of water, which was only 20 gallons per second, but owing to its temperature, which equaled 48 degrees C. For this reason the work was suspended in the north end and during November, 1903, only 260 feet had been cut on that side, while on the opposite side 525 feet were cut. In December, the southern side had advanced 460 feet, while the northern remained stationary. In the south end some very hard rock was encountered, composed of gneiss and mica schist, and here the advancement was only 16 feet per day. The total length of the tunnel is 64,119 feet, and by December 31 the north end had reached 32,968 feet, and the south end 25,194, making a total of 58,162 feet, and leaving 5,957 feet to be finished. But on account of the water flow which had been met with in November, steps had to be taken to carry off the water before any further work could be done on that side. The hot water which had filled the tunnel in the farther end, which sloped downward, was first drawn off and the pumping was continued until the two springs at this point delivered only 20 gallons per second. The conditions were not the same here as for the cold springs on the Italian side. The hot springs come from great depths of the earth and are inexhaustible, while the cold springs are fed by surface water and the flow diminishes as this supply is lessened. When the hot water had been drawn off as fast as it appeared, it became possible to remain in the gallery, as the heat was overcome by means of atomizers. These were already in use in some parts of the tunnel.

The south end was continued until the geological inspection of the strata gave evidence that the water-bearing layer lay not far off. The work was accordingly discontinued so as to avoid meeting the water flow. In the north end a cross-gallery was dug, starting some 10 to 20 feet back of the end where the water occurred, and coming to an end at the point where the south tunnel was to stop, so that they could bore from here to the end of the latter section. At the end of each gallery a solid wall was built, and each wall had a manhole and different openings for admitting the pipes for the air, cooling water, and drain pumps, using tight joints. Beyond the two walls the work of drilling was then taken up, but this time by hand. This operation was quite successful. However, in January the work had to be suspended on the north side on account of a great water flow which reached a total of 15 gallons per second from the two springs. Two pumps were installed to draw off the water, at the 3,200-foot point of the tunnel. Drilling was then continued by hand in the parallel gallery, and on January 31 the latter had reached a depth of 32,672 feet, counting from the mouth of the main tunnel. The end of the latter remained as before at 32,968 feet. At the end of January the work of drilling the transverse gallery which led to the south end was commenced, starting from the 32,925-foot point of the main tunnel. The south tunnel advanced by 475 feet, or at the rate of 14.5 feet per working day. At this time the latter tunnel had reached 25,669 feet, which, with the 32,968 feet on the other section, gave a total of 58,637 feet, leaving 5,482 feet to be finished.

The mechanical drilling of the north end was recommenced on the 20th of March. During the month of April it pierced through calcareous schists and the advance was about 13 feet per day. The temperature at the end of the tunnel reached 115.7 deg. F. At the south end, the tunnel advanced through granitiferous mica schists with veins of quartz. The drilling progressed at the rate of 20 feet per day. The temperature here was 92.2 deg. F. The water in the south end was carried off without any trouble, as before. At the end of June there were but 2,057 feet remaining to be finished, and allowing 475 feet per month, there would still be about five months' work, and this would bring the junction of the two ends of the tunnel up to the last part of November. After this, six months more must be counted for the entire completion of the tunnel, and this gives the finishing of the enterprise at the first of June, 1905. This calculation supposes that the south end will not meet with an excessive flow of hot water when it arrives at the place where the springs are located.

