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LIGHT-WEIGHT BICYCLES.

Our recent editorial on the increasing weight of the bicycle has provoked a widely extended discussion in which the suggestions we made have been generally indorsed; although in the case of one or two contemporaries devoted to the interests of the bicycle, the statement that the weight of the bicycle should be reduced has called forth a vigorous protest. The L. A.W. Bulletin, for instance, while it admits that in 1895 wheels were ridden that weighed 20 pounds, is quite satisfied that in 1898 the weight of wheels should have risen to 28 or 20 pounds—an increase of fifty per cent in three years. The Bulletin is of the opinion that this added weight is necessary, if the public is to be provided with a thoroughly reliable mount. "Nevertheless," says our contemporary, "light weight is desirable, and the lowest weight at which a machine can be produced which will embody all the essential features is what the public want, and they will demand it and get it, as soon as some one points out how the reductions can be correctly made."

The problem of the proper weights of the bicycle is, or rather should be, dependent primarily upon the weight of the rider. If an engineer is called in by a county board to design a bridge, his first inquiry will be as to the loads the bridge must carry. The amount of metal he will put into it will be absolutely determined by the maximum loads that are liable to come upon it. If the structure is intended to carry droves of cattle, marching regiments of soldiers, or heavy traction engines, the steelwork of the bridge will weigh very much more than if it is intended to carry nothing heavier than a few foot passengers and an occasional one-horse wagon. In the case of the bicycle, however, this very elementary and obvious consideration is entirely ignored, and the same weight of wheel is provided for the 100 as for the 225-pound rider. Judged from the standpoint of scientific design, this is doing things in a very rough-and-ready, rule-of-thumb way. The light rider is taxed for the sake of the heavyweight; and it is a proposition which needs no demonstration, that if a 100 pound man is riding a wheel which will carry a 250 pound man with a proper margin of safety, he is penalized to the extent of from five to eight pounds of unnecessary weight, which he must drag over hill and dale with not the least resulting benefit to himself.

The weight of the wheel is determined, primarily, by the weight of the heaviest riders. There is not a first-class maker in the country who would hesitate to supply a 200 to 225-pound rider with a standard wheel taken from stock, for he knows that the wheel has been built to carry that load. Having built their machines to withstand the "maximum load," the makers feel perfectly secure as regards the riders of moderate weight.

In the first place, then, there should be at least two weights of machine, to secure the best results, and provide a rider with a wheel that contained no unnecessary material. If the public demanded that wheels be built to match the weight of the rider, they would be accommodated. It is more convenient and profitable to the manufacturer to turn out only one grade; but the demand for classification of wheels according to weight of rider—at least to the extent of providing two grades—would be so reasonable that it would meet with a ready response.

With wheels built according to weight, the problem of reducing weight would be greatly simplified. The manufacturer would be no longer handicapped by a "live load" of say 225 pounds, except in the case of the heavyweight wheels, the demand for which would probably not exceed twenty per cent of all the wheels sold. "Shock," to which is due most of the failures in forks and frames, results from suddenly arrested momentum, and momentum is the product of mass or weight by velocity. If the weight is reduced by from forty to fifty per cent, so is the shock to which the wheel is exposed in striking large rocks on the road, passing over badly laid crossings, or in collisions. A reduction of forty to fifty per cent in the stresses to which a machine is subjected allows a proportionate reduction in the weight and strength of that machine, whether it be a locomotive or a bicycle. Just how much reduction can be made in the case of the bicycle, in which the destructive forces at work are chiefly dynamic, could only be proved by experiment; but that it would be considerable is proved by the fact that in 1895 twenty-pound wheels, which had been put together with the conscientious care that marked the construction of the lighter and more costly wheels of that date, did carry heavy riders through a season of hard usage.

