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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.

while 6 were to go to the Colonies. Germany had ordered 8 of the ships, aggregating 47,700 tons, and Russia 11 vessels, of 26,480 tons. Then in their order come Japan, 11 ships; Norway, 9 ships; Holland, 6; Denmark, 6; and Austria-Hungary, 3 ships. The vessel of large displacement is growing in favor, for the tables include 6 vessels of over 10,000 tons, 7 of from 8,000 to 10,000, 39 of from 6,000 to 8,000, and 57 from 4,000 to 6,000. There are 124 steamers, chiefly of the "tramp" class, of a tonnage varying from 3,000 to 4,000.

To these figures must be added those for warship construction, which show that 58 ships, of an aggregate displacement of 265,800 tons, are being built for the British navy. There are also 34 warships aggregating 110,635 tons, being built in private yards for foreign powers. Of this tonnage, the great Elswick yard, where a cruiser, the "Albany," is now completing for our government, is building 64,000 tons, or more than one-half. Adding the totals for warships to those for merchant vessels, we arrive at an aggregate of 690 vessels, representing the enormous total of 1,740,685 tons under construction. This, we believe, is the high water mark in the history of this industry.

PROPOSED CHANGE OF MOTIVE POWER FOR THE FOURTH AVENUE TUNNEL.

The practicability of using some other power than steam, with its attendant smoke and cinders, for drawing trains through tunnels has become so apparent during the closing years of this century that it is particularly gratifying to note the early change of power determined upon by the great railway systems having the Grand Central Depot in this city for their terminus.

Daily, at frequent intervals, trains drawn by large locomotives pass through the underground tunnel road stretching from Fifty-seventh Street north to about Ninety-sixth Street, keeping the atmosphere therein more or less continually surcharged with gas and smoke most disagreeable and unhealthful to passengers.

This useful section of road, equipped with substantial rails and a double set of signals, is about to be transformed into a road over which it will be a pleasure to ride.

It is proposed to draw trains over it either by means of compressed air locomotives or by electric power and to illuminate the tunnel sections by the electric light.

It is probable trains will be hauled by this means as far as the Mott Haven yards, where the steam locomotive will be used to continue the journey.

We trust this improvement, practical and feasible as it is, will take place speedily, that the traveling public may obtain relief from the existing annoyances. Surely it should be an easy question to solve when such a small outlay of capital is involved, in comparison with the great traffic which constantly passes over the roads.

THE LANGUAGE OF HAWAII.

BY W. R. GERARD.

Polynesia, which comprises a number of distinct archipelagoes, upon which are dependent several smaller groups, is inhabited by a brown-skinned people, with dark or black, smooth, curly hair, who are shown by their mythology, traditions, customs, and language to belong to one and the same race, to which ethnologists and philologists of recent years have applied the distinctive name of Mahori. A line drawn from New Zealand through Samoa northeast to Hawaii, all inclusive, very nearly defines their western limits. They are in exclusive possession of the whole of the water area to the right of this line as far as to Easter Island, and left of it are nowhere now found in an unmixed state, except in the Ellice and Union groups, and at a few scattered points in the New Hebrides, and in the southeast and perhaps northeast coast of New Guinea. They are thus shut off by the intervening Papuans from the Indian Archipelago, of which, in ancient times, they appear to have been the autocthones, and whence they emigrated eastward at a very early period and arrived first at Savaii, the largest island of the Samoan Archipelago. Their further migrations from archipelago to archipelago can be traced with some certainty through the uniform traditions of the various groups. In these traditions Savaii is constantly referred to under names that, in form, well illustrate the permutation of letters in the closely connected Mahori languages: Savaiki, the original Mahori form of the word; Savaii, the Samoan form; Havaii, the Tahitian; Hawaiki, the Maori; Havaiki, the Marquesan; and Hawaii, the Sandwich form, which became the name of the chief island of that group. It is not implied that each people came directly from Savaiki, but only that the several migrations took place at times when the name of its primeval home was still fresh in the memory of all, or at least survived in some mythological form.

The language of the Mahoris belongs to a primitive unmixed form of speech but one degree removed from the isolating or lowest stage (typified in Chinese), and occupying a sort of intermediate position between it and the true agglutinating tongues typified by the Finno-Tartaric family.

