

## THE AMERICAN YACHT DEFENDER.

The series of races in which the Valkyrie, as the British champion, attempted to win the America's cup in competition with the American yacht Vigilant took place off Sandy Hook in the autumn of 1893, the first race being sailed Saturday, October 7, the second, Monday, October 9, and the third, Friday, October 13, in all of which the Vigilant was victorious. Now work is being rapidly pushed forward on an American yacht which has been aptly named Defender, which will probably compete with a British yacht next September for that great blue ribbon of the sea which still remains in the land of its naturalization. After the defeat of the Valkyrie Lord Dunraven's challenge was of course a foregone conclusion, and all yachtsmen and the general public as well are looking forward to the races which will be sailed off Sandy Hook in a few months for the time honored trophy, for yacht racing probably appeals to a much larger section of the community than any other form of sport. The most important concession granted to Lord Dunraven this year was the right to choose his boat as the New York Yacht Club does at present, so that in all probability not only the Valkyrie III, which the Dunraven syndicate are building, but the Fife cutter Ailsa will be brought over and trial races sailed off Sandy Hook to determine which shall be the British champion.

In America we have, as it were, put all our eggs in one basket, and are relying almost entirely on the Vanderbilt-Morgan-Iselin boat Defender, which the Herreshoffs are building at Bristol, R. I., as this boat will probably have to race against the pick of two modern cutters designed by the two foremost naval architects in Great Britain. The order for the Defender was placed last January with the Herreshoffs, who are undoubtedly the greatest yacht designers in the world, and they are under contract to deliver the yacht June 15, and her trial races will be sailed soon after to see if any modification as to rig is required.

The Defender is a sloop yacht. The approximate measurements are as follows. The exact measurements have not as yet been made public, for from the time of their conception until long after launching the cup defenders have ever been mysteries to the public, and the present yacht is, if anything, more so than the preceding ones. This secrecy must be maintained, so as to keep the lines and dimensions from rivals and those interested in the challenging yacht.

The present figures, although in some instances unofficial, will probably be but little out when comparison can be actually made.

The Defender is not far from 126 feet over all and between 89 and 90 feet at the water line. The beam is about 23 feet, draught about 19 feet. She has no auxiliary centerboard forward, but is an out and out keel boat. She has a 35 foot lead bulb weighing 60 tons. In the lead bulb of the Defender, Herreshoff has remedied a serious defect in the Vigilant. Where the latter in a heavy sea pounded with her flat outside ballast, the Defender will rise and fall without pounding, as the egg-shaped form of her ballast gives easy entrance and withdrawal.

The Tobin bronze plates, as used in the Vigilant, have been superseded by manganese bronze plates below the water line, and above it as far as possible they are of aluminum with an alloy of about ten per cent of copper to resist corrosion and give added strength.

Not only is the upper portion of the plating of the Defender of aluminum, but the deck beams themselves are of the same material, and the saving in weight over steel will be more than double the amount saved by the plating. The total saving effected by the use of aluminum is estimated at seven tons, which is expected to tell greatly in favor of the Defender in the races. A dispatch from Boston states that the mast is 102 feet long; boom, 102 feet; gaff, 64 feet; bowsprit, 44 feet; topmast, 61 feet 2 inches; spinnaker pole, 72 feet. These dimensions may be slightly decreased in fitting. It is said that the Defender will have 7,000 square feet of canvas in her mainsail alone, and her total sail area will be from 12,500 to 13,000 square feet. The distance from the deck to the hounds will be about 72 feet. The Defender's principal gain in sail area will be in the mainsail, the spinnaker being somewhat smaller than that of the Vigilant. One of the most interesting features of the Defender is the manner of working the sails. All the halliards will be led below through tubes in the deck, and they will be worked by means of powerful winches.

The main sheet will also be led below, where it can be handled by a few men with the aid of a winch. Possibly the same may be done with the sheets of the head sails, but many of the details of the yacht are still kept secret. Much of the heaviest work of trimming sheets can thus be carried on below the deck, leaving the deck itself clear for other work. Our full page engraving represents the Defender as she will probably appear at the race with spinnaker set. Our smaller views give a side elevation and a half bow, half stern elevation.

