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Sugar had advanced at latest date from New York, and was quoted on the 12th at \$6.06 for Cuban centrifugals.

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The duty on cane and beet sugar imported into the Colony of Victoria, Australia, is three shillings per cwt. under the revised tariff.

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The plantations in and near Hilo have finished grinding for this year. Waiakea returns 4,300 tons, Hilo Sugar Co., 5,000 and Onomea Sugar Co., 6,600.

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The Watsonville, Cal., beet sugar factory promises to turn out this season with increased acreage of beets planted, and increased purity of juice, over three thousand tons of sugar.

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A new sugar refinery has been erected in Waukegan, Ill., for the manufacture of grape sugar, glucose, syrups, etc, out of corn, of which it uses 10,000 bushels per day. The plant cost \$500,000.

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The annual meeting of the Planters' Labor and Supply Company will be held in this city on Monday, October 6. The list of officers and committees will be found on the last page of this number. All interested in agricultural and mechanical pursuits will be welcome.

The cottony cushion scale appears to rapidly disappearing since the introduction of the lady bug, which has increased wherever it has been colonized. We are glad to note that the cottony scale does not attack sugar cane, so far as has been observed in the neighborhood of this city, and if not here, it probably will not elsewhere.

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From St. Kitts we have tidings of the discovery of a new process in making Muscovado sugar, which is likely to be generally adopted, for it adds nothing to the cost of manufacture, and it enables the sugar boiler to turn out a very superior quality of sugar. It is described in a lecture delivered by Mr. F. Watt, Government Analyst, Leeward Islands, who stated that it was in use on Mr. Boon's estate in St. Kitts, and working successfully. The process is known as Kneller's, and its great merit is the lowering of the "striking" temperature, the prevention of scorching, and the other wasteful results of the ordinary open-pan boiling. This is accomplished by forcing a blast of cold air through the boiling syrup, the apparatus required being cheap and simple. If any of our Muscovado estates would like to have fuller information regarding the practical working of the system, we feel sure that Mr. Boon would be ready to supply it.—*Demerara Argosy.*

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### PROSPECTS FOR 1891.

*Bradstreets* has the following remarks regarding the sugar supply for 1889: "As far as the future of prices is concerned it must be admitted that the outlook is not altogether as assured as could be wished. It is now certain that the beet sugar yield of Europe will not reach the figures calculated upon on the basis of showings, as the weather has been unfavorable for the development of the beets, and the crops are known to have suffered seriously. On the extent of this shortage in the beet crop will depend the future of prices; but the extent of the shortage is sufficiently uncertain to unsettle all predictions as to the probable course of the sugar market during the coming season. It is probable, however, that the general average of

prices will rule higher than last season. The news from Cuba has been less assuring of late than has been the case hitherto, while from other cane-producing islands the reports all point to smaller crops. As the sugar consumption of the world is constantly increasing, these shrinkages in production cannot but produce a more or less important effect on prices."

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### *THE BEET INDUSTRY.*

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Nebraska hopes to rival California in the production of beet sugar. Nebraska sugar beets produce about 19 per cent. of saccharine matter, as against 13 per cent. of the best German article. Three thousand acres are now under cultivation for use in the Grand Island Sugar Factory. These, in spite of drought, will yield fifteen tons of beets to the acre. There is every prospect that within a few years enough beet sugar will be produced in the United States to supply the entire demand for home consumption. Sugar importations from Germany have increased three-fold within the last fiscal year. During the year ended June 30, 1890, the United States imported 600,000,000 pounds from the German Empire.

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### *BEET SUGAR IN THE ASCENDANT.*

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The European fabricants are engaged at the present time in teaching the art of sugar making to the world, and some remarkable results are following. Their white sugar is now so well and cheaply manufactured that, not only is it threatening the very existence of the ancient industry of sugar refining by a second process throughout the world, but after paying the great cost of carriage to the European seaboard, and thousands of miles of sea-freight, best crystals and granulated can be sold in the most distant parts of the world, and even in cane-growing countries themselves. No one accustomed to the extreme cheapness of sugar in England can fail to be struck with the higher prices obtained for it in the producing countries, or in the neighboring colonies. Cane planters console themselves

with the idea that the cheapness of European sugar in the markets of the world is due to bounties, and to a trifling extent this may be the case in countries near the producing districts. But the main reason for its cheapness, is perfection in cultivation and manufacture. Indeed, no more striking illustration of the old fable of the hare and the tortoise could be chosen than the change in the relative positions of the towering cane and the humble beet.

The former from time immemorial has contained eighteen per cent. of saccharine matter by weight, from which most planters extract in a debased form half of the sugar the plant contains. The mangold, the original form of sugar beet, contains four per cent of sugar. The Germans, from improved varieties of beet extract close on to twelve per cent of their weight, to a great degree in the form of pure white sugar fit for direct consumption, or about three times what would be produced from the root not many years ago. It is to progress like this and not to bounties, that the cheapness of European white sugar is due, and if cane planters have a rude awakening by finding their own home markets invaded by Germany or Austria, it may at length cause them to realize their position, and ask how they can continue to make a profit if they sacrifice half of their possible income.—*London Produce Markets Review.*

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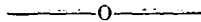
### *SUGAR IMPORTATIONS INTO THE UNITED STATES.*

An American exchange has the following regarding the increase in the consumption of sugar in the United States. It will be seen that these islands stand third in the list of countries supplying sugar. This increase referred to is only the natural demand to supply the very rapidly increasing population of that country, which from this time on cannot be less than one and a half millions yearly.

“A remarkable increase in the amount of sugar imported into this country has taken place in the past few years, the value of our imports in sugar, molasses, etc., in the twelve months, ending June 30, 1885, amounting to \$68,531,495, while last year it was \$89,737,284. In neither case do these figures include the imports from the Hawaiian Islands, which last year amounted

to \$11,559,142, and which would swell the grand total to more than \$100,000,000. The increase is due chiefly to the heavy increase in the imports of beet sugar, which comes mainly from Germany. In the twelve months ending June 30, 1888, our imports of beet sugar from Germany were about two per cent. of our total sugar imports, while last year they were nearly 16 per cent; indeed, Germany has now taken second place in the countries supplying the United States with sugar, as is shown by the following table giving, by countries, the value of over 98½ per cent. of the sugar imported into the United States during the year ending June 30, 1890 :

COUNTRIES.	VALUE.
Cuba.....	\$39,099,670
Germany.....	16,098,224
Hawaiian Islands.....	11,559,142
Austro-Hungary.....	1,578,494
Brazil.....	1,659,261
British West Indies.....	8,910,130
British Guiana.....	4,325,370
Dutch East Indies.....	2,722,320
San Domingo.....	1,715,460
Porto Rico.....	3,861,247
Philippine Islands.....	6,817,886
Danish West Indies.....	490,284
Great Britain and Ireland.....	931,676



### *PLANTATION LABORERS.*

The most important question that can come up at the Annual Meeting of Planters next month is that of Labor. With the large number of Chinese, Japanese and Portuguese now in the country, there ought to be the material for an ample supply of laborers. Those who have not kept account of the imported labor population may not know the number of these that are now part of our population. The best estimates are as follows :

Chinese of all grades.....	17,000
Portuguese, including women and children.....	14,000
Japanese " " ".....	14,000
Total.....	45,000

Of these probably 35,000 are males, most of whom have served as laborers on the plantations. The Portuguese increase in

number steadily by births and at the rate of at least five or six hundred annually, over the deaths, so that at the end of this century, they are likely to number 20,000 or more in this Kingdom. It would seem as if a sufficient number of this class had been imported for the best interests of the country, and that no more should be brought here. So, too, of the Japanese, the number of whom is quite as large as is safe for the Kingdom to have in its borders.

It is to China then that planters must look for their future supplies, provided laborers can be secured on terms that will compel their re-engagement under specified rates, or return to their own country. This will necessitate some uniform system of registration, by which they can at any time be identified wherever they may be. What is needed is something similar to the system under which the Japanese are registered by their consular or government officers. It is said that Japanese laborers cannot run away except at the risk of being recognized and returned to their employers. It is well known that every Japanese man, or woman, on arrival, is registered at the consulate, receives a number, and is known by that number as long as he remains under contract. He may run away from Kauai and go to Hawaii, but sooner or later the Japanese officials will find out where he is and send him back to his employer. This will show that registration of laborers can be made so as to protect the employer. But some better or more effective system may still be devised, if the subject is thoroughly investigated, and fully discussed by those who have had experience in it.

