SCIENCE

FRIDAY, JANUARY 18, 1889.

THE WHITE ELEVATED ELECTRIC RAILROAD.

THE crowded state of the streets of our great cities, and the increasing necessity of greater facilities for travelling safely through them with speed and comfort, have brought to the front many devices for solving the problem of rapid transit. One of the most recent of these is the elevated railroad lately invented by Mr. R. T. White of Boston, of which we present herewith two illustrations; one being a general view of a car, with a section of the roadway, including a short curve, and the other showing some details of the truck and track. In his elevated railway system, Mr. White has embodied the results of much railroad experience and many interesting experiments. As may be seen in the illustration (Fig. 1), the track is supported by a single line of columns. The car rests upon two wheels (one at each end), instead of upon eight (four at each end), as in the ordinary passenger-car. The car is steadied horizontally by eight guide-wheels (four at each end), assisted by small rollers, one projecting from beneath each guide-wheel (Fig. 2), and having an upward bearing against the side-rails, which form the horizontal guides for the car-trucks. These guide-rollers, which are only called into play in case of an undue oscillating or rocking motion of the car resulting from obstructions or too great speed, are safeguards against the car leaving the track. They also enable the car to pass around curves of short radii at a reasonable speed without danger of derailment.

The plan and cross-section of a box girder for supporting the main bearing rail is shown in Fig. 1. This is only one of many methods which may be used for sustaining the weights of heavy trains at high speeds; another support, shown in Fig. 2, being an I beam resting upon the columns. Trusses of various forms may also be used; the method of support, as well as the height and distance apart of the supporting columns, being determined by the varying local conditions.

One difficult problem in the perfecting of this system of road was that of switching; but Mr. White claims to have not only solved the problem, but to have made the arrangement of the switch such that the track is never open, even should the switch be turned the wrong way, as the bearing-wheels can never leave the supporting-rail, and consequently the car cannot leave the track.

This system of elevated railroad, though intended primarily for an electric road, may use steam or cables. As yet, we believe, there is no road in operation constructed upon Mr. White's system,

