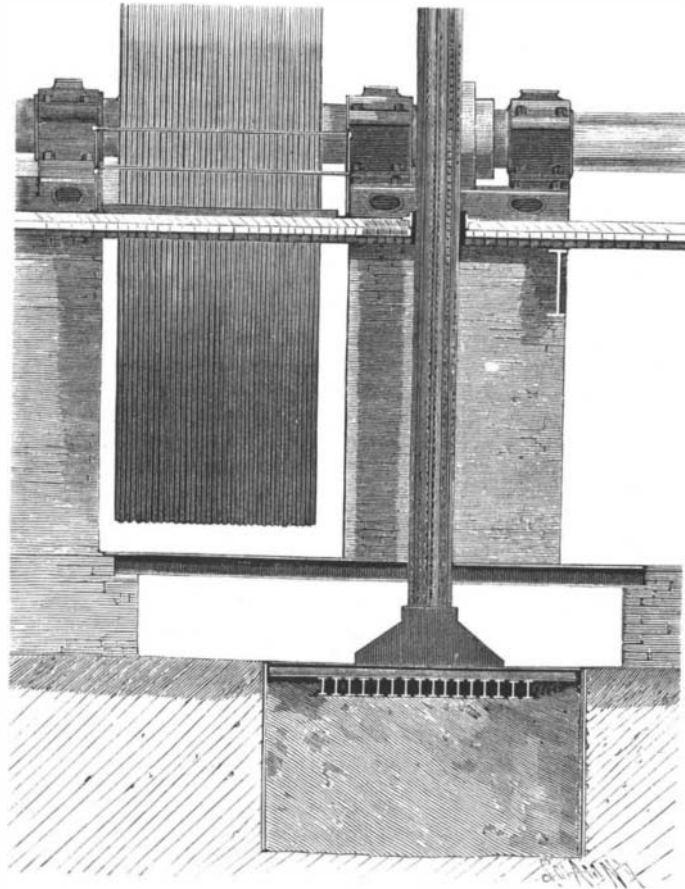
We have from time to time printed accounts of the progress of this great work, so that, so far as the practical details of the working of the road are concerned, our readers have had an opportunity to become informed. Our diagram shows the different loops of the cable. From 59th Street to 36th Street, the cars are propelled by cables running from the 51st Street power station; from 36th Street to Bowling Green, the cars are propelled by cables running from the Houston Street power station; and from Bowling Green to the ferries, the cars are to be propelled by a loop running out of the Front Street power station. The several loops of the cables are lettered A, B, C, etc., on the diagram. The loop at the Battery is a single cable, to which the cars from the main section will be transferred.

The Houston Street power station is provided with two pairs of duplicate engines, arranged for driving four separate cables, the loops B and C extending to Bowling Green and the loops D and E extending to 36th Street. As will be seen by the diagram, these cables are in duplicate, so that should one fail the cars may be easily thrown in connection with the other, and the engines are arranged so that any loop may be driven by any engine in the station. The loops G, F, running out from the 51st Street power station, are arranged in practically the same way. The 51st Street power station has already been described in these pages. The Front Street power station is not yet completed.

The Houston Street power station forms the subject of our engravings. It will be found difficult, on making a search at the corner of Houston Street and Broadway for the power station, to determine which of the corner buildings contains the engines and boilers for driving the central loops of the railway. The building which stands upon the northwest corner has every appearance of being an ordinary business building, and such it is from the ground floor to the roof; but the structure below the ground floor differs materially from other buildings on Broadway. It has a double foundation, or rather, it has a foundation which is separate from the foundations of the engines and machinery in the basement. The smaller engraving shows the construction of this part of the building. It represents one of the large steel columns which support the superstructure. It will be seen that it passes through the floor of the engine room and is entirely independent of this floor. By means of this construction any possible vibration of the machinery is confined to the engine floor and not transmitted to the columns which support the building. The engines, four in number, are supported on brick piers, rising from the bottom of the sub-cellar. The engines are arranged in two pairs, connected with the driving drums, as shown in the upper portion of the front page engraving. The engines,

entirely across the engine room, and carrying another rope drum opposite the driving drum of the other pair of engines. This shaft is made in four sections, each end section carrying a 26 foot drum, already described, and one 9 foot drum, grooved for thirty-four 2 inch cotton ropes, which run from these drums over 32 foot drums on the cable-driving shafts. The 9 foot drums are connected with the shaft by means of friction clutches, so that these drums may be connected with the power or thrown out of gear at pleasure.

