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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.

MUSHROOM AUTOMOBILE FIRMS.

There has been a general consensus of opinion among those who are qualified to judge of good mechanical work, that the bulk of the automobiles exhibited in the New York Show this year are marked by design and workmanship of a very high order. Indeed, it is the recognition of this fact that enables the most conservative well-wisher of automobiling in America to assert with positive conviction that our leading manufacturers have moved up to the front rank, and are turning out machines that compare in design, workmanship, and beauty with the very best of foreign make. An excellent opportunity for comparison was offered by the method of classification adopted, which gathered the foreign machines in a room by themselves, and enabled one, after familiarizing himself thoroughly with foreign workmanship, to pass into the main exhibit, and make immediate comparison with the best American machines. French manufacturers had so many years' start of this country, that their superb automobiles have naturally become the mark of excellence at which our own builders have aimed; and, therefore, the fact that in the few years covered by the exhibitions held in this city, we should have been able to make up the handicap of several years that was against us, is deeply gratifying. But having said this much of the exhibit as a whole, justice to the industry, and a regard for the interests of the purchaser, demand that a word of warning should be spoken against a certain type of exhibitor whose whole plant, capital, output, and experience is represented by the one, solitary machine that he had on exhibition, but who nevertheless does not hesitate to solicit orders, in the hope that he may place enough of them on his books to guarantee the purchase of a few more tools and the employment of a few more hands at his so-called establishment. Now, we do not for a moment charge that there is any suspicion of fraud attaching to these people. What they lack, and most completely lack, is the invaluable experience and the capital which alone can enable an automobile manufacturer to turn out a really reliable machine. The history of all the first-class makers in this country has been that they passed through a period of patient investigation and exhaustive and costly experiments before they felt justified in putting a new type of construction on the market. The firms that have gone by this slow but sure road, and these firms alone, have to-day an established reputation.

But now that the period of experiment is over, and the growing confidence of the public in the automobile is resulting in a remarkable growth of the industry, we are witnessing a rush of inexperienced and often completely unqualified people into the trade (just as happened a few years ago in the bicycle industry), with the result that a lot of crude machines, which are made up largely of poor imitations of standard makes, are being offered to the public, long before they have had that exhaustive trial which alone can establish them as fit for the severe demands of everyday service on the road. Of course, these mushroom firms will, in most cases, meet with the inevitable fate of such; but not until many an inexperienced purchaser has paid dearly in providing for these firms the experience which by right they themselves should have gained before they placed a single machine on the market.

It is a most serious matter to undertake the manufacture of automobiles. We do not know of a single form of mechanism to-day that demands such supreme excellence of workmanship and materials as this; and while it is impossible to prevent speculative people from rushing thoughtlessly and without due preparation into the making and selling of machines, it is sincerely to be hoped that the automobile press, the various clubs throughout the country, and the private

purchaser will discourage the mere speculator, and give their support only to those makers who can show the proper credentials.

THE RACING AUTOMOBILE AND ITS RELATION TO THE DEVELOPMENT OF THE PLEASURE VEHICLE.

To the casual spectator, the sight of a huge racing machine dashing around a track at a mile-a-minute clip is in itself an interesting and more or less thrilling spectacle. The higher the speed and the greater the risk run by the operator, the more intense is the excitement as he makes the dangerous turns amid clouds of dust. When several evenly-matched cars are running together, rounding the turns at express-train speed and in imminent danger of collision, while the chauffeurs strain every nerve in their efforts to steer them and get out of them the highest speed possible on the straight stretches, one is reminded of the mad excitement of the ancient chariot races of the Romans on the oval track of the great arena.

But apart from the excitement and exhilaration of the race, such competitive speed trials are of the greatest benefit to the automobile designer, first because, sometimes through failure and sometimes through success, they point the way to improvements in construction which, when tested and proven, are incorporated in the regular stock machines; and, secondly, because they give a chance for comparison of different forms of construction under conditions of very severe strain.

