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SCIENTIFIC AMERICAN SUPPLEMENT

No. 1044.

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THE MODERN BICYCLE.

The enormous amount of capital represented by the bicycle industry has been noticed in these columns before. Originally the velocipede found no application except as a toy. In the early days adults as well as children took up the bicycle as recreation pure and simple, its propulsion over the ordinary roads being so laborious as to make it available only under very exceptional circumstances.

In the old velocipede the inelasticity of the frame made it hard to drive, and it was only rendered endurable from the point of comfort by having a saddle mounted on springs. Slumbering among the patent records meanwhile was an invention which was destined to transform the primitive bone shaker into a conveyance of ease and comfort and to minimize the inequalities of the road. The application of this invention, now known as the pneumatic tire, the adoption of a slight change in proportions, and the use of multiplying gearing for the increase of speed, were all that were wanting to make the modern bicycle.

The development of the cycle, notwithstanding, was slow. First came the old-fashioned high-wheel bicycle, the possible diameter of whose wheel was fixed by the size of the person riding. By special leverage arrangement the size of the wheel was increased in some cases up to 7 or 8 feet in diameter. After various efforts at front-driven low or safety wheels came the modern safety, driven by the rear wheel. Solid India rubber tires were still in use, and various attempts were made, and with more or less success, to introduce springs into the frame, so as to moderate the jar incident to the inequalities of the road, until the pneumatic tire was introduced. The modern bicycle is the result.

Two exhibitions of bicycles and accessories are to follow each other in rapid succession during the next two weeks—one in Chicago and one in New York. In February a third exhibition is to be held in Denver. The SCIENTIFIC AMERICAN, realizing that comparatively little is known by the general public of the methods of manufacture adopted in the modern bicycle factory, and that many points in modern bicycle construction are but little understood, has determined to present its readers with the methods of construction and machinery used in the production of a first-class wheel.

The exhibitions alluded to above will show the present development of the machine, which, in conjunction with the electric railroad and the automobile carriage, is doing its part to make the horse-drawn vehicle in great part a thing of the past. In them will be represented the latest modifications of this most interesting mechanical achievement, which enables a man to increase his speed from four miles an hour to twelve or fifteen—a machine in which the study of joints has received great attention and where the art of connecting steel members of a frame has been brought to the highest perfection—in which the subject of bearings has been worked up to consummate excellence so that a ball bearing wheel will travel thousands of miles without the balls or cones showing any appreciable wear.

Merely as an example of the truss, a bicycle represents a veritable achievement, for its frame may be considered as a truss spanning a distance between the front and rear wheel axles, and in the case of quadruplet and quintuplex wheels the truss may have to carry nearly a thousand pounds.

The most healthful sign of what cycling really means is its employment by business men, by the farmer and by government officials. The cycle is being used by the police of different cities, by the postmen and by street inspectors. It is being used with the greatest success by the signal service department of the army, and cycle drills in the regular army will soon be among the tactical evolutions in this country, as they have long been abroad.

As an example of the practical use of the wheel in the regular army, Lieut. Hugh D. Wise's ride from Sackett's Harbor, N. Y., to Governor's Island, in the harbor of New York City, may be cited. Mounted on an 18½ pound racing wheel, and loaded with a pack representing the heavy marching order equipment of the regular army, the distance of about 400 miles was made in 84 hours. The heat of the weather, the sandy roads, and the mountains traversed made the ride an unusually trying one, but six hours' sleep being obtained during the entire trip. Considering the extreme lightness of the wheel, it stood the trying ordeal of the trip extremely well, and the light racing tires stood with but a few punctures until one gave out near the end of the trip. The riding speed was 12¾ miles an hour. Lieut. Wise is in the regiment of the Ninth Infantry, U.S.A. Such service as that represented by this ride might be invaluable in time of war or riot. One of the bushings split and six hours were lost by the rider in making a new one at a common blacksmith shop on the road. The performance shows the efficiency of the wheel for despatch purposes.