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### *THE AMERICAN SUGAR TARIFF.*

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The advices received by mail on the 19th instant were that the American Senate has passed the Tariff Bill with the Aldrich reciprocity amendment. The House opposed Mr. Blaine's reciprocity project, but it is understood that leading Republican members have since been converted to that belief, and that conference is likely to result in harmony, and the passage of the bill as approved by the Senate. The lowering of the standard of sugar to be admitted free of duty from No. 16 to No. 13 is in the interest of American refiners. It gives them free sugar to

work on, while affording them protection on partly refined grades. Sugar growers in the United States must look to the bounty of two cents for their protection. The present tariff on raw sugar is 1.45 cents a pound on that testing not above 75 degrees by the polariscope, with four-tenths of a cent a pound for every additional degree or fraction thereof.

The Reciprocity Amendment authorizes and makes it the duty of the President after July 1, 1891, to impose duties on sugar, tea, coffee and hides, coming from countries which do not, in his opinion, extend reciprocal advantages to the United States. It leaves him great discretion by making what constitutes proper reciprocity a matter of opinion.

The bulk of Hawaiian refinery grades being between 13 and 16 Dutch standard, they will receive a protection of four-tenths of a cent instead of the higher rate which will soon be abolished, and which averaged perhaps under two cents per pound. This, as we understand the subject, will be the result, as far as regards the duty—a loss of about four-fifths of the duties before received.

It is very doubtful how this change in the American tariff will at first affect the price of sugar in America. That there will be a much larger importation of beet sugar from Europe appears likely, but to what extent it can be sent to America and not affect the price in Europe is another question; the solution of which remains to be ascertained. The price which Hawaiian sugars will command in San Francisco will be governed as now by the daily quotations of similar grades in New York, and these will fluctuate as much after the new treaty goes into operation as they have under the higher tariff.

The reciprocity clause also will tend to unsettle the price, as this measure will be carried into operation only by treaties, and what treaties will be made and with what countries remains to be seen. For instance if Germany or Spain refuse to meet the demands of the American Government on the score of reciprocity, no sugars from Germany or Cuba can enter the United States without payment of the present high duties.

Probably no tariff law was ever passed that carried so great uncertainty regarding its operation as the present singular one, and all interested in its operation will have to await further developments.

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*MANUFACTURE OF DARK CRYSTALS FOR THE  
AMERICAN MARKET.*

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It is becoming more and more the custom in the colony to make dark crystals or non-chemical sugar, instead of making far famed yellow crystals for the English market. The causes of this are various, but amongst others may be noted : 1. The dark crystals can be sold in Georgetown, whereas the yellow crystals must go home to England before they can be sold. 2. The cost of manufacture of non-chemical is much less than that of the yellow. 3. Much less supervision is required in the factory. The process is as follows for dark crystals : The freshly expressed cane juice is pumped by the juice pump through a juice heater and heated to boiling point, and discharged into a gutter running over the subsidiers ; it is then limed to neutral point, and allowed to subside for a short time, then run to the eliminators, boiled sharply for a few minutes and discharged into the suction box of the concentrator ; it is then boiled till enough water has been evaporated and juice stands at about 20 deg. Baume ; it is then sent to suction boxes to pans and granulated, then being finally discharged as *masse cuite*, cured and sent to sugar store, where it is packed and shipped. On the other hand, the manufacture of the yellow crystals is much more complicated. The cane juice from mill is now first pumped through a sulphur box and thoroughly sulphured ; then through juice heater and raised to a temperature of about 180 deg. Fahrenheit ; into the subsidiers or clarifiers, limed, and then steam turned on till juice cracks ; then subsided and sent to eliminators, where phosphoric acid is added ; then to concentrators and to pans, where the bloomer for giving the rich yellow tinge is added, and then to centrifugals and sugar store. It will be easily seen that the above is a very delicate process ; the juice can not be cracked in juice heater, but must be heated again in clarifiers, whereas in the dark crystals it can be cracked in heater. Then again the sulphuring of the juice and the tempering and acidulating require great care and any amount of supervision. Expenses all round are higher, and it takes 10 to 15 per cent more juice to the ton of manufactured sugar.—  
*Demerara Corr. Louisiana Planter.*



## CORRESPONDENCE AND SELECTIONS.

*THE ORIGIN OF SOILS.*

BY DR. G. G. GROFF, BUCKNELL UNIVERSITY.

Soil is the unconsolidated earthly material which in most places covers the rocks of the earth. It is usually of considerable thickness and consists of exceedingly variable proportions of sand and clay, with vegetable mold, iron oxide and smaller amounts of iron, magnesia, potash, phosphoric and sulphuric acids.

Mold, or humus, is the darker surface soil, colored with decayed organic matter.

The subsoil is lighter in color and contains much less organic matter. Both soil and subsoil vary greatly in thickness and quality in different locations.

Soil originates from the decay or weathering of the rocks of the earth, to which decayed rock mass is added a variable quantity of decayed organic matter; that is, the products of animal and vegetable remains. The disintegration of the rocks of the earth is brought about by mechanical and chemical action. We consider first the effects of mechanical action. Frost is a principal mechanical agency in the production of soil. Any one who has observed the action of frost along recent street or railway cuttings has noticed the rocks broken into fragments and made smaller and smaller through the effects of this agent. Whatever rocks water can penetrate will, through the action of frost, be broken into fragments and finally reduced to soil. All of these smaller rock fragments and stones in the soil which absorb water will, year by year, be reduced to smaller particles; and hence the value of plowing soils in the autumn and exposing them to the winter's frosts.

Another mechanical agent is water. The falling rain, striking the rocks of the earth in an insensible manner, wears them away; and not only falling rain and running water reduces the rocks to soil, but water is able to dissolve certain rocks with considerable readiness. Thus limestone is soluble in atmospheric water. The lime dissolves and is carried away by the water, while the impurities in the rock largely clay, remain

behind and form the soil. Atmospheric water can also dissolve sandstones, the grains of sand of which sandstones are formed being frequently cemented together by carbonate of lime. This cementing material is dissolved out by the rain-water, and the sandstones are broken up into soil. Not only does frost and rain reduce the rocks to soil, but alternation of heat and cold acts in somewhat the same way as frost. This action is most marked in regions where the days are very hot and the nights cold. In such regions the sudden cooling of the rocks causes the surface particles to break off, and soil results. Such action has been observed in the Sahara Desert and on our Western plains.

The wind, also, to some extent, aids in the production of soils: where it carries with it corroding sands which, forced against and over the rocks, reduce them to soil; but this action is insignificant. The roots of trees and of plants penetrating rock crevices crack the rocks apart, and make opening for the entrance of water and frost.

Although the mechanical agencies above enumerated are important elements in the production of soil, the chemical agencies are probably still more important. One of these agencies most important is the oxygen of the atmosphere. This element, which directly supports animal life, has a constant tendency to enter into combination with almost all forms of matter, and so attacks the mineral substances in exposed rocks and by forming new compounds, causes the rock to crumble to pieces. Such processes are called oxidation, and are taking place continually on the surface of the earth. Not only does the oxygen of the atmosphere tend to enter into combination with the rocks, but the rain-water and the carbonic acid in the rain-water also in many cases, unites with the minerals of exposed rocks, producing new compounds, and in the formation of these new compounds the rock is disintegrated. In the decay of the organic matter on the surface of the earth, acid bodies are formed to which the general name of humic acids is given. These acids dissolve in the rain-water and are carried down to the soil, and reaching the rocks act upon them and assist in their disintegration. Through these agencies and others of minor importance, the solid rocks of the earth tend continually to pass into soil.

That soils are produced in the way just indicated may readily be made clear to any one who will take the trouble to walk along a recent railroad cut or street, or who will examine any opening in the earth recently made. At such places one will see at the surface of the earth, first, a dark colored mold of variable thickness; then a lighter-colored subsoil. This subsoil will finally pass in an insensible manner into the rock soil, and as we pass down we will find the loose material of the surface gradually becoming, first, soft rock, then harder and harder rock, until at a sufficient depth we find the best building stone. Hence the experience, that in stone quarries, the best rock is only reached at a considerable depth or at a point to which the atmosphere and rain-water have not penetrated.

