self higher aloft than is good for him when racing. The gearing, though substantially and skillfully made, is crude and unnecessarily bulky. The same may be said of the wheels and the frame body. The stern of this vehicle is nothing but a lumbering adaptation of the carriage idea, without adding a single advantage, and detracting from what would otherwise claim our approval as a genuine, though not entirely satisfactory British model.

The heavy, solid idea in French automobile engineering, furnished with extremely powerful motors capable of record-breaking speed, is probably best illustrated by the Mors model (Fig. 3). This design is a close approach to the locomotive idea, while doing away with the comparatively ungainly features of British vehicles constructed on the same basis. It is a much more ponderous model, but it is not so neat and graceful as Fig. 1. Though it is capable of developing sixty horse-power, and weight for weight is undoubtedly the fastest motor-propelled machine built so far, it is of a type which will hardly prove popular with any but automobile enthusiasts and expert chauffeurs, who view the sport from a professional racing standpoint.

The highest present development in American racing automobiles shows a distinct improvement over even the most graceful French patterns in point of novelty of style. As the French model excels the English in cleverness of design, so the American model has of late acquired a superior, original style of its own, considerably in advance of Gallic ideas. The Winton forty horse-power racer (Fig. 4) is a characteristic example of the progressive spirit of the American designer. Although this vehicle is almost equal to some of the fast French automobiles in speed, it has none of the latter's comparatively clumsy construction. The straight body frame—always the essential base of structural smartness in automobiles—has been preserved; but the unsightly and bulky machinery depending from the bottom of the Mors, has in the Winton been simplified and reduced to less than half its dimensions, and in exceedingly well-protected casings. The ponderous, chariot-like wheels of the Mors are replaced by spindling, but tough, spoke-wheels; the chauffeur seat, comfortably low, is pushed forward so that it overhangs the center of the vehicle, the condensers in front are squeezed into a minimum of space, and the stern slopes away in the smooth, highly-polished finish characteristic of the entire vehicle. It is a pattern which has almost every advantage of the French models (Figs. 1 and 3), besides being a trifle neater and smarter than Fig. 1, and almost as fast as Fig. 3, without the rather unwieldy aspect of that vehicle.

The latest American racing automobile as shown in Fig. 5, the Ford, possesses features entitling it to credit as being the most unconventional, if not the most beautiful, design so far produced by American ingenuity. It is a model that commends itself strongly to the automobile experts because of the chaste completeness and compactness of its structure. In this rarified type of racer, the same neat tapering stern will be noticed as in the Winton; the chauffeur seat has been shaved down to a mere "toad-stool" perch, and the forward condensers, instead of being inclosed in a pyramidal casing, have been placed in an inverted shield set at an angle with the air pressure so as to force air up under the pipes—a most ingenious arrangement. No matter how we may choose to view this machine, it is an automobile first and last. The carriage element, so detrimental to a clear-cut, unsophisticated style, has been avoided as in Fig. 1.

Since the discovery of the new magnetic steels we have been enabled to make permanent magnets which keep a constant moment for a whole year within 0.1 per cent. The question as to the best means of storing them when not in use is raised and answered by I. Klemencic. He incloses the magnet in a glass tube filled with cotton wool, which in its turn is embedded in an iron box with sides 3 mm. in thickness. This prevents both disturbances by jarring and by an external magnetic field. He finds that the protection ratio is 3. This is not very high, but it can, of course, be indefinitely increased by increasing the number of boxes.—I. Klemencic, Ann. der Physik, No. 9, 1901.

THE ARTIFICIAL CULTIVATION OF THE RUBBER TREE FOR INDUSTRIAL PURPOSES.

BY ENOS BROWN.

Owing to the extravagant methods employed by natives in harvesting crude rubber, the natural source of supply has been, to a considerable extent, depleted, with the usual results attending similar acts of extravagance and shortsightedness. The injury that has been done to the forests by reckless abuse of the rubber trees has resulted in the possibility of introducing under favorable advantage the artificial cultivation of the rubber tree. A tree of universal growth in equatorial regions, the rubber tree flourishes luxuriantly within the tropics wherever an exuberantly fertile soil, combined with excessive humidity, is to be found. The valley of the Amazon, in South America, and of the Congo, in Africa, would easily supply the world's requirements but for the inaccessibility of these regions and the unreliable, indolent and savage character of their native inhabitants, who only are fitted as gatherers of the rubber harvest, or able to endure the insalubrity of those miasmatic countries where the rubber tree grows.

