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 turret engines exhaust when the main engines are not working; there is also a circulating pump attached to this last condenser, which is driven by the steam pump that feeds the boilers. Four blowing engines are provided to ventilate the ship in action, and supply the furnaces with draught.

THE TURRETS AND ARMAMENTS.

The turrets are the same as those upon all the *Monitors*—11 inches thick in the walls, 9 feet high, and 21 feet in diameter inside. There will be two fifteen-inch guns, it is stated, in each turret. The quarters for the officers generally are aft, although some of them, the engineers for example, have accommodations forward. A great part of the storage is also aft, including the magazine and spirit room. Neither the bow or stern of the *Onondaga* overhang the hull, although the statement may be qualified by saying that the stern projects slightly, only enough, however, to cover the screws and protect them from damage by shot. The other arrangements of the vessel, internally, are unimportant to the public; we may mention that there are thirteen transverse water-tight compartments, and that the coal bunkers surround the boilers in addition to the protection afforded by the iron plating. A large force of men are employed on the vessel, and Mr. Rowland is putting the work through with his usual vigor. The extraordinary breadth of beam and full model should make the *Onondaga* a very stable ship. The *Onondaga* is known as the "Quintard Battery," having been contracted for by Mr. George Quintard, proprietor of the Morgan Iron Works.

The *Puritan*, near by in the ship-house, is in the first stages of construction; she is to be some 20 feet longer than her consort, the *Dictator*, and 2 feet wider.

A LECTURE ON COAL.

We learn from the Glasgow (Scotland) *Herald* that Professor H. D. Rogers—formerly of Pennsylvania, but now professor of natural science in the Glasgow University—delivered a lecture before the Geographical Society of that city on the 26th of February, on "Coal, its Distribution, Power and Products."

There are three chief peculiarities observable in every seam of coal. First, An invariable stratum of fire-clay—the fire-clay of the Scottish fields—which evidently served as a bed for the roots of trees, and for the over-lying profuse matter of coal vegetation. Second, The vegetation itself, often accumulated in immense thickness, compressed, macerated and, in its upper portion, stratified and laid even by the action of water. Thirdly, The overlying shale, or roof of the coal seam, containing, in the soft mud or fine sand of which it has been composed, beautiful impressions of ferns and other plants of the carboniferous age. Another unfailing characteristic of coal seams is their uniform stratification, especially in the upper layers, showing conclusively that the seams have been subjected to the leveling action of water in the vast bays and lagoons in which the vegetable mass first grew and then subsided. In one instance, that of the American coal fields, this mark of uniform stratification extends over an area of 14,000 square miles, thus showing that the physical geography of the period when the coal was formed must have been of a character and upon a scale of which we can now form but a limited conception.

There are different qualities of coal—anthracite, or compressed coke, semi-bituminous and bituminous—in one great coal-field in Pennsylvania. Subterranean heat acting in one part upon a vast scale distilled the bituminous matter from coal that was once bituminous, and at the center of greatest heat anthracite coal was produced. Gradually, from this center of heat, coal was obtained, varying from anthracite to qualities containing twenty per cent and thirty per cent of bituminous matter, and so on to the unaltered coal containing its full proportion of bitumen. Professor Rogers attributes the petroleum of the oil wells to the distillation of the bituminous coal. He stated that "the subterranean heat which converted the bituminous into anthracite coal had the effect of distilling from that coal the rock oil or petroleum of commerce, which, creeping into the fissures of the strata and impregnating the porous sandstones, remained collected, as it were, in vast underground tanks for the use of the present generation." The theory of Professor Rogers respecting the sources of American petroleum is different from that of most geologists.

With respect to the power of coal in effecting mechanical work by combustion, when applied to operate an engine through steam pressure, one pound is equal to the full day's work of a man, and three tuns of coal is equal to the work of a man for twenty years—almost his entire working life! The productive power of a nation is in direct ratio to the coal at its command. The area of the coal fields in Great Britain is 8,139 square miles of bituminous coal, and 3,720 square miles of anthracite in Great Britain and Ireland. In France, the coal area is 1,719 square miles of inferior coal; Belgium, 518 square miles; Prussia, 500 square miles; Spain, 3,408 square miles, and Russia scarcely 100 square miles. The British coal fields are able to sustain the national prosperity for ages to come. But the American coal-fields embrace an area of no less than 200,000 square miles—about twenty times greater than those of all Europe! "How cheering for the future," said Professor Rogers, "must be the prospect as it regards the material prosperity and industrial development of those vast coal regions of America which, in the course of Providence, must be intended to bestow happiness and comfort upon untold millions of that comparatively virgin country!"

VALUABLE RECEIPTS.