The peculiarities of this great linguistic family are a limited phonetic system; a great predominance of vowels over consonants; almost total absence of inflection; wonderful homogeneity; imperfect differentiation of the various parts of speech; and the curious practice of "tabooing" words, such as those forming parts of a chief's name, either during his lifetime or after his death.

The Hawaiian language of the Sandwich Islands (which were originally peopled from Tahiti, soon after its settlement by the Samoans) has become much changed and enfeebled in its phonetics. Manley Hopkins, former Hawaiian consul-general, says of it that it "isso soft as rather to be compared to the warbling of birds than to the speech of suffering mortals."

Every syllable, and consequently every word, ends in a vowel, and no two consonants can come together without the interposition of a vowel. No Hawaiian can pronounce correctly a word that ends in a consonant; his voice slides irresistibly into a vowel sound. Thus, in pronouncing Boston or London, he will say Bosetona and Lonedona. Hence, as syllables often begin and always end with a vowel, it is obvious that there must be a perpetual concurrence of sounds which renders the pronunciation of words difficult to acquire, although each sound is extremely simple in itself. The ratio of vowel to consonant sounds is nearly twice as great as in Italian.

In reducing the language to writing, the American missionaries employed 12 letters, viz.: 5 vowels, a, e, i, o, and u, having the invariable sound that they possess in Spanish; and 7 consonants, h, k, l, m, n, p, and w. These suffice to represent all the sounds in the language; but, in order to give proper expression to names of persons, places and things of other countries with which the Hawaiians need to become acquainted, and especially to Scripture names, the following nine consonants were added to the alphabet: b, d, f, g, r, s, t, v, and z. In the pronunciation of words, the full accent usually falls upon the penult, and there is a secondary accent upon the syllable preceding the antepenult.

As in all other languages of the same family, there is a deficiency in general terms and in words to express abstract ideas. At the same time, the language abounds in nice distinctions and possesses a copious vocabulary. It has no verb substantive nor any verbs to express existence, possession or duty. There are no variations in nouns for case, number, or person: but the moods and tenses of verbs are pretty clearly distinguished by simple prefixes and suffixes.

Upon the whole, says Sir George Simpson, the Hawaiian language may be considered as pleasing and agreeable to the ear after a time, although at first it sounds childish, indistinct, and insipid. It lacks anything like force and expression; and the natives are by no means to be compared, as orators, to the aborigines of North America. The language is not capable of reaching the lofty strains of the Blackfeet, Crees and other Indians, but flows in a mellifluous feebleness which, though it never offends the ear, always leaves us unsatisfied. The indistinctness and confusion which arise from the scantiness of its elements, and its consequent repetition of the same sounds, are considerably aggravated by the copiousness of the vocabulary, which is said to be in a great measure due to the pride and policy of the chiefs, who habitually invented new words for their own peculiar use, and constantly replaced them, as soon as they became familiar to the people, with other novelties of the same kind. Under such circumstances, to say nothing of the intricacy and precision of the grammar, a foreigner can never hope entirely to master the tongue; and missionaries, even, despite industry and zeal, often find their ears at fault, more particularly when the natives chant their barely articulate strings of words in a quick and monotonous strain.

The Hawaiians, moreover (says the same writer), have a different dialect for their poetry; or, at least, if the language be the same, its inflections and construction appear to be very different, and its metaphors and allusions, which give enjoyment to the native race, elude the comprehension of residents who are well acquainted with the Hawaiian language used in prose.

A young poetess, now dead, who bore the name of Poki, enchained the people with her lyrics; yet a gentleman who knew Hawaiian prose so perfectly that he could report in shorthand the speeches made in the house of legislature was entirely baffled in his efforts to comprehend the poetry that by turns melted and inflamed its native hearers. This is probably explainable by a fact mentioned by Mr. Hiram Bingham, namely, that Hawaiian poetry is not accurately measured, either in respect to the succession of feet or the length of the lines; nor did it, prior to the introduction of hymns by the missionaries, exhibit any rhyming at the end of the lines. As the songs were unwritten and adapted to chanting rather than to metrical music, a line was measured by the breath; the "hopuna," answering to our line, was as many words as could be easily cantilated at one breath.

The people are fond of fabulous tales and songs, and formerly spent much of their time in telling stories and crooning meles (songs) to the accompaniment of a small drum or musical stick.