Abroad, the benefits of racing have been more generally taken advantage of, and races have largely been held on the highways, which, because of their wide, smooth surfaces, form almost perfect courses for the testing of automobiles at high speeds and over long distances. Generally a circuit fifty or seventy-five miles in circumference is laid out, and the contestants traverse it several times. The annual race for the Bennett trophy, which is an international affair, has become the classic race abroad; and, if it is ever won by an American machine, it will have the effect of introducing road racing into this country, as the race follows the cup and is always held in the country whose team won the previous year. France, England, and Germany have each had the trophy, and the race next year will be held in the last-named country. The success of the German "Mercedes" machine in 1903 has been attributed by many to the use of ball bearings in the transmission gear and other important parts, and, as a result, many of the foreign manufacturers, as well as some here, have readopted this familiar form of anti-friction bearing on their 1904 machines.

In America, racing has been largely confined to the ordinary race-track, with occasional straightaway speed trials. During the latter part of the past season, the Winton eight-cylinder racer, which failed to make any showing in the Bennett race last summer, demonstrated the soundness of its principles of construction by winning many races and making new records on various race-tracks throughout the country. Driven by Barney Oldfield, it made a mile in 55 seconds; 10 miles in 9 minutes, 32 1/2 seconds; and 15 miles in 14 minutes, 21 seconds, all of which are track records for machines weighing over 1,800 pounds. A four-cylinder racer of the same make holds the mile, 5-mile, and 10-mile records for machines weighing from 1,200 to 1,800 pounds. The figures for these are 59.1-5 seconds; 4 minutes, 58.4-5 seconds, and 10 minutes, 6 seconds, respectively. A Decauville racer driven by Henri Page holds the 15-mile track record of 15:07.1-5 for this weight machine, while Dan Wurgis, on an Oldsmobile chassis, holds the 1 and 5-mile records for cars weighing less than 1,200 pounds, at 1:07.2-5 and 5:49.

Steam track records up to 5 miles were made last year by George C. Cannon, with his special racer equipped with a fire-tube boiler and simple steam engine. The first mile was covered in 1:01, and the five miles in 5:56.3-5. J. L. Hedges, on a White steam racer equipped with a flash generator and compound engine, made a 10-mile record of 12:20.4-5.

New track records for electric automobiles of a mile in 1:24.4-5, 5 miles in 6:29.3-5, and 10 miles in 17:58 were made last year by the Baker electric torpedo racer, in which are incorporated all the features used on the stock cars, such as ball bearings, but few cells of battery, and a low-voltage electric motor of high efficiency.

The Ormonde-Daytona beach on the east coast of Florida, pictures of which were published in our last Automobile Number, is said to be the finest speedway in the world. The second annual race meet, in which the best American, French, and German racers are entered, is being held there this week. New straightaway records were recently made there by the Packard "Gray Wolf" racer, driven by Charles Schmidt, and a Stevens-Duryea chassis, driven by Otto Nestman. The former machine has a 25-horsepower, four-cylinder motor, and weighs 1,400 pounds, while the latter has two double opposed-cylinder motors that develop 14 horse power, and weighs complete 900 pounds. Both have the same sized engines as are fitted to their respective firm's regular stock cars. The Packard 1904 "Voiture

Legère" has been directly developed from the experiences of the Packard Company with its racer throughout the past season, while the Stevens-Duryea racing chassis was built to demonstrate the speed possibilities of that company's motor. This machine showed its rapid hill-climbing abilities at the Eagle Rock, N. J., hill-climbing test last Thanksgiving Day, by ascending the one-mile hill in 1:37, which was only 1/4 second less than W. K. Vanderbilt, Jr.'s, time on his 60-horse power Mors racer. At the recent attempts to break records with this machine in Florida, it covered a mile in 57.1-5 seconds, thus lowering by 9 seconds the previous record for machines of this class, which was made at the same place by the Oldsmobile racer a year ago. A new 5-mile record of 4:57.3-5 was also scored. The "Gray Wolf" succeeded in coming within 2.5 of a second of tying the world's record for heavy cars (46 seconds), while its 29.2-5 seconds for the kilometer equals the record made by Baras on a light car.

