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The Cuban sugar crop for the year ending October, 1893, it is now conceded will not exceed 760,000 tons against for the previous year.

MR. H. POHLMANN, of Brooklyn, N. Y., has accepted a position on the Niulii plantation, in the Hawaiian Islands. So says an exchange paper.

Cane planting is now in progress throughout the islands, and the weather has been very propitious for a good start for the young cane, frequent showers being the rule, with bright sunny days.

The yield of the six sugar mills in the Hilo district, from Waiakea to Hakalau, has been exceptionally good, and will exceed 30,000 tons of sugar. All these mills will be through grinding by July 15.

By an oversight in the proof-reading, the credit of Deming's "High Temperature on Clarification" was omitted in the May number of this monthly. It appeared in the Louisiana Planter of April 8.

In commenting on the partizan and vaccilating policy of Congress, in its legislation regarding American sugar interests the *Beet Sugar* remarks: "By allowing the foreigner to supply us with sugar we make sacrifices to support the families of outsiders. If the bounty is withdrawn and a duty of one cent per pound established the effect will be bad, as this would be another indication of instability in the sugar industry. We repeat what we have frequently said: Let the United States Government do what it may, but settle the question once for all. Capital will never flow into channels cut out by ignorant legislation."

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WITH OUR READERS.

No planter or farmer can read this number of the Monthly without gaining information not readily accessible in any one publication. The various selections relative to live topics of general interest, have been obtained only by careful perusal of the many publications received at this office from almost every sugar growing country.

The article on Shallow Cultivation on page 274, credited to the *Louisiana Planter*, gives a consensus of opinion on the cultivation of annual crops—the term cultivation being applied to the after cultivation, while the crops are growing, and not to plowing and preparation of the land for planting. The opinions given are almost unanimous in favor of shallow cultivation of one or two inches only, just sufficient to keep the surface soil loose for retaining the dew and light moisture or showers.

The attention of mill men is called to the new Russian centrifugal invention described on page 268, which has been quietly coming to the front and promises to be among the most important improvements of the day. The only doubt is regarding its capacity for large mills. It is stated at 4,000 pounds for each machine, which may be questioned.

Horsemen will be interested in the account on page 266 of a new disease there described that has gained a footing on Hawaii. A gentleman informs us that the disease is common in Oregon, and it may have been introduced from that quarter.

Can it be possible that the American Government is preparing to adopt a policy that will tend to check the development of beet sugar manufacture in the United States? Experiments now being made in several states show that the soil is most admirably adapted to produce beets which will far surpass any European country in the richness of their saccarine contents. All that is needed is a term of ten years fostering of this promising infant industry to render America independent of every foreign sugar-producing country, and thus save to her own laborers a hundred millions annually. The increase in beet sugar produced in the United States last year was nearly three-fold over the previous. Five years with the bounty will bring it up to two hundred millions of pounds, and ten years to a billion pounds.

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PEARL HARBOR AS A SEASIDE RESORT.

For a summer resort, accessible at all seasons, no place near this city offers better inducements than "the peninsula" at Pearl Harbor. The Oahu Railway trains run there twice each day, occupying only thirty minutes time in going or returning. A recent visit to this locality shows considerable progress during the past few months. A commodious station building has been erected for passengers, opposite the enclosure reserved for a park. And near it are several dwellings in course of construction or finished by Mr. J. T. Waterhouse and ready for occupancy. One building is designed for a public hall and has a bell hung in its cupola, which daily rings the work hours of the laborers. This building may be used for school purposes, lectures, etc.

On the south shore of the peninsula, near the Hotel reservation, are also several new cottages recently erected by J. T. Waterhouse, ready for occupancy. Water is laid on to each cottage, while fruit trees and vegetables are planted in the surrounding yards.

Such easily accessible summer resorts as this of the peninsula add greatly to the attraction of life in this city, and they will each year be more and more sought for.

One cottage in particular, selected by Mr. W. for his own use, is surrounded by a beautiful lawn of manienie grass, the

path being lined with gaudy flowers. In this yard is found a variety of fruit trees, including mangoes, pears, cocoanuts, showing how vigorously they will thrive in this locality.

Near by Mr. J. A. Hassinger has a cottage where his family often resort for an outing. The fresh trades blow along the shore at all hours of the day or night, rendering it pleasant indoors or out at all times. There is not on this island of Oahu a better place for sea bathing, boating or fishing than around this peninsula. Most of the building lots along the shore were sold at auction a year or more ago, and from time to time new cottages are erected. In all there are some twenty-five new buildings on the peninsula, and if all were occupied it would make quite a little village.

Mr. Waterhouse is the most industrious among the settlers here, and on every side may be seen the marks of his energy. Among other things growing are four thousand pineapples, seven hundred coffee trees, patches of sea-island cotton, sorghum eight or ten feet high, splendid-looking tomatoes, beans, potatoes and other vegetables, which appear to grow with no effort, and only waiting to be gathered for the table.

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THE HAWAIIAN LABOR QUESTION.

It is pleasant to note an occasional generous act by one of the editorial fraternity, where a contrary course is too often pursued by the large majority. The *Sugar Cane*, of Manchester, Eng., one of the most widely-circulated periodicals of its class, kindly devoted a few pages of its May number to a well-prepared resume of the facts regarding the revolutionary uprising in Hawaii, based on an article which appeared in our April issue, contradicting the oft-repeated statemants made in sugar and other periodicals, that the revolution was the work of Col. Spreckles and other sugar planters, and that it was executed solely to secure the benefits of the American sugar bounty. Col. Spreckles has distinctly stated that he had no hand in it, and that he knew nothing of it till after it was an accomplished fact. He has declared himself in favor of a Hawaiian Republic, in order, as is reported, to preserve the labor system on its present basis, which is practically the same established in other cane-growing countries.

It is claimed by a few that annexation to the United States would destroy our sugar industry by depriving it of the cheap Asiatic bonded labor system which we now possess. But some will ask, if Louisiana, Texas and Florida can grow cane and make sugar with free labor, why may not Hawaii? American sugar planters possess a broader field for obtaining their free laborers, which no doubt is an advantage over what Hawaii possesses. Still we have some resources, though on a more limited scale. There are in this country not less than forty or fifty thousand men and women of the laboring class, including Hawaiians, many of whom are available for plantation work, if paid sufficiently. It is then simply a question of wages, which here as everywhere else, are regulated by the demand and supply.

In the event of union on any terms with the United States Hawaiian planters would of course be allowed to engage laborers in any part of the republic, on the same terms as Louisiana planters, but the long distance and consequent expense would be an onerous tax, that might amount to prohibition. Still some laborers could be procured from this source. It has been suggested that as the Geary act compels the deportation of Chinese, some provision might be made by which a few Chinese, who prefer to engage as laborers on plantations in Hawaii, might have the option of coming here under contract instead of returning to China, provided that all who come shall be held to the engagement that they can remain here only as long as they continue in service, and when that ceases, they shall return to China, in conformity to our present law, and under such additional restrictions as may be established at the time they enter service. In no case should Chinese laborers be permitted to go from Hawaii to America.

The British Colonies, Mauritius, Fiji, Demerara and the British West Indies obtain all the laborers they require for plantation work on very low wages from the Indian Government. These laborers are however placed under the immediate supervision of labor commissioners appointed by that Government, who are vested with supreme authority in all matters pertaining to them. Should all other sources of supply be exhausted, this is available at any time, when-

ever the Hawaiian Government is ready to concede the demands of the Indian Government. Once entered into, such a convention might result in Hawaii becoming a dependency of the British crown. Less probable events than this have happened in the history of nations, and may happen with Hawaii.

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DON'T TAMPER WITH THE SUGAR INDUSTRY.

It is about time that the sugar industry were let alone, (says the *New York Shipping List*,) whether under the existing bounty system, or under a sugar tax such as that which the bounty system displaced. The continual agitation of the form which the protection to sugar is to take harries and unsettles the industry, wisely remarks the *New Orleans Times-Democrat*. The production for the fiscal year 1893 compares as follows with that of the year 1892:

	1893.	1892.
Cane sugar.....lbs	450,000,000	364,829,411
Beet sugar.....	27,083,322	12,004,838
Sorghum sugar.....	986,900	1,136,096
Maple sugar.....	3,200,000	144,882
Total.....	481,070,222	378,115,217

Here is an increase in production of 103,000,000 pounds, or of more than twenty-one per cent. in the course of a year under the influence of the existing bounty agreement; and there is in this extraordinary increase the potential promise that, were the development of the industry allowed to go forward upon the present lines, the United States would within a measurable number years be producing enough sugar to supply the entire home demand.

What the industry needs above all things is to be let alone.

It is singular that a nation of shrewd politicians, as are the American people, should be willing to pay out over one hundred millions of dollars annually to support foreign sugar labor, when by a system of judicious protective bounties, such as Europe has established, that immense sum could in a few years be retained to enrich its own population, from Florida to the Pacific.

PRESIDENT CLEVELAND'S POLICY.

In an article on the future of the sugar interest of Louisiana, the Baton Rouge *Truth* has the following remarks, which, from all we can gather of President Cleveland's policy, are very near the truth:

"We remember that in the closing days of the late presidential campaign, Senator White, in a speech at the State Capitol, said that he bore a message from Mr. Cleveland to the democracy of this state, saying: "Tell our friends in Louisiana that their interests will not be jeopardized by my election to the presidency. Tariff reform does not mean the annihilation of duties, but reasonable protection under which the peculiar productions of Louisiana will be perfectly safe. There will be no reason to apprehend any danger to sugar if the national democracy comes into power."

"We rely upon this promise, and it should be kept in good faith. Millions of capital, the prosperity of thousands of laborers, nay, the very existence of a large and prolific alluvial section of the great state depends upon the just recognition of its necessities a competitor with more favored foreign countries in the production of sugar. Without protection to its special productions the lower Mississippi valley may possibly return to its original condition as a wilderness. In Mr. Cleveland's own words, "it is not a theory but a condition which confronts us."

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HAMAKUA, HAWAII, NOTES.

