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The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are sharp, the articles short, and the facts authentic, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

## THE 1909 AUTOMOBILE.

The tendency toward standardization and interchangeability of parts which for the past two or three years, has been one of the most promising features in the development of the American automobile, is more distinctly noticeable in the product for 1909 than in that of any preceding year. It is one of our national characteristics that, when the American takes hold of a device which, in its inception and early development, is distinctly, or at least mainly, foreign, he invariably improves it in two very important particulars; first, he simplifies both the construction and operation, and, secondly, he reduces the price. If simplicity and low cost, however, be gained at the expense of reliability, they are a doubtful and certainly very costly advantage, and the makers of the expensive foreign cars have argued, and not without reason, that their costly output, because of its greater reliability, was, in the long run, more profitable than the cheaper, but short-lived machine. The day when such an argument had any force, however, is now happily past; for during the past year the American car has proved, both in reliability runs and in the day-by-day service of the several hundred thousand automobile owners of the country, that it is a thoroughly serviceable machine.

In a first general survey of the cars in this year's exhibition, one is impressed with the relatively large number of really fine machines that are offered at moderate prices, for it is probable that over one-half of the exhibits are listed at less than \$1,500. The typical car of moderate price is driven by a 4-cylinder engine of from 20 to 30 horse-power, and will weigh from 1,500 to 2,000 pounds. The tires will be 3½ inches on the front, 4 inches on the rear wheels, and 34 inches in diameter, and the wheel base will be from 100 to 115 inches. It will have magneto ignition, with battery ignition in reserve; water-cooled cylinders; forced-feed lubrication; direct shaft drive, with three speeds ahead and one reverse; sliding gear transmission; a pressed-steel, riveted frame; some good form of leather-covered cone clutch; and a seating capacity for four people.

As compared with last year, the principal change noted in the chassis is that more manufacturers are using the drop frame, and thereby bringing the frame and gear nearer the ground, with the advantage of reducing the angle in the driving shaft at the universal joint. The semi-elliptic springs of former models are being replaced by three-quarter elliptic or full elliptic springs; and it is not unlikely that the use of the full-elliptic will become the standard practice of the future. The platform spring suspension, with its universal joint connection to two half-elliptical side springs, is used on some cars, but it seems destined to give place to the snugger and more simple full-elliptical springs above mentioned.

The general appearance of the car bodies has been improved by the removal from sight of many accessory parts, which formerly were obtrusively crowded upon the dashboard and running board. In general line, color, and decoration there is evidence of an even greater simplicity and more refined taste than marked the cars of last year. Outside of the various shades of red which still maintain their popularity, the colors are generally dark and pleasing; and there is a fortunate tendency to reduce the amount of lining and striping to a minimum. Naturally, the runabouts present the smartest and most racy appearance, and in this type is to be found, we are inclined to think, the last word in developing the automobile to the point of positive mechanical beauty.

In spite of its more even torque, reduced vibration, and acknowledged hill-climbing qualities, the 6-cylinder

engine has not fulfilled the promise of growing popularity which was freely made at last year's exhibitions. The 4-cylinder engine is the prevailing type, and the public seems perfectly satisfied to forego the above-named advantages of the 6-cylinder engine, in favor of the saving in weight, space, complication, and cost, of the 4-cylinder type. Although ball bearings are still used to a considerable extent on the wheels, there is a tendency to replace them by some form of roller bearing, especially for the front wheels. The belt drive for fans is disappearing in favor of the gear-drive. Pump circulation is almost universal; although the thermo-siphon system is still retained on some high-class cars. The 2-cycle engine was exhibited; but it does not seem to be making the advance that was predicted. Undoubtedly, the most marked tendency in engines is toward the lengthening of the stroke. The theoretical advantages of this change, in reducing shock and permitting a lighter construction in the reciprocating parts, have been borne out by the experience of the past year. Mechanically considered, there is much to be said in favor of the change. Shock and vibration are reduced throughout the whole of the driving mechanism; wear is lessened; and a general reduction of weight becomes possible.

In this connection it should be pointed out that the makers are thoroughly alive to the importance of weight reduction, because of its effect not merely in reducing the first cost of the car, but in prolonging its life and keeping down the running expenses. The ponderous machine of excessively high power is rapidly becoming a thing of the past, and the lessening of weight and improvement of details of design, particularly in the engine, has been shown in the racing of the past year, when light, moderate-powered cars covered the long-distance courses, at an average speed that was only a few miles below that of the most powerful racing machines.

The advantages of lighter weight have been shown nowhere more than in the tires. Tire trouble is becoming less serious, and the life of the individual tire has been greatly prolonged. No particular novelties have been exhibited by the tire manufacturers this year. The quick-detachable rims continue to show satisfactory results, and the several forms of non-skidding, metal-studded treads which were exhibited appear to have given satisfactory service.

The sliding-gear transmission, with three speeds ahead and one reverse, continues to be the prevailing type, although the friction-disk transmission is also exhibited and is attracting no little attention. Mention should be made in this connection of the hydraulic drive, which was illustrated and described in the SCIENTIFIC AMERICAN of December 12, 1908; for in this ingenious device is found the most striking and radical departure of the year from the commonly accepted standard practice. Although it is at present adapted mainly for heavy and relatively slow-moving vehicles, it possesses corresponding advantages in its application to high-speed vehicles, for which its great flexibility, absence of shock, and minimum amount of wear, give promise of ultimate popularity. The planetary gear transmission is reported to have given good service on light cars, if they were provided with ample power. Of the three types of clutch, namely, the expanding and contracting band, the floating disk or ring, and the cone clutch, the last-named still remains the most popular. Multiple-disk clutches are being improved by the use of a smaller number of disks of larger diameter, operated under reduced pressure.