The missionaries found great difficulty in translating the Scriptures into Hawaiian by reason of the number of words therein for which the language has no equivalent and of which the natives have no conception: such as faith, virtue, chastity, holiness, angel, throne, etc. The native conception of an angel is either kanáka léle, a "flying man," or akúa, a word corresponding somewhat to the Algonkin term manito—a spirit, something to be worshiped, or anything of a mysterious nature.

In giving names to each other and to their children the Hawaiians have always exhibited considerable whimsicality. The most trifling circumstance fixes their nomenclature, and names are as likely to be taken from things and qualities disgusting and vile as from those of the opposite character, and are borne without shame or disgrace. Thus, there are persons named Moékolóhe, "Adultery;" Kekúko, "Lust;" Kakáhu, "Anger;" Haahéo, "Pride;" Aihúe, "Thief;" Waháhe, "Liar;" Pelapéla, "Filth;" Inuráma, "Rum-drinker," etc. It is also customary for persons to exchange names with each other or to assume new ones at will. The origin of some of such names is amusing. Thus, when Kapíoláni, the woman chief at Kealákekúa, was sick and had to submit to a surgical operation, a child of one of the commonalty that happened to be born at the time was called by its parents by a name signifying "Four-inches-long," in order to commemorate the length of the incision made by the surgeon's knife.

Some of the names given to or assumed by members of the royal family remind us of those borne by some of the North American Indians. Thus the name of the king who reigned at Hawaii at the time of Capt. Cook's arrival in 1778 was Kalaníopúu, or "Budding Heaven." His nephew and successor was Kaméhaméha, whose name, subsequently assumed by four other kings of the dynasty, means "The Lonely One," or "The Solitary One." The favorite wife of this monarch was Kaáhumánu, or "The Feather Mantle," while the favorite of his successor was Kamamálu, "The Umbrella." Before Kaméhameha III. assumed the dynastic name he was plain Kauikéaoúli, or "Hanging-on-the-dark-sky."

The quick, observing eyes of the Kanakas or natives saw much to amuse and astonish them in the attire of the missionaries and their wives, whom they for a long time called Aióeóe, or "Long necks," because of the additional length of neck that seemed to be given to the ladies by the poke bonnets that they wore, and which were humorously designated as "hats with spouts."

The Hawaiians have a custom, similar to that which prevailed among the Hebrews, of occasionally conferring upon a person a new and significant name commemorative of some remarkable event in which he or she has been concerned. Thus Kaméhaméha IV., upon the death, in 1862, of his first and only child, bestowed upon his consort the name of Kaleleókaláni, an appellation by which she is now generally known, and by which she frequently subscribes herself. To make the sentiment and appropriateness of this new name understood, it is necessary to explain that nearly all the names of the superior chiefs end in lani, which has the double meaning of "chief" and "heaven," its radical idea being that of height or elevation. The name Kaleleókaláni may consequently be interpreted either as the "flight of the chief" or the "disappearance of heaven;" so that each version expressed in sympathetic and poetic language the loss sustained by the mother who received and the father who inscribed this epithet of the heart.

Upon the death of Kaméhaméha in 1863 the name of the queen was changed once more, but this time by the people in affectionate sympathy. The adjective particle na, meaning "all" or "entire," was substituted for ka, which is genitive singular. So that the desolation of the wife as well as of the mother, instead of being denoted by Kaleleó-ka-láni, "the flight of *the* chief," or "of *the* heaven," was thenceforward expressed by Kaleleó-na-láni, "the flight of *all* the chiefs," or "of *entire* heaven;" for it seemed to the people that to their queen all joy was now darkened and that earth to her was utterly void.

CAMILLE A. FAURE.

We regret to note the death of Camille A. Faure, the French electrical engineer, who died on September 14. He is chiefly known by his improvement of the storage battery. He was the first to build up the negative "pasted" plates with prepared spongy lead in place of the electro-chemical deposition process of Planté. He was born in 1840 and was largely self-taught. In 1878 he first appeared in the storage battery field, and in 1882 he made other important improvements by adopting methods of increasing the surface of plates with a given volume, and later by surrounding the plates with a porous covering. Faure also introduced improvements in the manufacture of explosives and in electro-chemical work.