THE NINTH INTERNATIONAL YACHT RACE.

It was in the year 1851 that the schooner America met and defeated a whole fleet of British yachts, big and little, and brought back the silver trophy toward which English yachtsmen have looked ever since with covetous eyes; for the possession of which they have contended with a pluck and persistence characteristic of the race. Eight times have they braved the dangers of the Atlantic passage, and eight times have they met with a crushing defeat. In the present issue we present our readers with views of the ninth international challenger, Valkyrie III, and of the probable champion that will oppose her, very aptly named Defender.

In all previous cup contests there has been prevalent among American yachtsmen a sense of security in anticipation of the approaching struggle which the event has fully justified. In the present instance, however, the confidence is not so marked or widespread; for, while it is true that the majority of patriotic Americans are confident in the ability of the Herreshoff creation of 1895 to accomplish its work as neatly as did their 1893 production, there are others (and they are chiefly to be found among the yachting experts) who are doubtful as to the result. This latter sentiment has been strengthened since the visitor was docked and has had an opportunity to show her abnormal power of hull and the enormous sail spread that she carries above it.

There are certain factors in the situation that render the issue more doubtful than in former years, and that make the challenger's prospect of winning more possible. In the first place, in previous contests, the English boat has been built and launched early in the year. She has sailed in many regattas; and her size, sail spread, best points of sailing, and a hundred and one other points of interest, have been in the possession of the home designer, as he sat down at his desk to draught out the lines of a boat that should beat her. This year the boats were built simultaneously, and there was no such information to hand. To our surprise we find that the tables are turned—we have to fight a boat much bigger than our own. Unlike the previous English boats, she is an unknown quantity. She sailed four races on the other side; and lo! before her sails are fully stretched, she unbends them, and goes to the yard to be rigged for her ocean voyage.

This would seem to show that her performance was fully up to the expectations of her designer, Mr. Watson, and of her owners, the Dunraven syndicate.

In former contests, moreover, the English have made the palpable mistake of trying to design a yacht that should win cups in English waters, and then come over here and win the America cup off Sandy Hook.

The experience gained with Valkyrie II proved the hopelessness of such an attempt. There is a weight and vim in the winds that blow around the English coast which necessitates a snug sail plan, if that sail is to be carried in all weathers. The prevalent winds off Sandy Hook, in the fall of the year, are relatively much lighter, and permit a much larger sail spread to be carried. This year Lord Dunraven has given it out that the Valkyrie is designed specially for Sandy Hook courses; that is to say, that she is an ideal light-weather boat.

Any one who takes note of her great beam, shallow under-water body, and her immense spar plan, must admit that Designer Watson may have reached this ideal. She should be a very fleet boat in light winds.

But what if it should come on to blow? Well, that contingency is simply unprovided for. Her record, brief as it is, proves this beyond a doubt. In her maiden race against Britannia, sailed in a light wind, she drew rapidly ahead from the very start, "and never stopped going until she was thirty-six minutes ahead by the clock, and about six miles in distance." Later she ran into a calm, and finished only slightly ahead of Britannia. She sailed her next race against Ailsa, a new ninety-foot boat. The course was seven and one-half miles to windward and return. It was sailed in a light breeze, and Valkyrie won by fifteen minutes. In another fifty-mile race she beat Britannia by nineteen and one-half minutes. The wind was fresh, and she averaged eight and one-half knots over the course. The yachting experts claimed that, had the wind been lighter, she would probably have beaten Britannia by twice as much. These races were sailed in the weather for which she was designed, and they are certainly creditable performances. There was another fity-mile race, however, in which she was thoroughly well beaten. It was sailed in a strong breeze, and Valkyrie appeared unable to carry her sail. She dropped slowly astern, and finished three minutes behind Britannia. She made a very poor showing, staggering along on her beam ends in a smother of foam, with the water half way up her deck, and a huge bow wave roaring away to leeward. She showed how little she was designed for hard driving in a strong wind. Britannia meanwhile, be it said, was standing up like the proverbial church. For such weather she is clearly over-sparred.