The middle portion of this shaft is divided into two parts, which may be connected with each other, so as to make the shaft continuous, and each also carries a



THE FOUNDATIONS.

9 foot drum. At the middle of the shaft is arranged a small engine, which is connected with each half of the shaft by spur gearing. This engine is intended for turning over either half of the shaft and the machinery connected therewith for inspection and repairs. The shafts which support the 32 foot drums carry at opposite ends cable drums for driving the cables which run out into the street and propel the cars. Each half of the plant is furnished with two cable-driving shafts, each of which carries a 32 foot drum, taking power from a 9 foot drum on the 20 inch shaft, and each cable passes four times around the pair of cable drums to insure the necessary friction for driving. The outgoing part of each cable passes around a sheave carried by a tension car in the lower basement, before running up to the conduit. Each tension car has a run of about 40 feet on a railway track laid in the sub-basement, and it is drawn in opposition to the pull of the cable by a weight of about 2 tons attached to a 1 inch rope running up over a sheave attached to the first floor of the building. All of the engines may

As our readers are well aware, Mr. John D. Crimmins, one of New York's best known contractors, was the builder of the road, almost all of the material, both for street work and power plants, being furnished by the Pennsylvania Iron Works Co. Both the design of the road and its construction have been under the direction of Major G. W. McNulty, the engineer-in-chief. His assistants have been H. W. Brinckerhoff, in general charge of the office; N. S. Latham, Albert Carr, A. N. Connett, and G. F. Simpson, division engineers in immediate charge of construction; M. W. Sewall, in charge of design of power plants, and C. I. Earll, in charge of design of track work, including grip and curve mechanism.

The Third Avenue cable road, which has been in process of construction for several years, is now practically completed and was officially opened last week. Cars are now running regularly on the upper portion of the road. This road differs from the Broadway and Seventh Avenue road in respect to its engines, cars, grip and grip-operating devices; also in other important particulars.

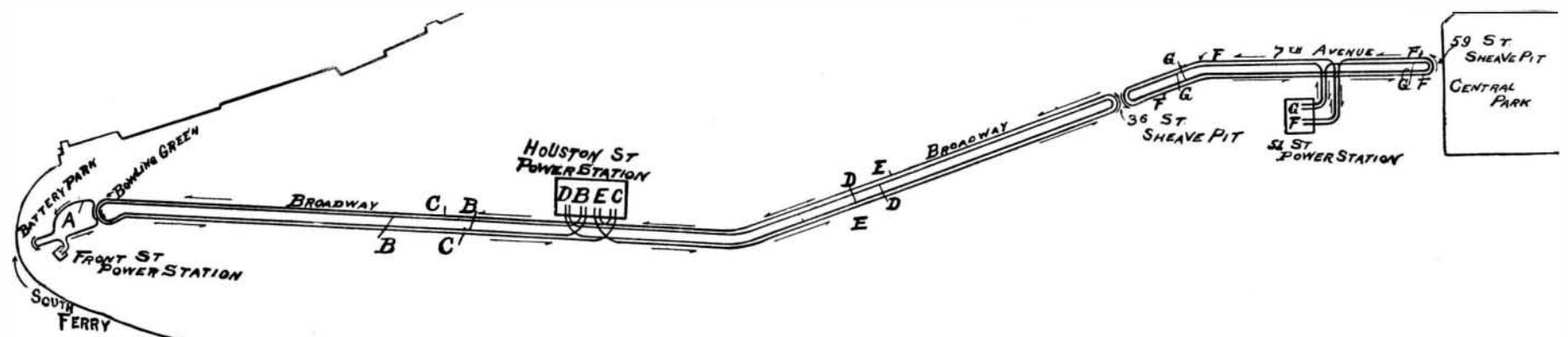
Early Use of Petroleum.

In a diary kept by one of the surveyors engaged in the survey of the Holland Land Company's purchase, at the very beginning of this century, an entry occurs to the effect that near the headwaters of the Allegheny River, in New York State, was a spring, upon the waters from which, when conducted into shallow pools, would collect quantities of oil. This the Indians collected and used. For unknown generations the Indians held this spring in high veneration, believing it was a direct gift from the Great Spirit. They dried the oil by exposure to the sun, and made an ointment that they used to mix their war paint, as well as for remedial purposes. This ointment was the vaseline of the present day in its crude state, for the oil skimmed from the spring was crude petroleum. The old spring and a plot of ground one mile square were given to the Indians as a reservation, and is so held at the present time, being known as the Oil Spring Reservation.