We have been asked to state in detail just where the reduction in weight could be made; we reply that the total reduction in pounds can only be gained by taking off ounces or fractions of ounces at every possible point in the wheel. We have already suggested that by increasing the height of the frame to reasonable proportions and introducing a diagonal strut, all bending strains in the plane of the frame would be eliminated, and the reinforcements of the joints could be considerably lightened without in the least impairing its strength. By returning to sprockets of reasonable diameter and cutting out of the sprockets all unnecessary metal, many ounces of weight may be saved, both in the sprockets and in the reduced length of the chain. The lighter pedal pressures, due to the use of moderate gears, would allow some slight reduction in the weight of pedals and cranks—not a great reduction, perhaps, in itself, but something that would go to make up the five or six pounds that could be taken off the present wheel. By abolishing the divided crank axle, with its heavy sleeve, and returning to crank hangers of moderate dimensions, more weight could be saved. There is a certain combined 32-tooth sprocket, cranks and axle in considerable demand just now which must weigh double what the same parts did in the machine of 1895. We have lately seen barrel hubs that were cast in the same generous mould—massive chunks of metal which, in comparison with the small and thoroughly efficient hubs of the earlier wheels, are hideous and clumsy to the last degree.

The largest saving of weight, of course, is possible in the tires. Here we tread on debatable ground, for we are well aware that there are thousands of riders who believe that anything less than a 1⅝-inch tire is a "snare and a delusion." A few years ago, it is true, the 1¼ and 1⅜-inch tires were unable to stand the test of road work; but so rapid has been the improvement in the art, that there are certain makes of light, small-diameter tires that will hold up a rider indefinitely upon the average roads which a tourist encounters.

In conclusion, we draw attention to the fact that the light but strong wheel ought to have just as much attraction for the staid tourist as for the most pronounced and wild-eyed "scorcher." To the latter the reduced weight means that, riding up to and beyond the limit of his strength, he is able to get more speed out of his wheel for the same power. To the tourist the reduced weight means that he can maintain his old gait with considerably less expenditure of power. That this gain in efficiency is desirable, no wheelman can deny, and it is equally true that the manufacturers will provide it just as soon as the riding public makes the demand.

OUR LATEST BATTLESHIP.

With the successful launching on October 4 of the "Illinois," the total number of first class battleships afloat in our navy was raised to eight. The others are the "Iowa," "Oregon," "Indiana," and "Massachusetts," which are in active service, and the "Kearsarge," "Kentucky," and "Alabama," which are nearing completion, the two former at the yards of the Newport News Shipbuilding Company, where also the launch of the "Illinois" took place, and the last named at the Cramp's shipyard, Philadelphia. The "Illinois" is one of three vessels whose construction was authorized by Congress in 1896. The other two are the "Alabama" and the "Wisconsin," the latter of which will be launched within a few weeks by her builders, the Union Iron Works, of San Francisco.

In estimating the power and all-round efficiency of the new battleship, we cannot do better than compare her with another ship of the same class with which the public has become thoroughly familiar—the "Oregon." Measured on the basis of the displacement, the "Illinois" is about 1,237 tons larger, the normal displacement of the "Oregon" being 10,288 tons, and that of the "Illinois" 11,525 tons. A comparison by displacement of two ships built at an interval of six years (the "Oregon" was authorized in 1890 and the "Illinois" in 1896) does not, however, give an adequate idea of the superiority of the later over the earlier vessel, as the improvements in the methods and materials of warship construction in the interim render the later ship, weight for weight, a greatly superior fighting machine.

In a general way it may be said that mere increase in size means increase of efficiency, for the larger ship will be more stable as a gun platform, will be less affected by a head sea, and in case of an artillery duel to the death will possess a larger reserve of buoyancy, that is to say, it would take a larger number of shot holes to sink her.

