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## THE FACTOR OF SAFETY IN YACHT CONSTRUCTION.

If we except the bicycle, there is probably no product of the mechanic in which the factor of safety is reduced so near to the vanishing point as in that highly developed machine known as the racing yacht. It has been estimated that the factor of safety in a light road bicycle when it is being ridden by a heavy rider over rough roads is not over 1⅓. That is to say, when the machine experiences its heaviest jolts the metal is being strained to within 25 per cent of its ultimate strength. The frequency of broken forks and buckled frames is the price we pay for lightness in a machine which, while strong enough to withstand the ordinary stress of travel, has but little provision for accidents in the way of rocks, curbstones, or collisions. The public is willing to sacrifice a surplus of strength in favor of light weight, and in the case of careful and judicious riders the sacrifice is abundantly justified.

In competitive yacht construction the saving of weight is not a matter of choice but of necessity, particularly in these latter days of the art, when the principles of design are so well known that in model and sail plan there will be comparatively little to choose between two rival yachts when they meet on the trial course. As far as the designer and builder are concerned, the contest has come to be one of weight-saving in construction; and the engineer can now claim yacht construction as one of the many arts which, like that of practical architecture, have called in his services and availed themselves of his knowledge of strains and the strength of materials. Thornycroft in England and Herreshoff in America had both achieved reputations in the construction of fast torpedo craft when the inevitable drift of ideas and events in yacht construction drove Lipton to the one and Iselin to the other in their endeavor to secure the ideal racing craft.

How closely Herreshoff and Thornycroft have crept to the danger line in the yachts "Defender," "Columbia," and "Shamrock" is suggested by the mishaps which have overtaken these boats in the course of their respective preliminary trials. In one race "Defender" carried away her gaff, in another the enormous strains on the shrouds caused them to cut into the masthead, and in a third race the steering gear collapsed. "Shamrock" at her launch is merely touched by the stem of a friendly tug which leaves a deep imprint in the frail metal of her hull. Later she goes out for a trial sail, and the breeze has scarcely filled her sails before the halliards part and the mainsail comes down on the run. On her first race she carries away her club topsail yard, and immediately after her start for America, something goes wrong with her bowsprit and she must needs put back for repairs.

And now it is "Columbia's" turn, and just what has happened to her is best understood by a glance at the two illustrations on our front page, one of which shows this lovely craft—by far the most beautiful that Herreshoff has ever turned out—under her full press of canvas, while the other proves on what a "slender thread"—in this case a slender stick—the integrity of that towering weight of spars and sailcloth depends. It was the case of the strength of the chain being equal to the strength of the weakest link—the link in this case proving to be the "port spreader," a slight pine stick which extends some 15 feet laterally at a point near the heel of the topmast and serves to "spread" the topmast and masthead shrouds and enable them to exert a more lateral and less vertical pull on these spars. When the spreader split, these shrouds slackened, and the enormous lateral pressure upon that towering pile of canvas, nearly 140 feet in height, fell upon the steel mainmast. While the mast was strong enough to stand the compressive strains thrown upon it by the pull of the shrouds, forestays, and backstays, it was quite unequal to the cross-bending strain when the shrouds were slacked up, and it promptly bent over and shut up, "after the fashion of a boy's tin putty blower," as some one expressed it, the wooden topmast snapping in two, and the whole mass of sails, rigging, mast and spars falling over to leeward in the picturesque confusion shown in our photograph of the wreck. No blame is to be attached to the steel mast, as a solid wooden spar would have proved equally helpless under like conditions.

There is a lesson in this circumstance which such a shrewd observer as Herreshoff will not fail to learn. While in the larger elements of a yacht, such as the hull and spars, weight may be judiciously saved to within a certain safe limit, there are smaller but very vital elements, such as the spreaders, the steering gear and certain details of the rigging, in which extreme economy of material may prove to be the very worst form of extravagance.

## OUR FOREIGN TRADE FOR THE LAST FISCAL YEAR.

The trade of the last fiscal year is most astonishing and is a remarkable indication of the prosperity of the country. Our total imports for the year amount to $697,116,854. Of this sum, $211,869,918 was for articles of food and live animals; $221,998,377 was for articles in a crude condition which entered into the various processes of domestic industry; while only $108,621,406 was for articles manufactured ready for consumption; and what the Treasury Bureau of Statistics terms "articles of voluntary use, luxuries, etc.," amounted to only $93,914,635. Duty was collected on 43 per cent of everything imported and amounted to $206,507,812.

Our total exports amount in value to nearly twice our imports, the sum reaching the enormous total of $1,204,123,134. Of this sum, $784,999,009 was for products of agriculture, so that in this class alone our exports amount to a larger sum that all our total imports. Our exports of products of manufactures amounted to $338,667,794. Our products of mines exported amounted to $28,832,547. Our products of the forests exported amounted to $42,316,779. The fiscal year shows indeed a magnificent trade balance in our favor.

Manufactures are now becoming more than a third of our total domestic exports and the quantity and value are constantly increasing. Of this remarkable growth, the manufactures of iron and steel are the most striking. Out of a total increase in our exports of manufactures during the year which amount to about $48,000,000 in round numbers, $33,000,000 is in manufactures of iron and steel. The total exports of iron and steel manufactures for the fiscal year 1899 were $93,715,000, or more than three times as much as those of 1894. On the other hand, the imports of manufactures of iron and steel continue to fall, having been during the year $12,098,239 against $25,338,103 in 1896 and $53,544,372 in 1891; thus, while our exports in this line have been constantly growing, the imports have fallen, so that they are now less than one-half what they were in 1896 and about one-fifth what they were in 1891.