The grinding season is drawing to a close in this district. Most of the mills have been doing good work, and some an immense amount of it. The Hamakua Mill for instance, is now making 80 to 85 clarifiers per day, the best run for one day having been 100, and the greatest number of clarifiers for a month 2000, or an average of 80 per working day for the entire month. This is said to be the largest amount of work ever turned out by a mill of this size, (ten ton) especially when we remember that a dilution of 30 to 35 per cent. is used in maceration, completely saturating the trash and reducing the mixed juice to 12 and often to 10 Brix. But when it is added that all this juice is evaporated down to 30 Baume, and all the No. 1 sugar boiled with exhaust steam

alone, and at the same time nothing but trash is used for fuel, it shows what has been done. Persons posted in sugar manufacture will know that this is extraordinary work, and when they are told that the boiling house closed down daily as soon as the mill was through grinding, they will be still more sure of it.

Mr. Renton, the manager of this mill, accounts for this unprecedented success by the efficiency of the exhaust steam super-heaters; as nothing approaching this amount of work was ever done here until they were put in use. There can be no question as to the effectiveness of these super-heaters, when it is stated that the temperature of the exhaust steam is raised to 400 degrees, actually many degrees higher than the live steam in the boilers. The boilers in use here are of multi-tubular type; and the super-heater is placed vertically under the smoke-stack, which is 100 feet high.

This mill was made by the Honolulu Iron Works and contains all the improvements designed by Mr. Alex. Young and others, but it is only fair to say that much of the success is due to good and careful management. The work performed here is undoubtedly first class, and the same may be said of the plantation.

To rush the work through at this rate of speed, and at the same time to get it done thoroughly and at the appointed time and proper season, with a limited number of men is no small undertaking, especially as this work has gone right along under all circumstances of bad weather, bad roads, etc. This plantation is one of the best in this district, and it is kept in good condition by a systematic course of fertilizing, manuring and cultivation.

Mr. A. Lydgate, by careful experimenting with different varieties of cane has ascertained that the Rose Bamboo will yield about two tons of cane per acre more than the Lahaina. The amount of cane planted each year is about 600 acres, the average yield about 4,000 tons, although it has turned out 4,700 tons. The last year's crop was all planted in Rose Bamboo, and is an exceptionally fine looking field, the best ever seen here. This variety seems to possess many advantages over the Lahaina, being much more hardy and prolific.

It is pleasant to record that the plantation, since it has been under the present managers, has been successful and properous.

G. O.

Hamakua, Hawaii.

CORRESPONDENCE AND SELECTIONS.

ECONOMY IN SUGAR MANUFACTURE.

TO THE EDITOR OF THE PLANTERS' MONTHLY:

DEAR SIR:—As economy is the watchword in all stages of raw sugar manufacture, I beg to call the attention of managers to the saving that can be effected by using an automatic cleaner for straining the juice from the different mills before entering the boiling house. At present this work is done by hand, requiring one to two men at each mill.

I felt satisfied it could be done automatically and the accompanying drawing is a plan of my automatic cleaner and elevator, I erected two cleaners, one at the beginning of the present crop, and they have been working day and night, giving great satisfaction and doing more effective work than by hand, the cleaner straining the juice through fine brass centrifugal cloth and the elevator receiving the screenings and returning them into the megass to again pass through the mill.

By their use I am able to dispense with the labor of three men each shift, or six men in the twenty-four hours.

As you will see by the drawing they are very simple, cheaply and easily constructed and ought to be placed in every mill where juice requires to be cleaned.

I remain, very truly yours,

JOHN A. SCOTT.

Wainaku, Hilo, Hawaii, May 25, 1893.

[NOTE.—Accompanying the above, we have received a diagram showing several views of the strainer described by Mr. Scott. Any persons wishing to examine them, can do so at the office of the PLANTER.]

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BY the last advices the shipments from Mauritius up to date are some 30,000 tons behind those of last year at the same time. The crop was finished, and the stocks in first hands were very small.

TEA CULTURE.—PART II.

TO THE EDITOR OF THE PLANTERS' MONTHLY:

A new clearing planted out requires little more attention except weeding until the trees are big enough for topping. Sometimes a few of the first put in plants may die out, then some fresh ones are put in to fill the blanks; this is called supplying. On a successful clearing the trees should be ready for topping in two years, if they have not been plucked, as the leaf of young trees is of little use for making tea, the bushes should not be touched until after topping Trees of a good jat should be topped higher than low jat, as the side branches come from higher up the stem of the bush, in the case of low jat. The side branches come out a little above the surface of the ground, so topping at fourteen to sixteen inches will leave plenty of side wood. In about three months after topping there will be six or eight inches of growth above the topping level; this is a broken back, leaving three or four leaves (above topping level). In two weeks more there will be other shoots appearing above the broken-back ones, which are treated similarly, being also broken back to same level; these two operations are called first and second topping, which bring the bush into plucking shape.

The bushes after topping will be about twenty-four or twenty-six inches high, and from the uppermost leaf of a broken-back shoot new shoots will begin to appear in about a month's time; this is a flush of which tea is made. The new shoots (from the primaries) having attained four or five leaves should then be plucked leaving one large leaf on the bush (above tipping level), from which other shoots will come. The upper three or four leaves of a new shoot are only used for making tea, the lower leaves being coarse are not easily withered and rolled, consequently turn out red leaf in the made tea. Plucking is done in different ways: in some cases two large leaves are left on the plucked shoot, sometimes one and half and other times only one. The leaving one half leaf on the shoot is considered to bring on the flush quicker.

The bushes should be kept as clean as possible of old leaves

called "bangy" as they prevent the bush from flushing. At low elevations the leaf requires to be plucked every eight days, and higher up where the growth is not so quick every ten or twelve days, but is also effected by the age of the bush, as a bush a few months after pruning comes on much quicker than one requiring to be pruned. At high elevations the bushes run much longer without pruning than at low elevation, where the growth is rapid to begin with, but the bushes run quicker to bangy and give up flushing. Pruning is done once in sixteen or eighteen months, but the extremes may be from one year to two, just according to the state of the bushes soil and climate. The estimated yield of bushes at different ages may be as follows: For first year's plucking, after topping, from 150 pounds to 300 pounds made tea per acre, bushes two and a half to three and a half years old. After first pruning after topping (trees about four years old), the yield for that year may be doubled as the side branches are now developed to a certain extent and flushing, thus bushes after first pruning may yield from 300 to 400 pounds made tea per acre.

After second pruning (trees from five and a half years old) should then be in full bearing and yield from 700 to 1000 pounds made tea. A great deal depends upon soil, climate and treatment and great care should be taken not to weaken the bushes when young and tender, but to encourage their growth as much as possible, as bushes do little good if not in good healthy order.

Hand plucking is as yet the means of taking the leaf of the bushes, and as long as that system is maintained the tea industry will be confined to a few countries that have cheap labor. For good leaf (fine plucking) an average of twelve to fifteen pounds a day green leaf, or three to four pounds made tea and coarse plucking an average of twenty to twenty-five pounds green leaf, all other costs are small.

Compared to that of plucking and in Ceylon where labor is cheap the plucking costs just about half of the whole cost of production.

J. A. HUNTER.

Ceylon, March 17, 1893.

SUGAR CANE DISEASE.

[Translated for The Louisiana Planter from *Le Courier de la Guadeloupe*]

The majority of planters and authors who have written on the subject of sugar cane are convinced that, like man, the cane is the victim of epidemics, and wherever canes have been seen to shrivel or die, disease, or an epidemic of parasites is expected.

The cane, like the vine, has always enemies, but there are no diseases, nor even parasites, that destroy them when they are cultivated as they should be, and in their own normal habitat. Some words are necessary to combat these beliefs and to account for them, which, in my opinion, we must assume in discussing the multiplication of the vegetable species. The natural reproduction of a vegetable is through the seed, under whatever form it is developed. In addition to this natural mode of reproduction, and the equally natural mode of reproduction by stolons, tubercules, etc., all other methods practiced by man are artificial, against nature, and full of danger. If this mode of artificial reproduction is exercised on a plant with a single stalk, developing neither shoots, stolons nor tubers, which produce a new plant, the difficulties are reduced, and may not appear perhaps for thousands of years—that is to say, they are perhaps hypothetical.

But if the vegetable periodically mutilated develops a seed tassel; if this ablation of the stock does not kill the mother stalk, but determines only the formation of a new shoot, destined to replace the mother stalk; if the future needs of man lead to the frequent repetitions of these operations, let us see what results.

The stalk leaves are the organs which liberate and preserve the nourishing juices for the growth of the roots, tubers, etc. In cutting the stalk this food reserved for the roots is abolished, and this portion of the plant finds itself in identical conditions of those of the organization of an animal that one nourishes very highly in order to obtain from it methodically every day the quantity of blood furnished by its organs already developed by intensive feeding.

Further, in cultivating a plant of its habitat there results with it a modification analagous to a condition of equatorial

anæmia, which is so easy to produce in Europeans by a sojourn of some years within the equatorial zone. It is under these conditions of pathological receptivity, produced by one or two causes, continual transmission by heredity, and not by a parasite, which is but the result, whereon we must place the real cause of all parasitic affections of vegetables. Cultivators of canes and vines have arrived, without desiring it, at a condition produced in animals by analogous treatment, with this aggravation, that there has never been any termination in the continuity of the practice, and the modification of the roots thus obtained has never been lost, since the reproduction by cuttings perpetuates the evil. There has thus been created during some centuries varieties of vines and canes with roots relatively feeble.

They have created, in a word, varieties of edible roots for the beetles and insects which live in the soil, as gardeners produce plump, savory and delicate vegetables for man, eliminating the bitterness which preserves them from the attack of animals. The insects thus provided with a subsistence, have multiplied like weeds, and by the destruction of the essential organs of the plant have brought about the various conditions described thus far under the name of cane sickness, vine sickness, serah, phylloxera, etc., under which the attack and destruction of the root is the cause of the death of the plant. All the world, as I have many times said, demonstrates experimentally the truth of this theory. In the midst of a cane field destroyed by a parasitic affection of the roots, plant a spontaneous cane. You will see it vegetate perfectly in the midst of a yellow and shriveling field. It is necessary to choose a cultivated field at a certain altitude, in order that the seedling or volunteer cane may not be removed too far from its habitat. Independently of these preceding conditions, sharply characterized by the destruction of the roots, and having as the termination of the death of the plant, there exists a number of intermediate conditions arising from the same causes.