These trials, such as they are, would seem to show that Valkyrie will be a very dangerous competitor in light breezes, and a very harmless one in a blow.

In our own Defender, on the other hand, we have probably a better all round boat than Valkyrie; though judged by her performances against Vigilant, and Valkyrie's against Britannia, in light weather Valkyrie would certainly appear to be the faster boat. Nor must we make too much of the reputed increase in Vigilant's speed; for it is certain that the increased sail-spread that was given Britannia this season has made her a faster boat than last year, when she met Vigilant.

Should the breezes be strong however, and should there be a short, lumpy sea running on the day of the races, for our own part we should not be surprised to see Defender cross the line fully 10 minutes ahead of her huge antagonist.

In construction the two boats are marvels of lightness. The Defender is built of steel framing with manganese bronze plating below the water line and aluminum bronze from the water line up. Her deck beams are alternately of aluminum and steel. The use of aluminum reduces her top weight and gives her, as compared with the heavier construction of the Valkyrie, a lower center of gravity and a proportionately greater sail-carrying power. Her rigging, spars, etc., are remarkably light, perhaps excessively so; though the cutter is now at Bristol for the purpose of having her gear overhauled and strengthened. She has moderate beam, remarkably fine lines, a fairly full under-water body for an American yacht, and abnormal draught, at least five more than the defender of 1893.

THE BRITISH YACHT VALKYRIE III.

The Valkyrie is of what is known as composite construction—elm planking on nickel-steel frames. She is not coppered, except on her lead keel; but is painted with a patent enamel, which is said to give a remarkably smooth surface. She is more stoutly rigged than the Defender, and is every way a heavier boat.

Probably about 55 per cent of the displacement of the Defender is in her lead keel; for Valkyrie the ratio will be about 50 per cent.

It will be seen, from the above facts, that there is much about the coming struggle to make it especially exciting. It promises to be more evenly contested than any previous series of races.

The winner of three races out of five will take the cup. The first race, which takes place on September 7, will probably be 15 miles to windward and return. This will be followed by a triangular race of 10 miles to the leg; the third race being over the windward and leeward course.

FORTY to fifty miles a day is about the maximum distance attained by ordinary riders on a tricycle.

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Habits of Spiders.

BY J. BEECHAM MAYOR, L.R.C.P., M.R.C.S.

Dr. W. H. Dallinger has recently written a paper dealing with the constructive ingenuity of spiders, from which we may conclude that they not only inherit, but also acquire, useful and beneficial habits, or modify those inherited. For instance, the triangle spider (Hyptiotes cavatus), of America, so called from constructing a web that is only a segment of a circle, makes the web not only a snare but also a gin, i. e., a stratagem or contrivance closing suddenly upon the snared victim. When, from position or other circumstances, it has been found necessary to keep the web constantly extended and drawn taut, it is often found that the circular web spiders will attach a weight to the end of a line connected by cords with the framework of the whole of the web. An instance of this adaptation to environment has recently come under my notice. A lead water supply pipe runs along the ceiling of a cellar, and from it depended a piece of twisted string, about eight inches in length. The end of this string was drawn upward by the spider with a strong silken strand attached to the ceiling some little distance away from the leaden pipe, so that the string formed a perfect curve. In the space thus bounded by the ceiling, the string and the silken strand, joining the two latter, a perfect circular web had been constructed by the ingenious spider, the string acting as a weight or counterpoise to keep the web firmly stretched, as well as forming a necessary boundary to it for the attachment of strands.

Purification of Petroleum.

It is known that in washing petroleum distillates with sulphuric acid the concentration and purity of the acid have an important effect on the quality of the refined product, but the question of temperature, which the author considers of equal moment, does not appear to have received proper attention on the part of chemists.

