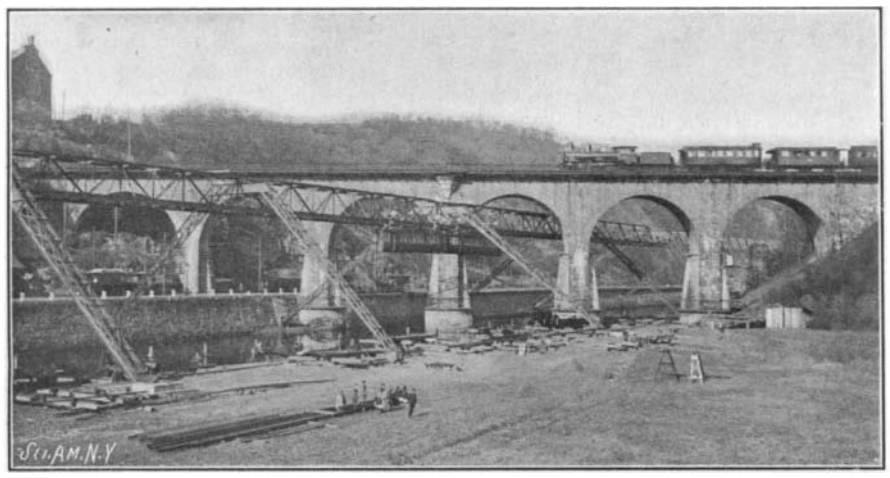
THE LANGEN SINGLE-RAIL SUSPENDED RAILWAY.

Among the many systems which have been proposed for the construction of a single-rail railroad, there is one which has been so far realized that it is to-day in partial operation, and is in a fair way to be completed. About half the system was in working order some twelve months ago, and the whole line, which



CONSTRUCTION BENEATH THE MAIN RAILWAY VIADUCT OVER THE WUPPER RIVER.

covers a total length of 8·3 miles, will be opened to the public during the present year.

We are all more or less familiar with the so-called single-rail systems which have in the past attracted attention, among which might be mentioned the Meigs system, the Lartigue, the Decauville, and that of E. M. Boynton, the remains of whose bicycle railway may still be seen in the vicinity of Coney Island, New York. Although the term single-rail is used in speaking of these railways, in reality they are dependent upon two, and in some cases, three rails for stability; for, although it is true that the carrying of the load is performed by a single rail, the designers have usually introduced one or more auxiliary rails, whose duty it is either to preserve equilibrium, as in the case of the Boynton railway, or to prevent oscillation, as in the A-frame system of Lartigue.

The Langen mono-rail railroad, which forms the subject of our illustrations, is named after its designer, Eugene Langen, who was led to turn his attention to the designing of a single-rail railway in the endeavor to overcome difficulties of transportation in connection with some sugar works, of which he was the owner. Strictly speaking, his system is the first to which the term mono-rail is applicable, for while it is true that the Decauville railway makes use of only one rail, in this case it is necessary that the cars be steadied by means of transverse shafts, which are supported by the operatives pushing the cars, or by the draught animals employed to haul them.

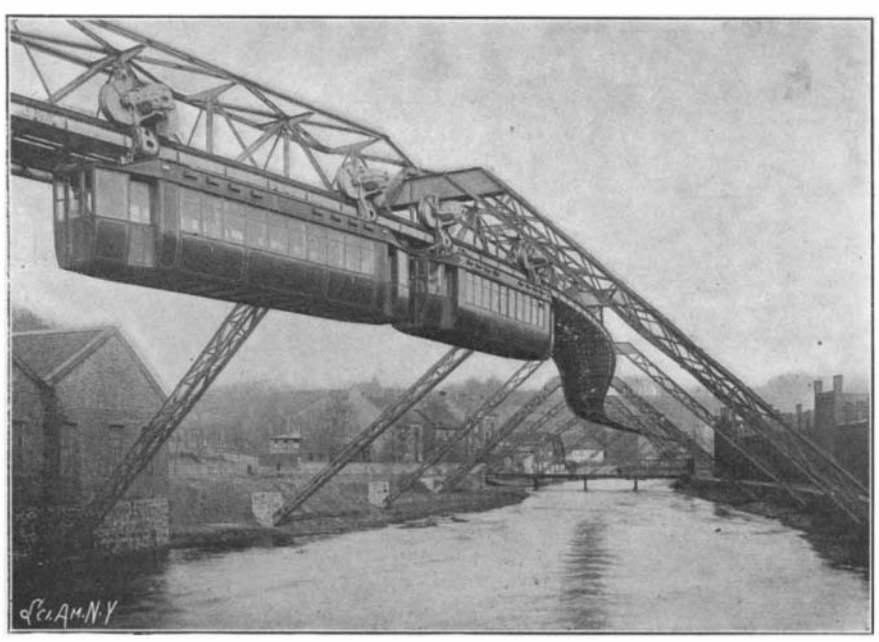
The railway under consideration extends between the towns of Barmen and Elberfeld, which are situated in the picturesque Wupper Valley. The superstructure, or railway proper, consists of a system of latticed longitudinal girders, one vertical and two horizontal, assembled into the form of an I-section, the main girders, forming the web of the I and the lateral girders, which give the necessary horizontal stiffness, serving as the top and bottom flanges of the I. Diagonal tie-rods extend from the upper panel points of the central girder to a connection with the chords of the bottom lateral girder. The last mentioned chords consist of steel I-beams, and upon their upon their upper flanges is laid the single T-rail, from which the cars depend and on which they run. The girders, which are generally of about 100 feet span, are carried upon two different styles of support. Where the railway is located immediately above the Wupper River, the A-frame style of pier is used, while in the suburbs of towns through which the line passes the trusses are carried upon large inverted U-frames. The A-frames consists of two rectangular, latticed struts, which are united at the top by a rectangular plate yoke.