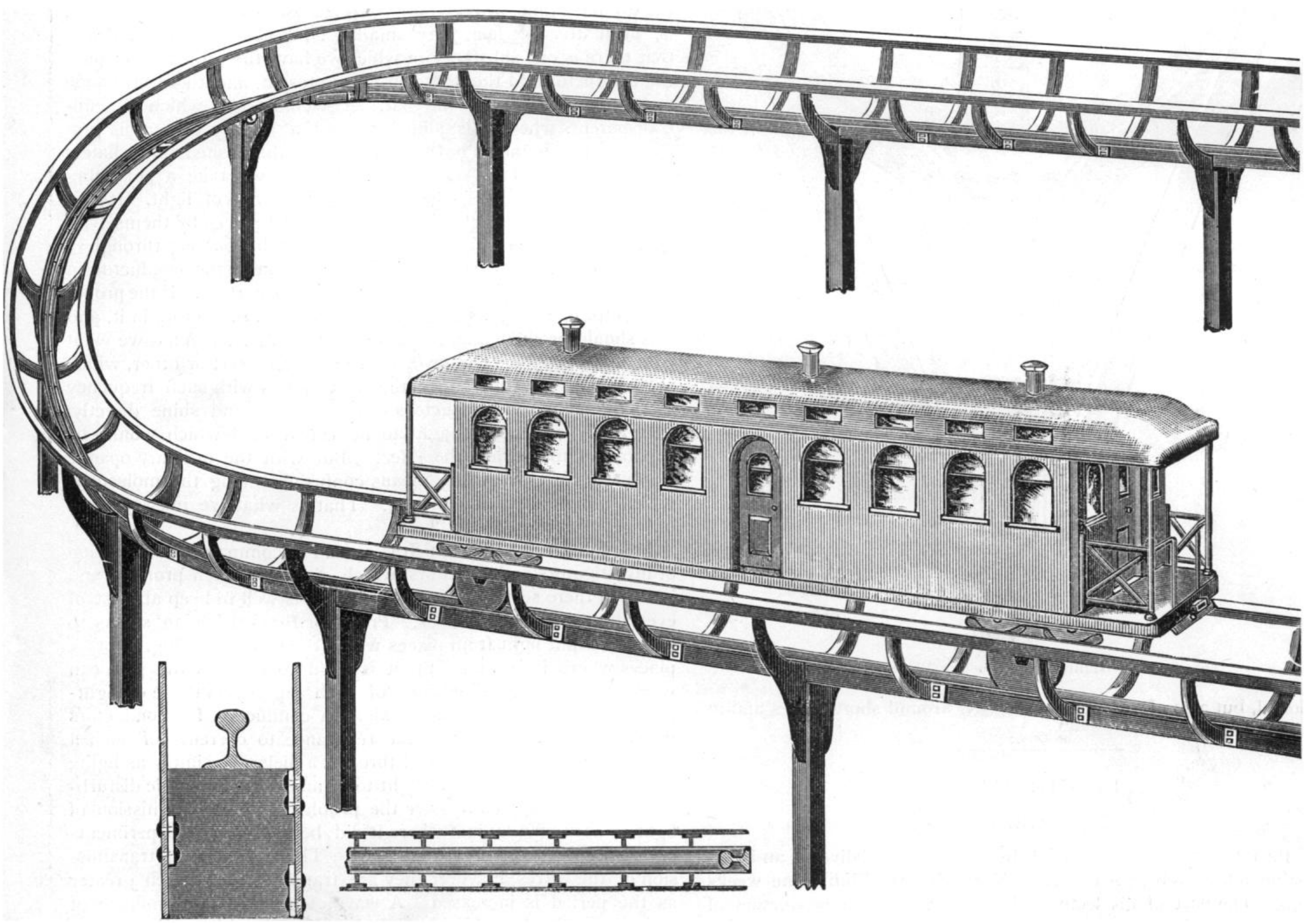

FIG. 1.— THE WHITE ELEVATED RAILROAD.

though large working models show the feasibility of not only running trains upon such a track by any of the motive powers men-

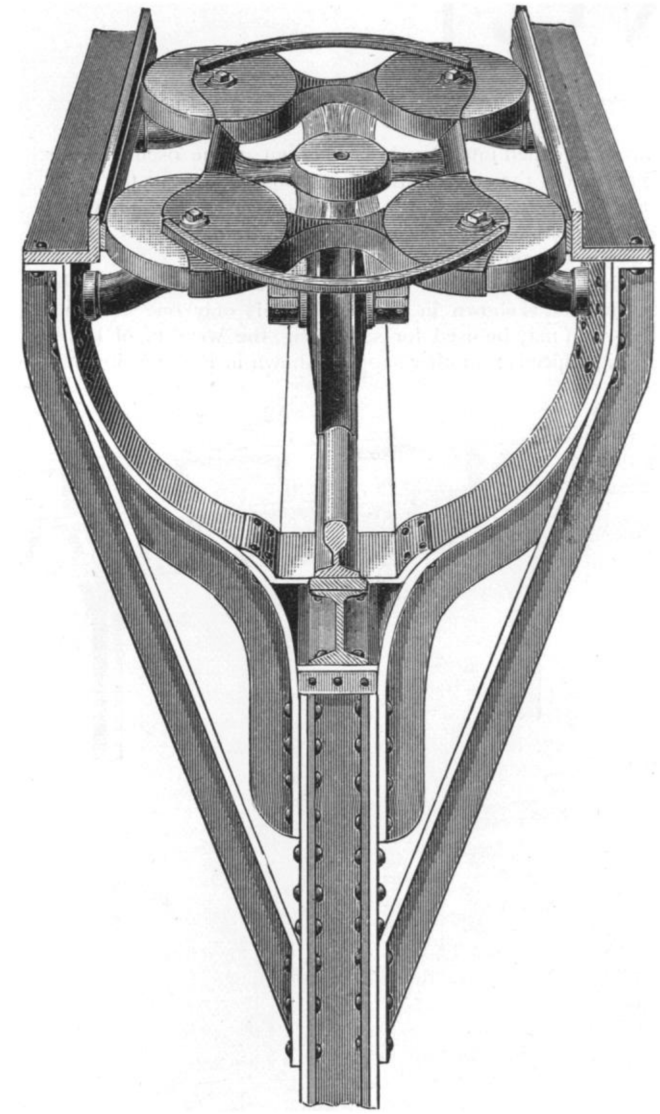

FIG. 2. — THE GUIDE-WHEELS OF THE WHITE RAILROAD.

tioned, but also of running them safely around short curves and at high speeds.

ELECTRICAL NEWS.

Light without Heat.

