

the general public. Another proof of its utility is the fact that it has been taken as a model for so many other bridges elsewhere. It is of interest, in this connection, to note that, in 1828, a second great chain bridge was constructed between Newburyport and Salisbury, at a point below Carr Island, with five spans, the longest being about 150 feet, and the entire bridge measuring 1,000 feet. It was subsequently bought by the Eastern Railroad, and removed, with the exception of the massive granite piers, to make room for a structure on another plan better adapted to the purposes of the railroad. Thus the old Essex-Merrimac chain bridge is left as the solitary specimen in New England of a style of suspension bridge that has served its intentions admirably, and may still be found preferable to the wire bridges under certain circumstances.

THE DION, BOUTON & COMPANY TRICYCLE AND THE BOLLEE CARRIAGE.

The newspaper advertisement of the Michelin combination offering 100 Dion, Bouton & Company tricycles and 200 Bollee carriages for sale at auction has called attention again to these vehicles, the manufacturers of which were the first to solve the difficult problem of devising an automobile locomotive apparatus for one or two persons that should be simple, strong, and of a sufficiently low price to bring it within the reach of those who hesitate to spend eight hundred or a thousand dollars for such an object.

We think it well, therefore, to give a description of the tricycle as well as of the carriage.

The Dion, Bouton & Company Gasoline Tricycle (Fig. 3).—The frame of the machine is the same as that of an ordinary tricycle, and upon the rear tube is bolted the motor, with a special suspension designed to deaden vibrations. The motor is vertical, has a single cylinder, makes four revolutions and is of about one-fourth horse power. The cooling of the cylinder is effected through numerous transverse projections.

The motive parts, connecting rod and crank, move in a reservoir containing oil. The driving axle, at its place of exit from the reservoir, carries a pinion that engages with a wheel keyed upon the rear axle of the machine.

The gasoline is contained in a polygonal reservoir, A, of a capacity of from two to three quarts, situated

according to the level of the gasoline, and which serves to lead air to the surface of the latter in order to quicken the evaporation.

The detonating mixture enters the cylinder through an ordinary clack valve placed upon the side in the valve box, and which opens automatically under the influence of the suction. After the explosion, the gases make their exit through an eduction valve controlled by a cam fixed upon the driving shaft. The eduction pipe divides into two parts, one of which runs directly into an exhaust consisting of a simple cylinder, fixed under the tube that carries the motor and provided with three orifices for the escape of the gases; the other part is continued by a worm that extends through the entire length of the carbureter and serves to reheat the gasoline.

The ignition is effected through two accumulators inclosed in a box, F, fixed under the horizontal tube of the frame. These accumulators are charged to about two amperes, and suffice, despite their small size, to give a useful effect for a continuous run of 100 hours. They are recharged by means of three bichromate batteries.

The electric circuit of the tricycle is established in the following way: The wire starting from the positive pole of the accumu-

lators is screwed to one of the terminals of the handle bar, and thence passes into the interior of the latter as far as to the handle, M, which performs the office of a commutator. It is afterward fixed to a terminal near the preceding and then runs to the Ruhmkorff coil that is situated to the right beneath the large rear tube. The negative wire runs directly from the accumulators to the coil. The wire starting from the bobbin and ending in the explosion chamber enters the latter through a porcelain ignition tube screwed into the wall. The spark forms between two platinum wires, one of which constitutes the extremity of the wire of the coil and the other is simply fixed to the side of the motor.

