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THE WORLD'S WHEAT SUPPLY.

At the time of the delivery of Sir William Crookes' address, in which he predicted a scarcity in the world's supply of wheat, we pointed out that the statistics upon which his estimate was based were in many respects unreliable. The shortage of last year was due, not to the fact that the wheat-producing land had nearly all of it been brought under the plow, nor to the fact that the land was becoming exhausted and calling for artificial fertilization, but it was directly traceable to the fact that, as the result of the prevailing low prices of the past three years, the wheat production had been allowed to decline. The financial question is a far more powerful factor in determining the amount of wheat that will be brought to the warehouse each year than any of the causes named by Sir William Crookes. Evidence of this is seen in the increase of over 300,000,000 bushels of wheat this year over the supply of 1897, due very largely to the better prices encouraging farmers to devote a larger area to this cereal. It is estimated that 236,000,000 bushels of this increase will be furnished by Europe, of which amount France is credited with over 100,000,000 bushels. The increase in North and South America is expected to reach about 90,000,000 bushels, of which 60,000,000 bushels will be furnished by the wheat fields of the United States. Evidently for one year, at least, we shall fail to see the necessity of starting the mammoth fertilizer factory at Niagara which the learned chemist suggested as the only solution of the problem.

THE PASSING OF THE MONITOR.

That Congress should have authorized in the year of our Lord 1898 the construction of four new warships of the monitor type is proof of the fact that even in such a progressive country as our own, the trammels of tradition and the mere spell of a name are powerful and controlling influences; for beyond the fact that it is a purely American invention, which in the very infancy of ironclad construction did excellent work, there is practically nothing to justify its existence in this advanced age of warship construction.

The "Monitor," Ericsson's original creation, was built for service in the shallow and sheltered bays and rivers of the Southern States, and in the battle with the "Merrimac" and the later naval engagements of the war, the type proved its splendid fighting qualities. From the first, however, it was evident that the monitor had its strict limitations, chief among which were its unseaworthiness and the utter discomfort to which the crew were subjected if it ever ventured out onto the high seas.

In the first few years of the modern era of warship building, the whole attention of naval architects was devoted to producing a ship which should carry a maximum number of guns behind a maximum thickness of armor. To give and take hard knocks was conceived to be the chief duty of a fighting ship, and the designs were laid down with an exclusive eye to these qualities. The monitor, because of its heavy guns, thick armor and low freeboard of a few inches, was considered to be the ideal ship, offering a small target to the enemy, able when hit to present great resistance to penetration, and capable of delivering telling blows from its few big guns.

In later days, however, it has been recognized that to use the fighting qualities of an armorclad to full advantage she must be essentially a seaworthy ship, able to venture out upon the high seas, and cast loose her guns, if necessary, in half a gale of wind. Moreover, it has come to be realized that if the crew are to be kept in good health and spirits, they must be provided with accommodations that have some approach to comfort. Hence the tendency in all the later designs is to build ships with high freeboard, providing ample accommodation, and mount the guns upon decks that will afford lofty and stable platforms, well up above the reach of the heavy seas.

Another fundamental truth that governs all later construction is that, given a ship of certain armor protection and gun power, her usefulness will vary directly as her speed.

Now, judged by these standards, the monitor is a decidedly obsolete type. She is not seaworthy—the very first monitor foundered off our own coasts—she dare not cast loose her guns in even a moderate sea, and, if she did, she could not, because of her quick rolling, hit anything; her accommodations are so cramped as to be extremely uncomfortable at any time and simply intolerable in the tropics; her low freeboard allows the green seas to roll bodily across her main deck and practically drown out the big guns; instead of her guns being carried well above the waterline, they are so near it that in a moderate sea the gunners cannot even see the enemy when the vessel is in the trough of the waves; their speed is low, five knots being all that Admiral Sampson was able to get out of the monitors that hampered his squadron in the Porto Rico operations; and finally, because of their small coal capacity, they dare not venture unattended to any great distance from a friendly base.

The actual experiences of war have gone to prove what has been for a long time anticipated by naval experts, and the inefficiency of this class of vessel is clearly set forth in the official report of Admiral Sampson (see report in current issue of SCIENTIFIC AMERICAN SUPPLEMENT.)

Secretary Long and the Bureau of Construction are to be congratulated on the expedition with which he has acted on the report of Admiral Sampson in revoking the unfortunate contracts for the four monitors, which we illustrate on another page. An effort is to be made to alter the designs so as to eliminate the worst features of the monitor type. We think the better plan would be to change the type altogether and design four, or if necessary only three, ships in their place of the true sea-going, coast defense type.

Excellent vessels of the kind are to be found in the Russian and German navies. The Russian ships of the "Oushokoff" class may be taken as an example. The displacement is 4,126 tons, or about 400 tons more than is proposed for our improved monitors. They carry as their main armament four 9-inch guns protected by 8 inches of armor, and four 6-inch rapid-firers, besides fourteen smaller guns. They have a 10-inch belt with which is associated a 3-inch protective deck. Their normal coal supply is 400 tons, and they have the serviceable speed of 16 knots. Now, the three ships of this class in the Russian navy constitute a most effective little squadron in themselves. Instead of being confined, like our monitors would be, to their respective harbors, they could rapidly concentrate at any threatened point and unite in holding at bay a whole fleet of vessels less heavily armored and armed than themselves. In a word, they possess those prime requisites of a modern fighting ship, seaworthiness and speed.