The best results are invariably obtained by conducting the acid washing process at as low a temperature as possible. The author worked at temperatures ranging from 0° to 25°, and obtained whiter and purer products the more closely he approached the lower limit. Working under identical conditions as to concentration and purity of acid, the distillate obtained after the acid treatment at 25° had a distinct yellow color, while that following an acid treatment at 0° was almost colorless, with simultaneous diminution of the difficulties accompanying the process of purification, i. e., at the lower temperature the rate of clarification increased with the yield of refined product.

The action of sulphuric acid on petroleum is of twofold character: (1.) Elimination and solution of impurities. (2.) Oxidation of the heavier portions. Although the rate of absorption is not materially influenced by slight variations of temperature, the oxidation increases rapidly with a rise of temperature, as is evinced by the copious evolution of sulphurous anhydride. Moreover, at a higher temperature, the solvent properties of petroleum for resin acids, and more especially for oxidation products, increases, the result being the contamination of the distillate with impurities, which it is impossible to completely remove either by washing with soda lye and water or by other means.—R. Zaloziecki, Chem. Zeit.

WHILE there are no complete statistics available, careful estimates from all possible sources of information make it probable that at the time of the discovery, there were not more than 500,000 Indians in all North America.

The Cause of Porous Rubber Tires.

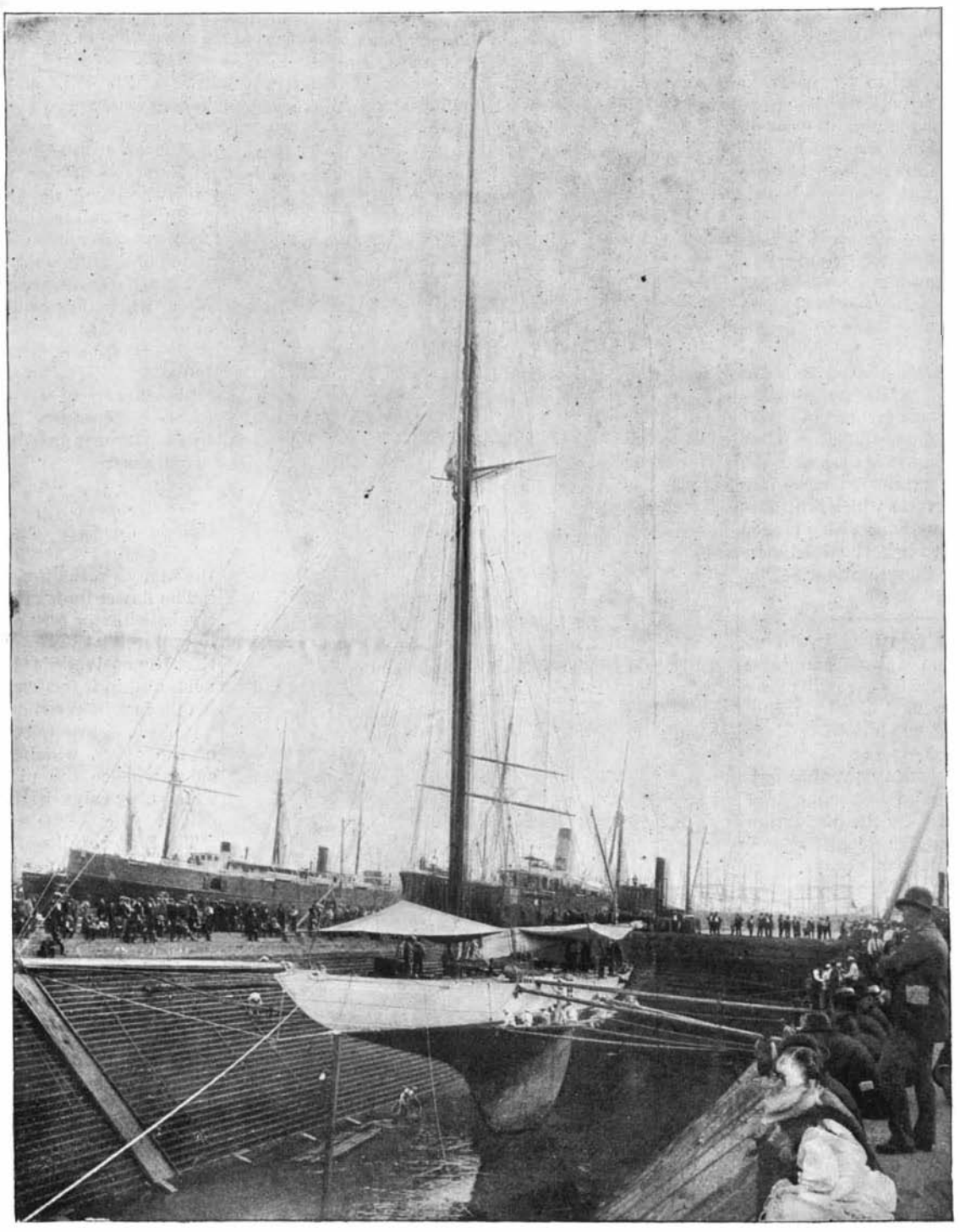
A writer in the India Rubber World, who styles himself a rubber manufacturer, says: "There is no one part of a bicycle so important as the tire, and no one part so little understood by the rider, and, in fact, by most of the bicycle manufacturers who use them.

