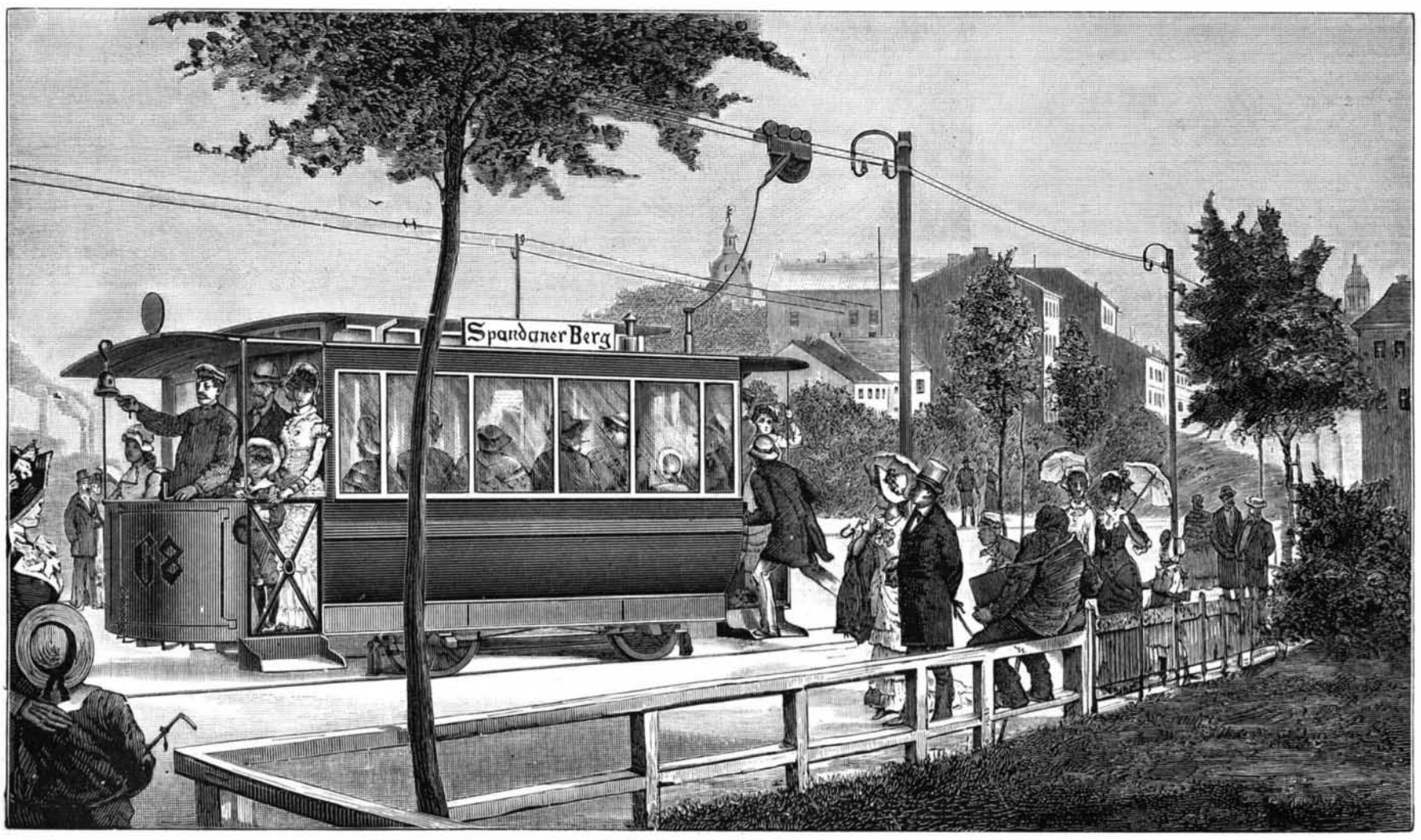
THE ELECTRIC RAILWAY AT WEST END, NEAR BERLIN.