To Dye a Dark Blue on Wool.—We have received several letters recently from persons living in the country, inquiring how to dye a dark blue on wool. To color fast dark blue on wool or woolen cloth, there are only two effective methods practiced by dyers; these consist in using indigo and woad in warm vats. The preparation of these vats and the modes of treating the coloring substances are impracticable to persons who wish to dye small quantities for domestic use. And besides this, it requires much experience that cannot be communicated in a receipt to conduct the processes. We will, therefore, describe more simple modes. Indigo is the only substance which really can be conveniently used to dye a permanent blue on a limited scale, and at the present price of this substance the color is expensive by any mode of dyeing. The best Bengal indigo should be selected. It may be known by its deep blue shade slightly tinged with a copper hue. It must first be reduced to an impalpable powder, then mixed with half urine and soft water in a wooden or stoneware vessel of sufficient size to hold about five pounds of wool for a small batch. The indigo powder is mixed at the rate of eight ounces to ten gallons of urine and placed in a warm situation—about 64° Fah.—and stirred occasionally for five or six days. During the intervals of stirring the vessel should be covered with a thick cloth. The indigo will not dissolve in the liquid or communicate its color to the wool until it is deprived of a certain quantity of oxygen. The urine under fermentation acts upon the indigo chemically, and the liquor gradually becomes deep green in color. This is a sign that the process has proceeded favorably, and the wool to be dyed may now be placed loose in the vessel and stirred occasionally for about an hour, then lifted and the liquor squeezed out into the vessel; none of it must be lost. The wool when lifted will be of a deep green color, but upon exposure to the atmosphere it absorbs a certain quantity of oxygen and becomes a dark blue. It may now be washed in cold water, then dried and prepared for carding. A second batch of wool should be treated in the same manner, but its shade will be lighter than the first. It however, may be carded with the first batch and thus produce a medium shade of blue. To obtain very dark shades of blue two or three vessels made up in the manner described may be used, and the light shades of blue dipped, after being aired, into the stronger blue liquor. This is the only economical way of proceeding when a considerable quantity of wool is to be dyed. The odor of the liquor is very pungent, but the blue thus produced is very permanent and will stand washing and sunshine wthout fading. Wool will not take on the color unless it is perfectly free from grease; it should, therefore, be washed before it is dyed. This is the old-fashioned method of dyeing blue in the rural districts, and is the most simple, though not a very pleasant operation.

A very dark blue may also be dyed on wool with logwood and the bichromate of potash. The wool being perfectly cleaned, is first boiled in a tin, copper or iron vessel—such as a potash kettle—with one ounce of the bichromate of potash to every five pounds of wool. Sufficient water to allow the wool to be stirred freely with a stick should be used, and the bichromate dissolved in the water before the wool is placed in it. After boiling for half an hour the wool is to be lifted out, aired and allowed to drip until it is in a moist state. The spent liquor of the bichromate or *mordant*, as it is called, must be thrown away and replaced with clean water. Two pounds and a half of logwood chips placed in a coarse bag are now to be boiled for one hour in the water, then the five pounds of prepared wool are placed therein and boiled for one hour, then lifted out, aired, washed and dried. A very good blue inclining to a black is thus dyed, but it is not equal in any respect to indigo.

Copperas may be substituted for the bichromate of potash. Blue vitriol (sulphate of copper) is used by many persons in the country to dye a blue-black with logwood, but this color always fades when exposed to sunlight. A little crude tartar is used by many dyers, mixed with the bichromate of potash and with copperas in the preparation; and with the logwood about one-tenth part of camwood is also used to good advantage. Purslain and carrot tops will color blue on wool, but the processes described are the most convenient. Concentrated logwood which is sold by most druggists may be used instead of chip logwood—a very small quantity of it will suffice to dye a dark color. A deep royal blue may also be dyed with the prussiate of potash and logwood, but the process is intricate. The above mode of dyeing may be practiced by any person with limited conveniences.

APPLICATIONS FOR THE EXTENSION OF PATENTS.

Steering Apparatus.—Jesse Reed, of Marshfield, Mass., obtained a patent on June 5, 1849, for an improved steering apparatus; and he has applied to the Commissioner of Patents for the extension of that patent for a term of seven years. The testimony will close on May 4th, and the petition will be heard at the Patent Office on the 18th of that month.

Barrel Machinery.—Reuben Murdock, of Warwarsing, N. Y., obtained a patent on June 12, 1849, for an improvement in barrel machinery; and he has applied to the Commissioner of Patents for the extension of that patent for a term of seven years. The testimony will close on May 11th, and the petition will be heard at the Patent Office on the 25th of that month.

Pressure Gage.—Eugene Bourdon, of Paris, France, obtained a patent on August 3, 1852 (previously granted in France on June 18, 1849), for an improved pressure gage; and he has applied to the Commissioner of Patents for the extension of that patent for a term of seven years. The testimony will close on May 18th, and the petition will be heard at the Patent Office on June 1st.

An Invention Wanted---A Small Cotton Gin.

We have lately received several letters making inquiries respecting "small cotton gins." One of these (from the proprietor of an agricultural warehouse, in Louisville, Ky.) says:—"We have frequent calls for a *small* cotton gin, such as would answer the purpose of small growers of cotton in Kentucky, Indiana and Illinois." Several of the farmers in the southern section of those States intend to cultivate cotton to a moderate extent; and a small cotton gin, that could be operated by a horse-power or by hand, would be suitable for such individual cases, and would, we think, meet with extensive patronage. Our present manufacturers of cotton gins should be able to supply this want.

The "Skedaddlers" to Canada.—The immigration statistics of Canada show that the number of "skedaddlers" from the United States, who became frightend at the prospect of a draft, numbered 1,942. Those persons took with them an average of $1,000 each in American silver, making an aggregate of nearly $2,000,000. This accounts, in part, for the plethora of United States coin, of which the Canadians make such complaint.—*Exchange.*