THE HORSELESS CARRIAGE IN ENGLAND.

The town of Tunbridge Wells was all excitement on the appearance there of horseless carriages and motor tricycles which were exhibited at the fair grounds last month. Large crowds came to the town to witness an exhibition which will help to mark another step in the progress of civilization from every side. The signs are coming that the days of the horse's usefulness are passing away. Sir David Solomon appeared in a horseless carriage, known as a "vis-a-vis." It was covered with morocco, with a movable hood. The motor was behind, the driver sat on the back seat, steering and governing being effected by means of a handle bar as on a bicycle. This regulated the speed, etc. Another handle was used to back it. On a stop the carriage was stationary, yet the motor continued to work. The motor is ¾ of a h.p. It can travel on a good road at 20 miles per hour, and average 12. It carries enough benzine to run it 200 miles. It weighs 1,200 pounds on the road. Another much larger carriage was exhibited to carry a heavy load at a slower speed, also a barouche with a petroleum motor on small wheels in front. Great interest was taken in the tricycles, of which several were exhibited. One worked with a petroleum motor ignited by an electric spark. It weighed 90 pounds, and behaved successfully. It is regulated by handles, the pedals being necessary for starting, but while in motion they are not used. A speed of 30 miles an hour can be maintained on good roads. Another was exhibited of ⅝ of one h.p. It ran by mineral naphtha. It also made good time, but was not considered as good as the former one. The London *Chronicle* had long articles on the exhibition, showing the advantages of these vehicles, and urging their adoption in England.

STRENGTH OF BRIDGE AND TRESTLE TIMBERS.

The Canadian Engineer is indebted to Walter G. Berg, assistant engineer of the Lehigh Railway, for the following valuable report of the committee on the above subject, of which Mr. Berg was chairman:

Your committee appointed to report on "Strength of Bridge and Trestle Timbers," with special reference to southern yellow pine, white pine, fir and oak, desires to present herewith, as part of their report, the very valuable data compiled by the chairman of the committee, relative to tests of the principal American bridge and trestle timbers, and the recommendations of the leading authorities on the subject of strength of timber during the last twenty-five years, embodied in the appendix to this report, and tabulated for easy reference in the accompanying tables I. to IV.

The uncertainty of our knowledge relative to the strength of timber is clearly demonstrated after a perusal of this information, and emphasizes, better than long dissertations on the subject, the necessity for more extensive, thorough, and reliable series of tests, conducted on a truly scientific basis, approximating as nearly as possible actual conditions encountered in practice.

The wide range of values recommended by the various recognized authorities is to be regretted, especially so when undue influence has been attributed by them in their deductions to isolated tests of small-size specimens, not only limited in number, but specially defective in not having noted and recorded properly the exact species of each specimen tested, its origin, condition, quality, degree of seasoning, method of testing, etc.

The fact has been proved beyond dispute that small-size specimen tests give much larger average results than full-size tests, owing to the greater freedom of small selected test pieces from blemishes and imperfections, and their being, as a rule, comparatively drier and better seasoned than full-size sticks. The exact increase, as shown by tests and by statements of different authorities, is from 10 to over 100 per cent.

Great credit is due to such investigators and experimenters as Professors G. Lanza, J. B. Johnson, H. T. Bovey, C. B. Wing, and Messrs. Onward Bates, W. H Finley, C. B. Talbot and others, for their experimental work and agitation in favor of full-size tests. Professors G. Lanza, R. H. Thurston, and Wm. H. Burr have contributed valuable treatises on the subject of strength of timber. The extensive series of small and full-size U. S. Government tests, conducted in 1880 to 1882 at the Watertown Arsenal, under Col. T. T. S. Laidley, and more recently the very elaborate and thorough timber tests being conducted by the U. S. Forestry Division under Dr. B. E. Fernow, Chief, and Prof. J. B. Johnson, of Washington University, St. Louis, afford us to-day, in connection with the work of the above mentioned experimenters, our most reliable data from a practical standpoint.

The test data at hand and the summary criticisms of leading authorities seem to indicate the general correctness of the following conclusions:

1. Of all structural materials used for bridges and trestles, timber is the most variable as to the properties and strength of different pieces classed as belonging to the same species, hence impossible to establish close and reliable limits of strength for each species.

2. The various names applied to one and the same species in different parts of the country lead to great confusion in classifying or applying results of tests.

3. Variations in strength are generally directly proportional to the density or weight of timber.

4. As a rule, a reduction of moisture is accompanied by an increase in strength; in other words, seasoned lumber is stronger than green lumber.

5. Structures should be, in general, designed for the strength of green or moderately seasoned lumber of average quality, and not for a high grade of well-seasoned material.

6. Age or use do not destroy the strength of timber, unless decay or season-checking takes place.

7. Timber, unlike materials of a more homogeneous nature, as iron and steel, has no well-defined limit of elasticity. As a rule, it can be strained very near to the breaking point without serious injury, which accounts for the continuous use of many timber structures with the material strained far beyond the usually accepted safe limits. On the other hand, sudden and frequently inexplicable failures of individual sticks at very low limits are liable to occur.

8. Knots, even when sound and tight, are one of the most objectionable features of timber, both for beams and struts. The full-size tests of every experimenter have demonstrated not only that beams break at knots, but that invariably timber struts will fail at a knot or owing to the proximity of a knot, by reducing the effective area of the stick and causing curly and cross-grained fibres, thus exploding the old practical view that sound and tight knots are not detrimental to timber in compression.

9. Excepting in top logs of a tree or very small and young timber, the heart-wood is, as a rule, not as strong as the material farther away from the heart.