The railway throughout its entire length is double-track, with a loop at each terminus. The maximum grade of the line is 4½ per cent., and the sharpest curves have a radius of 295 feet. It should be mentioned that in order to give the whole structure longitudinal stability, rigid double A-frames, with a broad, fixed base, are introduced at intervals of about 900 feet, the intermediate A-frames being provided with ball and socket joints. By this arrangement the intermediate posts, or A-frames, as the case may be, are free to move in a longitudinal direction and accommodate themselves to the expansion or contraction of the supported spans. The cars are suspended from two two-wheel motor trucks, which are attached to the roof of the car, one at each end, the distance between the trucks being 26¼ feet. The truck frame, as will be seen from the illustration, curves closely around the longitudinal I-beam upon which the track rail is carried, with a view to preventing the possibility of the wheels jumping the rail. The motor is carried on the outside of this truck frame and in position midway between the two wheels, and it receives the current by means of a slip-shoe and a contact rail, which is carried on the bottom of the lateral girder, a little to the inside of the main supporting I-beam.

The style of the cars is shown clearly in the accompanying illustrations. They can accommodate fifty passengers, and each car is divided into first and second class, and smoking compartments. The motors are of 36 horse power, and the maximum speed, between stations, is about 25 miles an hour. As it takes only about 15 seconds to reach full speed, the average speed, including stops, over the whole line, is about 19 miles per hour, and this in spite of the fact that there are eighteen stations on the road. The trains are ordinarily made up of two cars, but the station platforms are made sufficiently long to accommodate four-car trains whenever the development of traffic calls for them. As each car carries its own motor, the speed will not vary with the weight of the train. The system is fitted with an automatic block system, in which the signals are regulated by the car itself, and, consequently, the headway between the trains may be reduced, if desired, to two minutes. An efficient system of braking is used, chief reliance being placed upon the Westinghouse pneumatic brake, with which all cars are fitted. The speed may also be controlled by a hand brake connected up with the fittings of the Westinghouse brake, and also by an electrical brake; while an emergency stop may be made by reversing the motors.

In that portion of the line which is built above the river, the total weight of the structure, including the supporting struts, or piers, is less than 850 pounds to the foot, while the weight of the portion above the roadways, where the inverted U-posts are used, is 785 pounds. When we consider that the length of the spans averages about 100 feet, it will be seen that the structure has been designed with a due regard to economy of material. The cost of construction of the line was from $200,000 to $225,000 per mile, including the foundations and the stations. If we include the cost of the equipment, which provides a sufficient number of cars to allow the trains to be started at from two to three minutes intervals, the total cost per mile will be about $265,000.

THE INVERTED U-FRAME PIERS USED ON SUBURBAN STREETS AND HIGHWAYS.



A TWO-CAR TRAIN ON THE LANGEN SINGLE-RAIL SUSPENDED RAILWAY ABOVE THE WUPPER RIVER.

Purification of Acetylene.

Chromic acid may be used to advantage for the purification of acetylene, as has been shown by Ullmann and Goldberg. The phosphorus and sulphur contained in different samples of acetylene which had been purified by different methods were estimated by analysis, and the results show that ferric and chromic salts have no purifying effect upon commercial acetylene, and that cuprous chloride removes the hydrogen phosphide but not the organic sulphur compounds. On the other hand, chromic acid has been found to absorb not only the phosphorus compounds, but almost all of those containing sulphur. The results of their experiments show that pure acetylene is not attacked by the chromic acid solution, and that the quantity of the solution required to purify the gas depends only upon the quantity of gas to be treated and the amount of impurities it contains.

It appears from the observations made by F. B. Ahrens, that the mixture sometimes used to purify acetylene, made up of bleaching powder or other materials, gives off considerable heat and the action is accompanied by an evolution of chlorine. For instance, bleaching powder and sawdust are now used to remove the sulphur and phosphorus compounds present as impurities in commercial acetylene, and in this case it is found that the gas, after passing through the purifier, contains a large amount of a chlorine compound. Besides, after a short time, the mixture becomes strongly heated and loses its purifying properties. This result is not due to the action of acetylene on the mixture; this has been proved by the fact that when bleaching powder and sawdust are mixed with water, a considerable rise of temperature takes place. This is more or less rapid and is accompanied by the evolution of chlorine and water vapor in large quantities. That the action is due to the sawdust appears from the fact that when the latter is added to a cold solution of calcium hypochlorite the temperature rises to 95° after a short time. On the other hand, no change of temperature is observed when pure and finely divided cellulose is used in place of the sawdust. There is no doubt that it is the lignin of the latter substance, which reacts with the hypochlorite. This inconvenience resulting from the use of sawdust may be entirely overcome by mixing the bleaching powder with some inert substance such as infusorial earth, powdered coke, brick dust, etc.

Iodine in Sea Water.

In a contribution to the debated question as to the amount of iodine present in sea water, A. Gautier states that in the form of inorganic salts practically no trace exist in the water of the open sea. In the form of organic compounds, however, a considerable amount of iodine is found, amounting in an insoluble condition to 0·52 parts per million, and as dissolved organic iodine, 1·8 parts per million, giving a total of organic iodine of 2·32 parts per million.—Compt. rend., 128, 1079.

THE United States Marine Hospital Service has a new disinfecting steamer for use at Havana. It is named the "Sanator," and has a formaldehyde apparatus, sulphur furnace and bichloride of mercury apparatus. There is probably not a harbor in the world where a vessel of this kind is much needed as so Havana.