First. From the fact of the rarity of the destroying insects, the attack of the roots is slight and the plant, without dying, is weakly, remaining small and fragile.

Second. From the fact of the exhaustion of the soil caused

by continuous culture on the same lands, the plant, without dying, has no vigor and continues small.

In these two cases the weakly plant appears stricken by no specific malady, but it simply lacks strength.

I believe I shall not be contradicted when I affirm that animals full of vigor, possessing organs of good condition and in good growth, and living in their normal habitat, are but slightly attacked by parasites. It suffices to convince one to see animals attacked by parasites live and sleep in the same bed with relatives without these latter contracting the disease. It suffices equally to see the majority of these refractory diseases quickly removed by the removal of the animals to favorable grounds, that is to say by the return of the subject to a condition of original vigor.

It is the same case with plants. Need we say, then, that it is necessary to cultivate useful plants in a climate absolutely analogous to that of the island, valley or section where they originated?

I do not write against the claimed cosmopolitanism of man, or against that of the vegetable species, and I have, on the other hand, the conviction that some Semitic races and certain Mongolians are gifted with the precious faculty of adaptation to a habitat more extended than that of other human races.

It is the same with some rare vegetable families, which are better fitted to occupy the world, having received from nature some special capacity for that purpose, either in the constitution of their organs or a capacity for extension beyond that of other families. But, however large relatively this geographic area, it will have its precise limits, nevertheless, and experiments that I have made, as well as observations of the fact during a quarter of a century in the tropical zone, have proved that if animals or plants are transplanted to a climate to which they are not adapted, at the end of some generations they are stricken in the organs necessary for the reproduction of the species.

This modification of the ultimate term is the disappearance of the race by its infecundity after two or three generations of individuals and by an increasing attack of parasites. I have held to these points, although in the species considered

in this chapter there have been pathological modifications, due more especially to the exhaustion of the soil. Sugar canes, like vines, are quickly attacked by vegetable parasites which may exist or may be brought near them. This is the cause of all these particular conditions known in a number of countries under the name of sickness and fungus growth, which have been described by Delteil for Reunion and Mauritius.

These are also the cause of the maladies attacking the vine under the name of *oidom, pourridie, anthracknose* without considering those that may be introduced by new parasites.

I am surprised that, considering their soft structure, bananas have not yet had their tissue, and particularly their roots, attacked as those of the vine and sugar cane have been. The grafting of our fruit trees in Europe on the wide stalks has alone permitted them to resist such attacks thus far. If this precausion had not been taken such trees would have perished long since from injury to their roots. It is to be feared that the danger can only be delayed, that is to say, that animal parasites or vegetable parasites will in time attack the flowers, the fruits, the seeds, and perhaps even the stalks.

It is necessary in a manual of tropical agriculture to carefully consider all these principles. They are the more necessary because these maladies are not monopolized by the sugar cane or the vine, and it requires no prophet to announce that all plants, without exception, which are reproduced by processes other than the natural processes, I will not say will disappear, but will be so injured that it will be necessary to return to the mode that nature has sent for the perpetuation of the species. RAOUL.

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THE last circular of the West India Committee speaks in very hopeful terms of the situation of the sugar industry, and, after recapitulating the facts, concludes: "So far, therefore, from sugar in the British West Indies being in a state of decadence, it not only seems to be in a sounder position than ever, but promises to continue to be the most important staple of those colonies."

CLIMATE AND SOIL.

BY DR. GEORGE G. GROFF.

Climate is defined by the geographer Guyot as "The physical agency acting through the atmosphere on organic life, of which heat and moisture are the essential elements, the winds being the medium of circulation." Soil is the unconsolidated earthly material covering, in most places, the rocks of the earth's exterior. The humus of the surface soil consists more or less of organic matter and is darker than the subsoil from this cause.

Geology teaches that all soils are the product of the decomposition of rocks. All soils are the result of the attacks of the atmospheric elements upon the solid and rocky crust of the earth. These soil-forming agencies in the atmosphere are lightning, which hurls mountain crags into the valleys below, frost, ice, alternating heat and cold, falling rain, the winds carrying sharp cutting sands, but most of all the eroding oxygen and moisture of the air. All these operate constantly, and the total effect is to change solid rock particles to finer and finer soil. Part of the changes by which soils are formed are purely physical, while others are of a chemical nature. Thus the action of frost is always to reduce the rock particles to smaller and smaller pieces without otherwise changing them. This is a physical change. Oxygen and moisture, however, enter into new combinations with the elements in the rocks, producing new chemical compounds, and thus breaking the rock up.

Soils which remain where they were formed are called *sedentary*. Such soils are seen in the level and undulating fields of all the Atlantic States, but do not include soils along the sea coast, nor smaller areas formed by the filling up of lakes and swamps at some earlier geological period. Soils which have been transported only a slight distance, as to the foot of a hill from the top and sides of the same are designated *colluvial*, while those deep rich soils found in the lands along streams, and collected at a distance by running water, *alluvial* soils. The material carried into the ocean by the rivers, and hurled back again upon the borders of the continents, forming in places wide areas, may very properly be

known as *marine* soils. Such may be seen all along the Atlantic and Gulf coasts, from Long Island southward. In the States to the north of Pennsylvania, great areas are covered with a soil called *drift*, which is believed to have been formed by vasts sheets of ice, now thought once to have covered these States much as Greenland is now almost wholly occupied with ice and snow.

TROPICAL SOILS.

Where there is sufficient rainfall for the proper growth of plants within the tropics, the soils are found to be possessed of wonderful fertility. This is explained, in part at least, by the fact that tropical soils are well decomposed, and hence are in good shape to feed plants. It is with the soil in the tropics, as with plant and animal bodies, which *quickly* and *thoroughly* decay, making rich food for new organisms. The more complete the decomposition, the more easily plant food can be assimilated. But it is observed that there is no frost in the tropics to change rocks to soil. Where frost does its work there is less heat, and it has been observed that great heat alternating with cool or cold nights is sufficient to reduce rock particles to soil. Archibald Geieie, the geologist, thus speaks of the action of alternating heat and cold in the work of soil making:

"In the Sahara and other African regions, as well as in Central Asia, the mercury has been observed to range from above 90° in the day time to below 20° Fahr. at night. This rapid nocturnal contraction produces such a superficial strain as to disintegrate rocks into sand, or cause them to crack or peel off in skins or irregular pieces. Dr. Livingston found in Africa (12° s lat., 34° e. long.) that surfaces of rock which, during the day, were heated up to 137° Fahr., cooled off so rapidly by radiation that, unable to sustain the strain of contraction, they split and threw off sharp, angular fragments from a few ounces to one hundred or two hundred pounds in weight. This daily vicissitude of temperature produces results which quite rival those usually associated with the work of frost."

Where, in the tropics, there is sufficient moisture to carry food to the plant, we get the greatest luxuriance of vegetation seen on the earth, because here we have the richest soil, with the most heat and sunlight, these being the prime elements in promoting plant growth.

SOILS OF ARID REGIONS.

The arid and desert regions of the world are characterized by soils which are "sandy," "light" and very dusty, every wind raising the dust, while heavy winds lift vast clouds of dust—the well-known sand storms of deserts. There is an absence of clay in these soils, and this is the reason that they are so dusty. Clay, if present, would bind the particles together and prevent the dust.

These soils have been produced by the alternate action of heat and cold, for frosts have small effect in arid regions. Clay forms in the presence of moisture. The common estimate of desert soils is that they are sterile. This is, however, a popular error, for these soils are both deep and very fertile; what they need to enable them to produce great crops is water. With water these light "dust soils" become capable of producing greater crops than the strongest soils of temperate, well-watered regions; and it may be of interest to recall that the early civilizations of the world were located on soils where irrigation was necessary.

In these arid regions there does not exist the distinction between the surface soil or mold, and the subsoil, which is seen in temperate regions. If exposed, the subsoil is as capable of producing crops at once as the surface soil. This explains how the fields may be leveled to any extent where irrigation is practiced without any injury from the bringing to the surface of the subsoil. Hilgard remarks:

"In the case of a cellar, seven to ten feet deep, near Nevada City, Cal., the red subsoil moss was spread over a part of a vegetable garden close by, and as venture the annual vegetables—tomatoes, beans, watermelons, etc.—were sown just as usual. They not only did well, but even better than on the portions not covered, which had been cultivated for a number of years and were somewhat exhausted thereby. Even material from thirty feet depth has acted similarly."

At Garden City, Kan., at the United States Experiment Station, the wonderful fertility of an arid soil has been shown for crops adapted to live with little water, and, hence, without irrigation.

On arid soils stable manures cannot be applied to the soil until they have first been composted. Hence, in these regions, all manure and straw has commonly been burned or

thrown into streams, because of the labor necessary to place them in available condition for the use of plants. In time it will become profitable to compost all waste materials of farms in those regions, and inexpensive methods of doing it will be discovered. We do not yet realize the vast possibilities of the soils of our arid and sub-arid regions. There seems to be some tendency to undervalue them, and to permit them to pass from the control of the General Government into the hands of speculators, and especially of irrigation companies, which, having for a trifle secured possession of the richest lands on the continent, will for all time continue to exact heavy water rents from those who till these lands. They should for the present remain under Government control.

ALKALINE SOILS.

By the above term, we understand soils which contain so much of the salts of sodium and potassium as to be injurious to vegetation. They are found in all parts of the world in regions of scanty rainfall. In Europe, in Hungary and Spain; in India, Egypt, Arabia, Persia and Mongolia; in Chile and Peru; and in the United States in California, Oregon, Washington, Nevada, Utah and Montana.

Black alkali lands are those which contain large amounts of bittern salts, chlorides of calcium and magnesium and carbonate of soda. These salts dissolve the humus of the soil and prevent vegetable growth.

White alkali lands are those containing neutral salts, as niters (saltpeters) associated with sulphate and chloride of sodium. Vegetation can grow in these soils.

Saline lands border the sea, and contain common salt, and "bittern" salts derived from the ocean. These salts speedily wash out by the action of the rain, and such soils become normal. They are not due to climatic conditions.