"Most people imagine that the making of a pneumatic tire is a very simple operation. They liken it to a garden hose and fancy it a mere trifle, but there is nothing more difficult nor anything in the rubber goods line that requires more care in manufacture than a single-tube tire. We make both single and double tubes, and have sold far more of the former than of the latter. We give our patrons exactly what they call for, and are not prejudiced in one way or the other. I simply know that the volume of single-tube tires that are returned to not only ourselves, but, to my certain knowledge, to every other manufacturer, is amazing. No; the making of a double-tube tire is not so difficult. You can see what you are doing. With the single tube it is different.

"The cause of the trouble? The inability to locate the source of a puncture or leak. We can, of course, make a tire that is fairly safe, but from the very nature of things it must be heavy and dead. You may take it for granted that in every case a lively, resilient tire is easily—too easily—punctured. It cannot be otherwise. Riders must choose between the two. One reason why a puncture in the single tube is so hard to locate—impossible, in many instances—is that the puncture has gone not only through the thread of the tire, but has minutely pierced or pricked the inside of the part next the rim. Few riders realize this. In fact, from the number of tires returned it seems as if none of them do. But, perhaps, they are not to blame. When such a puncture occurs every rider and every agent immediately apparently concludes that the tire is 'porous.' They have all caught on to that term. The tires are shipped back to the makers, and it cannot be denied that they, too, are often nonplussed. The puncture not having gone clear through, but merely pricked the inner coating, when the tire is placed in water a splendid aquatic display ensues. The air oozes through and in and around the threads of the fabric, and usually finds a dozen or more outlets, not one of which may be near the true source of the trouble, which is, of course, inside and invisible. Frequently it causes little pimples or blisters, and though one may insert plugs wherever one appears or wherever the water bubbles, it does no good. The tire still leaks. We have often inserted twenty plugs in a single tire and then had to give up the chase, for it really amounts to that.

"What causes a porous tire? Oh! there are any number of causes. We once had a spell of that sort of trouble with our inner tubes, and were at our wits' end to find the reason. We finally located it. Workmen walking on the floor above shook from the ceiling into the rubber composition fine particles of dust and wood. Another time we found that in the absence of the foreman some of the men had been skylarking—throwing at each other rags or something of the sort, which had been lying on the floor, and which contained fine particles. These got into the rubber, and a big batch of porous tires resulted. A mere speck on the mandrel or pole on which the tires are formed will also cause expensive mischief of the same sort."

