

economic method of automatically cutting off the power with the governor is all that is necessary to control the speed of the train, the brake rarely coming into action. With steeper gradients, however, the brake would undoubtedly be very useful.

The way in which a single wheel-track is made to serve for one train, or rather two wheel-tracks

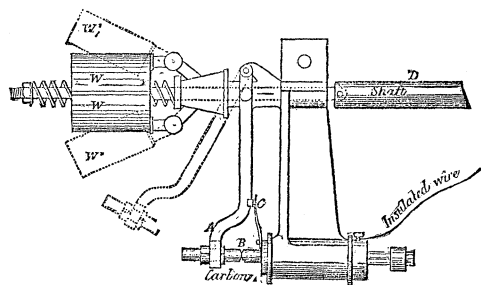


FIG. 2.

for two trains, instead of the necessity of having four wheel-tracks for two trains, as in the ordinary electric railways, is seen from fig. 4. [D is

It is found that for moderate inclines direct driving, with pitch chains, of two wheels with

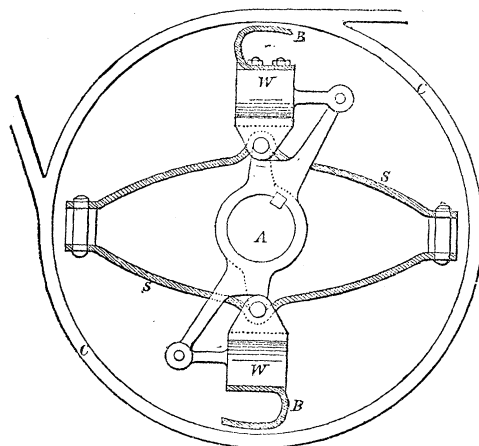


FIG. 3.

india-rubber treads, gives a gravitation grip sufficiently large for satisfactory haulage.

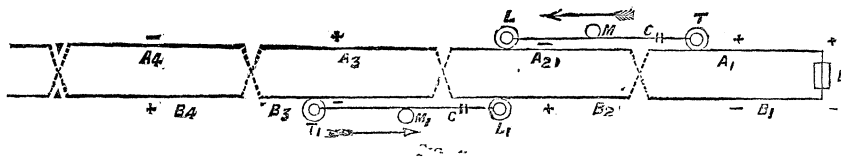


FIG. 4.

the dynamo maintaining two long conductors permanently at different potentials indicated by the signs + and - of each section. The wheels L and T of one train, and L_1 and T_1 of the other, are insulated from their trucks, and joined by a conductor attached respectively to the terminals of the motors M and M_1 . A current, consequently, is always passing from a + section to a - section through each motor. Mechanically, then, each train is supported by what is practically one continuous steel rod; but in reality at the tops of the posts the rods are electrically subdivided into sections, and joined across by insulated wires, one of which may be seen at the top of the posts in fig. 1. The wires connecting the two skeps with the motor, shown in fig. 4, are not seen in fig. 1, as they were too thin to appear in the photograph from which this figure was taken. To prevent the metallic wheels of the skeps short-circuiting the two sections as they cross the tops of the posts, there are insulated gap-pieces, which may be seen in fig. 1, at the tops of the posts where the steel rod is electrically divided.

THE PRE-COLUMBIAN HISTORY OF GUATEMALA.

THE well-known historian of Spanish America, Antonio de Herrera, in describing the first conquest of Guatemala, states that the natives of the province of Utlatlan had 'painted records,' which carried their national chronicles back eight hundred years, that is, to about the year 700 A.D.

Utlatlan was the Mexican name of the region in western Guatemala inhabited by the tribe called Quiches, whose capital city, Gumarcaah, was destroyed by Alvarado in 1524. Its ruins are still plainly visible near the little village of Santa Cruz del Quiche. So complete was the havoc of the Spanish conquerors that not a single building was left standing; and, of those 'painted records' referred to by the historian, not a shred is in existence. Fortunately for the antiquary, intelligent members of the tribe learned to write their tongue in characters devised for it by the early Spanish missionaries, and took pains to apply this knowledge to the preservation of their tribal traditions. In some cases they had a practical incentive to this

in order to vindicate their claims to hereditary lands. Hence several of these documents are called 'titulos,' or family titles.