In after years, the enterprising whites collected the oil, and it was bottled and sold under the name of "Seneca Oil." It had a wide reputation, and was eagerly sought by many, who extolled its merits in the most extravagant terms. Had it not been for the fact that the inquisitive whites found a way to get petroleum from the earth by sending the drill down through the rocks, "Seneca Oil" would doubtless now be a popular medicine worth \$1 a bottle.—*Pharmaceutical Era, Detroit.*

The Ignorance of Children.

By the liberality of Mrs. Quincy Shaw I was enabled to make comprehensive studies in 1880 of a large number of Boston children just after they had entered the lowest grade of the primary school. Fourteen per cent of these six-year-old children had never seen the stars and had no idea about them; thirty-five per cent had never been into the country; twenty per cent did not know that milk came from cows; fifty-five per cent did not know that wooden things came from trees; from thirteen to fifteen per cent did not know the colors green, blue, and yellow by name; forty-seven per cent had never seen a pig; sixty per cent had never seen a



ROUTE OF THE BROADWAY CABLE RAILWAY, NEW YORK.

which are 1,200 horse power each, were made by the Dickson Manufacturing Company, of Scranton, Pa. The cylinders of these engines are 38 inches in diameter, the stroke 60 inches. Each engine of each pair has a flywheel, and is arranged for connection with a rope-driving drum, common to both engines, by means of a slot and key coupling. The engines are of symmetrical design, but calculated more for strength and efficiency than for beauty. They are of the Corliss type, but with a modified cut-off. The driving drum is 26 feet in diameter and 5 feet wide. It is provided with twenty semicircular circumferential grooves for receiving the 2 inch cotton ropes, which drive a drum of the same description on a 20 inch shaft extending

be run simultaneously, thus driving all four of the cables, or they may be run independently, or either set of cables can be run by either engine, thus allowing for any contingency.

The Heine boilers, twelve in number, which supply steam to the engines are placed in the rear basement. They are of the water tube type, and are arranged in two batteries of six each. Each boiler may be used independently of the others. The coal used in the furnace is stored in bunkers under the street, and auxiliary bunkers are provided below the boiler floor. The plant is provided with a complete electrical outfit for lighting the engine and boiler rooms, as well as the rest of the building.

robin; from thirteen to eighteen per cent did not know where their cheek, forehead, or throat was, and fewer yet knew elbow, wrist, ribs, etc. More than three-fourths of all the children had never seen to know them any of the common cereals, trees, or vegetables growing.

These subjects were chosen because most of them constitute the material of school primers or elementary instruction which this new science of ignorance shows must make mere verbal cram of much matter of instruction. What idea can the eighteen per cent of children who thought a cow no larger than its picture get from all instruction about hide, horns, milk, etc.?
—*Pres. G. Stanley Hall, in the Forum.*