Electricity is gradually but steadily replacing gas and petroleum for lighting purposes, and now is even beginning to replace steam as a motive power. But few electric railways have been built as yet, but a number of them are projected; among them one from the foot to the summit of the Wartburg, near Coburg. The annexed engraving represents part of an electric railway which runs from West End, near Charlottenburg, Berlin, to the well-known summer resort and beer garden known as the "Bock," near the fortress Spandau. The current is not conducted to the electric motor through the rails, as has been customary heretofore, but separate cables are used, which are supported by insulators sustained on poles about fifteen feet high. These cables run parallel with the tracks, and the motor is connected with the cables by a double conductor attached to a small carriage running on the cables. This carriage is drawn along on the cables by the car or engine, and takes the current from the cables, delivering it to the conductor connected with the motor on the car. The West End Spandauer Bock Electric Road has some quite steep grades, the hill near Spandau being especially bad; but, nevertheless, the car, which, when filled, contains twenty-four persons, is moved at about the same rate of speed of a freight train. The probability is that all electric railways constructed hereafter will be provided with separate conducting cables and a carriage thereon for conducting the electricity to the engine, as shown in the engraving. Mr. Werner Siemens is the constructor of the above-mentioned electric railway.—*Ueber Land und Meer.*



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Paris as a Seaport.

The French Society of Civil Engineers have recently had under consideration a project of M. Bouquet de la Grye, Hydrographer to the Navy, for rendering Paris accessible to ships with a draught of six or seven meters (say 23 feet). He proposes to deepen the Seine bed by dredging, and to lower the water level between Rouen and Poissy, so forming a maritime basin about 103 miles long and 150 feet in width, twice the width of the Suez Canal. The excavation would progressively reach a depth of about 53 feet below the present bottom at Poissy, and the water level would be lowered about 40 feet. The quantity of matter to be removed is estimated at the enormous figure of 75,000,000 cubic meters. Only the sharper curves of the river should be avoided; bridges should be raised or rendered movable. At Poissy vessels should rise by a "cascade" of locks, about 110 feet in the forest of Saint Germain, to an upper canal, fed with water from the Seine, by means of turbines driven by the fall of Seine water at the locks of Poissy. This canal would extend to Aubervilliers, passing above the Seine and the railways; its level would be nearly that of the canal of La Villette. There should be two harbors, a lower and an upper, at the borders of the forest of Saint Germain, and ships going to the higher canal should not interfere with those at the lower port, whence Transatlantic merchandise should be sent straight to the Rhine Valley. The expense of the lower canal, between Rouen and Poissy, is estimated at about 150,000,000 francs, that of the upper about 100,000,000. The scheme has been vigorously discussed, and some eminent engineers have taken grave objection to it. Among other points the new behavior of the waters of the Seine at low water, and in times of flood, the maintenance of the new bed, the expense of execution (thought to be underestimated), are noted as presenting difficulty. The problem of the bridges between Rouen and Poissy is not regarded as easily soluble. It is asked, How will the *régime* of rivers or streams entering the Seine between Rouen and Poissy be affected? How are their mouths to be treated so as to maintain their water level and avoid damage to property on their banks? What of the strong drainage of land along the Seine, with resultant injury to cultivation from lowering the level of the river? Will not the waterfalls at works, the foundations of houses, wells, springs, in a word, property generally, be gravely compromised?

The Channel Tunnel.