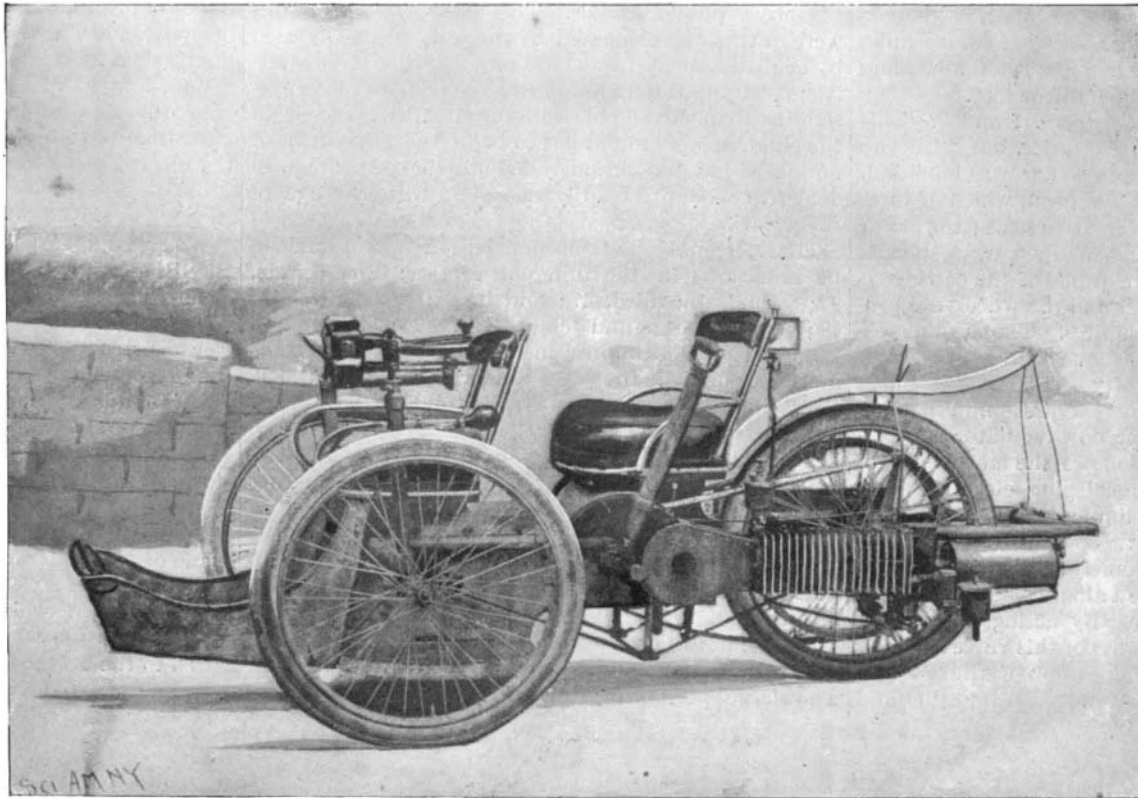


Fig. 1.—THE BOLLEE GASOLINE CARRIAGE.