The editor of the India Rubber World comments as follows: "As a matter of fact, the problem of avoiding porosity is one that has caused the rubber trade a deal of trouble and cost much money. There are times, of course, when particles of dust dropping upon sheets of thin rubber will cause porosity, but, as a rule, this is far from being the cause. A more common one is the presence of gas developed in the compound during vulcanization. For example, if the fabric upon which the compound is to be spread, or if the compounds themselves are damp, when heat is applied that dampness will become steam and will form little bubbles in the rubber, thereby causing porous places. Further than this, certain of the poorer grades of rubber contain ingredients that under heat resolve themselves into gases that do exactly the same thing. Then, too, in compounding, it oftentimes happens that two or more ingredients that are brought together will form a gas that results in the worst sort of porosity. For these reasons, rubber, adulterants, and fabrics should all be very carefully dried. After the compound has been spread on the calender, it is also an excellent plan to let it lie on the rack from twelve to twenty-four hours before using, which will oftentimes entirely do away with a tendency toward porosity. Rubber manufacturers who employ chemists can very easily tell whether their compounds are such that will develop gases during vulcanization, and should be able to avoid porous goods. A very good common cure for compounds that have a tendency to blister is to add a little slaked lime, which has long been known as preventive for this sort of trouble."



THE AMERICAN YACHT DEFENDER.

An African Gum.

This gum differs from tragacanth in being completely vitreous in appearance. It occurs in large pieces which are more or less elongated, but never rolled. When heated with water it forms a starch which separates in opalescent masses, and only dissolves on very prolonged boiling. Its solution is dextro-rotary and is precipitated by basic lead acetate, alcohol, and ammonium sulphate. With nitric acid the gum gives muric and oxalic acids, with sulphuric acid it yields furfurol. Potash colors it yellow, phloroglucinol and hydrochloric acid, or pyrogallic acid, pale red, but phenol and α-naphthol do not cause coloration. The gum appears to be formed under the bark.—C. Hartwich.

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Bacteria in Eggs.

It has been reserved for Dr. McClintock, of the University of Michigan, to point out that not even that dainty adjunct to the breakfast table—the egg—is free from the ravages of the "ubiquitous microbe." Hitherto this article has been consumed in happy ignorance, but the result of Dr. McClintock's investigation will be to seriously interfere with the peace of mind of many. In an evil moment the doctor took up the task of ascertaining whether eggs were infected with bacteria, and, if so, whether before they were laid or not. A healthy laying hen was obtained, and after repeated washings in a sublimate solution, she was placed in a sterilized cage. The hen laid regularly every other day, and the eggs were obtained as soon as possible after being laid and some of them wrapped in sterilized cotton and placed in an incubator. All these eggs became decomposed and swarmed with bacteria. Other eggs taken from the hen as soon as laid were broken and cultures made from their contents. Some of these culture tubes developed; others remained sterile. Some days after the hen was killed, and with due precautions, culture tubes were inoculated from various portions of the oviduct. Most of these tubes developed.

The evidence here seems to point to the fact that the egg was inoculated during its passage down the oviduct before the shell was formed. It does not, of course, follow that all eggs contain microbes, nor does it follow that even where bacteria are present they are in any way harmful. It is a matter of common knowledge that eggs kept excluded from the air will keep almost indefinitely. It is, moreover, difficult to understand how the experimenter succeeded in completely sterilizing his hen and her cage, and, if he succeeded in that temporarily, in keeping her sterile. The feathers of the bird, especially when shut up, would offer the more favorable medium for propagating bacteria, and it is quite possible that hence came the microbes. But, after all is said, what we want to know is the utility of information of this kind? If Dr. McClintock had boiled his eggs, and after that found in them the germs of some specific disease, such as typhoid or diphtheria, there might be cause for trouble; but, if there are any bacteria which will survive a few minutes in a frying pan along with a rasher of bacon, we would feel inclined to ask the Michigan professor to proceed with his investigations.—The Chemist and Druggist.

Pleasant Words from an Appreciative Neighbor.