The great perfection of the bicycle depends ... ball bearings, which eliminate so ... of the machine proper, and ... reduces so largely the rolling friction between the wheels and the road by its principle of recuperation of energy. To some slight extent these improvements have been introduced among horse-driven vehicles, but a curious moral is to be drawn from the fact that it is only when man became his own vehicle propeller that the utmost refinements in the abolishing of resistance were introduced. It still seems as if the lesson of the modern bicycle had not been fully appreciated by the carriage builder. Within little more than three years the ordinary road wheel has been reduced in weight from forty or forty-five pounds to twenty pounds or even less.

Little further development in this line is to be, however, looked for immediately. Probably the lowest limit of weight for ordinary use has now been reached, and the minor points of width of tread, length of wheel base and similar features of proportion have been pretty well fixed.

America has made the most wonderful progress in the development of the wheel, and her manufacturers have been so alert and enterprising, competition so keen, and the public so critical, that the American wheel is to-day the most beautiful mechanism and the lightest and easiest running of any wheel manufactured in any country. The most defective feature of the wheel is the tire, which is very perishable and which is ill calculated to withstand the severe exactions of our bad country roads. It is believed, however, that great improvement will be made in this line during the coming season.

A RETROSPECT OF THE YEAR 1895.

The past year has been distinguished as much, unfortunately, by the loss of great leaders in the world of science and art as by the number and value of the discoveries and achievements that have marked its progress. A death roll which contains the names of our own Professor Riley, United States Entomologist, and of James Dwight Dana, and on the other side of the water the names of Pasteur and of Thomas Henry Huxley, is a sad one to contemplate.

Engineering.—In this department the greatest event of the year was the opening of the North Sea and Baltic Canal, which has a total length of 61⅜ miles and cost $39,000,000. About the same time was opened the Harlem Canal to the north of New York City, which, though not remarkable for its size or cost, will have great commercial and strategic value, as uniting the East and North Rivers.

The Puget Sound and Lake Washington Canal, connecting the waters of the Pacific with a large fresh water lake in the Northwestern State of Washington, is progressing favorably. Of canals projected we note in the United States the Atlantic Coastwise Canal, from Philadelphia to New York, the Cape Cod Canal, and the canal from the Atlantic to the Great Lakes. The projected Nicaragua Canal has been somewhat set back by the report of the commission of experts, who have stated that the preliminary estimates were too small. It will be a far more costly work than was at first supposed.

During the year the contract has been let for cutting the longest tunnel in the world—the Simplon Tunnel, through the Alps. It will be 12¼ miles long, and will consist of two tunnels, spaced 56 feet apart, one for each line of rails. The contract price is $13,750,000.

Other great works that have been steadily advanced during the year are the Chicago Drainage Canal, in Illinois; the Peryar Dam, in India, which, when completed, will be 178 feet high, 1,300 feet long, and contain 5,000,000 cubic feet of masonry; and the great Siberian Railroad from Russia to the Pacific.

Transportation.—This year will ever be memorable for the great advance in railway speeds both in America and England. The remarkable long distance speed developed in the London-Scotland race, in England was followed by a similar acceleration in America, of both of which we give the results:

West Coast Route, London to Aberdeen	539·75	miles.
Average speed, including stops	63·24	"
" " excluding stops	63·93	"
New York Central, New York to East Buffalo	436·32	"
Average speed, including stops	63·54	"
" " excluding stops	64·22	"
Lake Shore and M. Southern, Chicago to Buffalo	510·1	"
Average speed, including stops	63·61	"
" " excluding stops	65·07	"

There has been a steady increase in the weight and power of locomotives. The driving wheels are being made larger and steam pressures are increasing, 180 to 200 pounds to the square inch being common.

Electrical traction has received some very important applications, notably in the 96 ton electric locomotives of the Belt Line Tunnel, Baltimore. These are doing excellent work, having on one occasion hauled a 2,000 ton train with facility and without any tendency to slipping of the wheels. Another important application of the system to a standard gage railway in this country has taken place on the N. Y., N H. and H. Ry., where a trial speed of 60 miles per hour has been obtained with a passenger train. In France a 90 ton