In many places we may observe a hard ledge or vein of rock, extending all the way from the solid rock below into the soil above, where it is broken off and scattered over the surface. This hard vein the air and water have not been able to dissolve and so it extends to the surface, a proof that originally the whole mass of soil was solid rock.

Another proof that soil is dissolved from the underlying rock is obtained by analyzing the soil and the rocks, when it will be found that both have substantially the same composition.

It may be interesting at this point to explain in what manner some of the most common rocks are transformed into soil.

We have already shown that limestones are dissolved through the action of rain-water. Limestone is rarely pure, however, for, in addition to the lime, there is a large amount of foreign matter. The carbonate of lime dissolves through the action of the rain-water, and much of it is carried away by the solvent, leaving behind the clay, oxide of lime, magnesia and other substances that were present as impurities. These processes of carrying off the limestone have proceeded so far in some places that the soil resulting from the decomposition of the limestone is nearly destitute of that mineral, it having been carried away by the water and only the impurities left behind. Limestone soils in different localities differ greatly, because of the greater solvency of some rocks over others. Much in the same way as limestone is reduced to soil through the action of rain-water, are shales, slates and sandstones

reduced, these rocks all containing carbonate of lime, which is eaten out by the rain-water, and the rest of the rock being left to form soil.

In the case of granitic rocks, it is somewhat different. These rocks, when typical, consist of three minerals, namely, quartz, mica and feldspar. Quartz is the mineral known as "flint," while mica is familiarly known as "isinglass." Feldspar is a light colored mineral, resembling marble, but twice as hard. Of these three constituents, the feldspar is the only one soluble in water; but not all of the feldspar is soluble. Minerals of the the feldspar class, or family, consist of silicates of potassium, sodium and aluminium. The potassium and sodium compounds are soluble in water, while the aluminium compound is not soluble. Hence, when the feldspar is dissolved out of the granitic rock, the mass falls to pieces. The quartz and mica remain to be reduced to soil through the mechanical agencies, while the insoluble portion of the feldspar remains to form bodies of clay or kaolin. We only find kaolin in granitic regions, and the explanation of its origin we have already given.

We pass over this explanation of the origin of soils to their classification. All soils may be thrown into two great classes, for purpose of classification.

1. Soils of disintegration; that is, all soils found in ordinary places, except on the seashore and in river bottoms.

2. Soils of disintegration and transportation. Under this second head we place first, alluvial soils, that is, soils of river bottoms, deltas, prairie soils and so forth; second sea-shore and other sandy soils; third, drift soils. Taking each of these for a moment's consideration, the alluvial soils are seen to be the soils removed from the upper course of streams and transported to the lower lands along the same. Running water continually tends to wash the soils from our hillsides. The stones, gravel and sand are carried but a little distance, while the finely divided clay and organic matter may be carried hundreds of miles, and is finally deposited in the lower course of the stream. Alluvial soils are seen to be produced, first, by disintegration, and then transported to their present resting places. It is through the action of running water entirely that the depth of soil is slight on the top and side of hills and

mountains and in greater depth in the valleys below. Prairie soils have probably been formed at the bottom of shallow, fresh-water lakes. This soil is much like that which accumulates in milldams. Much of the great prairies was, until recent times, under water.

Sea-shore soils are mainly sandy, and this sand is mostly composed of silica or quartz, although at the mouths of the large rivers, or places to which the currents have brought the muddy waters of large rivers, the sand may be replaced by a considerable portion of organic matter. This soil, too, has been produced by the disintegration of rocks.

Drift soils are found only in Northern latitudes, in the United States, mainly north of the thirty-ninth degree of latitude. They consist to a great extent of gravel and heterogeneous rock mass, and it is believed that they have been produced through the agency of ice and running water at that period of time known as the "Glacial epoch." These soils, from the large amount of gravel and its great depth, are often very porous. The New England States, New York, Northern Pennsylvania and the Northwest are largely covered with drift soils.

Different rocks produce soils which in a general way vary greatly in their natural fertility. The following statements are found to be true: Limestones and lavas usually produce rich soils. Alluvial and prairie soils are usually rich. Gypsum and chalky soils are very variable, some good, some bad. Sandy soils are poor and unless some clay is present are usually worthless. Serpentine produces poor soils. Shales produce variable soils, some good, some poor. Metamorphic rocks produce variable soils, depending upon the composition of the rock, some being quite fertile while others are sterile.

If this theory of the origin of soils is the correct one, it is observed that new soil is continually being produced from the underlying rocks, to take the place of that which is washed away by the rains. The rocks furnish to the soil the potassium, phosphoric acid and lime, as well as other minerals which plants need. Hence, on rolling and hilly soils, these are continually furnished by the underlying rock (though not always in a readily available shape). We see, then, one reason why a rolling farm may have a better soil than a perfectly level one.

It may be interesting to here give two or three tests by which the quality of an untried soil may be discovered. One test is by the crop growing naturally upon the soil. Yet this test is not to be relied upon; for some soils, naturally very good, may not, from various reasons, have a good crop growing upon them when first inspected by civilized man. Thus, in parts of Pennsylvania, when the first settlers were inspecting the lands, rich river bottoms were passed over and hilly and mountainous sections chosen, because the bottoms were not covered with such a heavy growth of timber as the more elevated regions, it having been burned off by the Indians; and the same thing has been observed in some of the Western States. Another test is that of texture and color. One familiar with soils can tell something of the value of a new soil by its texture and color, but this also is not always to be depended upon. A third test, and the best one, is by planting a crop; and this actual test should always be made before the soil is decided to be worthless. A chemical analysis should also show the composition of the soil, and tell much concerning its probable worth.—*Corr. Independent.*



### *EXPERIMENTAL CANE CULTURE.*

We are in possession of a copy of the annual report on "the Botanic Gardens and their work for the year 1889;" but are unable to deal with it fully this week. We consequently confine ourselves to the experimental cultivation of the sugar cane which has for several years past been carried on upon the ground aback of the Gardens. As that ground is remote and difficult of access, Mr. Jenman had, last year, a half row of the principal varieties of cane grown in the Nursery, for inspection by visitors who might not care to take the trouble to go aback. The land of the Nursery is much richer than that aback, having been repeatedly manured in past years with stable compost. As a consequence, the yield of cane upon it was double that of the land aback. Both sets were twice manured with gypsum and peruvian guano, at the rate of two barrels of the former and three cwt. of the latter to the acre, half of each being given at each dressing. Although the land

aback is very poor, it yielded, in consequence of the wet seasons experienced, an average weight of cane. In the Nursery plot the land is tile-drained, and consequently possessed one-sixth more bearing ground than the land aback. That, however, does not account for the enormous difference in the yield of the two plots, which was solely due to the difference in the quality of the land. Both plots are insufficiently drained, the Nursery plot being, however, the worse of the two in that respect. The lamented death of Mr. Francis, the late Government Analyst, prevented the analysis being made as early as in previous years. But Professor Harrison immediately after his arrival, energetically entered upon the work, and the very elaborate table of results furnished by him is given in the report. In connection therewith, Mr. Jenman observes that the juice on sugar estates generally was poor last autumn, but had improved with the age of the canes when they were cut. Of the canes grown in the Gardens, the yield of the White Mauritius, a variety which Mr. Jenman regards as the same as Selangore, was greatly in excess of any other variety of the plots aback, as well as of the plot of Selangore. This, however, was due to the fact that it occupied a ridge of elevated friable land at the end of the field. As a contrast, showing how much circumstances affect the yield of the same kinds, the rows of White Mauritius and Selangore in the Nursery were almost at the bottom of the list in weight of yield. It is impossible to deal in detail with Mr. Harrison's table to day, but we may mention that of the two kinds named by Mr. Jenman the yield per acre was as follows:—White Mauritius—Number of Canes, 33,900; weight, 65 tons, 4 cwt., 52 lbs; gallons of juice 10,410; sucrose in juice 15,240 lbs.; Selangore—Number of canes, 24,900; weight, 41 tons, 10 cwt., 40 lbs.; gallons of juice 6,635; sucrose in juice, 6,349 lbs. The canes analyzed were two-year-old ratoons. Mr. Jenman says that, taking the best varieties, the yield is one of the greatest he has ever seen recorded; but, taking all the 42 varieties, equal proportions of each, standing on 50 square roods, yielded 17,282 lbs. This, multiplied by six, gives as the yield per acre, 46 tons, 5 cwt., 92 lbs., and the number of canes, 18,324.