Whether we like it or not, we must accept the fact that the events of the late war have changed the whole scheme upon which we started out to build up our navy. Fifteen years ago the keynote to our naval preparations was "self-defense." We were careful to call our first three line-of-battle ships coast defense vessels. Cuba and Porto Rico were not in our thoughts and Manila Bay existed for us only on our maps and in our books of geography. Now, however, we are committed to a policy which demands that our navy shall possess above every other quality that of mobility. Our ships must be capable of steaming far and fast; we must realize that the best defense is that which commences at the enemy's coastline; our ships must be prepared to cut loose from the friendly shelter and succor at home ports and go far afield, carrying coal, stores, and ammunition, such as will last for a cruise measured by thousands of miles—in short, under the altered conditions, our ships must be almost everything that the monitor is not, and perform service of which the monitor is, according to Admiral Sampson's report, utterly incapable.

An excellent step in the right direction was taken when the speed of the three new battleships was raised to 18 knots an hour. Let the Bureau of Construction follow up the good work by throwing aside the monitor type altogether, and substituting in its place several sea-going, coast-defense ships of moderate dimensions, fair speed, and heavy battery. What better use could be made by the navy of the 13-inch guns already built for the "Alabama" class, but to be replaced, we hope, by the new 12-inch gun, than to mount them (two to each ship) in half a dozen coast defense vessels of the sea-going, coast defense type?

THE LIGHT-WEIGHT BICYCLE AGAIN.

We publish in this issue a letter from a correspondent which draws attention to an aspect of the question of bicycle weights which has not been touched on in the recent discussion of the subject. The writer is well qualified to speak on the question by virtue of the fact that he builds machines to order, and is, therefore, in an excellent position to judge of the relative behavior of light and heavy wheels of the same quality of workmanship. His experience has shown that it is not the heavyweight rider who taxes the strength of a wheel so much as the boys and men whose weight will run from 75 to 125 pounds. This apparent anomaly is explained by the fact that only a small percentage of the heavyweights are hard riders, the latter class being made up of boys and lightweight men, who "rush along over rocky roads with a reckless, don't-care-if-I-do-fall spirit." It is these riders, in the opinion of our correspondent, who are answerable for the present increase in the weight of the bicycle.

We are quite agreed with the writer that the breakages of machines are generally attributable to rough usage, and, in advocating a return to lighter construction, we had no intention of championing the cause of that reckless and altogether objectionable species of rider for whose designation it has been necessary to add a new word to the English vocabulary. In asking for a return to reasonable weights—and no one, surely, will affirm that in these days of high grade steel 27 to 30 pounds per wheel is reasonable—we are simply demanding that the average rider shall not be obliged to carry around with him from 6 to 8 pounds of superfluous weight, which has been worked into the machine simply because a heavy machine can be built more cheaply, and in less time, than a light one.

Some of the bicycle trade papers that have found fault with our advocacy of lighter machines have spoken of the discussion as a return of the "craze" for lightness; thereby suggesting that the desire to reduce weight is merely a fad and not based upon sound scientific principles. As a matter of fact, however, both the principles and history of mechanical engineering are behind the wheelman when he protests against the increasing weight as being a distinctly retrograde step. In every branch of engineering there has been, and is to-day, a steady reduction in the weights of all classes of machinery and construction. The engines of the old U. S. S. "Powhatan" weighed 867 pounds per horse power, whereas the engines of the torpedo boat "Ericsson" develop a horse power for every 50 pounds weight of the engines. No one will affirm that, in designing the "Ericsson's" engines, the Bureau of Construction were actuated by a "craze" for light construction. The reduction of weight was sought on sound theoretical and practical grounds, and the high speed of this little craft and her sisters is largely due to the fact that every superfluous pound of material has been excluded by the process of using material of the highest degree of strength for its weight, and disposing it in such forms as will give the greatest resistance for the smallest amount of material.

The reasons which justify the careful elimination of superfluous material from a torpedo boat's engines are even more cogent when applied to the bicycle, where the motive power is supplied by the sensitive and too easily overstrained organism of the human body—the only difference in the two objects sought after being that, in the torpedo boat, weights are reduced with a view to obtaining more speed with the same power, while in the bicycle the object is to secure the same speed with less power. Taking duly into account all the elements of resistance due to the machine, the roads and the weather, in propelling a bicycle, it may be said that the work done on a day's journey, as far as the wheel is concerned, is the product of the weight by the distance traveled; and if it is possible to reduce one of these factors (the weight) by 30 per cent, without impairing the needful strength of the machine, we claim that the wheelman is justified by all reason and precedent in asking that it shall be done.

That a hard-riding lightweight will strain a machine as severely as a slow-riding heavyweight, goes without saying. Shock is due to suddenly arrested momentum, and momentum is the product of weight by velocity. A 100-pound man, riding at 20 miles an hour, will produce as great a jar on his machine if he rides over a brick as a 200-pound rider moving at 10 miles an hour. The reason why the "scorcher" smashes his machine and the conservative heavyweight does not, is that the latter avoids the brick and the scorcher does not. The point raised by our correspondent, however, has no bearing upon the broad question of providing the lightest possible wheel compatible with proper strength and rigidity for the average type of rider, who, being neither heavyweight nor scorcher, is in seach of a machine that will carry him through his journey, be it 10 miles or 100, at a given rate of speed for a minimum amount of exertion.

We maintain that the 22-pound wheel will fulfill this condition and that the 29-pound wheel will not. That the makers are of the same mind is proved by the fact that several firms are voluntarily reducing the weight of this season's wheels by several pounds.

SHIPBUILDING IN GREAT BRITAIN.

If we may judge from the shipbuilding returns for the past quarter, the engineering trades in Great Britain have fully recovered from the evil effects of the great strike, at least as far as the volume of trade is concerned. The various yards had under construction no less than 598 merchant vessels, with a gross tonnage of 1,364,250 tons. This is an increase of 143 vessels and 480,000 tons over the returns for the same date last year. Of these ships, 572 were steamers and only 26 sailing ships. The list of customers is of interest. It shows that 492 of the vessels were for British owners.