It is of course still a question whether the Defender will be selected to compete, but there seems to be a very general opinion that the safety of the America's cup rests almost entirely with the Defender, for each new boat has been better than the last. The international yacht races have promoted an honorable rivalry among yacht designers, and serve the wholesome purpose of quickening patriotic feeling.

## Natural History Notes.

**The Dancing Hammerkop.**—The hammerkop, a bird of peculiar habits, is found in Cape Colony, some other parts of Africa and in Madagascar. It is something like a heron or stork, has a melancholy gait, lives on fish and frogs and is considered in Africa a bird of ill omen. Under its quiet appearance it nourishes æsthetic tastes. When it casts off its sober demeanor, it indulges in a fantastic dance. In a state of nature, two or three join in the dance, skipping around each other, opening or closing their wings. They breed on trees or on rocky ledges, forming a huge structure of sticks. These nests are so solid that they will bear the weight of a heavy man on the domed roof without collapsing. The entrance is a small hole, placed in the least accessible side. In a lonely rocky glen, Mr. Layard once counted half a dozen of their nests, some almost inaccessibly placed on ledges of rock. One nest contained at least a large cartload of sticks. They occupy the same nest year after year, repairing it as required. The female is credited with the joiner work and the male is the decorator. On the platform outside the inner portion he spreads out all kinds of objects of virtu, brass and bone buttons, bits of crockery and bleached bones.

If a knife, pin, or tinder box were lost within some miles, the loser made a point of examining the hammerkops' nests. Indeed, were it not that hyenas, leopards, and jackals ranged in their vicinity, it is highly probable that man's curiosity or resentment would have often extirpated these interesting artists, or, at least, destroyed habits founded upon leisure and immunity from persecution.

**The Courting of Animals.**—This subject seems to prove attractive to many naturalists. In Vol. X of the "Transactions of the Wisconsin Academy of Sciences," there is a highly interesting paper by Mr. and Mrs. Peckham on the "Courtship of Certain Spiders." It seems to be the case that the sharpness of vision in spiders is accentuated by love. A male of *Satis pulex* was put into a box in which was a female of the same species twelve inches away, and the male "perceived her at once, lifting his head with an alert and excited expression, and went bounding toward her." By experiments it was proved that this recognition was really due to sight. These results are interesting, because some have affirmed that spiders cannot see nearer than twelve inches. Further experiments seem to show that spiders can differentiate color. M. Racovitza, a Roumanian naturalist, has been studying the courting and marriage customs of the octopus, and in a recent number of the "Archives de Zoologie Experimentale" he gives us some of his observations. It is satisfactory to know that the octopus does not, as some have thought, behave brutally in its love affairs. M. Racovitza assures us that "there is nothing more than a courteous flirtation," and that "the male behaves with a certain delicacy toward his companion."

—Science Gossip.

**Agricultural Ants.**—Prof. W. J. McGee, of the government scientific corps, recently paid a visit to some very remarkable farmers in Sonora, Mexico. These are the so-called agricultural ants, which plant fields of grain and regularly harvest their crops, upon which they depend wholly for food. In fact, should the crops fail, they would perish of famine. On the other hand, the cereals that they grow have been specialized by cultivation, like the wheat and other grains of the human husbandman, and would quickly disappear if the attention of the insects was withdrawn.

The fields of the farmer ants cover scores of square miles in Sonora, a large part of which is quite densely populated by them. The home of a colony is marked ordinarily by a circular clearing from five to thirty feet in diameter, on which nothing is permitted to grow. This serves as a sort of parade and exercise ground. Around the clearing is a ring of luxuriant grass from three to twenty feet wide. On the seeds of this grass the insects subsist, planting it every spring and garnering the crop in the autumn. Across the rings which surround formicaries run turnpikes a few inches wide, connecting farm with farm for many furlongs.