Alkali soils are formed in regions of deficient rainfall in the following manner: The rain which does fall goes down into the soil a short distance dissolving what chemicals are in the soil. This water does not run off underground, as in regions of abundant rainfall, but *again comes to the surface* bringing with it the salts, which, when the water evaporates, are left behind as a white crust or efflorescence on the sur-

face. This goes on until there is a considerable accumulation of alkali on the surface, or in the surface soil. The great deposits of nitrate of soda in Peru, the saltpeter of India, and the deposits of carbonate of soda in California and Nevada have been formed in this way.

Alkali lands can be reclaimed. On the black alkali lands gypsum should be applied. This will produce chemical changes which will result in the neutralization of the salts. But to remove the alkali from the soil large quantities of water are needed, and this, after having done its work, must be carried off in underdrains. Thus the alkalies will be removed with the water. Experience has shown that irrigation does not lessen, but rather increases the amount of alkali in the soil. This is because the water applied goes deeper into the soil than does the rainwater, but it all comes to the surface again and goes off by evaporation, and leaves a heavier deposit of the alkali than did the rainwater. A rainfall of twenty inches or more per year seems to prevent the formation of any alkali soils. Those interested in this matter should consult Bulletin No. 3, of the Weather Bureau, United States Department of Agriculture. This Bulletin was prepared by Dr. E. W. Hilgard, of the University of California, and is the highest authority on soil chemistry in the nation.

SOILS IN REGIONS OF EXCESSIVE RAINFALL.

If the rainfall is excessive, and the surplus can pass off to the sea, there will be a loss to the soil of all the soluble materials in the soil. The salts of sodium are more soluble and of less value in agriculture than those of potassium. Hence, the soda compounds leach out of the soil first. The soil seems to hold on to the valuable potassium salts, even when they are soluble. This fact is of great value to the farmer, and is one of the wise provisions in Nature for man's benefit.

SOILS OF TEMPERATE REGIONS.

In temperate regions of moderate warmth and moderate rainfall we find soils produced both by the chemical and physical forces of the atmosphere. In the north we may find drift soils. In small areas, peaty soils are seen. It is also possible to discern saline lands and possibly small areas of alkaline lands, when, for some reason, the rainfall has been

limited to less than twenty inches a year. The moisture of temperate latitudes favors the formation of the clay in the soil. The soluble compounds, the salts of lime and potash, are slowly removed by the rains, and where cropped without the use of stable manures, such soils tend to become heavier and heavier, that is, more and more clayey year by year. Stable manures decompose and add humus to such soils, making them more porous and open to the air. While undecomposed manures should not be added to soils in the arid regions, they are a necessity in temperate regions, where the problem is how to secure the humus, and the salts of potash and phosphorus in the cheapest forms—*N. Y. Independent.*

LEWISBURG, PENN.

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THE REPORT ON THE BOTANIC GARDENS, MANGOES AND OTHER FRUITS.

(*Demerara Argosy.*)

The concluding part of the report, as mentioned in our first notice, deals with an enumeration and description of the mangoes, bananas and plantains grown at the Gardens, and with analysis of a few miscellaneous subjects. This part we must touch lightly. The history is given of the introduction of the mango into the West Indies. There is much of interest in this narrative, for, as the writers say, it describes an historical incident. There is some uncertainty as to whether the mango had reached the West Indies before the date alluded to, 1782. It seems strange, however, that neither the French nor the Dutch, who respectively held possessions in both the Eastern and Western tropics, should not have brought a plant so valuable, as they brought the sugar cane, before that time. Its introduction to Jamaica in 1782 is well authenticated. In June of that year a French ship from the Isle of France to San Domingo, containing a large collection of young oriental fruit and spice trees, was captured by Captain Marshall, of Her Majesty's ship *Flora,* attached to Lord Rodney's squadron. These young trees were taken to Jamaica where they were planted in a garden at Gordon Town, which afterwards became the first Botanic Garden established in the island. The introduction of the mango at that late date however could not have been long delayed, and the chief in-

terest attaching to the incident above narrated arose from the fact that one of the varieties proved of such high quality afterwards that it became famous under the name of the number it bore on its introduction, and which it still bears, namely, the No. 11. Curiously enough, as the Report narrates, this same variety of Mango was under another name received at our own Botanic Gardens from India just a hundred years later, where it was planted in the nursery, quite by chance, side by side with a plant of the No. 11, obtained some years previously from Jamaica. Last year both fruited for the first time, and revealed the fact that they were one and the same variety. On comparing the trees, on this discovery, it was found that no shade of variation had taken place in one or other of the plants, through the century that had passed between their respective dates of transfer from the old to the new world. This, considering the very great variation that has taken place in the mango by natural means alone, seemed to the writer a remarkable fact, and to point to an enormous antiquity in the life of the species. With regard to this fact, though it proves that varieties keep quite true from generation to generation over very great periods of time, to express our own opinion, it seems likely at the same time that part at least of the almost endless variation into which the mango has run may have arisen from natural, but very casual, cross-fertilization. Though we have not proved this, we have observed instances—and they are quite rare—that seemed to indicate it, that is, of an odd fruit—not malformed, but naturally quite different in form from all the rest of the fruit on the tree, thus conveying the probability that such instances of distinct and marked modification might arise from an occasional flower being, by chance, fertilized with pollen from another quite different variety. If this be the case, such fruits, if planted, would probably produce plants that would bear fruit of the same modified character, rather than of the character of the normal fruit of the parent variety. Modification in the fruit by cross-fertilization we have said is a rare occurrence in the mango; it may however, and we mention this as proof of its possibility in general plant life, be more frequently observed in certain other plants. In peppers *(Capsicum)*, for instance,

it is a common occurrence under certain conditions, and we have seen all the fruit of a variety for many months together modified, when other kinds had been planted near them, from this cause, which previously, while growing alone, had come always true to the type.

From the point of view of quality, following the report, mangoes fall into two primary divisions, long and short-fleshed—that is those in which there is much fibre in the flesh and those in which there is very little or, comparatively speaking, none. The former are as a rule popularly known as "stringy" mangoes, and sometimes also as "turpentine"—the latter, due to a marked characteristic in the flavor, reminding one of the oil of that name. Both here and in West India Islands the stringy mangoes are far more abundant than the better kinds, a circumstance which the authors ascribe partly to their greater vigor, and partly to the fact that the peasantry, who are the chief consumers, seem to have no preference for the better kinds, together with the easy spontaniety of the growth of the seed when ejected from the mouth on roadsides or elsewhere by migrant consumers. Fighty-eight names are enumerated as representing kinds under cultivation at the gardens, but as all have not yet fruited it is thought possible that some of them may represent duplicate varieties. Of the kinds that have fruited a detailed description is given in each case. Judging from these descriptions the majority seem to be of good quality. In fact the report states that now the trees have fruited, enabling the good to be distinguished from the inferior, only the good kinds are propagated. The best of the common colony mangoes is said to be the "spice," but the name is not very strictly employed, for we know ourselves as a fact that several very different mangoes pass under that designation. The true spice recognized by the writers is a lump, obtuse, rather large fruit, averaging ten to twelve ounces in weight, but often reaching a pound; green or purple, devoid of fibre, but of rather common or indifferent flavor. It is recommended for canning, as peaches and other fruits are canned in the United States, the long-fleshed kinds not being suitable, owing to their fibre, for this purpose. It is pointed out that to create a trade in tinned mangoes, the fruit should be put

in the market in quantity, permanently, and as cheaply as tinned peaches are in the United States and Canada. Mangoes have been preserved in this way, for many years in Kingston, Jamaica, and the general opinion is that these preserves are equal in quality to the preserved peaches. But they are sold at so high a rate in Jamaica that they are chiefly bought to be sent, or taken, to temperate countries as curiosities of tropical fruit. This is attempting to make a market by samples, a system which the writers say has often been tried with this and other fruits in the West Indies, but which, they add, can in the nature of things never succeed, for an abundant and cheap supply is absolutely essential to secure a market. This applies not only to mangoes, but to preserved bananas and all other tropical fruit it is desired to get a market for in the same form. But the general opinion expressed regarding our mangoes is not very favorable:—"No first class fruit," says the report, "has ever yet appeared on the fruit stalls of the Georgetown Market, nor have the great majority of the inhabitants of the land ever tasted one. Indeed the great majority are ignorant of the existence of such a thing, and would be greatly surprised by the discovery, for it would be a revelation of a high quality in the mango such as they never even dreamed possible."

Mangoes are not grown to the extent they were years ago, and few dams are now planted anew, but under the conditions existing in former days among the more humanizing, because the communal and socialistic features of a sugar estate was the "fruit-walk," *i. e.*, one of the principal dams, in many cases miles long, planted, avenue-like, on each side with fruit trees, chiefly with mangoes, but in many instances intermingled freely with other fruits such as guavas, sapodillas, star-apples, oranges, golden and other plums, soursops, custard-apples, cocoanut and abbey palms, and the miscellaneous small fruits of the colony. In favorable seasons these walks produced enormous quantities of fruit, in which master and slave participated alike—for, in a sense, the produce of these fruit-walks was regarded as the property in common of all on the estate—but which, from the very abundance of the wholesome nutritious food afforded, it was found under the changed conditions of subsequent years, was not without a demoraliz-

ing influence in diverting the inclinations of the masses, who had no object in life beyond a full belly, from the elevating and moralizing influence of labor. Consequently in nearly all cases, as it must be admitted, a regrettable element of somewhat picturesque if entirely utilitarian variety in the dreary monotony of the physical aspects of a sugar estate of this colony, these fruit-walks have long since disappeared; but few Georgetownians are aware that one—a true survival and relic of the olden time—exists, bearing, it is true, the decay, neglect, mutilations and hoary evidence of age within an hour's walk of their homes. We refer to that on the Bel Air estate, running parallel with the first southern reach of the Lamaha Canal, two or three hundred yards beyond the back of the Botanic Gardens, till of late years, when, we regret to say, mule traffic has spoilt it for pedestrian use, the most delightful place, if the wanderer were provided with a pipe and Indian hammock, within a short stroll of the town, to while away, undisturbed in the midst of nature, a dreamy summer's day; and, as one lounged and smoked, to conjure up in the mind the animated scenes of a past time in the fruit harvest, when the day's work was done, and men, women and children, with agile limbs and noisy tongues—the parents roughly kilted, the children in nature's unabashed nudity, (which practice we may remark in parenthesis, the later Adamite experience and the necessity of present Manchester trade, bridging the entire span of time, agree, oblivious of the æsthetic elements in life, and to the absolute conviction of our easily-shocked age, in regarding as perilously near the verge of sin) turned out to partake of the bounty, and wander home, with merry chattering and winsome laughter in the warm tropical gloaming, laden with the luscious fruit. But though the fruit-walks have disappeared, and with them the scenes we have pictured, many seedlings spring up spontaneously, and the prevalence of the tree is thus maintained, though the fruit produced is usually of an inferior order. Those who want to improve their orchards should look to the Report for information in regard to how best to do it, and the kinds of mango that are best worth growing. The same advice may be given in regard to bananas and plantains, which occupy several very interesting pages, that

had we the space to spare we would like to go over. These fruits are described as morphologically almost identical, though the writers describe at some length a feature by which they can be distinguished one from the other when in fruit; but in texture, quality, and general economic utility they are said to be widely sundered. Analyses are given at the end of various water and other plants which yield useful food stuffs.