Spurred on by these newly-made records on the Florida sands, Henry Ford next made an attempt to beat them on a specially prepared course on the ice. The trial was made with the reconstructed Ford-Cooper racer, and it was successful. The astonishing time of 39.2-5 seconds was recorded by the official timekeepers, which means a speed of 90 miles an hour. This new record makes it seem as though a speed of 100 miles an hour will soon be realized. Such speeds are in themselves of no benefit, yet there is no denying the fact that the strains to which they subject the mechanism of the racing cars are so far in excess of those met with by the every-day runabout or touring cars, that if these are built with practically the same strength of parts, the factor of safety must be very great. In other words, just as a piece of steel that is incorporated in a modern auto must have several times the strength necessary to withstand the stresses that are likely to be put upon it, so the complete machine should be so constructed that it as a whole has a large factor of safety. Just how strong to make every part is at first somewhat a matter of experiment, and it is far better to risk the life of one man who realizes his danger, than to jeopardize the lives of numerous purchasers who ride about unconscious of the risks they are taking. Before the development of the racing car and the trying out of parts upon it, the automobilist was liable to serious accidents, such as the breaking of the steering gear or of the rear axle; but now, as a result of these exhaustive and machine-racking speed tests, a purchaser buying a car from a firm that has had racing experience is pretty sure to obtain one that is not structurally weak, and with which there is not much chance for a dangerous breakdown.

THE FOURTH ANNUAL NEW YORK AUTOMOBILE SHOW.

The exhibits in the Fourth Annual New York Automobile Show were of such general excellence that it can, we think, be truthfully said that America has caught up with France, or, at any rate, that she is close at her heels. Many of the noteworthy features of the Paris show were found on American automobiles, such as, for example, numerous honeycomb radiators, as well as flanged tube radiators incased like those of the honeycomb type; and mechanically-operated inlet valves arranged in the cylinder head and, in some cases, placed in a single combustion chamber on one side of the cylinder. Cylinders appear generally to be cast separate and to be made interchangeable, which is also the latest foreign practice. Several of the motors were of the horizontal type, either single cylinder or double opposed. This is a strictly American type of engine, and one that is rarely met with abroad. Another motor that is gaining in popularity with the manufacturers is the air-cooled type. There were half a dozen new machines of this type that attracted general attention. On most of them copper heat-radiating flanges were shrunk on the cylinders, and the motor was placed in front where it could get the full blast of air, a fan also being employed. Cylinders four inches in diameter can, it is now claimed, be successfully cooled this way, even in the warmest weather. When this fact becomes generally known and thoroughly substantiated, we shall expect to see a revolution in the construction of gasoline automobile motors, for who would not dispense with the troublesome water circulating systems if he were sure that a simple fan could be made to do instead? A description of some of the novel methods of air cooling will be found on another page.

Many of the older manufacturers whose cars have a well-established reputation, besides making a few minor changes, have added canopy tops with glass fronts and side curtains, thus making the machines serviceable in all kinds of weather. The minor improvements consist chiefly of mechanical lubricators, giving a positive oil feed to all important bearings; the use of ball bearings in the transmission gear and rear axle; and the employment of carbureters that are automatic and that require little or no adjustment to obtain the proper mixture at all speeds of the engine.

The three-cylinder motor is gaining some adherents, for, besides the well-known machines with one-hand control, which have used a horizontal motor of this type for the past seven years, three other firms exhibited tonneaus with vertical three-cylinder engines in front. The three-cylinder engine was a feature of the Paris show, and is said to have very steady running qualities. Large stationary engines of this type are used direct connected to dynamos for electric lighting, and they give a very steady non-fluctuating light. Such triple-cylinder motors are balanced without the use of counter-weights, since the cranks are set 120 deg. apart; and, as the impulses occur regularly every two-thirds of a revolution, the motor has an extremely steady torque.