In the region described there is practically no vegetation except the grasses cultivated by these ants. The latter appear to keep down and exterminate all other plants, such as cacti, greasewood and mesquite. The plants naturally prevailing in that part of the country are entirely absent from the most thickly settled farming districts. In short, these insects have developed an art of agriculture peculiar to themselves, have made conquest of the land for their needs and have artificialized certain cereals as thoroughly as maize and barley have been artificialized by man. "Thus," says Prof. McGee, "the rigorous environ-

ment of the desert has developed one of the most remarkable intelligences; and incidentally, an animal and a plant have come to be mutually dependent upon each other for existence." The favorite cultivated plant of these ants is the familiar buffalo grass.

**Co-operation in Plants.**—Although in some cases it is difficult to distinguish between true parasitism and symbiosis, says Mr. George Clayton, in a recent paper on this subject, and to pronounce definitely that the host plant does not get some advantage from the parasite that feeds upon its juices, yet innumerable cases are known in which the two plants in union mutually benefit each other, and the term applied to such unions would be symbiosis. Symbiosis may then be defined as the associated existence of two or more plants for purposes of nutrition.

Unlike parasites, two symbiotic plants living in union each supplies its partner with materials that the partner requires; a reciprocity system being the rule of their combined existence. Many of the forest trees, common shrubs, etc., have attached to their roots fungoid partners which, absorbing from the ground moisture and mineral matters, hand these chemicals over to the larger tree, receiving in return starch and other organic materials, which the tree has formed in its foliage. The black poplar and many other plants have the thread-like filaments of fungi woven over their roots.

In the first instance, the root which descends from the germinating seed into the ground becomes entangled with the myceloid filaments of the fungus already existing in the soil, thenceforward the connection continues until death. As the root grows onward the mycelium which invests it grows with it, accompanying it whatever direction the root may take.

The number of plants having symbiotic relations of the kind described is very large, most of the Ericaceæ, Coniferæ and Cupuliferæ co-operating with subterranean partners. It is notable that the chief species of flowering plants which are symbiotic are gregarious in character, and, like the oak, fir, heather, etc., form large forests, or moors, and one may be filled with wonder at the magnitude of the immense colonies of subterranean fungi which must exist interlacing themselves at the roots of such forests of trees.

It will also be plain why there is such a profusion of fungi of all kinds in forests and round the roots of certain trees. The lichen is now almost generally admitted to be of a composite character, each lichen being comprised of (1) a fungus made up of a web of myceloid threads with (2) an alga in its interior, the combination of alga and fungus thus forming the one lichen plant.

The myceloid threads of the fungus, being most exterior, fulfill the function of gathering from the air moisture, while its partner, the alga, owing to its having chlorophyl, manufactures starch and other chemicals; thus here, again, the partners supply each other with matter necessary for the life of both.

A most interesting proof of this union is afforded by the fact that a lichen may be actually synthesized by sowing certain algæ along with certain definite fungi in a favorable place, when the two separate plants amalgamate and interweave their cells, with the result that a lichen is formed.

## Sleepy Grass.

In some parts of New Mexico there grows a grass which produces a somniferous effect on the animals that graze upon it. Horses, after eating this grass, in nearly all cases sleep standing, while cows and sheep almost invariably lie down. It has occasionally happened that travelers have stopped to allow horses to feed in places where the grass grew pretty thickly, and the animals have had time to eat a considerable quantity before its effects manifested themselves. In such cases horses have gone to sleep on the road, and it is hard to arouse them.

The effect of the grass passes off in an hour or two, and no bad results have ever been noticed on account of it. Cattle on the ranches frequently come upon patches of this grass, where they feed for perhaps half an hour, and then fall asleep for an hour or more, when they wake up and start feeding again.

The programme is repeated perhaps a dozen times, until thirst obliges them to go to water. Whether, like the poppy, the grass contains opium, or whether its sleep-producing property is due to some other substance, has not been determined.—Pearson's Weekly.

Mr. Frederick V. Colvill, Botanist United States Department of Agriculture, says: "The so-called sleepy grass mentioned in a recent article in Pearson's Weekly is known technically as *Stipa viridula robusta* and is known from reliable persons to have a narcotic effect on horses and other stock."

It is often supposed that boys in growing keep ahead of girls; but recent measurements disprove this. The boys, up to their eleventh year, were found to run about a quarter to half an inch taller than the girls. They were then overtaken by the girls, who surpassed them in height till their sixteenth year, when the boys again grew faster than the girls, and came to the front.