Some interesting observations on the Channel Tunnel have been communicated to the French Academy of Sciences by M. Daubrée. After referring to the three stages of the work, the scientific researches, the preparatory operations, and the execution of the project, he points out that while the Rouen chalk is water-bearing in its upper strata it is only slightly so in its lower beds. The French Association have dug two wells at Sangatte, each about 95 yards deep, and have begun to run two galleries from them toward Shakespeare's Cliff under the sea. In one of these galleries, at a depth of 60·7 yards below the French hydrographic bench-mark, the Beaumont perforator will be at work, and in the other the machine of Mr. Brunton will be employed. On the English side the under-channel gallery begins at a depth of about 32 yards below the French hydrographic bench mark, thanks to the drier nature of the chalk near the surface, and runs under the sea at a descending slope of 1 in 80. This gallery is now nearly a mile long under high-water mark, and no water has entered it as yet. The mass of the rock through which the tunnel is bored is quite dry, but from time to time little tunnels of water are met with issuing from cracks in the rock. The cylindrical form of bore adopted by Colonel Beaumont has an advantage under these circumstances, as it allows of the gallery being insulated from these tricklings by means of an iron lining formed of rings having a diameter equal to that of the gallery. These rings are in five segments, bound together by ribs, through which pass bolts which connect the segments together, and each ring to the next ones. When a water fissure is encountered, one or more of these rings are placed over it so as to mask it completely. At first four segments are put into position and then the fifth or key is added. The last joint is tightened by a band of thin sheet iron inserted into it. When the spring from the rock is tolerably strong it is luted with a cement containing red-lead before the rings are placed over it. If the fissure is oblique a sort of tube has to be built up of the rings until it is masked, but half an hour serves to place a ring into position. Owing to the slope of the gallery the borers recently attained a depth of 56 yards below the French bench-mark. At this point the depth of low water is 5½ yards, so that the thickness of strata between the tunnel and the sea bottom was there about 50 yards.

Flameless Combustion.

At the *soirée* of the Society of Chemical Industry at Owens College, on Thursday, the 6th inst., a new theory of combustion was practically illustrated by Mr. Thomas Fletcher, of Warrington, the results being so totally unexpected that many present would, and in fact did, go away with the impression that some deception was being practiced. Mr. Jacob Reese, the inventor of the Reese fusing disk, has stated his belief that, if it were possible to produce combustion without flame, the temperatures and duty obtained from any fuel would be enormously increased. It has remained for Mr. Fletcher to not only prove the possibility of flameless combustion in more than one form, but also to demonstrate practically the enormously high temperatures which can be obtained by this means. Taking a ball of iron wire, about three pounds in weight, Mr. Fletcher placed it on a slab of fire-clay, and directing a blowpipe flame on it for a few seconds he suddenly blew the flame out. The temperature increased so rapidly that in a few seconds the wrought iron fused and ran into drops, and this temperature was steadily maintained. The room was darkened, but the closest examination did not show a trace of flame, although the fact that the gas was burning was proved by repeatedly relighting and extinguishing it. The same experiment was repeated in another form by directing the flameless heat into a small fire-clay chamber, in which a refractory clay crucible, made specially for nickel melting, was partially fused and worked into a ball like soft putty, the sides of the fire-clay chamber being at the same time fused. The heat was so tremendous that the blowpipe laboratory which was given up to Mr. Fletcher for the evening was much too hot to be agreeable, in spite of open windows and ventilators. How far this discovery can be utilized remains to be seen, but it would appear that the presence of flame, usually considered to be a sign of combustion, is really an indication of imperfect results, and the best duty is to be obtained only when flame is totally absent. It is certain that such temperatures as obtained by Mr. Fletcher without flame have never previously been obtained with the fuel used, which was nothing more than a small gas supply for a quarter-inch pipe, assisted by an air-blast.

Seeing and Signaling.

M. Charpentier tells us that the time elapsing between a person seeing a signal and being able to repeat it with his forefinger is about thirteen-hundredths of a second. With some people the interval is twice as long, but the above may be taken as the average. M. Charpentier terms the interval in question the "duration of luminous perception," and he measures it in a very ingenious manner. A black disk is set revolving at a given speed, and the observer faces it, having under his finger an electric key. There is a small opening or window in one part of the disk, and when this comes round opposite the observer he sees a light shining through it. Immediately he presses the key and an electric signal passes to the revolving disk. The disk is stopped, and the distance between the window and the record of the signal being measured furnishes the result. The distance between the two points on the disk is, of course easily turned into time, since the disk was revolving at a known speed.