Our esteemed contemporary, the Manufacturer and Builder, which has with marked ability through many years catered to the wants of a most discriminating class of readers, is pleased to make the following kindly commendatory remarks upon our work:

"The career of the SCIENTIFIC AMERICAN, that universally known and popular journal, has been one of remarkable success. It may now claim the distinction of being the oldest among the popular scientific journals of the United States, and it has always been among the best. The SUPPLEMENT, which was started in the Centennial year, has come to be recognized by all who are interested in the progress of science as the best source of general information, respecting the current of scientific thought, to be found in any language. It is almost exclusively eclectic in its make-up, but its selections are made with such intelligent discrimination that every field is culled of its best fruits. The ARCHITECTS' AND BUILDERS' edition of the SCIENTIFIC AMERICAN is of more recent origin, but fulfills its mission so well that it ranks with the best—as it certainly is one of the most useful—of American technical journals.

"Of the miscellaneous publications of Munn & Company, the 'Scientific American Cyclopedia of Receipts, Notes and Queries,' a large quarto volume of over 700 pages, is perhaps the most notable. It is a valuable work of reference on all subjects relating to the arts and industries, containing 12,500 receipts carefully collated from the latest and most trustworthy sources. Another admirable, practical work, especially praiseworthy for the excellence and wealth of its illustrations, is 'Experimental Science,' edited by G. M. Hopkins. As a hand-book for the study of natural philosophy it is unsurpassable. Without dwelling upon a number of miscellaneous technical works, all characterized by their practical treatment of the subjects to which they relate, we may refer finally to the 'Scientific American Hand-book,' an attractive little pamphlet, giving in concise form a large amount of important information respecting patents, caveats, trade-marks, etc., which every inventor will find highly useful to know. The great experience and extensive business of the firm of Munn & Company in this branch of professional work has made their name more widely known throughout the country, as well as in Europe, than that of any other American house."

THE President of the French Republic has a salary of £24,000 a year, and a further allowance of an equal amount of expenses.

AN IMPROVED HARP.

In the accompanying illustration is represented a harp in which are embodied late devices designed to improve the instrument in every way and to greatly enhance the quality and quantity of the tone, especially in the lower register. For these improvements a patent was recently issued, and they have been incorporated in the really superb instruments known as the Lyon & Healy Harps, built by the firm of that name in Chicago. As harps have been ordinarily built heretofore, the upper end of the sound board is of a width equal to the length of the string at that point, say three inches, while its lower end is less than one-fourth the length of the string, or is only about fourteen inches wide for a string about five feet long. To widen the base of the body of the harp and spread the pedals is impracticable, and has obvious objections in considerations of convenience and appearance. But by a combination with the body of side extensions, and a sound board secured thereto near their outer edges, with most skillful mechanical construction, the width of the sound board in the lower register is increased without increasing the width of the body, whereby the power, clearness, and beauty of the lower notes is greatly increased, so much so that they can be readily distinguished in full orchestra passages. Eminent virtuosi upon the harp have passed

THE LYON & HEALY HARP, WITH ENLARGED SOUNDING BOARD.

high encomiums upon the Lyon & Healy harps, and the new harp catalogue issued by the manufacturers contains portraits and the strongest kind of testimonials from such world famous artists as Aptommas of London; Cheshire of New York; Cervantes of Constantinople; Bressler of Paris; Possé of Berlin; Breitschuck of New York; Snoer of Leipzig; Bauer-Ziech of Dresden; Schuecker of Boston and others.

Flowers as Food.

Although it is well known that many kinds of flowers are used in medicine, the fact may not be known to many that the blossoms of certain plants are employed as articles of food. In many parts of India the flowers of a sapotaceous tree, Bassia latifolia or mahwah, form a really important article of food. These blossoms, which are succulent and very numerous, fall at night in large quantities from the tree, and are gathered early in the morning and eaten raw. They have a sweet but sickly taste and odor. They are likewise dried in the sun and sold in the bazars. The Bheels dry them and store them as a staple article of food, and so important are they considered for this purpose that when in expeditions for the punishment or subjection of these tribes, when unruly, a threat is made by the invading force to cut down their Bassia trees, the menace most commonly insures their submission.

An ardent spirit like whisky is distilled from these flowers, and is consumed in large quantities by the natives of Guzerat, etc. The Parsees and hill people eat the flowers both raw and cooked, often with the addition of grain, and also make sweetmeats of them. A single tree will afford from two to four hundred pounds of the flowers.