# SCIENTIFIC AMERICAN

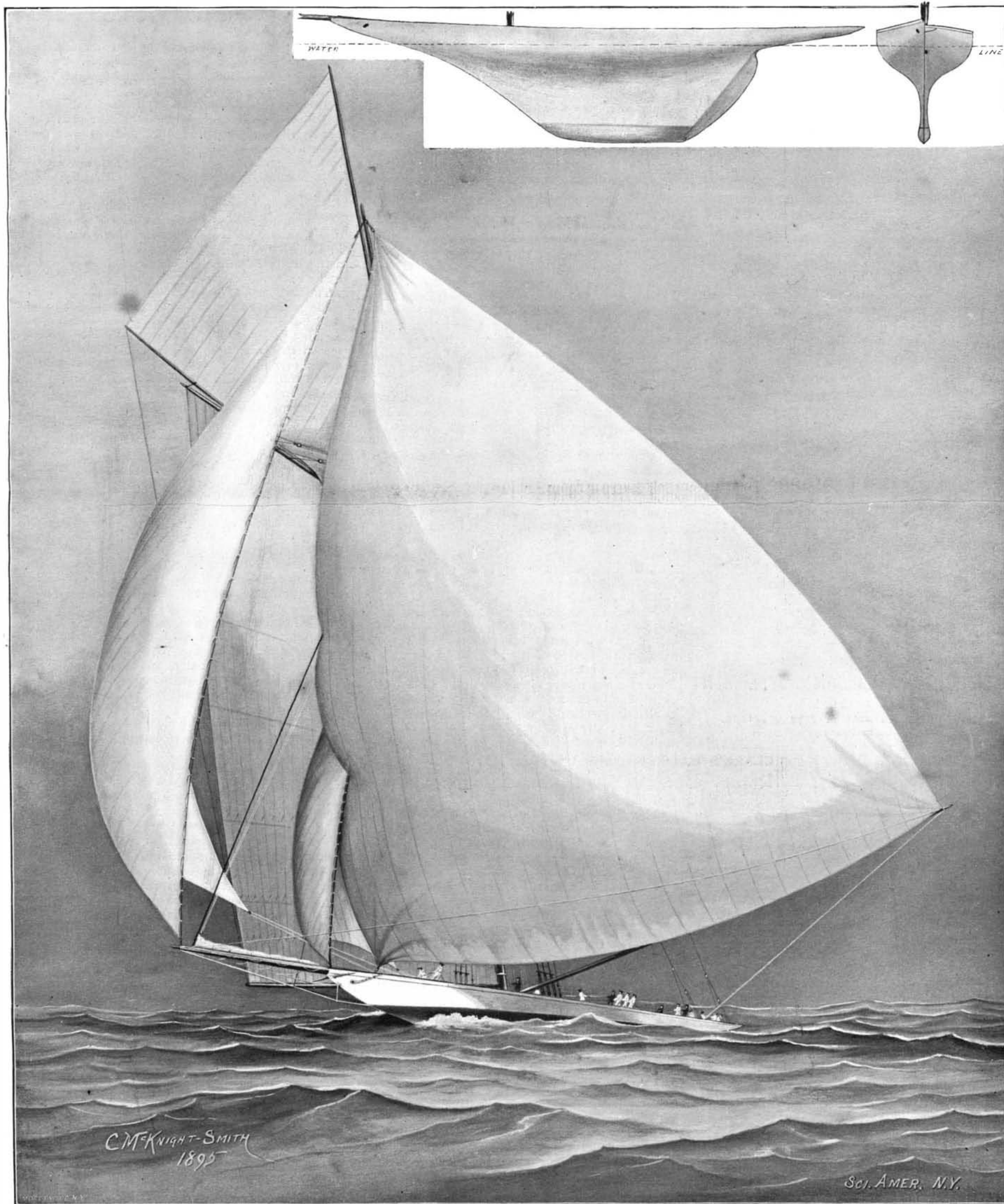
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THE NEW AMERICAN YACHT THE DEFENDER.—[See page 327.]