Some of the finest mechanical work on the automobile is shown in the live rear axle construction, which is generally of the floating type. Great attention has been paid to the housings, which have been made more rigid. In some cases, they have been made in two pressed steel, coned halves, with the resulting advantages of complete inclosure of the parts and unusual rigidity.

The direct shaft drive is almost universal in the standard American machine, although some high-class vehicles were shown which still use the double, side-chain drive. Much attention has been given to the improvement of the brakes, the tendency being to lessen the number of brakes on a car and improve their quality. Some vehicles show two sets on the rear wheels and others one set. The diameter of the drum has been increased, and the faces have been widened, with the resulting advantage of greater power and longer life in service. Asbestos and cork are being largely introduced, although many machines still adhere to the straight metal contact.

Unquestionably, the low-price car, costing less than \$1,000, has come to stay. If we include the comparatively new and increasingly-popular buggy type of machine, it is safe to say that a large proportion of the space at the Grand Central Palace show was taken up by automobiles of this class, costing from \$500 to \$950. The \$500 machines are, of course, of plain appearance. They are driven generally by 2-cylinder engines, of the opposed horizontal type. But perhaps the "biggest

show for the money," if we may be allowed the phrase, was presented by the runabouts costing from \$800 to \$1,000. These machines contain all the essential elements of the elaborate high-powered, high-priced machines shown in neighboring exhibits, since they embody pressed-steel frames, 4-cylinder, water-cooled engines, magneto ignition, direct shaft drive, etc. Moreover, the record of the past year shows that, because of their light weight, they are remarkably economical in fuel and particularly in repairs to tires.

One of the finest sections of the Grand Central Palace exhibition was that devoted to heavy commercial vehicles, such as trucks and drays, delivery vans and wagons, buses and sight-seeing cars. The character of the work both in the chassis, driving mechanism, and bodies was fully up to that of the high-class automobiles. The comprehensive character of this section is shown by the fact that one western firm alone had eight separate exhibits, including a 1½-ton chassis, a 1½-ton truck, a 12-passenger Pullman, a 1-ton wire-work delivery truck, a 16-passenger sight-seeing car, a 5-ton chassis, an ambulance car, and a delivery van which covered 2,000 miles in the Glidden tour without making any adjustment.

## STANDARDIZING THE AUTOMOBILE.

The largest and best-equipped automobile factories to-day make a point of accurately duplicating parts, so that there is no resorting to cut-and-fit methods in the assembling department. The utmost precision is observed in casting, forging, boring, grinding, and threading to exact standards, so that a gear will operate as well in one set as in another, and valves and their stems and operating camshafts will fit in any one of a thousand different engines of the same size and design.

The "standardization" of certain parts and fittings began more than five years ago, when certain manufacturers agreed upon the spacing of tire lugs for wheels of different diameters, and wheel and rim makers bored their products in accordance with this standard. Rim and tire makers also agreed upon a certain standard form and standard dimensions for steel clincher rims and tire beads, so that during the past five years almost any leading make of tire could be fitted to any car. The advantages are plain. Lamp brackets were similarly standardized, the lamp and fork makers agreeing upon the distance between centers of the arms or prongs, the diameter and taper of the lamp sockets and arms, and the size of set-screws.

This work has been carried on since 1904 by the oldest and most reputable of the American motor-car builders. Among the important results obtained have been the adoption of standards for screws and nuts, reducing the former multiplicity of sizes and threads to a minimum, based on the United States standard, to which carriage bolts conform. Since every hardware store and machine and carriage shop carries carriage bolts in stock, the man whose car is built to conform to this standard will have no trouble in replacing a lost or broken bolt wherever he may be.

The spark plug has also just recently been standardized and the engines of some thirty or more prominent makes of motor cars will hereafter be bored and threaded to receive plugs of ⅞ inch diameter, with straight thread of eighteen pitch. Steels and other metals purchased as raw materials must now conform to certain chemical and physical standards; and as these standards are very high, the user of a machine built from such metals is assured of a high factor of safety, provided the design is good throughout.

In the long run, standardization and interchangeability of parts will have the effect of giving us a higher grade of motor car at a lower price, but this is dependent in considerable degree upon the production of one model in great numbers and the elimination of extensive annual changes in design that necessitate the making of costly jigs, gages, and special machinery.

## GROWTH OF THE AUTOMOBILE INDUSTRY.

Evidence of the stability of the automobile industry and the permanent popularity of this new means of locomotion, is afforded by the fact that, in spite of the recent financial depression, there was but little, if any, falling off in the volume of trade. Statistics published in connection with the present automobile exhibitions draw attention to the fact that whereas the automobile business done in 1903 amounted to less than \$8,000,000, the total for 1907 reached \$105,000,000, and in 1908 will show but little, if any, falling off. The total amount of capital invested is about \$200,000,000 and the various establishments connected with the manufacture, sale, and housing of automobiles employ nearly 110,000 people. There are in the United States over 250 firms engaged in the construction of automobiles, and it is estimated that over 52,000 cars have been sold during the year. Returns from the twenty-nine States which have compulsory registration show that over 250,000 cars have been registered; and an estimate of the approximate total for all the States gives reason to believe that