Judged as a seagoing vessel, the most marked advantage of the "Illinois" over the older ship is in her increased freeboard. The main deck in the "Oregon" is about 12 feet above the waterline, but the "Illinois" is provided with a spar deck which extends above the main deck for over two-thirds of the ship's length. This raises the freeboard to 20 feet forward and amidships and 13¼ feet aft, an increase which would enable her to steam full speed and with fairly dry decks into a sea which would roll green water over the bows and forward turrets of the "Oregon." The advantage of freeboard was noticed during the Santiago blockade, when the "Oregon," or one of her type, was steaming to Guantanamo in company with the "Texas" (a high freeboard ship) against a nasty head sea. The "Texas" was dry and buoyant, while the low freeboard vessel was plunging heavily. A further advantage resulting from lofty decks is the high command of the guns. The bore of the forward 13-inch guns of the "Illinois" will be 26½ feet above the water, as against 18 feet for the "Oregon." The other guns will be carried at the following heights: The 6-inch guns from 15 to 22½ feet, the 6-pounders from 30 to 40 feet, and the 1-pounders in the tops will be from 60 to 80 feet above the waterline. Command in a gun at sea has been likened in its advantages to "reach" in a boxer. Not only are the guns and their mounts out of the reach of the waves, but their projectiles are less likely to be deflected by striking the tops of the waves.

The protective arrangements of the "Illinois" are greatly superior. Not only does she carry armor of a greater resisting quality, but it is better disposed. The side armor of the "Oregon" only extends in the wake of the engines, boilers, and magazines, that of the "Illinois" is carried right up to the bow. The bow of the "Oregon" might be broken in by rapid-fire shells, letting water into the forward compartments and throwing the ship out of trim. This could scarcely happen to the "Illinois," whose bow at the waterline will be protected with 4 inches of Harveyized steel—sufficient to burst the shells of medium caliber on the outside of the vessel. The protective deck, moreover, will be heavier, being 2¾ inches on the flat and 3 to 4 inches on the slopes, as against a uniform thickness of 2¾ inches in the "Oregon." The heavy armor of the sides, turrets, and barbettes will be of about the same thickness as that of the "Oregon;" but as it will embody the improvements in the art of armor manufacture which have taken place in the past six years, its resisting qualities will be considerably greater.

The same degree of improvement is noticed in the armament, for although the main battery is the same, consisting of four 13-inch guns, the improvements in turrets and turret gear, in mounts and breech mechanism, are such as to greatly increase the efficiency of these weapons in the "Illinois." When we come to the secondary or intermediate armament, we are on debated ground. In the "Oregon" this consists of eight 8-inch and four 6-inch slow-fire weapons, while in the "Illinois" it is represented by fourteen 6-inch rapid-fire guns. The twelve guns of the "Oregon" are capable of about nine shots per minute, under favorable circumstances, whereas, under similar conditions, the fourteen guns of the "Illinois" could deliver between eighty and ninety shots in the same time. The destructive and crippling effect of an 8-inch shell would be enormously greater than that of a 6-inch shell, but the chances of making a hit would be 9 to 1 in favor of the rapid-fire weapons. The results at Santiago show that rapidity of fire is of prime importance, and seem to confirm the wisdom of our naval authorities in replacing the 8-inch slow-fire by the 6-inch rapid-fire guns.

But what a pity that we do not possess an 8-inch rapid-fire gun in our navy.

The 6-inch battery is disposed on two decks and is protected by a complete wall of armor 5½ and 6 inches in thickness; moreover, the effect of a bursting shell is localized by walls of 1½-inch steel which extend out from the sides of the ship between each pair of guns. Other improvements will be found in the method of supplying ammunition to the guns and in the mounting and general handiness of the guns themselves.

Taken altogether, the "Illinois" is a great advance upon the earlier ships, the only point in which the "Oregon" approaches her being that of speed. The "Oregon," on her trial trip, made 16·8 knots; the contract speed of the "Illinois" is 16 knots. As there is no speed premium attached to the later vessel, it is not probable that it will exceed, even if it equals, that of the Pacific coast vessel.

IMPORTING SONG BIRDS FOR OUR WOODS.

Humiliating as it is, the fact must be recognized that our native song birds have been so flagrantly destroyed that many varieties have become rare visitors in our woods and parks, and a few are even threatened with total extinction. The attempts to protect the birds adequately have only succeeded partly in stemming the crusade of destruction, and in no instance have these protective measures resulted in any material increase in the number of songsters. It is believed by experts that the work of killing off the birds has gone