EXPERIMENTS WITH CHINESE SUGAR-CANE.

We have recently received a treatise entitled "Contributions to the Knowledge of the Nature of the Chinese Sugar-cane," by Charles A. Goëssmann, of Syracuse, N. Y. The information furnished in this treatise is scientific and valuable. In 1857, while in Philadelphia, he made several chemical experiments to ascertain the quantity and nature of the juice of the sorghum cane. The results of his investigations, with information regarding sugar-cane obtained while on a recent visit to Cuba, are now given to the public for the benefit of those who may engage in a more complete elaboration of the subject. Mr. Goëssmann's experiments were made with Chinese sugar-cane plants which had been grown on soil consisting of crumbled syenite slate, previously manured with calcareous loam and stable manure. According to his analysis fresh sorghum cane-juice consists of water, 78.94 parts; soluble matter, 10.22 parts (of which 9.5 parts are cane-sugar); cellulose, 8.20 parts; cerosine and insoluble earthy compounds, 1.24 parts; albuminous matter, 1.40. It yields about as much sugar as beet-root juice, which consists of water, 83.5 parts; cane-sugar, 10.5 parts; cellulose, 0.8 parts; albumen, &c., 1.5 parts; fat acids and saline matter, 3.7 parts. The tropical sugar-cane juice yields about 20 per cent of cane-sugar—double the amount of beet-root and sorghum. According to Dr. Goëssmann a full-grown Chinese cane, deprived of leaves, seed, head and root, weighs about two and a half pounds. In estimating the product of an acre at 18,000 stalks, the yield will be dry seed, 142 pounds; dry leaves, 4,425 pounds; cane stalk, 36,000 pounds, from which 25,200 pounds of juice and 10,800 pounds of moist bagasse will be obtained. J. S. Lovering, of Philadelphia, has made at the rate of 1,466 pounds of sugar and 74 gallons of molasses from 18,000 stalks per acre; more than half the sugar in the juice was thus obtained. When the first Silesian and French beet-root sugar manufactories were started, only about five per cent of the sugar in the beet was extracted and the rest left in unpalatable molasses. Sorghum molasses are sweet and pleasant, and whatever sugar may be left in them is not wasted as in the beet-root sugar manufacture. From such experiments and examinations it is evident that the manufacture of sorghum sugar and molasses affords far more encouragement to our people than the manufacture of beet-root sugar did in Europe when first introduced.

As the juice of sorghum contains several organic and inorganic impurities, these must be removed to obtain the pure saccharine matter—sugar and sirup. According to Dr. Goëssmann, slaked lime added in small quantities to the fresh juice, is about the best substance that can be used for this purpose. It was first applied to beet-root juice and it is equally valuable for sorghum juice. He states that when a small quantity of slaked lime was added to the fresh juice and then heated up to 167° Fah., a bulky coagulum was formed which increased in quantity until the boilingpoint was reached. When passed through a filter a limpid liquid was obtained, which, when concentrated, yielded crystals of sugar. On the other hand fresh juice which had been concentrated without lime only yielded a dark red sirup, without yielding crystals of sugar after standing for some months. Cautiousness is enjoined upon manufacturers of sorghum sugar in the use of lime. If an excess of it is employed and the boiling of the juice continued too long, the color of the juice will become very dark.

The term "sugar" was formerly applied to all sweet substances, and the acetate of lead was called sugar-of-lead from its taste. At present the term is of more limited application, being confined chiefly to three organic compounds, which resemble one another in their sweet taste and their ability to form alcohol and carbonic acid under fermentation. These three sweets are milk sugar, grape sugar and cane sugar. Grape sugar can be formed artificially from starch and vegetable fiber, with sulphuric acid, but not cane sugar. The latter is the chief sweetening substance used in domestic life. The occurrence of cane sugar in any considerable quantity is limited to a few plants, some palms, the maple and the beet.

The cultivation of sorghum in all sections where it can be raised presents several advantages. It yields a large amount of true cane sugar and sweet sirup, and its leaves afford good food for cattle. Its seed also yields a bright red dye and considerable fatty acid, thus rendering it a valuable cereal for feeding cattle. The expressed cane also yields 3 per cent of a strong flexible fiber well adapted for the manufacture of paper; and by improvements in its preparation, it may yet be profitably employed for making cloth. The hypochlorite of soda bleaches it without injury to its strength.

It is estimated that about 30 pounds of sugar per head are annually consumed in the United States or 900,000,000 pounds for a population of thirty millions. Of this amount, taking the maple sugar product at seventy million pounds and the Louisiana crop at two hundred and fifty millions, there is still left five hundred and eighty million pounds for the imported crop. At six cents per pound in the raw state this costs no less than $34,800,000. Besides this amount of foreign sugar consumed annually, about 25,652,000 gallons of foreign molasses were consumed in 1862. What a large market we have for a cheaper home product! It is well known that the common sugar-cane flourishes best in very warm latitudes; the beet-root in the more northern climates, while the sorghum cane seems best adapted for temperate latitudes—embracing all our Middle and Western States. By the careful selection of seeds and judicious culture the quantity of sugar in this cane may be increased. This has been the case with the sugar beet in Europe. New and improved species, such as the Otaheitan variety, may also be successfully cultivated, as noticed on page 154, current volume of the Scientific American. Viewing this question in all its aspects, it appears to us that very favorable prospects are presented to our people for the extensive cultivation of the sorghum. Every article of common use that can be profitably produced within the boundaries of any country tends to increase its prosperity and strengthen its independence.