The two-cycle motor does not seem to offer many attractions to the average manufacturer, and there was but one firm exhibiting vehicles of that type. A novel detachable glass front with side curtains was shown on one of this company's stanhopes, and a similar arrangement was found on a runabout with coupé top employing a de Dion type of motor, so that the improvements for protection against the elements are not limited to the touring cars.

Among the exhibits in the basement were to be seen a novel two-cycle motor having a crank shaft on top of the cylinders and driving the flywheel located near their base by a Reynold silent chain. In place of a crank case, each cylinder was prolonged at the bottom and carried a second piston connected to the main piston above it and, on the outside, to the crank shaft. On the downward stroke of the pistons the lower one draws the mixture into the space between them, and on the upward stroke crowds a large part of it into the working part of the cylinder through a port high up in its wall. The arrangement is intended to do away with the crank case, which in time is apt to get leaky around the crank shaft bearings. A small three-cylinder steam engine with concentric poppet valves, intended for use with a flash boiler, was also on exhibition. This engine had $3\frac{1}{4}$ x 4-inch cylinders, and was said to be capable of developing 20 horse power at 1,500 revolutions per minute.

While dealing with novel motors, mention should be made of a three-cylinder compound gasoline motor which has been thoroughly tested on the road. This motor has two four-cycle working cylinders on the outside, with a large two-cycle cylinder between them. The two outer cylinders exhaust in turn into the inner one, so that the piston of the latter gets an impulse once every revolution and exhausts into the air at a pressure of but 25 pounds per square inch.

Among the gasoline engines exhibited was a double opposed-cylinder motor made in several sizes from 6 to 60 horse power and intended to be used on vehicles with a three-speed, sliding-gear transmission of the same make. This motor has been on the market for the past two or three years and is said to be a powerful, well-built engine.

Among novelties in motor arrangement should be noted two double opposed-cylinder engines arranged side by side longitudinally of the car, and coupled together, with a common flywheel and sprocket from which a chain was run to a countershaft. Another large touring car of this make had a vertical four-cylinder motor fitted with both make-and-break and jump spark ignition. This type of double ignition is in some favor abroad.

A novel transmission device was exhibited by a well-known maker of spark plugs and coils. It consisted of a casing on the center of the rear axle, containing two rotary water motors. Connected with this casing was another on the longitudinal driving shaft. This contained four or five plunger pumps arranged in a circle and in such a way that their strokes could all be varied from nothing to the maximum. The two casings were filled with oil and were oil-tight. By starting the pump's plungers, the wheels could be made to turn very slowly, and by increasing their stroke, the wheels could be speeded up. The device has been well tested and is said to be thoroughly practical. It is a very neat solution of the transmission problem.

At the show this year the disposition of the manufacturers to satisfy the public as to the smallest details of construction and operation was apparent. Several of them showed their motors in full operation, turned by electric motors. The exhibit of a popular runabout was the finest one of this sort. The body was fitted with glass sides, and within it was a motor cylinder with the upper half cut away, showing the piston moving back and forth and the valves as they opened and closed. Even electric automobile motors were shown in the course of construction, a half-wound armature being exhibited beside a cell of Edison battery. The exhibit of Exide battery plates and separators was spread out on a large board, and was most interesting as showing the appearance of the plates of the lead pasted type of cell, the competitor of the new Edison nickel-steel battery. Several machines were shown with Edison batteries, though the majority

were fitted with batteries of the lead type. The only novel electric car was a light surrey, in which the electric motor is mounted in front under the hood, and a bevel gear drive is used to the rear axle.