The air supply plays an important rôle in connection with the tunnel construction. In the north tunnel the temperature rose as high as 119.8 deg. F., and then fell to 107.9 deg. On the other side it rose regularly to 101.1 deg. The temperature is taken at a depth of five feet in the side of the rock, as near as possible to the end of the tunnel. Great care was taken to secure a good ventilation, especially on the north side, and the result was quite satisfactory. The mean temperature of the air, in spite of the heat of the rock, is only 86 deg. F. The quantity of air sent in is only slightly higher than last year, but this air is cooled several times and in different ways before it comes to the different working points. The air is brought from the exterior by way of the parallel gallery and is cooled at the 21,870-foot point by a large water-spray apparatus. It then passes into the tunnel by one of the cross-galleries (at the 32,160-foot point) and then goes to the outside. Just back of the working front of the tunnel the walls are sprinkled plentifully by watering nozzles, and this lowers the temperature considerably. For the masonry working point there are two cooling apparatus placed at the entrance of the cross galleries. This apparatus has sixteen horizontal tubes 8 inches in diameter. In each tube is a jet of water. The air which passes in the gallery before the cooler is drawn through the tubes with great force and is cooled by the water sprays. Besides this, there are two large spray apparatus in the tunnel at the 31,600 and 26,550-foot points and another in the finished part of the tunnel at the 22,425-foot point. The use of ice cars has been entirely discontinued, as the system was not found practicable. On the south end the air is cooled in about the same way. The mean quantity of air sent into the tunnel per 24 hours is 30,000,000 cubic yards on the north side and 35,000,000 on the south.

THE AUTOMOBILE AND ITS UTILITY IN THE INDUSTRIAL DEVELOPMENT OF LATIN AMERICA.

BY MARRION WILCOX.

The employment of automobile trucks or trains which can run on ordinary wagon roads and serve as feeders to the railway and steamship lines is a subject which must before long command the attention of the governments of the Latin-American republics. By the introduction of the automobile truck or train a new era of industrial expansion is in store for South and Central America and the West Indies, which is likely to bring about the adoption of a special policy by many of the Latin-American governments. There is also an increasing social and commercial Europeanization of certain Latin-American communities going on which will aid in hastening the use of the automobile, especially in its advantages for the easy and rapid transportation of agricultural, and, to a smaller extent, of mineral products, over short distances and in regions where moderately good roads and bridges can be maintained. Within these strict limits the field is vast, and vastly interesting it is certain to become in the near future to statesmen and manufacturers alike.

Let us glance first at Cuba.

To the insufficiency of the supply of agricultural laborers is commonly, but erroneously, ascribed the circumstance that 100,000 tons of sugar cane were left in the fields of Cuba when the last crop was harvested; and now we find that the Cuban Congress has appropriated $800,000 to be expended for the encouragement of immigration—that is to say, practically to pay the expenses of families or individuals who shall cross the Atlantic (from Spain, as a rule) to help load, drive to the mill, and there unload, those primitive ox-carts and mule-carts that "creep like snail, unwillingly," with creaking remonstrance along the country roads. With excellent intentions, the Cuban government is following old-fashioned methods and practices. Of course the immigrants thus secured will serve other purposes as well; but a fact which will not escape the attention of anyone who is familiar with the conditions of Cuban agriculture is this: Given automobile trains, or capacious gasoline cars, with or without trailers (the engines and the trains being in all respects specially and perfectly adapted to the purpose of moving the sugar cane swiftly from field to mill, and the raw sugar from the mill to the railway or port of shipment) even the present laboring population would be sufficient to handle an average sugar crop thoroughly, and indeed to extend the area of cultivation. We shall realize the force of this assertion and reflect upon it as it well deserves (since it is applicable to a score of countries besides Cuba) if we remember that a large number of the best laboring men now employed in building, repairing, or driving the carts, and caring for the animals, would be available in that case for the planting and cutting. It may be said with the energy of positive conviction, though most courteously, that the best plan which the Cuban government could adopt for promoting the agricultural interests of the island would be to continue the admirable work for the improvement of highways which it has already begun, and to admit free of duty all machinery used in handling and transporting the crops.

It will be remarked with interest in this country that El Economista, a valuable review published at Havana, advocates in its issue of October 1 the reduction of duty on machinery and material for railways to two per cent *ad valorem*, with complete exemption to be accorded to that of American origin, in grateful recognition of the advantages conferred upon Cuba by the United States through the treaty of reciprocity.

