

recognized the coming match as one in which the victory is likely to be gained by seconds and minutes, and the boat which he has produced shows that his line of action has been in recognizing and strengthening the weaknesses of the two previous challengers rather than in striving after a marked degree of originality. Generally speaking, it may be said that the chief novelty in the design of "Shamrock III," lies in the fact that stiffness and great sail-carrying power, which have been the characteristic of each Cup challenger since and including "Valkyrie III," have been treated on this occasion as a matter of secondary importance. All yacht designing is largely a matter of compromise. If a stiff, powerful boat is the main object of the designer, then the soft flow of the lines which give ease of driving must be sacrificed to some extent. In "Valkyrie III," "Shamrock I.," and in less degree, in "Shamrock II.," the design was controlled by a desire to produce such a hull as would stand up well to the immense pyramid of canvas which it was proposed to use for driving. In the latest boat the controlling feature of the design has been altered, and Fife has apparently directed his energies first to the posed to use for driving. In the latest boats the conditions of weather. He has therefore given "Shamrock III." a round fullness of body which makes her stand out from the list of challengers as a yacht of marked individuality. The fin-keel type of underbody is naturally retained, but the hull of the boat is drawn so well down that the fin is made much shallower than usual. It is, in short, less of a fin and more of a keel than has been seen on any Cup racer in recent years. The draught has also been cut down to a considerable extent, and the new craft will float in two feet of water less than was necessary to keep the Watson boat off the bottom.

These changes mean naturally a certain loss of initial stability, and to partly compensate for this the beam, as compared with that of "Shamrock II.," has been slightly increased. The full round head which was characteristic of the Watson boat—and helped greatly to her undoing when she met a head sea—has no place in the Fife model. From the point of greatest beam the bow is carried forward in an easy sweep which gives an entrance cleaner than on any of the previous "Shamrocks." The excessive thinning down of the flanks, which was also a noticeable feature of the previous challenger, has also been avoided, and the beam of the boat is carried well out into the counter. In profile the yacht has fewer peculiarities. The bow is shorter and sharper than usual, and rises at an angle that should keep the decks moderately free from water in anything less than a heavy sea. The sheer is peculiar, and looks ungraceful to eyes accustomed to the low waist and the rise fore and aft to which yachts are usually sheered. The rail of "Shamrock III." is practically level.

In the construction of the boat Messrs. Denny Brothers have produced an interesting bit of work, but the interest lies mainly in the details and the quality of the workmanship rather than in the introduction of any new principles. In the matter of material, the boat might be regarded as a retrogression, for the manganese bronze with which the last Cup yacht was plated is discarded in this instance for nickel-steel, such as is largely used in the construction of launches and torpedo boats. The builders, on whose advice this was done, are, however, convinced that this is a step in the right direction. The difficulty of working the manganese bronze and the extra thickness necessary to make up for the doubtful hold of the seams, etc., more than compensated, in their opinion, for the superior smoothness and other advantageous qualities of the alloy. The present yacht is plated from keel to rail with nickel-steel. The plating used in closing in the underbody, where a little extra weight is of little account, is fairly stout, but from the waterline up, where every pound tells against the stability of the boat, the plating is so thin that it is difficult to understand how a satisfactory bedding has been got for the countersunk heads of the rivets. The only aluminium used in the vessel has been put into the decks, whose plates are composed of an alloy which is mainly this light, but perishable metal. Taken as a whole, and allowing for the weight saved by the use of thinner metals, the shell of the boat is lighter than that of "Shamrock II." and works out at a figure very close to that of the first Fife challenger.

In a yacht of this type the spars are always deserving of special attention, as much from their great size as from the ingenuity displayed in the effort to secure the maximum of strength and rigidity with the minimum of weight. In this, Fife had the experience of the last challenger to guide him, and he has made few departures of note. The mast, gaff, and boom are of steel, the bowsprit being solid wood, and the lighter spars of hollow wood. The mast follows the idea carried out in the second spar of this kind fitted to "Shamrock II.," in being mainmast and topmast in one unbroken length. The reason for this is the saving of weight and windage as compared with

the ordinary main and topmast, and the saving of weight and complication of gear as compared with the Herreshoff system of telescoping spars. All the steel spars are constructed on the same principle, a framework of light angle steel being first laid down, and bound and strengthened by a series of short straps zigzagging across the diameter of the spar. The complete skeleton is then closed by light steel sheets bent to shape and riveted.