## A NATIONAL PARK IN THE EAST.

The creation of a great national forestry and game reserve in northern Minnesota, embracing 7,000,000 acres around the headwaters of the Mississippi River, with many lakes of rare beauty, well stocked with fish, will be advocated before Congress next winter by prominent citizens of Chicago and Minnesota. The promoters of the plan are not likely to experience much difficulty in interesting Congress. The game and the virgin forests of the United States are disappearing so rapidly that it is exceedingly important that measures be taken, before it is too late, to save some of the great wooded areas of the continent.

It is one of the marked features of the legislative and popular indifference to their best interests common to those regions that such enterprises as this never originate in our Southern States. Yet there, it would seem, we have the most promising, most adaptable, and most accessible regions for such purposes to be found anywhere within our national limits. Nearly all of the forestry reserves that have been established up to the present time are in the far Northwest; the chief of them, the Yellowstone National Park, is inaccessible to the great majority of the people. Nothing of national scope is to be found east of the Mississippi River.

Within about a day's travel of New York, Philadelphia, Baltimore, Washington, and most of the Atlantic seaboard, and quite as accessible to Pittsburg, Cincinnati, Louisville, Indianapolis, and St. Louis, there are vast stretches of virgin forests—along the line of the Great Smoky Mountains, on the border between Tennessee and North Carolina—that are thoroughly suited to the purposes of a great game and forest preserve. Going up from the lowlands at Walhalla, S. C., to the high plateau surrounding Highlands, N. C., a stage trip of about thirty miles, the late Prof. Gray, the eminent botanist of Harvard, tells us that he encountered a greater number of species of indigenous trees than could be observed in a trip from Turkey to England, through Europe, or from the Atlantic coast to the Rocky Mountain plateau. The region surrounding that described by Prof. Gray, especially to the west, with the headwaters of the Tennessee, the French Broad, and the Savannah Rivers, all within a few miles of each other, with fertile valleys and mountain elevations of 5,000 feet or more, and a density of verdure unapproached elsewhere, is an ideal spot for a preserve, where every sort of North American animal or fish would thrive and where almost every tree or plant found within our borders from the Atlantic to the Pacific would grow uncared for. The land in this region is still purchasable "for a song," certainly at as little as or even less than that obtaining in the Northwest. The climate, while sufficiently severe in the winter to suit the more northern species of animal life, is never sufficiently so to kill great quantities of game, either by freezing or through lack of winter food, as is not uncommon in the Northwest woods.

Added to the climatic and the varied physical characteristics of this region, which especially fit it for the purposes in view, there is no like region obtainable where the varied and picturesque scenery so admirably adds to the desirability of the location. While these headwaters are singularly devoid of lakes, there are ample streams running through deep valleys and gorges which render the production of artificial lakes and reservoirs a matter of detail and of slight expenditure. Cascades and even waterfalls of very considerable dimensions abound on every hand, vast stretches of virgin forests, with an evergreen undergrowth of laurel, kalmia, rhododendron, etc., afford ample shelter and browsing for the winter, while the steep mountain sides, largely covered with bowlders and rocky ledges, from every cranny of which dense vegetation springs forth, furnish safe homes for all varieties of our smaller mammals.

A park that would take in the region along the Smoky Mountains around Clingman's Dome, or the southern slopes around where North and South Carolina and Georgia meet, in the middle of the headwaters of the Savannah River, or where Tennessee, North Carolina and Georgia meet, would not be misplaced. The timber and mineral wealth of the regions mentioned are such that it can only be a question of a few decades when these mountain slopes will be denuded and when the people of the vast valleys that depend on these watersheds for their water supply will suffer from the blindness of a generation that could not foresee the otherwise inevitable and combine its prevention with the benefits of an enduring national park in the populous East.

## POSTAGE AND THE EXPORT TRADE.

A correspondent of ours from Sydney, N. S. W., has made a complaint regarding insufficient postage on matter sent to him from the United States, and we have also received complaints from so many other sources that at last it has become necessary to sound a note of warning which American manufacturers and exporters should heed. Our correspondent states that American firms are extremely careless in the matter of postage paid by them. He and his partner are native Americans, and understand American methods of doing business, and the bulk of their business is in American goods. They keep a mail book and enter every letter posted, and when an answer is received a check mark is entered after it and an account is kept whether a reply is received or not, or whether the letter is returned to the Dead Letter Office. He found on going back over this book that 20 per cent of the letters were never answered, and that in the matter of underpaid postage from the United States it has cost them on an average of $3 for each mail during the years the book has been kept. Often this amounts to from twenty-five cents to a dollar on circulars of absolutely no use to the firm of manufacturers' agents, importers, and commission merchants. They find that in twenty years only two failed to reply from English and Continental firms and in only three cases was their postage short. He strongly condemns American neglect and methods of business in this respect. Our export trade is now at the highest level which it has ever reached, and if we are to maintain our present satisfactory position it will be necessary for our manufacturers and importers to pay the strictest attention to all the minutiæ connected with the business. Our consuls abroad are constantly sending complaints regarding the lax business methods in correspondence and in the matter of postage. There is no difficulty in prepaying all matter sent abroad, so that an onerous burden is not placed on the recipient. Often small matters of this kind defeat the very end which the sender has in view.

## THE PRODUCTION OF SLATE.

Various materials have been proposed to take the place of slate, but the ease with which this substance can be cleft assures for it a permanent use and it is interesting to note the actual importance of its production.

France holds an important place in this respect, and ranks second among the slate-producing countries. In Marne-et Loire the slate quarries produce annually about $4,000,000 worth. Her principal competitor up to the present has been the United Kingdom, where, in Wales, Cumberland, Westmoreland, Ireland, and the Isle of Man, are situated quarries whose production last year amounted to nearly $8,800,000. But it will soon be necessary to place the United States well up in