Concerning the very interesting experiment with seedling canes, much very valuable information is given. Mr. Jenman

says that in April Mr. Bovell sent over a seedling from Dodd's Botanical Station at Barbados, which at the time was about three inches high; but which at the time he wrote (31st March) had grown into one of the most robust cane plants he had ever seen. (This is the cane the analysis of which was given in the *Argosy* of last week). The variety is distinct from any Mr. Jenman had previously known. Again in December, Mr. Bovell sent twelve canes of the best varieties raised at Dodd's in 1888. All these are likewise distinct from any of the kinds in cultivation here. So that, in addition to the lot of seedlings raised here last year, the Gardens now possess and have under trial nearly a dozen seedling canes raised in Barbados. In connection with this subject, Mr. Jenman observes that, the secret of the cane's seminal fertility having been discovered, one of the chief duties of the future will be the raising, testing and selecting of new cane stock, with the object of obtaining varieties superior to any now in cultivation. Previously, the experimental cane work at the Gardens had been confined to collecting the known varieties from different parts of the world, growing them side by side to determine their cultural character and qualities, and subsequently chemically analyzing them to ascertain their qualities for manufacturing purposes.

This was sufficient to enable planters to judge which varieties were worth cultivation and which were not. Now, however, the discovery of the sugar cane's seminal fertility, and of the prospect of obtaining thereby numberless new varieties, gives a new aspect and importance to experimental cane cultivation. Hitherto, the cost has been defrayed from the annual votes for the flower garden and nursery at the Botanic Gardens, but the time has assuredly now arrived when a special vote has become necessary to carry on the work with the completeness of detail, and on the enlarged scale required. It has become necessary to have mill power to grind a sufficient bulk of canes to ensure certainty in the results of analyses. Mr. Harrison thinks a small horsemill, such as the peasant farmers of the West India Islands use, will suffice for the purpose. This can easily be obtained, and will remove the objection to increasing the area of the experimental plots, the extension of which would enable experiments with different



manures to be carried out. There is sufficient unoccupied land at the back for the purpose, but it is poor and insufficiently drained; and Mr. Jenman says that he sees no way of removing the latter obstacle. But, we are quite sure that if the Government will consent to ask the Combined Court at its next session to provide funds, not merely for the carrying out of experiments in seedling cane culture, but also for the clearing and enclosure of an adequate area of land, really suitable for cane culture—which that aback of the Botanic Gardens most certainly is not—and of which there are millions of acres readily accessible on the banks of our rivers, the Court will respond in no niggardly spirit. The opportunity of improving illimitably the chief factor in our principal industry is at this moment ours; if we let it pass other cane-growing countries will not, and British Guiana, which now holds almost the foremost place, will be left in the rear.—*Demerara Argosy*, June 28th.



#### *EFFECTS OF SEASONS ON AGRICULTURE.*

Other subjects, besides the propagation of new and improved varieties of sugar cane from seed, of the very highest importance to an agricultural community, are dealt with in the report by Mr. Jenman on "The Botanic Gardens and their work for the year 1889." Among these, Mr. Jenman assigns the first position to the influence of weather and seasons on crops, and we propose to follow his example, the almost unprecedented continuance, with only a short interval, of what may fairly be designated wet weather from the middle of November last to the present time, a period of very nearly eight months, having a very important bearing on the subject; although Mr. Jenman's remarks are properly confined to the meteorological and other exceptional conditions of last year. He begins by telling us that the dry weather which prevailed through the latter half of 1888, continued until the middle of August, 1889, and was followed by five months of heavy rain; then succeeded two dry months; after which the year closed with a month and a half of heavy rain, the total fall for the year, recorded at the Gardens, being 123.52 inches—the largest since the Gardens were established, eleven years ago. Indeed, many years have

passed since so extensively wet a year was experienced in the Colony. The highest annual fall during the last ten years (1880 to 1889 inclusive) was 99·55 inches in 1866, the mean fall for the period being 84·75 inches. There was considerable variation in the rainfall of different parts of the Colony, though everywhere the fall was much higher than usual. Even within small areas the variation was very material. This is exemplified in Georgetown, where a record is kept at four separate stations in an area of less than a square mile. At the Botanic Gardens the total fall for the year amounted, as already stated, to 123·52 inches; at the Demerara Foundry it was 114·61 inches; at the Water Works, 108·66 inches; at the Colonial Hospital, 101·81 inches; the mean of the four stations being 105·67 inches. The published records give a mean for the whole Colony of 105·67 inches. The mean of the different counties for the past two years (showing that of the large islands in the Essequibo separately from that of the main land) was as follows :

	1888.	1889.
Essequibo .....	85·56 inches.	112·23 inches.
Essequibo Islands .....	87·92 “	110·79 “
Demerara .....	78·25 “	110·84 “
Berbice .....	67·85 “	88·84 “

According to these figures, the rainfall in the County of Berbice seems (as Mr. Jenman observes) to be nearly uniformly lower than in the counties lying north of it. At the Botanic Gardens in 1889, rain fell on 189 days, against 171 in the previous year. The quantity exceeded an inch on 46 days, as against 26 days in 1888; and was slightly more than five inches on two days, the 2nd of May and 2nd of August, respectively, the fall on the latter day being confined to a heavy shower of about two and a half hours' duration. Seven months—April, May, June, July, August, November and December—were wet; June, July and December, excessively so. Only one day in the previous year did the rainfall exceed three inches. Mr. Jenman observes that between the highest and lowest annual rainfalls recorded at the Gardens in the decade ending with 1889, there is the enormous difference of nearly 100 per cent. On referring to the detailed returns for the period (included in the report) we find the lowest annual rainfall recorded was 59·05 inches in 1885, or about half the quantity that fell in 1889. Bright sun-

shine was recorded on 354 days, leaving only 11 days on which the sun was all day entirely obscured; though on many other days only a few minutes of bright sunshine was recorded, even a slight cloud or mist being sufficient to interrupt the record. The mean of the daily duration of sunshine for the year was slightly under seven hours; 1889 being the first year in which a record of the duration of sunshine was kept, no comparison with previous years is possible. But the rainfall for the year being so much greater than usual, it is probable that the duration of sunshine was less than usual. The duration of sunshine in each half of the year was nearly equal, the periods of greater and lesser record being correspondent with the respective wet and dry seasons. The mean maximum day temperature of the year was 86 degrees; that of the night minimum barely 75 degrees, while the mean maximum in the sun was nearly 146 degrees. The highest day temperature in the shade was 90 degrees, which occurred twice in October, but 88 degrees and 89 degrees occurred frequently in August, September and October. The lowest night temperature was 70 degrees, which occurred twice in January and once in June. The highest solar radiation record was 169 degrees; it occurred once only in November; the lowest dew point on the grass, 65 degrees, also once only in November.

Having thus laid the basis of his conclusions, Mr. Jenman proceeds to describe the effect of the phenomenal weather of 1889 upon the agriculture of the year. The dryness of the weather during the earlier months of the year (owing chiefly to its being a continuation of a longer period of similar weather in the preceding year) unfavorably affected both agricultural and forest industries. Planting could not be carried out on estates, and growth in the fields was reduced to a very low rate. Gold digging operations also were restricted, many of the forest streams used for washing out the metal being dried up. Balata ceased to be a fluid, and could not be extracted from the bark of trees; while the water in the creeks in some situations became too low to admit of the floating of timber out of the wood-cutting grants. This dry, or relatively dry weather, lasted up to the middle of April, after which for several months the other extreme prevailed—the usual case in this country where the seasons oscillate from one extreme to