Many of these native writings were lost; so that, of them all, only four are certainly known to be in existence. They are named in the note,¹ and it will be seen, that, while they are now all accessible in print, two have appeared only within a year, and two are merely Spanish translations without the original text. The 'Popol vuh,' or 'national book,' of the Quiches, is already well known to scholars. About one-half of it is concerned with the religious myths of the Quiches, the remainder with their historic traditions. The precise date of its composition is uncertain, but it may be assigned to the last half of the sixteenth century. The 'Titulo de Totonicapan' is officially dated in 1554; the title of the Princess Nehaib is somewhat later, and refers to lands south-west of the Quiche territory, in the province of Soconusco; while the 'Annals of the Cakchiquels' were written by a native who was already a married man when the Spanish troops first entered his country. The Cakchiquels, it may be observed, were of the same lineage and language as the Quiches, and adjoined them on the east.

These four publications, therefore, offer to students who would investigate the pre-Columbian history of Central America a large amount of authentic aboriginal material. We may say that it has never yet been utilized; for the Abbé Brasseur, in his 'Histoire du Mexique,' was utterly uncritical, and spun a romance from these writings, all of which he had consulted; while Mr. H. H. Bancroft had never seen three out of the four when he prepared his 'Native tribes of the Pacific coast,' and his 'History of Central America.' A comparison shows that all the native writers drew from some common stock of national legend; all deny that the regions they occupied were their original homes; all refer to some distant land in the west or north-west, beyond the sea, as the residence of their ancestors. An echo of ancient Nahuatl tradition floats through these earliest reminiscences. We hear of the wondrous city of Tulan, the mysterious land of Zuiva, and of battles with the Nonoalcos. But the many problems presented by these writings cannot even be men-

tioned here. As a whole, they offer the most complete body of American mythology and legend extant.

GEOGRAPHICAL NOTES.

Heights of mountains in Lapland. — Recent explorations of Swedish Lapland by Bucht Svenonius and Rabot have revealed the existence in the department of Norrbotten of a mass of mountains, of which several summits rise considerably over 6,000 feet. Their ravines enclose numerous glaciers. The highest is called by the Lapps Kebnakaisa, is situated in latitude 68°, a degree and a half eastward from the meridian of Stockholm, and between the Luleo and Torneo lakes, and by trigonometrical measurement appears to be 6,940 feet in height. The two next highest are Kaskasatjokko, 6,800 feet, and Sarjetktjokko, 6,760 feet, approximately.

Northern Norway and Finland. — The observations of Charles Rabot in the mountainous area of Store Baergefjeld, in Nordland, arctic Norway, represented on the best charts as occupied by an immense continuous glacier field, show that it has been wholly misunderstood. There is no primary glacier, but merely seven secondary glaciers, isolated in ravines, and hardly passing beyond the stage of *névé*. Their total area does not exceed six square kilometres, about one-fiftieth of the area formerly supposed to be ice-covered. The field is not a plateau, but to the north a mountain mass, whose culminating points reach nearly 6,000 feet, and which averages 3,600 feet; and to the south a densely wooded tableland, cut with myriads of deep and regular cañon-like valleys. Fir-trees three feet in diameter a yard above the ground were not rare. After completing his work on the field, Rabot made explorations in the Kola peninsula of Russian Finland, determining the existence of three distinct chains of mountains between the Polar and White seas, which reach a height of more than 3,000 feet. The country has hitherto been charted as a sort of plain, broken merely by lakes and low hills. The area between the ranges is level, and trees of good size and form reach latitude 68° 50'; beyond they extend some distance, but do not exceed twelve or fifteen feet in height. Collections were made of geology, terrestrial and fluviatile mollusks and fishes.

Connecting the Volga and the Don. — The project of connecting the Volga and the Don dates back to 1568, when Selim, the son of Solymán the Magnificent, besieging Astrakhan, attempted to join the two rivers in order to transport material of war. His work was brought to an end by the power of Ivan the Terrible, czar of Moscow. In 1700, aided by John Perry, an English engineer,

¹ *Popol vuh; le livre sacré des Quichés*. The original text, with a French translation by the Abbé Brasseur de Bourbourg. (Paris, 1861.)

Titulo de la casa de Ixcuin-Nehaib. Edited by Don Juan Gavarrete. (Guatemala, 1873.)

Titulo de los Señores de Totonicapan. The Spanish text, with a French translation by M. le Comte de Charencey. (Alençon, 1885.)

The annals of the Cakchiquels. The original text, with an English translation by Dr. D. G. Brinton. (Philadelphia, 1885.)