RUBBER TREE 16 MONTHS OLD—13 FEET 3 INCHES HIGH. MEXICO.

In the Amazon Valley, where the larger portion of the rubber supply of the world is obtained, the risks attending the gathering of the crop are great. Heavy advances must be made to the improvident natives, who depart into the depths of the limitless forests to remain for months, with the chances against their ever returning. The loss is on the factor, whose season's profit must include that which the native gatherer has robbed him of. The result is the enhanced price of the crude rubber.

The territory where rubber trees grow in the Amazon Valley is constantly decreasing in area. The tree cannot survive the murderous butchery of the native gatherer, whose sole aim is to extract in the quickest manner the gum which is required to pay the advances of the factor, even if the death of the tree is involved.

Every year the native is compelled to travel deeper into the forests in order to reach the living and untouched trees, and the supply is maintained with increased difficulty with each successive season. The valleys of African rivers can be depended upon as a source of rubber supply only when the natives are taught some degree of civilization and submission to their overseers, and after a careful exploration of these regions is made. A century hence Africa may become a tangible entity in the world's rubber supply. Formerly the Central American states and their contiguous Mexican territory exported considerable quantities. There are large areas admirably fitted in physical conditions for the successful growth of the rubber tree, but the native practice of killing the tree in order to get a large present crop has about extirpated the trade. These countries have ceased to be of any account as sources of supply.

Under these circumstances, with supplies becoming every year more precarious, and the demand constantly accelerating, it is not surprising that the attention of investors should have been directed toward projects involving the cultivation and harvesting of a product necessary to the comfort and utilities of the world, and the supply of which is far below actual requirements.

The methods employed in the cultivation of the rubber tree and the harvesting of the crude rubber are shown in the accompanying views, for which we are indebted to the Chiapas Rubber Plantation and Investment Company, of San Francisco, Cal., which has acquired from the Mexican government some 25,000 acres of land, situated in the Valley of the Rio Michol, State of Chiapas. This tract of land was selected because the soil, temperature and rainfall are particularly favorable to the rapid growth of the rubber tree.

The temperature of this section seldom rises above 93 deg. or falls below 60 deg. The rainfall is from 100 to 150 inches annually, and is pretty regularly distributed, though the first four months are less in amount than the last eight. The soil is the deposit of ages of decayed tropical vegetation. The *Elastica castilloa*, from which the Aztecs procured their supply of rubber, is here indigenous. Mahogany and many other woods useful in the arts flourish.

There is no plant of equal value that responds so quickly to careful cultivation as the rubber tree. In lands adapted to its growth, once started, the tree requires but little care. It continues to yield for decades, provided it is not killed by violence. To prepare a plantation requires only the clearing of undergrowth and its destruction or removal. The forest trees are undisturbed so as to afford the partial shade that the growing rubber tree craves. The young trees, just from the nursery, are planted 14 feet apart, or 200 to the acre. The planting season lasts from May to January, during the months of heaviest rainfall. The trees are grown from seed, procured on the spot, which rarely fails to sprout.

SAN LUIS NURSERY—SHOWING GROWTH OF YOUNG RUBBER TREES.

The problem of a regular and efficient labor supply—one of the most serious questions affecting the industry—has been happily solved. The natives are naturally indolent, and, at first, suspicious of foreign interlopers; but, with better acquaintance, their confidence is gained and distrust vanishes. The jingle of the silver dollars is very fascinating to the untutored Indian and is a great persuader to industry. No difficulty is found in securing all the labor required. In clearing the lands and planting trees the native Mexican is very apt, and the climate is so humid and enervating that only a native could endure it.

Dr. Helm, of Dantzig, has analyzed several samples of bronze found in the explorations at Nussar, or the ancient Babylonian city of Nippur. He ascertained that the ancient founders employed, in making bronze, not only tin, but antimony as well. The proportion of antimony is larger in the oldest examples. Copper is supposed to have been found in northwest Arabia. Two heads of almost full-sized gazelles which were found by Prof. Hilprecht show wonderful skill in the use of metals. An analysis showed the existence of nickel in the copper.