HEAVY ARTILLERY.

Should the attack upon the city of Charleston by our iron-clad fleet, now in the vicinity of that place, be strenuously opposed, we may look for some very interesting data in reference to the destructive effect of our new 15-inch guns. As yet no tests of their capacity have taken place at all commensurate with the importance of the subject; at least none that have been made public, and we do not yet know, as a nation, whether we may place implicit reliance upon those ponderous missiles as defensive agents. Fort Sumter is said to be iron-plated, and there are also two or three rams in Charleston harbor, which have their sides or roofs heavily plated; these will make good targets on which to try the smashing powers of the new guns. Emphatic assertions have been made, privately, by professional men, that these weapons are failures; that the range is limited; that the charge is not sufficient to propel the ball at its most destructive velocity; that the gun is not strong enough to withstand larger quantities of powder, and one or two other features which may be passed over. These criticisms may or may not be correct; from lack of positive evidence on some points we are unable to controvert them. We only know that the *Montauk* has been in action several times, and the supposition is that her large guns were used to their fullest capacity, and that the weapons were effective in destroying the *Nashville* at a distance of 700 yards from the turret from which the shells were thrown with great effect. This is not by any means a long range, and is not cited as any test of the capabilities of the gun.

In using artillery there are some questions to be considered which bear directly upon their fitness or inutility as weapons of war; these questions relate to the end it is desired to obtained. If, for example, we are assailed by an iron-clad, we must dispose of the adversary summarily; if at short range it is possible that this may be accomplished by riddling her with shot, thus creating a moral effect upon her crew which will be extremely disastrous. Men who fancy themselves securely sheltered behind iron walls will fight heroically; but let a shot come tearing through their defense and they lose that sense of invulnerability which was their strongest ally. Or, on the contrary, should we think the shortest road to victory lies in so shattering the enemy's hull that she will sink after a few broadsides, we must then dispose our forces to effect this result. In either case disabling the adversary by penetrating his armor or by smashing in his sides, the weapon must be suite to the end in view.

We do not think it is claimed by the Government that the 15-inch guns possess penetrative power in a high degree, but rather that each shot is a ram and produces the same effect that the bow of one vessel in collision with the side of another would. At all events, whether such a qualification—that is, perforation—is asserted for the weapon or not, it is apparent, from well-known laws, that it cannot be attained except limitedly. Whether this detracts from the value of the gun is a question not to be answered until an absolute test has decided the matter for ever. The destructive effect of rams is well known; and if we view our new artillery in that light, we must concede that they possess qualities which our enemies do well to stand in awe of. If, on the contrary, a small rifled shot with a high velocity is the best medium for destroying an assailant, then the new heavy artillery is of no more use than so much old iron. At short range the impact of the huge shot and shell is tremendous, and we have great faith in their ability to place an opponent *hors du combat* in a short time, when the guns from which they are fired are securely housed in turrets. In view then of these facts we shall look for valuable scientific data from the forthcoming attack on Charleston. We have both heavy rifled guns and large and small smooth bores at that port; and the merits or demerits of each will, we hope, have a fair trial.

THE "ONONDAGA."

The iron-clads now building in New York and other ports of this country are approaching completion as rapidly as circumstances will permit; when they are launched we shall have a fleet of batteries and ships that we can point to with pride, and use with great effect against our foes—either foreign or domestic. The *Dunderberg*, *Puritan*, *Dictator*, *Onondaga* and others of the *Monitor* class will form an invincible bulwark on which we can fully rely for protection. We have no desire to embarrass the Government, or to abuse the privileges which have been extended to us of viewing these ships, but inasmuch as the public are not prohibited from looking at or examining them on the stocks, it is not improper to append a few details concerning one of the new iron-clads—the *Onondaga*. This vessel is being built in the yard of the Continental Works, at Greenpoint, by Mr. Rowland; she is constructed wholly of iron, having neither the projecting guards nor some other features of the *Monitor* batteries. The hull is 226 feet in length, and 48 feet in extreme width, the frames are of angle iron, five inches by three, riveted to a central plate or keel at the bottom; there is no keel, properly speaking, only a ribbed or arched plating in the place of it, to which all the frames are joined. The lines of the ship are very easy forward and aft, presenting much less resistance than some other iron-clads now afloat. As previously remarked, there are no projecting armor shelves on the sides of the *Onondaga*. She is protected from shot by single plates 4½ inches in thickness, bolted directly to the hull. There is no wooden backing of any kind to support this armor, but inboard there are a series of iron knees or angle pieces, secured to the deck and hull which strengthen it materially, and enable the weight outboard to be carried without straining the ship, or making her liable to leak. The draught of water will be ten feet; speed not stated.

THE ENGINES AND BOILERS.

There are two propellers or screws, one on each side under the stern, each propeller being driven by two engines built by the Morgan Iron Works, making four in all. The engines are of the horizontal, back-acting variety, and have cylinders 30 inches in diameter by 18 inches stroke; they have slide valves worked by a link motion, and the usual eccentrics. The propellers are 9 feet in diameter, and have an increasing pitch, the same being 11 feet on the forward side, and 18 feet 6 inches aft. There are four main boilers (Martin's patent) and one large donkey boiler for working the auxiliary engines. Sewell's condenser is furnished to the main engines, and a separate smaller one is added into which the