On this occasion there has been abundance of time for the performance of the work; every detail was subjected to searching inspection, and the result is a boat that, whatever her sailing qualities may prove, should at least have none of the weaknesses which helped to mar the career of the second "Shamrock."

THE SECOND EAST RIVER RAPID TRANSIT TUNNEL TO BROOKLYN.

Plans recently submitted to the Rapid Transit Commission by their Chief Engineer for the improvement of traveling facilities in Brooklyn include the construction of a second East River tunnel from Nassau and Orange Streets, Brooklyn, to Maiden Lane, in Manhattan. The tunnel will terminate at a station near William Street, from which point two lines will be run, one across Manhattan to West Street at the foot of Cortlandt Street, and another line below William Street and diagonally beneath the Brooklyn Bridge structure to Park Row, whence it will proceed by way of Center and Grand Streets, to the Manhattan terminus of the Williamsburg Bridge. Here connection will be made between the subway tracks and the tracks which pass over the bridge. It will be seen that this second line will provide a loop for the Brooklyn railways by way of the new tunnel and the Williamsburg Bridge.

Mr. Parsons also recommends removing the elevated trains from the Brooklyn Bridge, sending them across the East River by the new route, and transferring the trolley cars from the roadways to the bridge railroad tracks, thereby restoring the roadways to the exclusive use of vehicles. It is also proposed to connect the two bridges by adding two tracks to the Second Avenue Railroad, and building a new branch of the elevated system down Delancey Street to the Williamsburg Bridge. If these suggestions are carried out, Brooklyn and Manhattan will be connected by three bridges carrying six elevated tracks and ten surface tracks, and by two tunnels carrying four tracks. The report also recommends for Brooklyn a new subway system and a development of the elevated railroad system. From Flatbush and Atlantic Avenues, the terminus of the tunnel now under construction, it is proposed to build a four-track subway to the Prospect Park plaza, with a loop at the plaza, and from this loop to carry a three-track line easterly below Eastern Parkway and East New York. Another proposed extension is to run from Flatbush and Atlantic Avenues below Fourth Avenue to Fort Hamilton. In addition to these extensions of the subway system, the report proposes no less than nine new elevated lines or extensions of existing elevated lines. The cost of these improvements exclusive of abutment damages will be about \$52,000,000; \$31,000,000 being for the subway system and \$21,000,000 for the elevated system extensions.

SPICES—PURE AND OTHERWISE.

BY A. S. ATKINSON, M.D.

Spices properly used have their value in helping digestion and stimulating the flow of the gastric and pancreatic juices, and at the same time they tempt the jaded appetite to a better relish of good, wholesome foods. But spices are not always what they are sold for; neither are they always as wholesome and harmless as they should be. The tendency to adulterate extends to nearly all our foods, and unfortunately a good many people in buying cheap foods are not getting all they bargained for.

When adulterations are wholesome or harmless, possibly the deception is not so bad, especially if we cannot distinguish by taste the genuine from the artificial. Naturally dealers and manufacturers in adulterated foods try to select harmless articles to mix with their adulterated goods. Whatever the nature of the material used for adulterating, it is always cheaper than the genuine goods. It is usually some woody substance, which when ground fine enough will pass muster without being easily detected. Thus in such spices as cloves, cinnamon, mace, allspice, nutmeg, mustard, and ginger, there are many such materials as ground cornmeal, parched wheat, peas, beans, and coffee beans, which can easily be mixed with them without changing the general appearance or even taste beyond lessening the strength. As some people like chicory in their coffee, so some people might prefer adulterated ginger and mustard to the full strength of the genuine article. If the adulteration is to be done, however, it is much more desirable that it should be done at home than in the store.