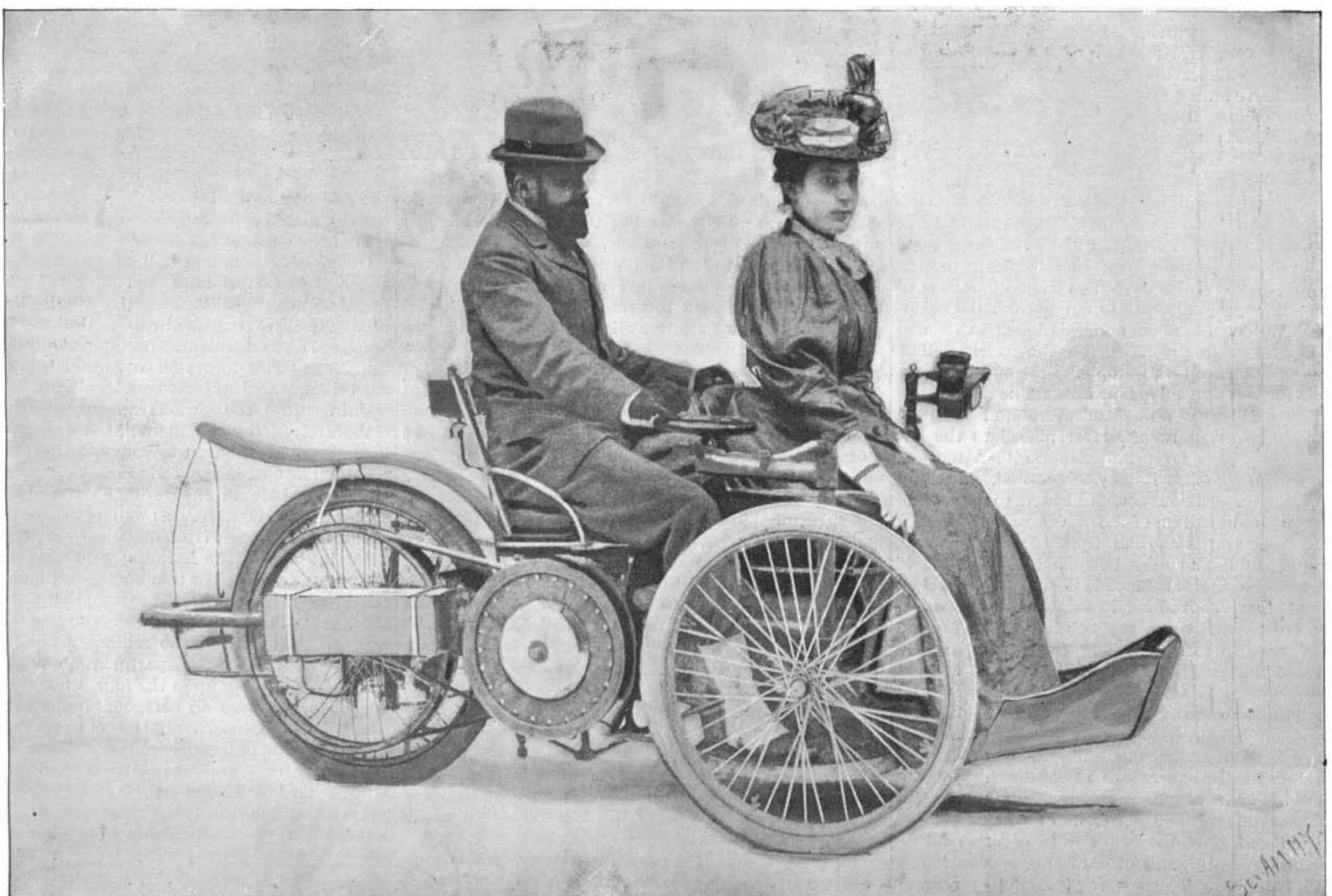


Fig. 2.—VIEW OF A BOLLEE CARRIAGE IN SERVICE.

A reference to the figure will show that the machine is provided with pedals. These actuate the pinion through the intermedium of a ratchet wheel, and, therefore, act in but one direction and only as long as the motor is not revolving faster than they. They produce their effect only upon steep gradients, while the motor is running slowly and it is desired to aid it in making a difficult passage.

This machine, which weighs but a hundred pounds in running order, easily reaches a speed of twelve miles an hour on level ground and is capable of ascending gradients of two-thirds of an inch to the foot.

The Bollee Gasoline Carriage (Figs. 1 and 2).—This machine is likewise of the tricycle order, but with two steering wheels in front and the driving wheel behind. It is characterized by a very low form, which assures great stability. In front there are two seats; the motor and the gasoline reservoir are in the rear, upon each side of the driving wheel. The frame of the carriage is formed entirely of hollow tubes and the wheels are provided with Michelin pneumatic tires. The gasoline reservoir has a capacity of seven quarts, a supply sufficient for a run of more than fifty miles. The gasoline descends to the carbureter by gravitation, in passing through a Panhard & Levassor flow regulator containing a hollow brass float that follows the movements of the liquid, and, through a conical plug, closes the inlet orifice when the influx of the liquid is too great. The gasoline entering the carbureter spreads over a bronze cap and is reduced to an extremely fine state of division, and in this form is carried along by a current of air regulated by a clack valve. By acting upon a rod, it is possible to uncover the holes of this valve more or less, and thus modify the composition of the gaseous mixture in such a way as to render it explosible, and so that the work produced by the explosion shall suffice to cause the motor to run under normal conditions.

The ignition is effected by means of a platinum igniter heated by an external burner.

The motor is of the normal type of four revolutions. It develops two horse power. The cooling is effected through heat radiators that are clearly seen in Fig. 1. The connecting rod and crank move in a bath of oil, as in the Dion, Bouton & Company tricycle. The velocity of the motor is regulated by an apparatus that acts upon the education valve, which, when the motor is running wild, prevents the lifting of this valve and consequently the expulsion of the burned gases and the introduction of a new charge at the succeeding revolution.

During a normal running the valve is directly controlled, through the intermedium of levers and rods, by a box fixed upon an axle parallel with the driving one. This box actuates a link that transmits motion to the valve. The valve is pulled back by means of springs. The gases, after their egress from the cylinder, pass into an education cylinder designed to deaden the noise, and are finally expelled to the exterior. The setting in motion and the stoppage are effected by a special and very ingenious process. The axle of the driving wheel is movable backward and forward through the intermedium of a lever placed to the left of the driver. This lever moves opposite a toothed sector, at whose notches it may be arrested. The motion of the driving axle is communicated to the wheel through the intermedium of a drum keyed to a hollow shaft that receives its motion from the driving axle. This drum, through a rubber belt, carries along another and larger one that is dependent upon the wheel. When the lever is shoved backward, the driving wheel moves forward and loosens the belt, which is then no longer capable of carrying along the wheel. At the same time, the latter applies itself against a fixed brake block and is arrested on the spot. If, on the contrary, the lever is shoved forward, the wheel moves backward and stretches the belt, and an opposite effect is produced. This arrangement has the advantage of suppressing the inconvenience of a stretching of the belt, since, in order to tauten it, it suffices, upon starting, to push the lever one more notch forward.