There were some steam vehicles on exhibition, the most prominent, of a well-known make, having a flash boiler, condenser, and a compound steam engine direct connected to the rear axle by a longitudinal shaft with bevel gear drive. Steam cars of the surrey and runabout types, which were fitted with the usual type of engine and boiler, were shown by other manufacturers, one of whom exhibited a machine fitted with a mechanical lubricator driven by the engine. A very commendable new steam vehicle was one in which the lack of reserve power characteristic of flash boilers was overcome by combining "flash" and tubular principles in one steam generator—the flash coil being located below the horizontal tubular portion, and the whole having a heating surface of 96 square feet. The engine consisted of two high-pressure cylinders opposed to two low-pressure—all horizontal, with a valve by which live steam might be turned into all cylinders—thus increasing the power, in emergencies, by simply throwing over a lever.

Wheel steering is well-nigh universal on the 1904 machines. In most instances, however, the wheel can be tilted or the steering post moved forward in order to allow the driver to enter and leave his seat with ease. The spark and throttle devices are generally placed on the wheel, and in one or two instances the change-gear lever is on the steering column also. The contact boxes of the jump spark ignition systems are generally placed so that they can be conveniently reached for inspection and adjustment. On one machine the contact box was fitted with a glass cover, while on another it was located on the front end of the car, beside the starting handle.

Dry batteries are still chiefly used as a source of current, only a few of the larger cars being fitted with magneto ignition. One interesting device that was shown separately was an electro-magnetic igniter arranged as a plug to screw into the cylinder and operated by current from a spring-actuated magneto.

Interest in automobiles, as evidenced by the attendance at the show, is much greater than in previous years. It is estimated that 30,000 people visited the Garden during the opening night and first two days of the following week. The dearth of commercial vehicles on exhibition is doubtless accounted for by the fact that the demand for pleasure vehicles is so great that manufacturers, in seeking to supply this more profitable trade, have no time to devote to the commercial automobile. Yet this is the machine that will eventually be developed, and that will relieve much of the traffic congestion in the crowded streets of all large cities. An increase in electric vehicles for business purposes was apparent.

IMPROVEMENTS AND CHANGES IN AUTOMOBILE CONSTRUCTION AS NOTED AT THE PARIS SHOW.

As the Parisian *modiste* sets the style in feminine dress, so the motor car manufacturers of that famous old-world city may be said to set the fashion in things pertaining to automobile locomotion; and it is at the annual show held in the spacious Grand Palais each December that their models for the coming year are first exhibited.

In the construction of multi-cylinder motors for the powerful gasoline cars, the cylinders are now generally cast separately instead of in pairs. This does away with the mass of metal between the cylinders, which was apt to cause unequal expansion, and makes each cylinder a unit that can be removed in case of breakage, and replaced at one's convenience. The mechanically operated inlet valve has gained not a few adherents during the past twelvemonth. Instead, however, of the inlet valve being in a chamber on one side of the cylinder and the exhaust valve being in a similar chamber on the other side, thus necessitating a cam shaft on each side of the motor for each set of valves, the practice now is to locate the two valves side by side in a single chamber, and operate them by a double cam on the single half-speed cam shaft. By this arrangement, the motor has been brought back almost to its former simplicity, while the advantages of the mechanically operated valve—quiet and steady running, with a wide range of speed—have all been retained. The use of steel cylinders has diminished considerably.

With regard to bearings, there is a decided tendency to go back to the old style ball bearings, for the engine crank shafts, as well as for the transmission gear bearings, and other important bearings throughout the car. The ease of adjustment of the ball bearing, together with its frictionless and smooth running qualities, has doubtless had much to do with influencing manufacturers toward its readoption; and if the balls are made of the best hardened steel and properly proportioned to the loads they have to carry, there seems to be no good reason why this form of bearing should not give entire satisfaction, besides having the great

advantage of instant adjustment, which the ordinary plain bearing does not have.