With one other remark we close our review. We said at the outset that in consequence of the great length, and the unavoidable dryness of many of the details, the writers appeared to have thought it necessary to throw an air of interest over ther matter, to induce the public to read it. Among the several elements contributing to this impression are occasional anthitetic touches, which though they have no doubt, unconscious, and based on fact, are not without the suspicion of being deliberately sly ironical humour. Here is one, the last we passed, near the end. After a rather eulogistic description of the Jamaica banana, they say "the flavor is very sweet, *with an after-taste of tannic acid.*" The italics and inverted commas are ours. Think of a gourmet with a lingering flavor like that of the residue of a disused tannery in his mouth as a subject to ponder over after a hearty epicurean meal!—*Demerara Argosy.*

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A NEW HORSE DISEASE.

Mr. W. W. Goodale of Hilo sends an account of a disease which has been developed among the horses and mules of that district. Accompanying the account published below, is a photograph exhibiting the swollen head of a horse suffering from this disease which affects the upper and lower jaws, and is supposed to be the "Lumpy Jaw," or Actinomycosis. He writes:

"The jaw bones of a mule that died of a disease, apparently the same as that of the horse in the picture, were found to be of a spongy or cheesey consistency that could be cut in slices with a sharp knife.

"The bones of the lower jaw thicken and there seems to be a general growth of all the bones of the head and especially

about half way between the eyes and end of the nose; the head and face take a bloated, deformed appearance.

"In the last stages of the disease the animal affected seems to lose the power to swallow its food, chews its food into a wad or cud and then drops it, the animal grows thin and finally has to be killed.

"A horse which died of the disease in Hilo had reached a suppurating stage, matter dropping from the mouth and nose.

"Dr. Henry M. Lyman of Chicago, in his Text Book of the Principles and Practice of Medicine, referring to Actinomycosis, says that it is produced by a vegetable parasite that finds access to the tissues of cattle, the parasite organisms having entered the tissues through the cavities of carious teeth; the tumor thus formed enlarges downward and extends into the neck, leaving a track of cicatriciate tissue. Similar tumors may form outside of the upper jaw, and may invade the cavities of the face and head, burrowing along the base of the skull and along the vertebral column.

"Suppuration finally becomes established and in the pus may be discovered yellow masses made up of the mycelia of the fungus. * * * The suppurative processes thus inaugurated are chronic in their character and usually terminate fatally unless the tumors are so situated as to permit of removal by surgical aid.

"The parasite is seldom communicated from animal tissues to the human subject. It must pass through an intermediate stage of development in vegetable tissues before it can invade the body of man.

"For this reason infection usually occurs through the chewing of straw, after the manner of horse jockeys and stable men, who thus become infected directly from the vegetable kingdom, instead of deriving the disease from animals with whom they associate."

The following is from the Massachusetts Ploughman of August 13, 1892:

LUMPY JAW, OR ACTINOMYCOSIS.

The Department of Agriculture has issued a bulletin under date of July 22, in which Dr. Salmon states:

"This Department has never considered it necessary to condemn animals affected with actinomycosis on account of the contagiousness or incurability of the disease. Such condemnations have been made when the disease was so far advanced as to affect the general condition of the animal, and all such carcasses would be condemned, whether the disease from which the animal suffered was contagious or not, or whether it was curable or incurable."

Notwithstanding, it has been customary at Chicago to condemn all cattle affected with this disease, even when it had made but little progress. The carcasses were sold to the rendering establishments at one cent per pound. About twenty head per week were thus condemned in May and June.

This disease is believed to be curable by treatment with iodide of potassium. The proper dose of this salt is one and one-half drams once or twice per day, or larger doses for very large animals.

Experiments are now being made by the Bureau of Animal Industry upon the treatment of this disease.

The London Lancet of July 9th says: "There is no proof that the malady actinomycosis (lumpy-jaw) is contagious in the ordinary acceptation of the term, and if so at all it must be in a very feeble degree. The affection of mankind appears to be quite independent of diseased animals, as it exceedingly rarely happens that persons suffering from actinomycosis have ever had any relation with diseased cattle."

[This is not in accordance with the accepted theory of the doctors in the United States. Which is right?—Ed.]

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CONTINUOUS SWINGING OUT OF WHITE SUGAR.

(From the Sugar Beet.)

Some years since the journals devoted to sugar making called attention in a very general way to a centrifugal invented by a Russian. Since then experiments have been made in every beet-sugar country of Continental Europe; the results obtained are very satisfactory, and should certainly receive a trial in the United States. We consider it interesting to view here some of the results obtained by a committee

that investigated most thoroughly the question. The *masse cuite* experimented upon tested 87.89 per cent. sugar, 8.23 per cent. water, and had purity coefficient of 95.7. *Masse cuite* from the pan falls into a horizontal carrier, where a syrup mixing is affected at temperature of about 122 deg. F. The diluted product is run into a suspended wagon having a weighing appliance, then into a vertical mixer from which it is distributed into the centrifugal.

The white sugar runs from the apparatus in a continuous stream. One centrifugal can swing out nearly 4000 lbs. white sugar per hour, and the average percentage of white sugar obtained is about 54 per cent., while with an ordinary centrifugal the average percentage obtained is 52. During the first part of the experiment the sugar was not perfectly white, on account of inexperience of the workmen in charge; subsequently the product was of the highest grade white sugar. The velocity of the centrifugal was 470 revolutions per minute; and the yield and quality of sugar obtained can be regulated with mathematical certainty.

The most important advantage of this continuous centrifugal is its extreme simplicity; when once regulated little or no care is necessary for its working. The product from first to last is perfectly homogeneous; the automatic discharge arrangement contains no mechanism that can possibly get out of order. The entire question of working sugar in centrifugals is hereby reduced to a most simple operation.

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CANES, AND SEEDLING CANES.

(Demerara Argosy.)

The Agricultural Committee of the Royal Agricultural Commercial Society of British Guiana visited by pre-arrangement the Botanic Gardens, with several guests that the committee had invited to accompany the members, to inspect the cane cultivation. The old varieties (that is the varieties collected in years past from several parts of the tropical world, the origin of which varieties is not known) were first inspected, then the seedlings raised during the past few years were examined, row by row; and, finally, the committee went over the manurial plots of which there are nearly a

hundred. These took some time to get through. Each plot is divided into halves, one of which is limed and the other not limed, the advantage on the limed half of each plot being very evident to the eye,—the yield of cane on these half-plots last year in excess of that from the unlimed halves being more than enough to pay for its application. The plots are manured with different manures. As checks, some plots have no manure, others, a few, have farmyard manure, the rest, the great bulk, have different kinds and proportions of artificial manures, a term for which, by the way, by a wretched misnomer we regret to see some English papers are substituting the word "fertilizers," borrowed from corrupt American phraseology. These manures are duplicated on a fixed system over different parts of the field, with the object that the results may check each other. In walking up and down the dams that divide the plots, it is very remarkable to come on these duplicated plots in different places, and see how thoroughly, even to the eye, they agree in size of cane and uniformity of growth,—a fact that was settled on a firmer basis than mere eye impression, and beyond question by weighing and analysing the produce of each half-plot last autumn. These particulars were pointed out and explained to the committee by Professor Harrison, the differences in effect being recognized by all, they are so very obvious and remarkable. The committee being men of life-long experience in sugar cultivation, were much interested. Afterwards the members inspected some 5000 pedigreed seedling canes, raised last autumn in the nursery, and then examined the seedlings, not yet mature, but showing clearly their characters of the previous year. These are eighteen months old from the seed, have four to six feet of clear cane to the stalks, and will go through the preliminary analysis to ascertain their sugar and other contents in a few weeks' time; the final analysis being left for the autumn, when they will be two years old from the seed, and at their full maturity.

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The revenue derived in Germany in 1892-93 from the tax on raw sugar amounted to £578,600, and that from the tax on the consumption of sugar reached £2,826,200, total £3,404,800. By the Law of May 31st, 1891, the tax on beetroot was abolished on August 1st, 1892.

CULTIVATION OF COCOA IN CUBA.

(Journal of the Society of Arts.)