the other. In the early months of the year the ground was too dry for cane tops to grow when planted, or for stools to spring when cut. At the close of the year it was too wet; the tops when planted rotted in the sodden soil, while the stools when cut perished over large areas. During the summer, however, growth was rampant, and when the grinding season arrived in the autumn, the fields bore one of the heaviest crops ever cut. Unfortunately, there was not a proportional yield of sugar from the heavy growth of canes, as the juice was poor, being at least 20 per cent. inferior to that of normal seasons. The excessive bulk of the crop involved a large increase of expense in reaping, transporting and grinding, while the yield of sugar was only normal. Proprietors' profits were consequently diminished rather than increased by the exuberance of the crop. Similar results were experienced in gardening. The opening months of the year were too dry for planting, the summer months too wet, the autumn again too dry, and the winter months too wet. The planting done with the advent of rain in April failed, as all but the most robust kinds of plants perished by the excessive rains of the ensuing months. The victims included a large quantity of rose plants imported to replenish the beds and borders in the Gardens. With the change to the autumn drought (though it was not nearly so severe as usual) many of the established subjects in beds and borders also died, being unable to bear the sudden change, and such wide extremes of drought and deluge. An acre and a half of woodland planted after the autumn drought fared as badly as the garden subjects had during the summer season, and required to be in a large measure replanted. Graziers also suffered, the unempoldered savannah pastures being submerged during the greater part of the year. Still, notwithstanding these disadvantages, the year was on the whole a prosperous one for the Colony, trade being active and expansive. In the value of the great staple of the Colony, there was a considerable advance during the spring months, and, though it receded again before the bulk of our sugar was put in the market, the produce realized more per ton than it had for several years before. The forest industries also were active and gave considerable stimulus to trade. They consist chiefly of balata, timber and gold. In all there was material increase. Of gold, the quantity exported was nearly

double that in the previous year. In proof of these assertions Mr. Jenman appends, for the purpose of comparison, tables of the principal agricultural products, also of minor articles of natural produce, in 1888 and 1889 respectively. The excess under the former head in the latter over the former year being considerably over \$2,000,000. The value of the minor articles exported in 1889 was \$1140 less than in 1888, but it is gratifying to observe that it was due almost entirely to the lesser quantity of bird skins and feathers exported, the value in 1888 having been \$908, while in 1889 it was only \$480. Fruit and plantains are the only other articles that exhibit any conspicuous decline, while that of cassava starch on the other hand leapt up from \$493 to \$2,229. Referring particularly to the conditions of the Gardens at the time he wrote (March 31st, 1890) Mr. Jenman thus describes the effect upon them of the excessive rainfall of last year:

“During the heavy, long-continued summer and winter rainy seasons the cultivated land of the Gardens suffered from almost unintermitted and excessive saturation, and frequently complete flooding of water. The soil in all the tilled areas settled down as a consequence with great density, as was manifested by its concreted condition, when it became dry and contracted, in the subsequent dry season. Weeds naturally grew apace while the rain lasted, and could only be removed by hand, for the surface was too wet, sloppy and putty-like for a hoe to be used upon it. To prevent the smaller plants being smothered by the rampant weed growth, hand weeding had frequently to be practiced, though the necessity, considering the condition of the ground, was an unfortunate one, as the trampling of the working people's feet puddled the surface into a state entirely inimical to the health of the plants. Frequent and deep tilling is now required for several months under moderately dry or mild weather, if such should fortunately be realized, to restore the land to a healthy state again. I regret to say, however, that, much as this is needed, it cannot be afforded to the extent required.”

If, as we have no doubt, such was the condition of the Gardens three months ago, their condition after subjection to a further period of more than three months of comparatively “heavy wet” must be considerably worse, and will require a good deal of extra expenditure to relieve it. It may be hoped that in the exceptionally prosperous condition of the Colonial finances His Excellency the Governor will not hesitate to authorize whatever expenditure may be necessary for the purpose.—*Demerara Argosy.*

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*SCIENTIFIC EDUCATION.*

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Commenting in our last issue on the arrival of a new Island Professor of Chemistry, and the work that lies before him we insisted on the necessity of greater prominence being given to scientific teaching in our first and second grade schools. As we observed, chemistry is at present looked upon merely as a by-subject, even in the solitary school in which it is taught. It leads to no scholarship that can help its winner to an education in England, and consequently the best talent of our schools is devoted to classics and mathematics—things good in themselves, we do not gainsay it, but not sufficiently to our purpose. We urged that natural science deserves better of us; that in the application of science to our agriculture, lies our only hope of maintaining our prosperity, and that a proportion of our youth should be encouraged to devote their best attention to it. We may import professors of chemistry and they may experiment and analyze; but until we have men educated to go between them and the rank and file of our planters—pioneers, who will test practically and on a large scale the conclusions arrived at by them in the laboratory and on the experimental plot—we shall not make commensurate progress. Could we but contrive to carry the teaching of chemistry—more especially in relation to agriculture—into all the schools of the island that are now supplying us with our planters it would greatly promote our advance. It is generally conceded now-a-days that biology, physics, and chemistry, constitute most important branches of education. The methods of science are precise; accuracy is essential in its procedure. The teaching of science inculcates habits of accurate observation and reasoning from observed facts. The pupil is not taught to believe this and that because some one has said it: he is told to see this and that for himself with his own eyes and know it for fact. He is taught to observe closely and think for himself, and a habit of this sort must be invaluable to men, who like our planters, have to study the ways of nature. We shall get back cent per cent for all we spend in imparting to our embryo planters even the rudiments of scientific knowledge. We have spoken chiefly of the planter, for with his interests we are here mainly concerned; but what we have said of him applies more widely.

And apart from its bearing on the mere £ s. d. side of the question we shall find our gain in other directions. Some acquaintance with the principles of natural science enlarges our ideas. We remember what an event in our personal experience it was when first it was demonstrated to us in the course of chemical experiment that there is no such thing as destruction of matter; when first we saw the gases and aqueous vapour evolved by the combustion of a candle collected and weighed and shown to be of the same weight as the candle consumed and found from that and other considerations that nothing is lost in nature, nothing destroyed; and again, when we learned of the co-relation of forces and the conservation of energy throughout the universe. Those boys who are fortunate enough to be within reach of Harrison College have some opportunity of gaining an insight into those great principles that underlie natural phenomena. But what chance have our youth in the out parishes of acquiring any real conception of such fundamental truths, truths that once grasped immensely widen the mind.

We cannot but think that the Agricultural Society, as the mouth-piece of the planting interest, should address the Executive or the Education Board on this subject, and urge the need, if indeed this be required, of putting facilities for the acquirement of the elements at least of chemistry and such sciences as bear on the planters' work, within reach of our rising generation throughout the island. Scientific education is a prime necessity of our time, and we repeat, must not be suffered to hold a secondary position at our schools.

We have been led again to this subject though we had intended more especially to confine ourselves to same remarks on the experimental work that is being done at Dodd's and is required to be done in other parts of the island as well. We have been led to it through feeling that without such extension of scientific teaching the work of the experimental stations will not be generally appreciated at its right value nor be productive of its maximum good. It must be borne in mind that scientific agriculture is a comparatively new thing. "It is indissolubly associated with the experiments that have been made at Rothamstead for just about fifty years, and which were instituted by Sir John Bennet Lawes." We met recently

an account of an interview with this veteran scientific agriculturist by a representative of the *Pall Mall Budget*, and were much impressed by a remark of Sir John to this representative, which bears on what we have said." "What I feel most," said he, "is how little can be done in one lifetime. It takes so long to test our theories, and we know so little of the influences of soil and atmosphere that we make many false steps. A man who enters into this work should have several lives, for in actual experiments with soils, unless the same land can be employed, every one must go over exactly the same ground we have." And if everyone must go over the same ground it will need a wide diffusion of scientific knowledge to render successful results possible. Professor Harrison in bidding farewell to the Agricultural Society told us that if he had done anything to help us on with our agriculture we must in part thank Sir J. B. Lawes for it, for on hearing of his appointment to the post he filled so ably here, Sir John invited him to Rothamstead to study the methods of experiment there pursued. Now we have our Dodd's Station fairly on the way, and are going over the ground there, with reference to our particular need, that Sir J. B. Lawes has already indicated for all the world. In other parts of the island we must at Government Experimental Stations go over the ground that has been traversed at Dodd's, and finally each planter will have to "go over the ground" for himself on his particular estate. Every estate will in time, we venture to prophecy, have its manure record as carefully kept as it is at Dodd's; but if this is to be done efficiently we must see to it that we make provision for the coming planters' education in science.

Sir J. B. Lawes was led to his special line of investigation by a remark made to him by his neighbour, Lord Dacre, to the effect that bones used as manure produced excellent results on one farm, while on another they were comparatively useless. This laid the train, and investigations were made and experiments tried that led to important discoveries as to the application of artificial fertilizers.