The blossoms of another species, B. longifolia, are employed in a similar manner by the natives of Malabar and Mysore, where it abounds. They are either dried and roasted and then eaten or are bruised and boiled to a jelly and made into small balls, which are sold or exchanged for fish, rice and various sorts of small grain.

The flowers of the Judas tree, Cercis Siliquastrum, of Europe, have an agreeable acid taste and are sometimes mixed with salads or made into fritters with batter, and the flower buds are pickled in vinegar. The flowers of the American species, C. Canadensis, the red bud, are used by the French Canadians in salads and pickles.

The flowers of the Abutilon esculentum, bençao de deos, are used in Brazil as a boiled vegetable.

The flowers of Moringa pterygosperme, the horseradish tree, are eaten by the natives of India in their curries.

The large and showy flowers of Tropæolum majus, the Indian cress or nasturtium, are frequently used along with the young leaves as a salad. They have a warm taste, not unlike that of the common cress, and it is from this circumstance that the plant has obtained the name of nasturtium.

The young calices of Dillenia scabrella, and D. speciosa, which are swollen and fleshy, have a pleasantly acid taste and are used by the inhabitants of Chittagong and Bengal in their curries and also for making jelly.

The flowers of Rhododendron arboreum are eaten by the hill people of India, and are made into a jelly by the European visitors. Yet poisonous properties are usually ascribed to the species of this genus, and it has been said that the R. Ponticum was the plant from whose flowers the bees of Pontus collected the honey that produced the extraordinary symptoms of poisoning described as having attacked the Greek soldiers in the famous retreat of the ten thousand.

The flower buds of Zygophyllum Fabago are used as a substitute for capers, and the flowers of Melianthus major, a plant of the same order, are so full of honey that the natives of Good Hope, where the plant grows wild, obtain it for food by shaking the branches, when it falls in a heavy shower.

Coccoloba urifera is remarkable from the peculiarity of the calyx, which becomes pulpy and of a violet color, whence the plant is called the seaside grape. This pulpy calyx has an agreeable acid flavor and is edible.

The flower stalks of Hovenia dulcis become extremely large and succulent and are used in China as a fruit. It is said that in flavor they resemble a ripe pear.

The flowers of the pumpkin were cooked and eaten by some of the tribes of the American Indians, especially by the Aztecs, by whom they were highly esteemed.

The cauliflower, which has been known from remote antiquity, differs in a remarkable manner from all the other varieties of the cabbage tribe, whose leaves and stalks alone are used for culinary purposes. Instead of the latter being used, the flower buds and fleshy flower stalks, which form themselves into a firm cluster or head varying from four to eight or more inches in diameter, here become the edible portion and one of the greatest of vegetable delicacies.

The flower buds of Capparis spinosa, a plant which grows on walls, etc., in the south of Europe, are pickled in vinegar in Italy and form what are commonly known as capers. These are chiefly imported from Sicily, though the plant is largely cultivated in some parts of France.

The cloves of commerce are the unexpanded flower buds of Caryophyllus aromaticus (Myrtaceæ), a small evergreen, native of the Moluccas, but cultivated in several parts of the East and West Indies. Before the expansion of the flowers, which are produced in branched panicles at the extremity of the branches and are of a delicate peach color, the buds are collected by hand, or else sheets and mats are spread under the tree and the buds brought down by beating it with sticks. They are cleaned and then dried in the sun. A uniform brown color is imparted by slightly smoking them over a wood fire. The flower buds of Calyptranthes aromaticns, another plant of the same order, may be advantageously substituted.

The flower buds and the berries of the myrtle, Myrtus communis, were eaten as spices by the ancients, and are still used in Tnscany instead of pepper.

Long pepper is furnished by the immature spikes of flowers of Chavica Roxburghii, which are gathered and dried in the sun. In chemical composition and qualities it resembles ordinary black pepper and contains piperine.

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