The French Consul at Santiago, in a report of his Government, says that the cultivation of cocoa is closely connected in Cuba with that of coffee, and is carried on at the same properties. In fact every coffee planter, if the nature of the soil permits him to do so, sows between the rows of young plants cocoa berries, which will produce trees that will continue to bear crops when the coffee plants have ceased to produce. It is impossible to discover the precise date at which the cultivation of cocoa was introduced into the island, but as this plant was cultivated in Mexico and in New Grenada before the Conquest, it cannot long have remained unknown to the Spanish colonists in Cuba, who kept up constant communication with the possessions of Spain on the American continent. It was not, however, until about 1830 that several planters made an effort to introduce cocoa into Cuba, and at this time plantations of a certain importance were formed at Figueroa and elsewhere. Unfortunately for many years the cultivation of the cocoa remained unprofitable, in consequence of the small demand and the low selling price. The price slowly rose however, the number of cocoa plantations increased, and by 1860 every coffee plantation in Cuba combined the cultivation of the cocoa, if the nature of the soil permitted it. The cocoa-tree lives longer than the coffee plant, but it is much slower in producing. It takes in fact five or six years before the newly planted cocoa begins to bear fruit; it is at its full bearing at the end of the year, and begins to decline at the end of fifteen, but without ceasing to bear; on some old estates there exist cocoa-trees of upwards of fifty years of age, which still produce. The cocoa is usually planted in the spring, by preference directly after rain; an interval of from ten to twelve feet is usually left between the plants. The kinds which are most used are those of *Caracas*, *Guayaquil*, and *Creòle* variety, which latter is said to come from Trinidad. The Caracas and Guayaquil varieties bear the finest fruit, but they are not so hardy, and do not bear so well in Cuba as the Creole variety. The Caracas, however, fetches the best prices. The crop is gathered

from the month of October to the month of August. During this period the trees are covered with blossom, and little bunches of ripe and half-ripe pods. The crop may therefore be gathered day by day, but as it is difficult to obtain the laborers necessary for the work, the owners generally prefer to harvest monthly or fortnightly. To prevent fraud as much as possible, the laborers are paid by piece-work, and receive wages calculated upon the number of measures of fruit which they pick. There is no harm done by leaving the pods on the bushes for one, two, or even four weeks, except in the spring, when, if possible, they should be picked at shorter intervals.

The cultivation of cocoa, like that of coffee, is undertaken with the aid of colonists, who are hired by the day. The day is calculated from 6 a.m. to 4 p.m., for which time a man is paid about 2s. 6d. if food is not included, and about 6d. less if it is. The colonists are farmers to whom the proprietor of a cocoa plantation has let a piece of ground, with the right to cultivate fruit or vegetables, but with the obligation of yielding the planter half or two-thirds of the cocoa gathered on the same piece of ground. Cocoa is weeded in the same way as coffee, but as the cocoa-tree sometimes grows to a height of 15 or 20 ft., it is not so much troubled by coarse weeds as the coffee is. The spread of weeds is, moreover, checked in cocoa plantations by the continual fall of leaves, which soon cover the ground. The cocoa is pruned in the same way as the coffee-tree, with a view to prevent each plant growing too high and mingling its branches with those of its neighbors. It is necessary always to take great care to remove the suckers which are continually being thrown up from the foot of the tree. As soon as the pods are ripe, they are pricked and broken on the spot. The berries, which are full of a curious syrup, are measured and piled up in heaps, covered with leaves. These heaps are allowed to ferment for two or three days, the fermentation being regulated every morning by a rearrangement of the heaps. This process softens the bitterness of the berry, destroys the gum which surrounds it, and enables the cocoa to dry more rapidly. Moreover, the color of the berry depends on the proper conduct of the fermentation. Cocoa, like coffee, is then spread for two or three days

on a sort of platform made of cemented stones, called a *secadero*, there to be exposed to the sun and dried. As soon as the cocoa is thoroughly dry, it is rubbed, cleaned of all the detritus which has gathered upon it, placed into bags, each containing about 105 lbs. of cocoa, and sent on the backs of mules to the market at Santiago. The conditions of transports are the same as in the case of coffee. Each mule carries two sacks, or 210 lbs. of cocoa, and travels 10 leagues every day. Each group of 20 mules is led by a *capataz* and two watchmen, and travels by night to avoid the heat. The conductor, or *arriero*, is responsible for the arrival of the convoy, which is paid at the rate of 5d. a mile, and per mule, or from 5s. 6d. per day's journey of 10 leagues. Part of the cocoa grown in Cuba is consumed in the island, but the berries of the finest quality are sent abroad, and generally to Barcelona. France import no Cuban cocoa whatever. The Cuban cocoa is, says the French Consul, exceedingly fine in quality, and it appears strange that there is no market for it in France. The price of cocoa in Cuba varies from 12 to 16 piastres the quintil, and sometimes, but rarely, rises to 18 piastres. The Caracas berries are sold one piastre dearer than the other varieties. The Consul says it would be difficult to foretell the future of cocoa cultivation in Cuba. Many cocoa plantations were destroyed during the civil war, but cocoa has suffered on the whole much less than coffee from the effects. In many of the largest plantations in the island, the cultivation of coffee is now entirely abandoned, and the cocoa plants only are depended upon for a return. Many planters moreover prefer cocoa growing, because for small capitalists it is an industry which requires much less outlay than coffee.

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The sugar possibilities of Florida are so great, and sugar so important an article to our country, that the Department of Agriculture has established an experimental station on the shore of East Lake, opposite St. Cloud, to thoroughly investigate the subject. Eighty varieties of cane have been introduced from all parts of the world, and they will be thoroughly tested, and every method of cultivation will be applied and no pains will be spared to make the investigation a success.

SHALLOW CULTIVATION.

(From the Louisiana Planter.)

In recent years many have come to the conclusion that shallow cultivation of growing crops is better than deep cultivation. This conclusion is opposed to all former ideas. It is natural to believe that thorough cultivation, pulverizing the soil to the greatest possible depth, and as closely as possible to the growing plants, is superior to a mere scratching of the surface. But there appears to be much force in the arguments in favor of shallow cultivation. It is urged that sugar cane, and also sorghum have no tap root, but like all grasses have a great number of fine rootlets which spread laterally as well as downward. The observations of Mr. Henry Ling Roth were that the rootlets of sugar cane extend laterally from three to four feet. The rootlets of sorghum, planted in four-foot rows, often interlace between the rows. These rootlets are fine and tender; they adhere so closely to the soil that they can be traced unbroken, only by careful washing away of the soil. These rootlets are the feeders of the plant, they are the mouths by which the plant is fed, they explore the soil all around the plant for food. In many cases the lateral spread of the rootlets is far greater than the height of the plant above ground. No system of cultivation can avoid all injury, but it seems reasonable to avoid injury to the rootlets as much as possible, and this can be done only by shallow cultivation, for comparatively few of the rootlets are deep enough to escape amputation by deep and close cultivation. If the soil is not cultivated at all, it becomes dry and hard; deep cultivation not only cuts off the rootlets which supply the plants, but also exposes the soil to greater evaporation.

The *Western Rural*, published at Chicago, says: "Then comes the cultivation of the crop, the purpose of which is not to stir the soil to the depth at which it was stirred by the plow. That part of the work has been done. Weeds and drought are to be fought. The soil contains moisture which will come to the surface and be lost by evaporation unless the surface is mulched. If the soil is kept stirred and finely pulverized to a depth of an inch the finely pulverized soil

acts as a blanket which prevents evaporation and retains moisture, while the industrious feeders of the plants escape injury."

The *Prairie Farmer* says: "Corn may be greatly injured by cultivating too deep. A cultivator running three or four inches deep inevitably cuts off a great number of roots indispensable to a good crop." The *Western Resources*, published at Lincoln, Nebraska, says: "After trying different cultivators, we have thrown aside all but surface cultivators, because the surface cultivator only goes two inches deep, and does not injure the roots."

The Dean of the Missouri Agricultural College said: "Deep tillage in time of drought is an erroneous practice, founded on erroneous views. It adds to the mischief by severing the roots. In drought, the true policy is frequent and shallow tillage."

The Director of the New York Experiment Station said: "By examining the results it will be seen that the difference in results between the two methods is fully equal to the difference between a good crop and a poor crop, equivalent to the difference between prosperity and poverty."

The Iowa Agricultural College after extensive experiments arrived at this conclusion: "Deep stirring of the soil should precede plant growth, for it weakens the plant if done after the roots have spread."

The conditions of soil, moisture, and weed growth are so widely different that each planter should judge for himself after considering views held by others.

The sorghum growers of Kansas have easy cultivation so far as weeds are concerned. The problem for them is mainly one of retaining moisture in the soil, and the following simple experiments are stated as showing effect of methods of cultivation upon moisture in the soil. Mr. Francis Watts, government chemist at Antigua, W. I., placed damp soil in two tins of similar size and shape, the weight of soil and water being the same in each, the soil in one tin being compact, like badly tilled soil, in the other loose and porous. Both tins were exposed to the sun alike, and then weighed. At the end of three days the loose soil had 12½ per cent. more moisture than the other.

At the Experiment Station at Garden City, Kansas, six boxes were filled with loose soil, the weight being the same; three of the boxes were lightly mulched with straw, all were alike exposed. After several weeks the boxes were again weighed, the mulched boxes having at the rate of nine tons more moisture per acre than those not mulched.

In the second experiment the six boxes were again filled with soil alike and weighed. In three of the boxes the surface of the soil was kept loose and pulverized, while the others were allowed to become compact. After several weeks the boxes were again weighed, and it was found that surface cultivation had retained more moisture in the soil than mulching with straw.

In Kansas it appears to be true that if the surface soil is allowed to become crusted or packed, the crop speedily suffers for moisture in time of drought. It appears to benefit the crop when the surface soil is pulverized while moist, after heavy rains, to prevent crusting, no matter how free from weeds or how large the crop may be, if the cultivation is shallow, by retaining moisture in the soil.

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INCREASE OF BEET SUGAR PRODUCTION IN CALIFORNIA.

(*Corr. Sugar Beet.*)

California now occupies the leading position as the beet-sugar state of the country, says a correspondent of Sugar Beet. Of the total 27,000,000 lbs. sugar extracted from beets in the United States in 1892, about 22,000,000 lbs. were produced in three factories on the Pacific Coast. As the production during 1891 was 8,000,000 lbs. the progress achieved needs no comment.

The Western Beet Sugar Company used 54,000 tons of beets, and proposes to further increase its capacity during the current year. The yields obtained at the Watsonville factory are certainly comparable with those of the best European practice. Am told that 4,000 acres of land have been contracted for in one section. Besides this must be added the beets growing on Moro Coso and Cooper ranches. As farmers of Pajara and Salinas Valleys are willing to contract

for beets, the appromiate yield for 1893 campaign will be 75,000 tons of beets.