PROFESSOR BRACKETT of Princeton College delivered an interesting address before the New York Electric Club some weeks ago. The part of his lecture which treated of the production of light without heat gave an admirable summary of Dr. Hertz's experiments on electro-magnetic waves, and afterwards Professor Brackett indicated the lines on which he thought it would be best to experiment to obtain practical results. Briefly the state of the case is this: light consists of electro-magnetic vibrations of a definite and very short period. In our ordinary methods of artificial illumination we produce vibrations of a period that will affect the eye, by heating particles to incandescence, the resultant vibrations being of a great number of periods, only a few of them being of use for illumination. In fact, a great deal of energy is wasted, only a very small proportion of the total appearing in a form that is useful to us. Now, the problem that is presented is to produce vibrations of the period we want, and no other; and the problem is a very difficult one to solve. In nature there are phosphorescent substances and certain insects — glow-worms, fire-flies, etc. — which are very efficient illuminants, the light produced being accompanied by very little heat: so the problem is not impossible, and we may regard it hopefully. The most serious difficulty lies in the extreme rapidity of the oscillations required, billions of them a second, — a rapidity so great that it seems impossible to attain it by any mechanical means. Nor would it be possible to economically distribute the vibrations when they were produced.

Professor Brackett proposes to solve the problem by working it backwards, to take a beam of light, polarize it so that all of its vibrations are in one plane, and "harness that to a wire, so that it will make a current vibrate and also make the magnetic field about the wire vibrate: in other words, if you cannot do the sum, take the answer and work backwards. That is what I intend to do, and I will hint to you exactly how I propose to do it. It cannot be done with the ordinary materials employed for conductors, if it has to heat the wire. . . . We must get something that is not a conductor in the ordinary sense. I remind you that the amount of energy expended in the movement in the high vacuum tube, in the ordinary tube, where you have the most beautiful illuminations, is, in matter of fact, very small. . . . I point out to you next that there is one substance in which we have the properties of both the conductor and the non-conductor present, and there are some very hopeful indications in that. A selenium cell, which is semi-transparent, when it is joined up and a battery current is put through it, is found to have its resistance diminished immediately a flash of light falls on it. . . . Suppose we take a polarizing apparatus by which we can polarize a long web of light. It will consist of vibrations all sorted out in parallel planes by themselves. . . . Now let this polarized web of light be passed through a narrow slit so as to pass directly upon or near the conductor in which we wish to set up an alternating electric current. If the proper conductor can be found, it should have the current set up in it, and this should produce a magnetic field about it. . . . What we want is an alternating current or discharge of some sort or other, which shall enable us to produce the alternations with such frequency that the so-called conductors will break out and shine directly. . . . A dynamometer ought to be constructed which would be capable of measuring the effect. But with the ordinary opaque conductor, such frequency means confusion among the molecules, which brings about a difficulty. That is what we must get rid of."

In a subject like this, which is certain to command the attention of investigators and inventors, which gives so much promise, and in which there seems no impossibility, it is well to keep abreast of even the suggested solutions. Professor Brackett's plan seems to be to transmit light from places where the sun is shining, to other places where it is not. But it is hard to see how this plan can work successfully. Vibrations of such rapidity as those of light-waves cannot be transmitted along a conductor, for conductors would offer a practically infinite resistance to currents of such a period. They are transmitted through a dielectric simply as light; and the fact that we believe light to be an electro-magnetic disturbance does not help us to solve the problem. The transmission of light as such stands just where it did before Hertz's experiments or Maxwell's theory were published. The efficiency of transmission of the waves, however they are transmitted, is much greater as the period is increased. A wave of a period some millions of times less than that of light might be transmitted from China here without much loss, provided we did it properly, while the energy of a light-wave would be dissipated before it had gone a mile. If we wish to transmit light, we must reduce the vibrations to a greater period at the sending station, and raise them again at the receiving end; and this will be difficult. If we wish to produce light, we have little encouragement in the line of producing an electric wave of the required period by mechanical means. The period of vibration of a charge of electricity, displaced on the surface of a sphere of a centimetre radius, might be a thousand million a second; but to reach the millions of millions necessary for light, the size of the sphere would have to be decreased until it had reached molecular proportions. We have in nature, however, instances of the kind of action we wish. In glow-worms and fire-flies the results we are attempting to attain are reached, and we need not despair of a problem the solution of which is called to our attention on almost any