The requirements of the soil were evidently different. Similar cases concerning the requirements of our soil will probably crop up when we begin to apply the conclusions arrived at from the experiments at Dodd's to other parts of the



island, the highland and ratooning districts more especially. As an illustration of the seemingly contradictory results arrived at by experimenters in different parts of the world, we quote two passages, one from Dr. Stubbs report from the Sugar Experiment Station in Louisiana, the other from the Dodd's Station Report for 1889.

Dr. Stubbs: "That no form of potash is preferred by the cane plant, and that small quantities neither increase the tonnage nor the sugar content."

Messrs. Harrison and Bovell: "On both series of plots the addition of potash salt to the other manurings has resulted in increased yields of canes, of cane juice, and in the saccharine richness of the cane juice and canes. These results taken in connection with the concordant results obtained at Dodd's during the three previous years point to the necessity of potash applications for soils such as Dodd's, and possibly to the fact that in the cultivation of the sugar cane as in that of others of the graminaceæ, potash is the first of the mineral constituents of soils which becomes exhausted."

For us and our soils it would seem that potash is required. May be they have enough of it in Louisiana. At any rate looking over Professor Harrison's note book of analyses with him shortly before he left the island, we were struck by the progressive increase in the percentage of this element in the manures analyzed by him during the last eight or ten years; and we know how our crops have been steadily increasing.

What holds of one holds of others. We want to know what our soils require, what the cane requires, and what special varieties of it require so as to be able to supply it. Our new Professor of Chemistry has an interesting field for investigation before him. With a painstaking coadjutor like the present Superintendent of Dodd's, already on the way, the reports that issue from Dodd's as the result of the joint labors of Messrs. D'Albuquerque and Bovell should not be less interesting and instructive than those that resulted from the collaboration of Messrs. Harrison and Bovell.

But it will be evident from what we have adduced that another experimental station is required on the highlands in the ratooning district. As time goes on we may find this even not sufficient for our needs. It should be borne in mind that

Dodd's was not originally selected for an experimental station but for a reformatory.

We require now a much larger estate for our second station—a fine large estate should be secured. It will surely pay its way like any ordinary estate, and the profit over and above probably defray the cost of the experiments conducted on it.—*Barbados Agricultural Gazette.*



### CALUMET FACTORY REPORT, 1889-90.

Since my report of the campaign of 1888-89, four alterations worthy of note have been made in the plant at Calumet.

Immediately in front of the existing five-roller mill was placed a three-roller mill, the rolls of which are four feet three and one-half inches long, and thirty inches in diameter. The journals of its top roll are ten and one-quarter inches long and eleven inches in diameter, and those of the bottom rolls are ten and one-quarter inches long by eight and one-half inches in diameter. This mill is equipped with Rouselot housings, exceedingly heavy wrought-iron and steel turn-plate, and steel pinions and crown-wheels. The driving shaft is eleven and three-quarter inches in diameter. The rolls were kept very rough, and were intended not only of themselves to give a higher extraction of juice, but also to prepare the cane for better and more uniform work by the five-roller mill. This addition makes in all eight rolls, or two three-roller mills and one of two rolls.

There were also added at the double effect two of Gaunt's helix separators; one for entrapping oils and water from exhaust steam, just before it entered the steam chamber of the first effect, and one on the vapor pipe of the last effect, to stop all globules of syrup which might be entrained by the vapor on their passage to the condenser. This last separator was shown to be necessary by last season's control work, when a considerable amount of sugar was found to be lost at this point.

Two filter presses, each of the same pattern and capacity as the five already in use, gave an increased filtering area of 436 square feet,

The foot valve of the vacuum pan was enlarged, allowing a stiffer boiling of first masse cuite. The rest of the machinery remained the same as last year, and a description of it can be found in Bulletin 23, Chemical Division, U. S. Department of Agriculture.

#### THE CANE CROP.

Never since the present proprietor has been in possession of the plantation has the yield of cane per acre been so small, nor since the employment of a chemist has the sugar content of the juice been so low. It is an interesting fact, and worthy of note, that, in opposition to this year, the crop of 1883, which gave the highest tonnage on record at Calumet, also gave the largest per cent. of sugar ever known to have been present in the juice worked on this plantation.

The poor crop of the present season is attributed to exceedingly unpropitious climatic conditions. Rains early in the season delayed planting until the seed cane had greatly depreciated. This was quickly succeeded by a drouth of eighty-four days, during which many of the young canes perished. This drouth was in turn followed by exceedingly wet weather, which prevented a laying by of the cane until the latter part of August, an operation which should be performed by July 1.

#### THE SUGAR HOUSE WORK.

As has been the custom for five years, the stubble and plant cane were kept separate in all their products, and this was the only division into runs made. No third sugars were boiled.

The inferior quality of the material, the space necessary to store it, the steam necessary to keep it warm in the wagons, and the work of purging it, would, it was thought, have made the expense greater than the increased value of the product secured.

The mill was started October 31st and stopped in the early morning of November 28th. There were, during this period, twenty-four days in which the mill was run a whole or part of the time. The system of daily reports gave a more thorough knowledge of the capacity of the various portions of the factory than had ever before been possessed. It will also prove of much value in calculating the capacity of the house for working future crops.

## THE STUBBLE RUN.

There was during this run an inversion of 3,668 pounds of sucrose, or 1.10 per cent. of the sugar extracted. This was, without doubt, due to some minor delays, the greatest of which was shutting down the apparatus for twelve hours, with juice left in several of the clarifiers. On several other occasions, delays occurred which necessitated the holding of juice for some time, and which could not result otherwise than in inversion. There was, besides this inversion, a mechanical loss of 17,803 pounds of sucrose, of which 16,167 pounds were lost at the double effect, 504 pounds in the press-cake, and 1,024 pounds in handling first sugar. This latter loss was in most part from transferring sugar from centrifugals to bins, and from bins to barrels, and seems to be unavoidable. The loss at the double effect will be discussed further on, under the head of Gaunt's Helix Separator.

Forty-eight thousand nine hundred and ten pounds of press-cake contained only 504 pounds of sucrose; so lixivation was carried as far, probably, as it was profitable. Good cake was not, however, made all the time, some of the pressings almost approaching slush. In comparing this with last year's work at the presses, I can attribute it to but one thing, *i. e.*, the lower purity of the present year's juices. The average purity of the juice of 1888-89 was 85.00; of 1889-90, 82.56; and, though the latter were limed quite as high as the former, and no more work required from an individual press than before, the resulting press-cake was not as solid as desired.

It would seem, then, that the skimmings and settlings of cane juice will filter readily in proportion to the purity of the juice from which they are derived.

Taken altogether, this run gave the poorest results of any during my two campaign's work on this plantation. There was a total loss of 21,463 pounds of sucrose, out of the 332,216 pounds extracted, which amounted to 6.46 per cent. of the material entering the clarifiers.

The delays in manufacturing were none of them very serious, but they were almost continual. They prove most conclusively the necessity for rapid and regular work. There was *no other reason besides these petty annoyances for the poor results of this run*, and Calumet needed no better proof of the correctness of her

regular working system than this one irregular run, with its comparatively large losses.

The percentage of marc, or woody fibre, was not high in the stubble cane, though every one connected with the agricultural work had predicted that, on account of the severe drouth during the cultivating season, such would be the case. The results were, however, entirely at variance with this theory; indicating, rather, that the structural tissue grew proportionately only as the rest of the cane, and did not much, if any, exceed the amount present during a wet season. The only way then that the percentage of marc would become excessive during a dry season would be an entire cessation in the growth of the plant, in which case the water would begin to evaporate and normal conditions cease to exist. Final conclusions, especially in agricultural work, cannot be drawn from one season's results; but at Calumet, the cane, after passing through one phenomenal drouth, and not containing an excessive amount of marc, would indicate that dry weather does not materially affect this constituent of the cane.

The masse cuites of this run, both first and second, were boiled very stiff, only 6.33 per cent. of water being left in the first, and 7.29 per cent. in the second.

The final molasses contained 31.75 per cent. of sucrose, double polarization, 25.13 per cent. of glucose, and had a purity of 40.11.

The first product was a high-grade yellow clarified sugar, 98.74 pure. The seconds were an ordinary yellow sugar, of 87.51 polarization, and contained 3.32 per cent. of glucose. The yield of firsts was comparatively high, being 77.91 per cent. of the total commercial sugar obtained from the two boilings, and 7.16 per cent. of the weight of the cane worked.