A person of some influence in Sonoma County told me some time since, a great future was certainly awaiting the beet-sugar industry in the sandy loam of the Southwest; Blucher and Sebastapol districts offer special advantages. It is recommended that factories be erected in the valleys and the beets be cultivated in the uplands. The transportation of beets could then be reduced simply to the action of gravity. The planting of beets on the Chino ranch commenced in February, and up to the time of the present writing prospects for a successful crop are more favorable. The seeds used have been mostly of German and French origin.

During January Mr. Gird informed the farmers of the locality that an increased price would be paid for beets during 1893; for 12 per cent. sugar, $3.50 per ton, and 40 cents per ton additional for each per cent. above 12, in place of 25 cents, as previously. If beets in special cases test 18 per cent. sugar, as they did last year, their selling price per ton would be nearly $6. If the average yield is 20 tons of 15 per cent. beets per acre, the increased profits for farmers by the new rates will be $9, which for the entire ranch will certainly represent $35,000.

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THE SUGAR INDUSTRY IN MARTINIQUE.

[Translated for THE LOUISIANA PLANTER from Le Propagateur Martinique.]

For about three weeks the weather has been quite favorable for the season's work, with a hot sun, which has hardened the roads and increased the yield of canes, interspersed with beneficial showers which have refreshed the young plants now actively growing. The yield in the field is good and the yield in the factories has improved as we advance in the month of March. For the first time in a long period the planters and manufacturers are through their work, and unless there be some unanticipated trouble in the way of the factories we may reasonably count upon a crop of 67,000 to 68,000 hogsheads of sugar. Who would have dared believe it on the 19th of August, 1891 ?

Although presenting these encouraging results, we should not lose view of the difficulties that surround us and which are so difficult to surmount. One of these difficulties which accentuates itself day by day is that which we call the *cane sickness*. Whatever may be the nature, whatever may be the cause. the thing becomes more and more serious and demands consideration. If one stands between two canes in one of our central factories in the centre of the island he will be struck by the condition of the cane as there seen. There is no longer the white blanket of bagasse that one was accustomed to see and which may still be seen in the factories of the North. The bagasse comes from the rollers ordinarily stained with red, and here and there discolored by large blotches, black and muddy, and it is easy to understand how impossible it is with such material introduced into the factories that they should not seriously affect the results. To throw them out is impossible, as they are legion. "All the care that we can bring to our manufacture, all the manufactures and innovations scarcely enable us to maintain our yield," was said to us by one of the most experienced directors of one of the best factories in a recent visit we made, and he further estimated their season's loss at 150,000 francs, the result of the bad quality of the cane. On his part the planter can also say that in certain quarters, on certain lands, there is the fifth, if not more, of the crop abandoned.

We repeat that the situation is really alarming, and it is accentuating and aggravating in place of responding to our numerous attempts to arrest the malady. It seems to us that the time has arrived to seek new means for combating this plague. We can suggest one which is radical it is true, but easy to practice, which has thus far given good results. This means is to carefully burn all of the cane trash on the land This precaution will not suffice perhaps to entirely relieve us of the numerous enemies of the cane that live on it at our expense, but the evil is so great that it suffices if the remedy be partially successful.

It is especially in those sections cultivated for the longest time that the evil is the greatest. There is no sickness in the North; the factories have been built there but recently. In the factory centres, on the contrary, for fifteen or twenty

years all of the trash has been buried in the land. Scarcely have the ratoons sprouted, while the stalk is still quite tender, there is brought to the foot of the plants the debris of the previous crop, with all the insects nourished upon it, destroying the crop and multiplying, to continue their ravages in still greater degree. In burning this debris of cane trash, tops and old canes with much care we should destroy infinite quantities of the larvæ, of eggs and of injurious insect germs.

There is no lack of objection. We know the most serious one—the trash contains valuable fertilizing materials. This seems certain, but if at the same time this trash carries into the soil the germs of ruin that we have been discussing, had we better not deprive the earth for some time of this fertilizing element, and relieve it of the vermin which are about to annihilate the crops there growing? It is not in Martinique only that cane is destroyed by this sickness. Everywhere they have tried various means to remedy it. The results have everywhere remained negative, except perhaps in Louisiana, where excellent results have been obtained from the practice that we have recommended to our planters.

In fact, in the report of the meeting of the Sugar Planters' Association of the 8th of December last, Dr. Stubbs, Director of the Sugar Experiment Station at Audubon Park, and Prof. Morgan, the etomologist, attributed the almost complete relief of their experimental fields from such insects as the borer and others which would invade them to the care with which they have gathered and burned all the debris of the previous crop. Consulted by a number of planters on the best means to relieve themselves of these difficulties, they have counseled none other, having recognized the effectiveness of this plan alone. This plan should be considered, and we believe should be imitated. In traversing the Lamentin we have seen at some points near the Soudon factory where they had burned the cane trash. That is well; but if the intelligent planter who has taken this initiative will allow us to advise him, we should say that he ought to use his influence to induce his neighbors to follow the same plan, for the more general the adoption of this measure, the more easily will the good effects follow.

Incidental thereto, let us counsel him to burn the trash

with still greater care. "We have raked our fields and piled the trash before burning it," says Dr. Stubbs; "they are as clean as the floor of this room." It is this thoroughness that we should approach as nearly as possible in our practice. In fact, if we calculate well, it has been five years that we have been battling against cane sickness or the diseases more or less well defined that pertain to the cane, and altogether the situation has not improved. Here is a new plan with which to experiment and which men who are real authorities claim to have true virtue.

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Pulleys that have been in use that are to be papered should be made clean and free from grease by scratching with a file over their entire surface, cleaning with a caustic soda wash and then pickle the surface with hydrochloric acid and water, equal parts. Wash with hot water and dry, when its surface will be in the best condition to receive the glue. Use the best light brown glue, which may be tested by its great strength and elasticity when breaking a piece in the hands. Make up the glue in the usual way and when ready mix a tablespoonful of strong decoction of oak bark or tannic acid, hot, add to the glue and thoroughly mix. The strongest hardware paper should be used, cut and prepared by previously moistening, so as to allow of it drawing to fit the crown of the pulley. The pulley being slightly warmed, so as not to chill the glue, and temporarily hung, proceed to brush the glue on its surface, putting the paper on at once, drawing it tightly to expel any air and overlapping with glue and paper, until the proper thickness is obtained. To make the best job requires three persons. Upon stretching the paper on firmly depends its best service.—*Scientific American.*

When a rope transmission is running well there should be little lateral swinging of the ropes, except the unavoidable motion produced by the wind. If swinging occurs it may be due to the pulleys being unbalanced or untrue, or to their not being in the plane of the rope; or it may be due to the pulleys filing, or the rope being too much worn, or bad splicing of the ropes.

DIFFUSION AND FUEL.

(J. M. Paton, in Sugar Cane.)

During the last few years the attention of cane sugar planters has been called very strongly to the urgent need for improved methods of dealing with the cane, and the most economical means of extracting as large a proportion as possible of the crystalizable sugar it is known to contain.

The diffusion process having proved such a decided success in connection with beet-root sugar, it is also natural that the question of its adoption for dealing with cane should receive considerable attention.

The experiments recently carried out in Java appear to have excited much interest in that country, but after reading Mr. Sargent's translation of the report of the committee, as it appeared in the *Sugar Cane*, there does not appear to have been any very new light thrown upon the matter.

No one who paid attention to the subject can have doubted that a large percentage of juice would be extracted by diffusion as compared with ordinary crushing in mills, but the question of fuel at once crops up, and almost in every case it has been sufficient to cause planters to hesitate before adopting an otherwise tempting process.

It may be taken for granted that there is no difficulty in the slicing of the canes and the extraction of an amount of juice equal to eighty per cent. on the original weight of the cane. It may also be taken for granted that this eighty per cent. of original cane juice will be diluted with sufficient water to bring the diffusion juice up to the weight of the cane from which it has been extracted. The figures will of course vary slightly under different conditions, but the above result is easily obtainable, and will serve as an average for purposes of comparison with other methods of juice extraction.

Enthusiastic believers in diffusion as the grand remedy for the present state of things usually under-estimate the real proportion or effect of the added water. The usual line of reasoning is somewhat as follows :—A good mill will give us, say seventy per cent. of juice, or seventy pounds of juice

from one hundred pounds of cane. By employing the diffusion process it is possible to get eighty per cent., or eighty pounds of juice from one hundred pounds of cane. It is true the eighty pounds will have had twenty pounds of water added to it, so that the diffusion juice will weigh one hundred pounds, and of the one hundred pounds of diffusion juice only twenty per cent. is added water, consequently one-seventh more sugar will be obtained, and there is only twenty per cent. more water to be evaporated.

The above mistake is made so frequently that it appears desirable to call attention to it, and to point out that the quantity of extra fuel required for working sugar cane by the diffusion process is likely to be a serious question when it has not been fully anticipated and provided for.

Those who advocate maceration or double crushing with mills, usually speak of very large percentages of juice, but it may, perhaps, be better at present to compare diffusion and ordinary crushing.

Taking 70 per cent. as good work for a mill, and taking the masse cuite as equal to 20 per cent. on the juice, from which after evaporating from 56 to 84 pounds of water, we obtain 14 pounds of masse cuite.

Taking diffusion juice as equal in weight to the cane, and presuming that 80 per cent. of the original juice is obtained, then the quantity of masse cuite will be raised from 14 to 16, while the amount of water to be evaporated will be raised from 56 to 84 pounds. We have two pounds increase in the yield of masse cuite, and we have to evaporate twenty-eight pounds, or fifty per cent. more water.

In round numbers the amount of added water is about two and a half times as much as it is sometimes represented or thought to be.

In a good modern sugar factory, fitted with heavy mills, economical boilers, triple effect evaporating apparatus, etc., it is found that the crushed cane furnishes sufficient fuel for all purposes, and it is nothing unusual for a large quantity of megass to be left over at the end of the season.

In factories which have not been furnished with modern appliances for effecting economy in fuel, it is found that a considerable sum has to be spent on fuel, and from half a ton

to a ton of coal per ton of sugar is not uncommon, in addition to the whole of the megass.

Taking the megass as being just sufficient to evaporate the water from the mill juice, it is clear that if diffusion is adopted it will be necessary to at once provide wood or coal equal in evaporating power to at least one-half of the whole megass, or in other words, fifty per cent. more fuel will have to be provided.