The water circulating pump and ignition dynamo or magneto is gear driven in almost every instance, and all gears and small parts are inclosed or otherwise completely protected. A new pressed steel frame brought out by the Darracq Company has sheet steel extending inward from its side bars to a rectangular opening in which is placed the motor and transmission. The cases of these organs are bolted to the sheet steel "apron" thus formed, with the result that the chassis has a complete flooring on its front end, which protects all the parts from dust, mud, or water.

The majority of the manufacturers are using the pressed steel frames for their chassis, i. e., a frame like that just described, which is stamped out of a single piece of steel by hydraulic presses. There are, however, quite a few firms like that of Panhard & Levassor, for example, who are using the armored wood frame as heretofore, while still other makers—Renault, de Dion, etc.—stick to the tubular frame. Some cars are fitted with a honeycomb radiator without a pump, thermo-siphon circulation alone being relied on, as on the Renault cars. A novelty that will be appreciated by many is an arrangement whereby pushing in on the starting crank in order to make it engage, automatically retards the spark, and makes it impossible for the motor to kick back.

The honeycomb, or cellular radiator, although considerably in evidence, is being replaced by a modification of the old-style coiled tubes with corrugated heat-radiating disks or flanges. The new type of radiator consists of an outer rectangular frame of square cross-section (which acts also as a tank) with small horizontal or vertical flanged tubes connecting the sides or the top and bottom. Although this type of radiator is not so efficient as the honeycomb type, in which the water is held in numerous thin films, it does not spring a leak so easily, and can be repaired with greater facility. Besides the danger of leaking, the honeycomb radiator is said to give trouble from dirt or precipitated calcium carbonate choking up its passages. Furthermore, recent experiments have shown that from 46 to 60 per cent of the heat in the fuel is carried away by the cooling water when a honeycomb radiator is used; and so it is advantageous to run a motor as hot as it can be run without causing trouble, even if the water does boil away sooner and require replenishing several times a week instead of but once a month.

Improvements in carbureters form another interesting feature of the recent Paris show. Great efforts have been made to design carbureters that will accomplish the same results as the Krebs carbureter, the novelty of the previous Salon, by furnishing as nearly perfect a mixture as possible at all speeds of the motor. M. Bollée has designed a carbureter with two spraying nozzles—one in a small pipe and the other in a large one. When running at slow speeds, the air is inspired by the motor very rapidly through the smaller pipe, thus drawing a good supply of fuel from the spraying nozzle; while when the motor runs at full speed, the suction is through the larger pipe, the spraying nozzle of which delivers practically the same quantity of gasoline because the air drawn in at an increased speed passes through a larger pipe, thus making the rate of flow past the nozzle about the same. The changing from one pipe to the other is accomplished automatically according to the speed of the motor.

In ignition devices, what is known as the Eisemann magneto is coming into quite general use. This magneto, a description of which was given in SUPPLEMENT Number 1452, generates both a high-tension or jump spark current, and a low-tension current. The high-tension spark first jumps the gap between the spark plug points, thus making a passage for the low-tension primary spark, which follows instantly, and gives a hot, red spark having the best igniting properties. By the use of this specially wound magneto, a regular spark plug can be used and yet as sure and hot a spark be obtained as with the ordinary make-and-break igniter. As a number of the best machines have heretofore been fitted with both jump and contact igniters, the development of this magneto has made possible a simplification of the ignition apparatus.

The live rear axle, with bevel gear drive through a universally jointed longitudinal driving shaft, is coming more and more into vogue for all but the heaviest cars, and in a few instances it is used even on these, as on the new Hotchkiss cars, for example. The machines built by this well-known firm, the makers of the Hotchkiss rapid-fire gun, contain a great deal of fine engineering work. Among the novelties noted on them are an arrangement whereby the pitch of the blades of the fan for cooling the water can be varied, thus increasing the air draft when desired, as in climbing a long hill; a positive locking device similar to the breech-locking mechanism of a gun, whereby the main driving shaft is positively locked to the engine crank shaft after the clutch is thrown in; and steering pivots in the center of the front wheel hubs.