Of 379,236 pounds of sucrose in the cane, 323,114 pounds, or 85.20 per cent. of that present, were extracted. This left 56,122 pounds of sucrose in the bagasse, which was used for fuel. On the stubble cane, then, 14.8 per cent. of the sucrose was grown, not to enter the sugar house proper at all, but that some very good sugar could be used to make a little very poor fuel.

#### THE PLANT RUN.

The work during this run was as good as that in the first was poor. There were no delays of any import, and the house was

worked to a capacity which before had been thought impossible. There still continued about the same amount of trouble at the filter presses as in the first run, but none serious enough to cause any delay to the rest of the factory. The loss of sucrose was 1,711 pounds in the 112,560 pounds of press-cake made. What little trouble was experienced with the presses only confirmed the opinion previously expressed, that the skimmings and settlings from a low-purity juice filter with more difficulty than those from a juice of high purity.

The loss at the double effect was 9,645 pounds, or 1.01 per cent. of the sucrose extracted, against a loss of 4.87 (?) per cent. in the stubble run. There was no inversion large enough to be detected by the analyses, and the loss, aside from that at the double effect, amounted to but 0.27 per cent. of the sucrose extracted. There was a loss of sucrose in the bagasse of 128,486 pounds, or 12.07 per cent. of the sucrose in the cane. This gives an extraction of 87.93 per cent. of the sucrose in the cane on a mill extraction of 80.23. The marc in the cane was 9.86 per cent. of its weight, which is still further proof that a drouth, in the early part of the season at least, does not tend to produce an excess of insoluble matter in the cane.

The marked difference in the losses of the two runs should be carefully noticed and the cause remembered. Aside from the loss at the double effect, which was excessive in the stubble run on account of a defect in the helix separator, remedied during the plant run, the loss at other points of the house was much greater in the run with stubble cane.

With the stubble, the losses, chemical and mechanical, exclusive of those at the double effect, were 1.42 per cent. of the sucrose extracted, while in the plant run they were but 0.27 per cent., with absolutely no inversion, equivalent to a clear gain in the latter of 1.15 per cent. of extracted sucrose.

If the losses, aside from the double effect, had continued in the same proportion throughout the campaign as with stubble, they would have been increased by 10,945 pounds of sucrose; and if the same percentage of total losses, inclusive of that at the double effect, had continued, 49,343 pounds less of sucrose would have been secured. This, instead of the loss of extracted sucrose being 12,192 pounds, would have made it 61,535 pounds out of the 952,563 pounds of sucrose present in the juice.

The masse cuites of the plant run, like those of the stubble, were boiled very stiff, the first containing only 6.78 and the second only 6.62 per cent. of water. The first sugar made polarized 99.02, and the amount secured was 7.20 per cent. of the weight of cane worked. The second sugar polarized 81.67, and contained 4.24 per cent. of glucose.

Quite a good deal of second sugar ran through the sieves of the centrifugals. No reason could be assigned for this, or rather no proof in substantiation of any particular theory could be obtained, and no sieve, either of wire cloth or perforated plate, would stop it. The final molasses contained 40.82 per cent. sucrose, double polarization, 15.96 per cent. glucose, and had a purity of 50.89.

This molasses, on the basis of last year's work, would have given quite a large crop of crystals; but the manner in which the material had behaved during its working for seconds left no doubt that nothing satisfactory could be obtained by boiling for third sugars. The juices this year were not only more impure to start with, but the restraining influence upon crystallization possessed by these impurities appeared greatly increased as over previous years. This was especially noticeable in the lower products. The glucose was not very much in excess of that of last year's juice, which would indicate the correctness of Mr. Wilbray J. Thompson's expressed belief that the restraining influence of glucose in preventing sucrose crystallization is not as great, pound for pound, as that of the non-sugar present in the juice.

#### THE GAUNT HELIX SEPARATOR.

The object in adding this apparatus to the double effect has already been mentioned. It will be noticed, however, that, notwithstanding the presence of the separator, there remains a heavy mechanical loss of sucrose at the double effect, reduced very much, however, in the last run as compared with the first.

It was noticed from the time the double effect was started that in the three-foot guage glass at the side of the separator the liquor stood at fully two-thirds the height of the glass.

The pipe intended to draw off the liquor collected from the vapors by the separator had been placed in the center of the bottom casting of the apparatus, and it was not till seven days after the second run had been commenced that the cause of its

failure to operate was determined. Mr. Wibray J. Thompson found that the centrifugal force of the vapor kept the liquor thrown against the side of the separator, preventing its reaching the return or drain pipe leading back to the pan, and, at the same time, allowing the vapors, from the rapid motion given them by the helix, to carry it off through the condenser.

After this was found to be the case, it was soon remedied by putting the tail or return pipe at one side of the separator, thus drawing off all the liquor collected. Unfortunately for determining the exact value of the apparatus, no separate run was made after this change, so it cannot be stated positively whether or not all loss was avoided. From the marked decrease in the loss at this point in the last run, it is certain that the separator was a decided aid, and, in my opinion, almost perfectly attains the object for which it was constructed.

#### TREATMENT OF JUICE.

Last year's practice of saturating the raw juice with sulphur dioxide fumes and leaving it very slightly acid was again maintained with no bad effect. There was, indeed, no inversion that could be attributed to sulphur, the small amount which did occur being due to unavoidable delay in working the juices.

This is the second year at Calumet in which the most careful chemical work could detect no inversion due to sulphur, and leaves no doubt that, where the sulphur dioxide is properly treated before its contact with the juice, there is no reason to fear inversion from it. There is at Calumet quite a quantity of sulphuric acid formed during the washing of the fumes, but this is all carefully trapped off before it comes in contact with the juice. Were Calumet to adopt diffusion, I should not, I believe, hesitate to recommend sulphuring the diffusion juice, even though it was drawn from a battery at a high temperature. If clarification was performed in the cell, sulphuring would, of course, be discontinued.

The clarified juice, as has always been the custom here, was concentrated to syrup immediately on getting enough to start the double effect, and no material was at any point held for settling, except in the clarifiers.

#### HOT AND COLD WATER MACERATION.

Maceration was practiced throughout the whole crop, with the usual good results, but, as its merits have been so well



proven, it needs no discussion here. There was, however, a trial of hot water maceration, which lasted twenty-seven hours and fifty minutes, and which is worthy of some notice.

A table showing normal juice extracted in per cents. of cane for the run in which hot water was added, and for the runs just preceding and following it, during which cold water was added, is given below :

	Run previous to Hot Water Maceration.	Hot Water Maceration.	Run following Hot Water Maceration.
Mill extraction, per cent. ....	79·50	78·58	80·18
Tons cane ground per hour .....	16·58	15·35	18·05
Gallons juice made per hour.....	2,730	2,730	3,272
Dilution, per cent. ....	15·42	14·11	14·17

It has been supposed that the danger from hot water maceration lay in raising the temperature of the mill juice, thus tending to increase the inversion during sulphur saturation. There was, however, not the slightest loss from this cause; in fact, the temperature of the juice, as a whole, was raised but very slightly. A loss, however, did occur, and at a point where it had been least expected. The mill extraction was very perceptibly lowered, being 0·92 per cent. less than in the previous, and 1·62 per cent. less than the following run, extraction being expressed in terms of normal juice on weight of cane.

As far as absorption by the bagasse, there was no question but that hot water had a decided advantage. Here, however, the advantage ceased. The bagasse, by its absorption of heat and a larger quantity of water than in cold water maceration, was considerably more distended, and the difficulty in feeding it to the mill was thereby increased. In fact, from the very time its use was begun, the back or maceration mill had to be "slacked up" to take the feed; and this continued to the end of the run, the number of tons of cane ground per hour falling off considerably at the same time. The poorer extraction would seem, then, to the lighter pressure which it was necessary to use with a ridge mill.

It is hoped that advantage can be taken of the better absorption of hot water by the bagasse during another campaign's work. A forced feed apparatus will be attached to the back mill, which will, it is thought, compel it to take as large a feed of hot bagasse with as high a pressure as it heretofore has taken during cold water maceration without forced feed. At

any rate, hot water maceration will be given another trial during the next campaign.