The carriage is provided with a train of three differential gearings that permit of obtaining speeds of 5, 9 or 15 miles an hour. The steering is done by means of a winch, which, through the intermedium of a rack and pinion, acts upon the wheel to the right. The motion is transmitted to that of the left through a cranked axle.—*La Vie Scientifique*.

The Eyesight of School Children.

Public Opinion has gathered from various sources, for which they give due credit, the following interesting facts relative to the defective eyesight in children and young people:

Acting under authority of the school board and with the direction of a committee of oculists, the Baltimore school teachers tested the eyesight of the children of the city's public schools. The eyes of 53,067 pupils were in this way examined by the tests ordinarily used by oculists and the results are interesting and suggestive; 9,051 pupils were found to have such defective eyesight as to make school work unsafe; 53 per cent of the children were found not to be in the enjoyment of normal vision, but curiously enough the percentage of defective eyesight steadily decreased with the age of the pupils.

The percentage of normal vision was found to be as follows in the different grades: First grade, 35; second, 41; third, 47; fourth, 49; fifth, 48; sixth, 48; seventh, 54; and eighth, 56. No explanation is offered for this improvement in eyesight with age and the use of the eyes under school conditions. Until such explanation is given it might be argued either that the eyesight of the race is deteriorating, being worst in children latest born, or that there are defects in vision which are remedied either by nature or art.

It was found that many blackboards and maps in the schools were not placed in the proper light, and the report of the oculists recommends yearly examinations hereafter of the pupils' eyesight, and that a uniform system of adjustable seats and desks be adopted and that these be regulated to the heights of the children. The large percentage, nearly one-fifth of the total

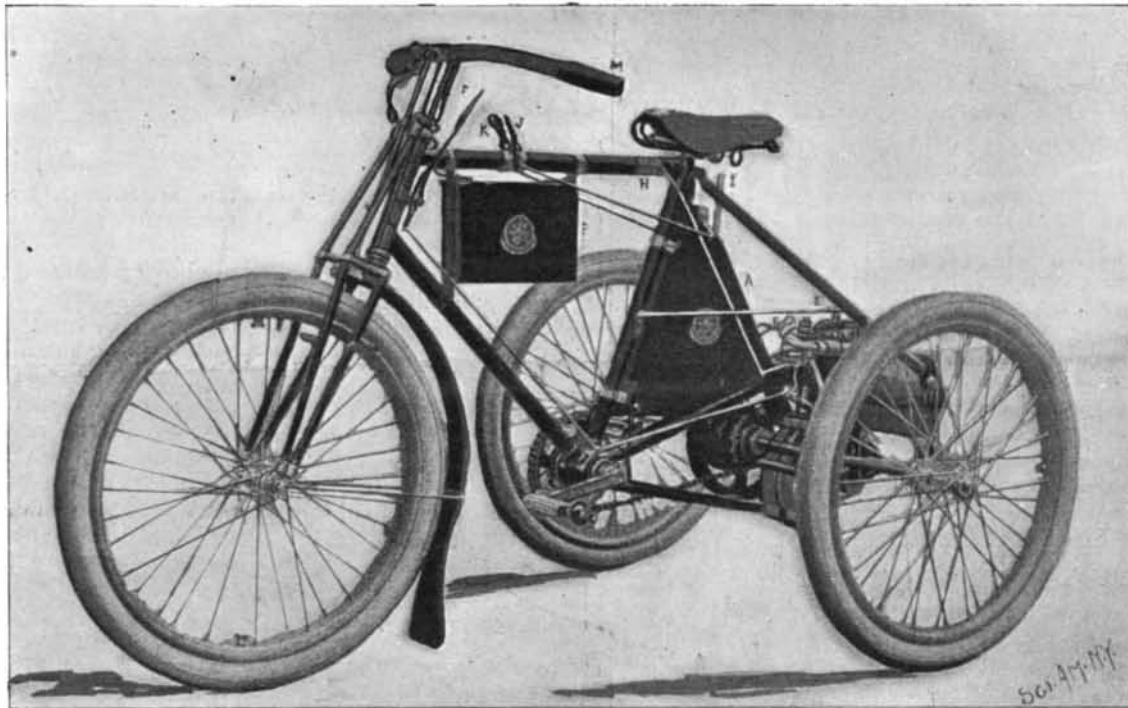


Fig. 3.—THE DION BOUTON & CO. GASOLINE TRICYCLE.

number examined, found to be in no condition to do school work at all is a warning to parents and school authorities all over the country. It shows great negligence and ignorance on the part of parents, where the responsibility rests in the first place, and where periodical examinations of the pupils' eyesight by school authorities will place it at last.—*Philadelphia Inquirer*.