SCIENTIFIC AMERICAN

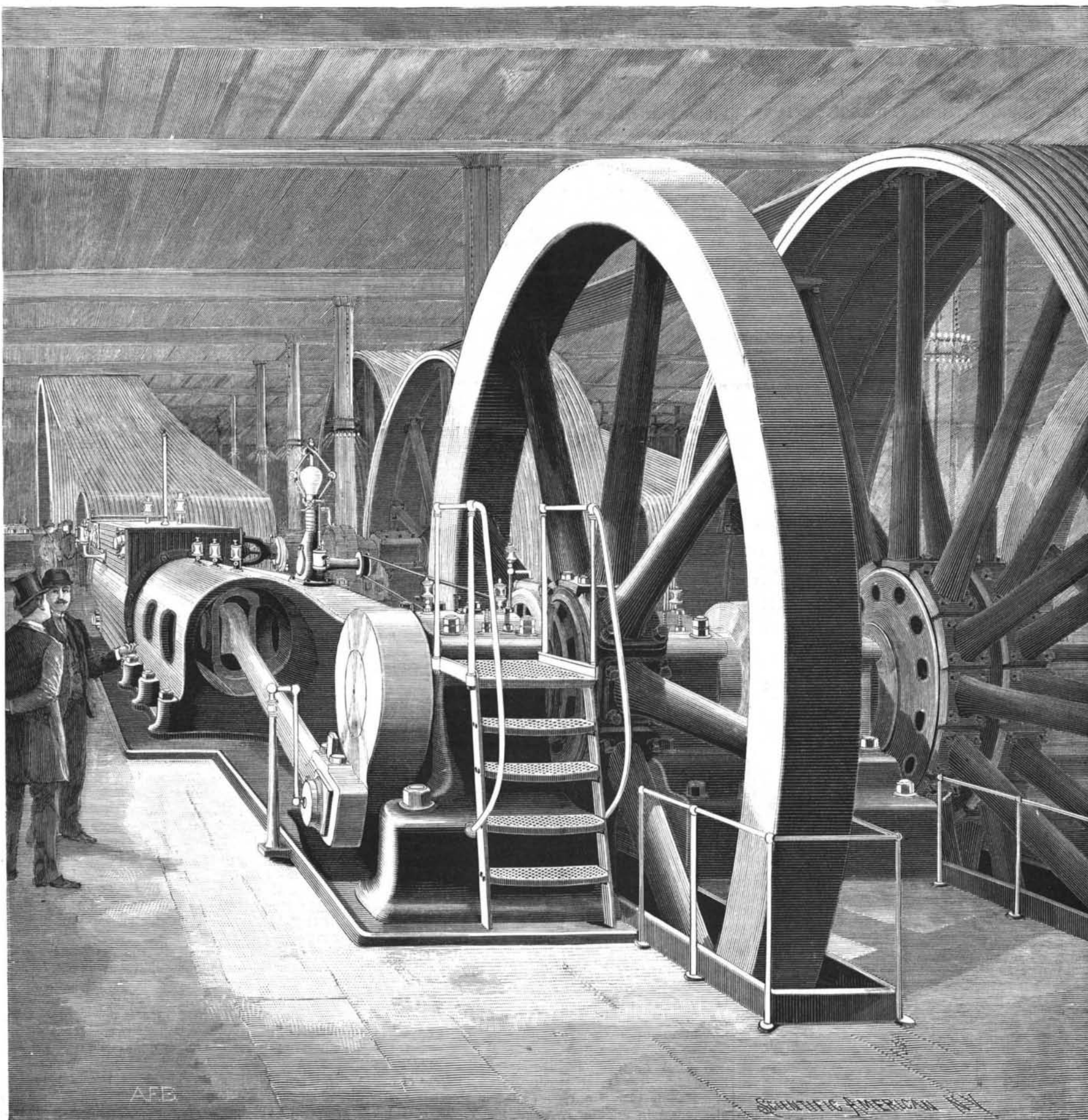
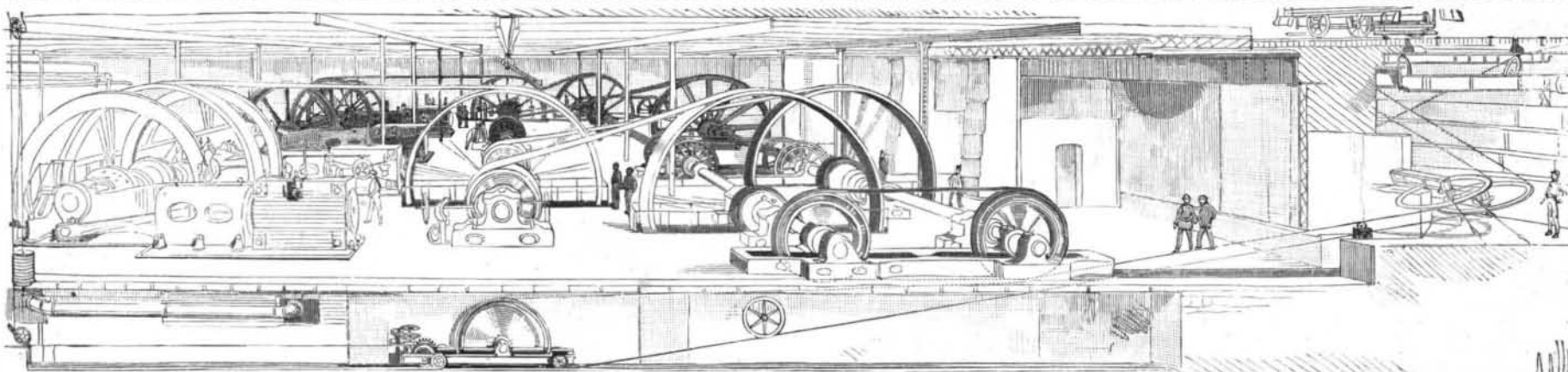
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