A step in the right direction is thus advocated, since in Cuba, as in German East Africa and Togoland, automobile trains may soon be run on the wagon roads as feeders to the railway lines; and the Cuban government, when building bridges and improving roads, will be only following the precedent established by the German colonial administration in Africa. It is self-evident that an enormous increase in the national wealth of Cuba will result from extending the margin of cultivation, by the means indicated, so that it will include fertile tracts that lie at a distance from railway or port.

Similar but very much greater opportunities exist in other Latin-American countries. Thus it has been customary to say that the natural resources of some of the Mexican States are still almost wholly undeveloped—and, more pointedly, the mineral wealth of certain localities nearly untouched—simply because their railways, though long ago projected, it may be, are not yet in operation, or the existing lines of railway are inadequate. But good wagon-roads are common there, and it may be assumed that in automobile trains, to be run on ordinary roads, even such as have steep grades, will be found the best solution of the problem of bringing out the products of field, forest, and, in some cases, of the mines as well.

Again, in the Argentine Republic, Uruguay, and Paraguay—in general, throughout the valley which in so many respects is comparable with our Mississippi Valley—automobile trains are required in very large numbers, as feeders to railways, or as substitutes for short railway lines in many fertile regions bordering the Paraná, Paraguay, and Uruguay rivers, to transport both the products of the cattle-ranches and those cereal crops which are grown for export in rapidly increasing quantities. To southeastern Brazil, with its valuable crops of coffee, etc., the same system of transportation is applicable in a measure, though the natural features of the country are less favorable. In the aggregate, territory in Latin America nearly equal in size to all that part of the United States lying east of the Rocky Mountains may be brought within the margin of cultivation; and a year may ripen what the centuries never matured. It is a territory rich enough to secure immediately whatever is imperatively needed for its development, for we are considering now the moderately level or rolling agricultural country, the products of which are so valuable that the local governments are vying with each other to obtain immigration in many parts of the world—using the governmental resources to pay the expenses of settlers from point of departure to destination.

SCIENCE NOTES.

The 36½-ton meteorite which was brought to this country some years ago by Lieut. Peary has been removed from the Brooklyn navy yard to the American Museum of Natural History. It was necessary to use the big derrick owned by a wrecking company. The meteorite was landed at the West Fifty-fifth Street pier, Manhattan, whence it was brought to the museum on a large truck.

Up to the present it seems that hydrochinon has not been extracted from any living plant. It has now been extracted from the buds of the pear tree by Messrs. G. Riviere and G. Bailhache, of Paris. The buds are macerated in ether for a certain time, and in this case they lose the viscous matter which adheres to the scales. The ether solution is evaporated and the matter which remains is slightly heated. It is sublimed and yields some transparent crystals. The proportion of crystalline matter which is obtained is found to increase with the progress of vegetation. The experimenters show conclusively that the crystalline matter is hydrochinon, and they also prove that it exists in the buds themselves and is not a product of decomposition. What is somewhat singular is the relation between the pear and the apple tree in this respect. The buds of the apple tree do not yield hydrochinon, but on the other hand they contain a considerable quantity of phlorizine, and this latter body does not exist in the buds of the pear tree. In this way the two different species are each characterized by an appropriate chemical compound.

Among the most recent objects which have been found by the Rev. P. Delattre in the excavations at Carthage may be mentioned a sarcophagus of large size containing relief sculptures. The sarcophagus is of white marble and is painted, like some other specimens which have been found here. It was found along with some other objects at a depth of nearly 60 feet. On the two main faces of the sarcophagus is a relief which represents the monster Scylla with her arms extended. At the middle of the body are seen dogs which are facing in different directions, following the ancient tradition. The same subject has been found before upon a sarcophagus at Carthage, but in the latter case it is simply painted and not in relief. What is to be especially remarked concerning this group is that the same subject is found in the mausoleum of El-Amoroumi in Tripoli, which belongs to the later Punic period. It occurs among other well known mythological subjects. It is therefore of interest to find that at the Punic period of Carthage the myth of Scylla already occupies a prominent place. Up to the present it has only been found on Roman remains.