The above presumes that the chips from the diffusors will be equal in evaporative power to the megass from the ordinary mill, but unfortunately this is not the case.

The chips as discharged from the vessels are fully charged with water and contain at least as much as the original cane. Up to the present time no practical method of drying the chips had been discovered, and even when small quantities are dried by long exposure to the sun. it is found that as a fuel it is much inferior to ordinary megass.

So great is the practical difficulty of dealing with the enormous bulk of soaking wet cane chips that it may be considered certain that it will cost more to handle and dry them than they are worth as fuel, even when they are eventually rendered fit for burning.

It is quite probable it may in the end be found actually more economical from a financial point of view, to get rid of the chips in any possible way, and to provide other fuel, such as coal or wood, for all purposes of evaporation and manufacture.

Unless these points are fully appreciated it is extremely likely that any planter adopting the diffusion process will be much disappointed with the financial result, to say nothing of the annoyance and worry, caused by an insufficiency of fuel, and the consequent interruptions to the work.

The amount of capital invested in a sugar estate is so large, and the interests at stake so important, that owners as a rule display a very conservative spirit whenever any radical or sweeping alteration is proposed. It consequently becomes most important that when so serious a question as the adoption of diffusion is contemplated, that there should be no hopes held out as inducements unless there is every reason

to feel satisfied the results in actual practice will be fully equal in every particular to what was anticipated or promised.

It will always be much easier to adopt the diffusion process when arranging an entirely new factory, than when it is desired simply to replace a crushing mill by a diffusion battery. The reason for this will be at once apparent if the increase in the amount of water to be evaporated, and the altered condition or character of the fuel are taken into account.

Any sugar planter about to erect an entirely new factory, and intending to adopt the diffusion process, will be most likely to arrive at a satisfactory result if he will from the first totally ignore the value of the cane chips as fuel, and at once have the furnaces and boilers arranged to work entirely with coal. Modern appliances to secure economy both in fuel and steam are so efficient, that an improved result, from a financial point of view, may be looked for even under these conditions.

Looked upon as simply as a process of extracting a large percentage of sugar from the cane, diffusion is beyond question a great success, but most planters are more anxious to make money than to make sugar, and consequently the whole matter hinges on the question—will it pay? This, in its turn, hinges almost entirely on the question of fuel.

The friends of diffusion will do it much injury if, in their great admiration of the process, they lose sight of or underestimate the importance of this point. Unless the fuel question is boldly faced and amply provided for, nothing but disappointment will result, and the result of one failure will be to frighten any who may be at present thinking seriously of adopting the process.

It is unfortunate that little or no reliable information with regard to this most important question of fuel is available. Reports on experiments with diffusion machinery usually go into great detail when endeavoring to show exactly, to a fraction of one per cent., what increase will be found in the quantity of sugar contained in the diffusion juice, but they pay little or no attention to the consumption or other points in connection with fuel, although any uncertainty about this

latter subject may result in the entire sweeping away of all gain arising from increased production.

It may, however, be taken for granted that it is quite possible to erect a new factory to work with the diffusion process, which will, after making all necessary allowance for fuel, still show a better financial result than is likely to be obtained for an ordinary mill plant. How far this will be true of an altered factory which has previously been working with a mill will depend entirely on the way in which the alteration has been designed and carried out, or in other words on how nearly the old factory has been made to resemble the new one in the arrangements and proportions of details.

Do not expect too much from diffusion; weigh each point carefully; where there is any doubt, make ample allowance for contingencies.

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RIBBON CANE.

(From Lawrenceville (Ga.) Herald.)

The farmers in this section of the State have not until the last year or so believed that ribbon cane could be successfully raised in this climate. Experience has demonstrated that they have made a mistake. On nearly every farm in this country there is raised annually a considerable amount of sorghum. This is grown for the purpose of making syrup.

It is a good substitute for the ribbon cane of South Georgia, if we could do no better, but the syrup is nothing like so valuable either for use or in the market as the ribbon cane.

Mr. J. M. Martin and some of his neighbors have experimented with the real sugar cane for two or three years, and their success has settled the question as to its being raised successfully in this country. He showed us stalks raised this upon poor land with but little manure that shows a yield that is surprising.

He says that experience has shown that there can be raised enough cane on one acre to make 200 gallons of syrup. It can be cultivated with less labor than the sorghum, and the syrup made from this cane will sell for from fifty to sixty cents a gallon, while the sorghum can be purchased for half that sum.

In fact, it is more profitable than corn, or cotton at ten cents a pound.

Then why can't our farmers adopt this ribbon cane in preference to the sorghum? As is well-known, it is propagated from the stalk and not from the seed. An abundance can be obtained from South Georgia for all the planting we expect to do next year.

Parties who propose to test its virtue and profit should make their arrangements this winter to get cane from Southwest Georgia. Have it shipped here in April and plant it the same time you do cotton.

Will it pay? That is the first question asked. Experience has shown that it will. One man in this country made fifty-two gallons of nice syrup from one-fourth of acre.

We call attention to it now to induce our enterprising farmers to give it a thorough test next year. If you do not want to take too much risk plant only a fourth of an acre. If it succeeds you are well paid, if it does not you have lost but little.

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THE LIME AND ITS CULTURE.

(American Agriculturist.)

The lime ranks next in importance to the lemon, and if its merits were appreciated in distant markets as they are at home, the demand would soon exceed that for the lemon. Seedling trees are generally grown, and they always come true, growing rapidly, are very prolific bearers, and in three years from the seed will generally produce abundantly. The fruit is smaller than the lemon, but very juicy, and the acid is more decided and pleasant. Limes grow and fruit finely in hedge form, or they may be planted ten to fifteen feet apart. They are of a bushy habit and need not be pruned, except to remove dead branches, and a few of the inner limbs that shut out the air and sunshine. They are the most tender of the citrus family, and are often cut by frosts, consequently they cannot be raised in the northern part of the State unless well protected. The lime will grow and fruit in poor soil, and without fertilizing, but will respond liberally to kind treatment. The fruit should be picked just as it is ripening,

thoroughly cured on the drying shelves, and assorted, wrapped and packed like the orange and lemon.

The following varieties are the most popular: *Tahiti*—Fruit large, juicy with very strong, rich acid; very early and heavy bearer; a strong grower; nearly thornless. *Persian*—Fruit large and very fine; juice very pleasant, with rich acid; nearly seedless; a rapid grower and quite hardy.

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AGRICULTURAL SCIENCE IN FRANCE.

(Sugar Journal.)

French agricultural scientists are hotly engaged with the question, not of feeding stock, but of feeding the soil. In other words, how best to manure land to maintain its fertility. There are three schools represented; one maintains that barn yard manure alone suffices; the other that mineral fertilizers simply are adequate, while the third school assert that barn yard manure ought to be complemented by mineral agents. The latter view is the one generally accepted. The soil is viewed as a rock, at which plants feed; humus is a necessity as the laboratory wherein the transformation of the food for plants is effected and prepared for assimilation. It is requisite then to keep up the store of organic matter in the soil, and that barn yard manure contributes to secure. But the latter does not contain sufficient elements of fertility to produce heavy crops, nor is its action uniformly beneficial for every soil or for dissimilar plants. It is here where the role of mineral fertilizers comes into play by supplying nitrates, phosphates and alkalis according as the demand for them may be special and peculiar to the soil and its vegetation. From yard manure alone we can postpone, but cannot ultimately prevent the exhaustion of the soil. Nor can the employment of mineral fertilizers prevent the soil's exhaustion if the supply of humus is not kept up. If the soil be naturally rich in organic matter, as is the case with the commercial kitchen gardens around Paris, mineral manures can be employed singly for several years. Alone, organic and artificial manures are insufficient; combine their action then for the maintenance of fertility and large returns of produce.

It is in this direction that farmers are moving; there is quite a mania setting in for the ploughing under of green crops to swell the volume of humus in the soil, and a rage for gypsum applications, the latter being wholly inexplicable.

Closely allied to this subject is the application of mineral fertilizers to the growth of vegetables, the latter being now cultivated in field gardens as a very remunerative branch of farming. In the south of France, where early vegetables are extensively cultivated for the markets of Paris and London, stable manure is scarce; cultivators now rely, not on beds of the latter, but on cotton seed cake, some at the rate of one to two tons per acre; this manure not only augments the yield of vegetables, and most markedly of spring potatoes, but secures their maturity three weeks earlier. One ton of the cotton seed cake contains 47 lbs. of phosphoric acid, 80 lbs. of nitrogen, and 33 lbs. of potash. It is to these fertilizers then that the action of the cake is due, not to the organic matter, as it would require 24 tons of farm yard manure per acre to supply the same quantity of phosphoric acid, etc., as exists in one ton of the cake. Professor Wagner, of Darmstatt, has some years been occupied with experiments on the most appropriate artificial manures for ordinary vegetables for field gardens. He concludes that peas and beans require no complementary nitrates; cabbages exact, as do carrots and turnips, high doses of potash, superphosphate, and nitrates; but he finds that phosphate of potash, not chloride, and sulphate of ammonia are the most appropriate fertilizers for potatoes.

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METEOROLOGICAL SUMMARY.

FROM RECORDS OF THE WEATHER BUREAU.

PHENOMENA.	*Jan.*	*Feb.*	*March*	*April*
Average temperature.....Fahr.	70	71	72	73
Average morning minimum.....	65	65	67	69
Average mid-day minimum.....	76	77	78	78
Lowest observed temperature	56	61	63	65
Highest " "	81	81	83	83
Smallest daily range of temperature.....	4	6	3	5
Greatest " " "	18	19	18	17
Greatest difference between two consecutive days.....	6	5	4	3
Relative humidity .....per cent.	74	79	71	70
Rainfall .....inches	2.88	14.91	1.31	2.32
Trade-wind .....days	15	6	15	23
Fine .....days	13	8	14	15
Fair .....days	7	4	6	7
Lowest barometer	29.84	29.75	29.96	29.96
Highest "	30.16	30.22	30.25	30.24
Average force of wind, Beanfort scale.....	3.5	2.5	4.5	4.5
Daytime cloudiness.....per cent.	46	60	42	48

Curtis J. Lyons,
Meteorologist.