verted into a dynamo, and the train could be slowed or stopped by its energy being given up to all the other trains running on the same railway, so that the trains going down hill helped the trains going up hill, the stopping trains helped the starting trains. At that time we suggested detailed methods for carrying out this economical mutual aid arrangement whether the trains were running on the parallel or on the series system. But there is this difference, that, whereas on the parallel system it is only when a train is running fairly fast that it can help other trains, the series system has the advantage that, when a motor is temporarily converted into a dynamo by the reversal of the connections of its stationary magnet, the slowing train can help all the other trains even to the very last rotation of its wheels. Brakes that save the power instead of wasting it are of purely English extraction, but their conception has recently come across the Atlantic with such a strong Yankee accent that it might pass for having been born and bred in the States.

Economy is one feature that gives electric traction the right to claim your attention; safety is another. This model telpher line worked on "the post head contact" system is so arranged that no two trains ever run into one another, for, in addition to each of the three trains being provided with an automatic governor which cuts off electric power from a train when that train is going too fast, the line is divided into five sections connected together electrically in such a way that as long as a train is on any section, A, no power is provided to the section B behind, so that if a train comes into section B, it cannot move on as long as the train in front is on section A. [Three trains shown running on a model telpher line with four automatic locks.] Whenever a train—it may be even a runaway electric locomotive—enters a blocked section, it finds all motive power withdrawn from it quite independently of the action of signalmen, guard, or engine-driver, even if either of the latter two men accompanied the train, which they do not in the case of telpherage: no fog, nor colour-blindness, nor different codes of signals on different lines, nor mistakes arising from the exhausted nervous condition of overworked signalmen, can with our system produce a collision. Human fallibility, in fact, is eliminated. While the ordinary system of blocking means merely giving an order to stop—and whether this is understood or intelligently carried out is only settled by the happening or non-happening of a subsequent collision—our automatic block acts as if the steam were automatically cut off; nay, it does more than this: it acts as if the fires were put out in an ordinary locomotive and all the coal taken away, since it is quite out of the power of the engine-driver to re-start the electric train until the one in front is at a safe distance ahead.

The photograph now seen on the screen shows the general appearance of the Glynde telpher line, which has recently been much extended in length by its owners, the Sussex Portland Cement Company; and a telpher line with automatic blocking on the broad principles I have described is about to be constructed between the East Pool tin-mine in Cornwall and the stamps. There will be four trains running, each consisting of thirty-three skeps containing three hundredweight each, so that the load carried by each train will be about five tons.

It may be interesting to mention that the last difficulty in telpherage, which consisted in getting a proper adhesion between the driving-wheels of the locomotive and the wire rope, has now been overcome. The history of telpher locomotives is the history of steam locomotives over again, except that we never tried to fit the electric locomotives with legs, as was proposed in the early days for team locomotives. It is a tedious discouraging history, but it is so easy to be wise when criticizing the past, so difficult to be wise when prospecting the future. Gripping-wheels of all kinds, even the india-rubber tires used for the last three years, have all been abandoned in favour of simple, slightly loose, cheap iron tires, which wear for a very long time, and give a very perfect grip when the bar supporting the electro-motor is so pivoted, pendulum-wise, to the framework of the locomotive that the weight of the motor no longer makes the locomotive jump in passing the posts, as it did until quite recently.

After several years of experimenting, we have in telpherage, I venture to think, at last a perfectly trustworthy, and at the same time a most economical, method of utilizing distant steam- or water-power to automatically transport our goods, and in time it may even be our people, over hills and valleys, without roads or bridges, and without interfering with the crops or the cattle, or the uses to which the land may be put over which the telpher trains pursue their snake-like way: we have, in fact, the luxury of ballooning, without its dangers.

SOCIETIES AND ACADEMIES.

PARIS.

Academy of Sciences, September 17.—M. Des Cloizeaux in the chair.—Complement to the theory of overfalls stretching right across the bed of a water-course (weirs, mill-races, and the like), by M. J. Boussinesq. In supplement to the theory worked out in the *Comptes rendus* of July 4, October 10 and 24, 1887, the author here deals with the discharge as influenced by the velocities of the currents at the overfall.—On M. Lévy's recent communication on the subject of Betti's theorem, by M. E. Cesaro. This theorem, which plays an essential part in Betti's "Teoria dell' Elasticità," is practically that of Green, which is capable of such manifold applications, and which M. Lévy has shown to admit of so many interesting corollaries in graphostatics. In the present paper M. Cesaro confines himself to proving that the formula of Laplace, giving the velocity of sound in rectilinear elastic mediums, is itself a consequence of Betti's fruitful theorem.—Compressibility of the gases, by M. E. H. Amagat.—On the chlorides of gallium, and on the value of the elements of the aluminium group, by MM. Nilsson and Otto Pettersson. Here are tudied the two different chlorides Ga_2Cl_6 (or $GaCl_3$) and $GaCl_2$, as determined by M. Lecoq de Boisbaudran, the discoverer of gallium. The combinations are also given that are formed with chlorine by the elements of the third group of the natural system, whose chlorides have so far been studied. It is pointed out that aluminium and gallium displace three atoms, indium two, and thallium one of hydrogen of the hydrochloric gas. In this group, with the increase of the atomic weight the elements show an evident tendency to form several combinations with chlorine.—On ferrous chloride and the chlorides of chromium, by MM. Nilsson and Otto Pettersson. The preparation and properties are described of ferrous chloride, and of the two known chromium chlorides—the trichloride, $CrCl_3$, and the bichloride, $CrCl_2$.—Papers were communicated by M. René Chevrel on the great sympathetic nervous system of bony fishes; by M. Alexandre Vitzou on the incomplete intercrossing of the nerve-fibres in the optic chiasma of the dog; and by MM. Raphaël Dubois and Léo Vignon on the physiological action of para- and metaphenylene-diamine.

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