A report has been presented to the British education department by Brudnell Carter on the vision of 8,125 children attending 25 elementary schools in London; 3,181 children, or 39.15 per cent, were found to have normal vision in both eyes; 1,016, or 12.5 per cent, had normal vision in the right eye and subnormal in the left; 700, or 8.6 per cent, had normal vision in the left eye and subnormal in the right; and 3,228, or 39.7 per cent, had subnormal vision in both eyes. Comparing the sexes, the total was made up of 3,928 boys and 4,197 girls; of these 43.7 per cent of the boys had normal vision in both eyes and 33.4 per cent of the girls. Mr. Carter is of the opinion that the eyes of London school children generally are not in any way injuriously affected by the conditions of elementary school life. Myopia is not of frequent occurrence, and Mr. Carter has failed to find any evidence of its progressive increase from younger children to the elder ones, or any correspondence between the degree and the prevalence of the defect and the quality of the lighting in the schools where it was found. He holds that the prevalence of subnormal vision is due to the fact that children so rarely look at distant objects.—*Science*, New York.

One of the common causes of pain above the brows is the overuse of the eyes and the strain of accommodation in constantly looking at near objects. This pain, familiar to most people, is more readily excited and permanently developed among the children in the public schools and the girls of the high schools. The ocular

headache is often coexistent with the anemic headache, especially in growing girls. Here is found a complication of all kinds of nervous misery, due to the eye strain associated with the vertical pain felt over the top of the head, all this being characteristic of bloodlessness. To combat this anemia, there is nothing like plenty of out-of-door exercise and wholesome food. While the practice of looking at distant objects and—unhappily—the use of appropriate spectacles may relieve the headache of eye strain, reading, writing, and sewing will permanently damage the sight; so that for the sake of education, and in the struggle for existence, the coming race will have to look out that it does not become altogether purblind. The suggestion may be pessimistic, but it is none the less timely.—*Minneapolis Times*.

THE POULSON METAL HOUSE.

We present two illustrations of a house erected at Bay Ridge, N. Y., for Mr. Niles Poulson, which presents some remarkable features obtained by the unusual combination of iron and copper for exterior and interior construction and ornamentation. The methods used represent the ideas of the owner in securing a fireproof building and in making use of galvanoplastic metal to produce striking effects.

In building the exterior walls of the house the foundation was prepared in the usual manner and topped with a stone belt course extending entirely around the house. Upon this was erected a wrought iron skeleton made of tee and angle irons placed some four or five feet apart.

At proper intervals from the belt course to the main cornice were placed 4 × 4 angle irons, which were secured to the upright framing. At each sill and lintel course was placed a horizontal angle iron extending entirely around the building, and above the window sill was another for receiving the floor construction. The angle irons were covered with pilasters made of deposited copper, embellished with designs of an attractive character. The pilasters were first riveted to the angle irons in such a way as to leave at each edge a flange, to which were riveted the copper panels carrying ornamental designs in bass relief. After the copper panels were put in position the entire copperwork was backed up with an eight inch brick wall, extending from the foundation to the roof. The latter is covered with red tile, and the tower which is covered with the same material, terminates in a copper finial. The roof of the veranda, extending across a portion of the front and side, is supported by cast iron columns, while

the balcony around tower is made of cast iron and heavily plated with copper, so as to withstand the action of the weather.

On entering the main hall, of which we show an interior view, one is impressed with the liberal use of metal and the peculiar formation of the floor and ceiling. The floor is finished with delicately tinted tile, so arranged as to constitute an elaborate design of striking effect. The decorated cast iron ribs, arched across the ceiling, the bronze treated columns between the openings into the various apartments, the rich and elaborately decorated mantel, the wrought iron work in the semicircular archways, and the iron railing about the circular opening on the second floor, are a combination to produce an effect which is peculiarly striking. The ceiling of main hall, as well as that of all the other rooms in the house, is of novel construction, and is of great interest to the building trades. It involves the use of ordinary flat bar iron and cement, and represents the ideas of the owner of the building as to what constitutes absolutely fireproof construction. The scheme pursued is such that the ceiling of one room is the basis of the floor of the apartment above. The ceiling is made by placing upon the four brick walls of which a room is composed an octagonal frame made of angle iron. From each corner of the octagon are sprung two arches, or ribs, of flat bar iron, and where the bars cross each other they are clamped together with V-shaped bolts. This arrangement leaves a small octagonal space in the center of the ceiling, formed by the intersection of the bars already referred to. This space is covered by shorter bars, which are arched across from corner to corner of the central octagon. These are also clamped to the main bars by V-shaped bolts, thus forming a complete dome of wrought iron. The construction is such that any pressure from above only tends to make the con-