Ginger, for instance, is frequently adulterated with

pepper, mustard hulls, and turmeric. These give nearly as sharp a taste to the mixture as pure ginger would, and the effect is that the adulterated spice frequently passes unchallenged. Cinnamon has quite a variety of materials used for cheapening its retail cost. Cassia, arrowroot, mustard hulls, charcoal, burnt shells and cracker dust are all frequently ground to swell the bulk of the spice. Then in cloves we have some of these same materials, and such other articles as clove stems and hulls ground up, allspice, peas, wheat, and even mineral colors. Nutmegs, since the days of the first Yankee nutmegs made in Connecticut of white birch colored to resemble the natural ones, have been susceptible to considerable adulteration, and starch, cereals, mustard, peas, and other roasted articles go to make up ground nutmegs. Of course, whole nutmegs are hard to imitate, but even these are sometimes sold as genuine when they are nothing but wild, flavorless nutmegs.

Pepper has its weight increased with the addition of such cheap and harmless substances as bran, peas, rice, corn, charcoal, mustard hulls, sago, arrowroot, and coconut shells. None of these add any spicy flavor to the combination but they serve to enhance the profits of the maker. If one had the time to separate these different articles of adulteration and examine them carefully through a microscope, he would easily see the deception practised upon him. A good many dealers will tell you that harmless adulteration like this is liked by many people. They prefer the mixtures and blends which they put up, and therefore it does no harm. It is a good deal like coffee and tea blends which dealers mix for their customers, using cheap grades with the high grades, and then selling the results at the highest prices. This may be partly true, but no deception can be practised continually without causing some danger.

For instance, some spices act as a special poison to many people. The mere touch of ginger in one person's food is sufficient to cause nausea and great suffering. Cinnamon to another acts like a mild but quick poison, and mustard in any form will cause another to break out in red, prickling spots. All these spices when mixed together, or adulterated one with another, might be the contributing cause to a person's illness and death. For instance, the person using pepper may be easily affected by mustard, and if the pepper is adulterated with ground mustard hulls the damage is done. Ginger is sometimes mixed with mustard, and the result in using these two together might develop strong symptoms of poisoning.

One cannot afford to take into the system anything under a disguised name. The modern man and woman of intelligence have studied their diet sufficiently to know what disagrees with them, and they do not care to have anything smuggled into their stomachs under some fraudulent name. To many the chances of harm from such a source appear very remote indeed, and they discard them from serious consideration; but to others it is a matter which seems not so slight. It makes a difference whether one is in delicate health or strong and robust in flesh. The former cannot take risks that the latter might daily face in his eating with perfect impunity.

SCIENCE NOTES.

A civil war record of the height of Indiana soldiers shows that out of 118,254 there were 15,047 5 feet, 10 inches tall; 8,706 5 feet, 11 inches; 6,679 6 feet tall; 2,614 6 feet, 1 inch; 1,357 6 feet, 2 inches; 406 6 feet, 3 inches; and 330 over 6 feet, 3 inches. Commenting on these statistics, Dr. Gould, Actuary of the United States Sanitary Commission, writes: "It is evident from our statistics that the Indiana men are the tallest of the natives of the United States, and these latter the tallest of all civilized countries."

Silk is known to be the secretion of two glands of the silkworm alongside of the digestive canal. These glands, which consist of tubes in numerous coils, terminate in the spinning-wart, and open in a common orifice from which the secretion, of the consistency of honey, issues forth, promptly hardening into a thread on exposure to the air. Usually the silk is colorless on leaving the body of the silkworm, but sometimes it is straw yellow or greenish. There has been a dispute of long standing between the savants as regards the origin of this coloration. Some claimed that the larva itself produced the color, others ascribed it to impurities which it acquired upon secretion, and still others were of the opinion that the green color of the leaves of the mulberry tree was the cause of the coloring. The last-named opinion seems to be the correct one. Latterly, Levrat and Conte fed silkworms on mulberry leaves which had been saturated with non-poisonous aniline red and aniline blue. The result was that not only the silkworms turned red or blue, but they also secreted silk of the respective colors. Injections of the above-named dyestuffs into the anal organ of the silkworm produced the same result.—Die Seide.