#### COMPARATIVE YIELD OF STUBBLE AND PLANT.

It will be noticed that this year there is very little difference between the amount of sugar secured from stubble and plant canes. The juice of the stubble cane contained 0.62 per cent. more sugar than that of the plant. The cane, however, contained 0.68 per cent. more marc, and the mill extraction was lower, being 77.21 per cent. in the stubble, against 80.23 in the plant.

The stubble cane contained the most sugar, having 240.83 pounds per ton, against 231.48 pounds in the plant, and slightly more sugar was extracted from it, but a little less was crystallized, because of greater manufacturing loss in its treatment.

#### AVAILABLE SUGAR.

This year again proved the folly of predicting results on the amount of glucose present in the juice.

I cannot but again conclude that there is no necessity, and, in fact, no way of predicting results with any degree of accuracy from the amount of impurities in the juice. The character as well as the amount of impurities varies greatly, and this alone, aside from the difficulty of maintaining constant conditions in the manufacture, would preclude the possibility of a general formula.

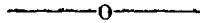
#### CALUMET MILL WORK COMPARED WITH DIFFUSION.

Much has been said of late in regard to the work done at Calumet as compared with diffusion. It is well, therefore, to state as nearly as possible the difference which actually exists, as based on this year's work. There was in the cane at Calumet 233.86 pounds of sugar per ton of cane. Of this, the mill secured 203.97 pounds, leaving in the bagasse 29.89 pounds for each ton of cane entering the house.

Good average diffusion leaves in the chips about 7.5 pounds of sugar per ton of cane. Better than this has been done by diffusion for two or three consecutive weeks, and at least as good can be secured in regular work. Diffusion would then have given from the Calumet cane 226.36 pounds of sugar per ton, or 22.39 pounds more per ton than was secured by the

Calumet mill. At five cents, net, per pound of sugar, including its pro rata of molasses, this would be an increase in value per ton of cane of \$1.12. The dilution from maceration at Calumet was 13.62 per cent., the maceration juice requiring multiple effect, evaporation as much as diffusion.

With cane richer in sugar than the above, the advantage of diffusion would be relatively greater, from the fact that the loss in the chips remains constant with diffusion, while with the mill it varies with the quality of the cane worked.—*The Sugar Cane.*



## THE SUGAR INDUSTRY IN DEMERARA.

### MOUNTAINS OF SUGAR AND RIVERS OF RUM.

At a political meeting held here lately, and which I had the pleasure of attending, one of the orators on that occasion remarked at the opening of his address, that this was a country with "mountains of sugar and rivers of rum," so, sir, you will observe that when I took these two predominant staple products for my text, it was because they were the largest of the colony's products. To go into very minute details on this question, I can not, nor do I think statistics would be of any interest or use to you if quoted, so my object will be to give you as fair an idea of the general run of estates here, how they are managed, the process of sugar making, etc., as my humble ability will allow.

Just where to begin operations on this extensive subject is what I have been trying to determine, and have at last concluded that the proper place is the head of the estate—our friend, "The Manager," as well as the very efficient staff who assist him in the general work of management. "The Manager" is a gentleman who does not always wear white kids and a dress coat; nor did he gain his present position of importance in any other way than by years of hard work as an overseer, and so we find him competent to handle the many hundred of employes under him, to deal with knotty questions of cane growing, drainage, machinery, sea defences and a dozen and more questions of vital importance to his estate's welfare; he is alone held responsible for an increase in expense; if sugar

brings a low price it is his fault ; too much rain is bad for the cane, he should prevent that. Complaints of all kinds are made to him, both by the employes and employers, so you see that after all a manager's lot is not always a happy one. In the good old days he had not the anxiety that the manager of to-day has ; in those days sugar brought double its present price ; labor was not so difficult to obtain ; the complicated machinery of to-day was unknown ; in fact, his responsibilities in years gone to return no more were far lighter ; it was more manual labor than scientific knowledge that was required of him ; now it is a happy combination of both that he must possess. I would not have you run away with the idea that the "Sugar King" sits in his office all day, or that he only watches the machinery in his factory. Not so, for I know from experience what it is to accompany him on his morning ride away back through the fields of tall waving cane, under a tropical sun, and on the hurricane deck of that ever kind and obliging animal the "mule," where from his lofty position he is "Monarch of all he surveys," etc., and can see that his overseers are in charge of their gangs ; makes notes of work requiring immediate attention ; gives directions as to repairing a breach in the sea-dam, constitutes himself into judge and jury, and there and then hears particulars of a dispute over the price demanded and that allowed for certain work ; these are but a few of the matters that come under his eye and ear during his ride of six or eight miles. He returns to his house about 11 A. M., when a sumptuous breakfast awaits all hands, and after refreshing both outside and in, overseers and manager seat themselves to do justice to fish, roast, and fowl, and it is unnecessary to say that they always succeed. The inner man being satisfied, a smoke is indulged in for a few minutes, after which the overseers ride off on their mules to the gangs under their charge, while "Massa" and his deputy now take a turn toward the buildings to see how things are running in that department.

Each estate has so many overseers, according to its size, the average estate having about five. They are mostly active, strong young fellows, of good education, and all in all a fine lot of chaps to meet ; the larger proportion of them are from the isles across the sea. Their duties are to assist the manager,

and they do it in many ways. They are put in charge of different gangs of laborers; see that those under them turn out to work, and prosecute them if they do not; make up the pay book of their gangs, and in a general way look after the special work assigned to them. The head overseer on most estates pays off all hands on Saturday afternoon. Each overseer has a pet known as the overseer's mule. It is the duty of this animal to carry its rider to and from his work, stand all day in sun or rain, and make itself generally useful (this with a mule is often reversed) to its master.

Next under the head of management or staff, comes the engineer, whose duties are to take full charge of the machinery and its working, order all repairs, make plans of any alterations or additions to the buildings of the estate, and in fact he is the mechanical superintendent of the establishment. The chemist makes all tests of sugars, analyzes the soil when necessary for the purpose of ascertaining what manures are required; he, in turn, may be called the scientific superintendent, and to his credit, it is said, many of the late improvements in sugar making are due, owing to the careful application of scientific knowledge. The attorney is generally a man of experience in planting and sugar making; he also acts as a sort of consulting physician as to the necessities and general management of the estates, and is as well a stop valve on the extra expenditure of money by the manager. He also makes elaborate reports for his non-resident employers. The last on the list is the bookkeeper, and in addition to his books, he has weekly returns to make out that would even stagger our hard-worked banking officials at home.

Now let us turn our attention for a little toward the buildings or factories, where, in crop season, the incessant noise of heavy machinery is heard from Monday morning till midnight Saturday, and where immense lanterns, or, better still, the electric lights, guide the employes during the dark hours of their labor; for most estates find that it pays best to grind steady till the whole crop is taken off; this often takes three or four months night and day, early and late, so that during those months the work falls heavy on all hands; and the close of what is called the grinding season is always looked forward to with pleasure. We enter the main building and are at once

taken by the managers to the mill, close to which runs the main navigation trench. Here several large iron punts filled with canes are being unloaded by the laborers and thrown into the cane carrier, which slowly but surely feeds them into the ponderous rollers of the crushing mill; through this and on the carrier directly opposite appears the smashed fiber, or megass, which is carried up toward the roof along a tramway and then pumped on top of the large furnaces; here the shovelers soon push it into the feed box, or slide, and down into the fire box it disappears. Thus the cane deprived of its juice becomes the heat producer of the factory, and saves a large annual expenditure on coal. From the mill the juice falls into a tank and is then pumped through a juice heater into what is called a battery of clarifiers, where it is allowed to stand until it subsides. It is then drawn into iron vessels called illuminators, which have 80 to 100 circulating steam tubes. As soon as sufficient juice has entered these vessels the steam is turned on, the juice boiled and skimmed of its dirt, the scum running into subsiding pans, where it is heated and allowed to settle; the pure liquid is then drawn off and the dirt passes into filter bags. From the illuminators the juice passes through filter bags into receiving tanks to supply the triple effect, or yaryan, as the case may be. Here it is increased to a certain density, pumped again into another lot of receiving vessels from which it is drawn into the vacuum pan, where the evaporization is completed and the masse cuite or raw sugar formed. After being discharged from the pan it is run by centrifugal force in perforated wire baskets to separate the dry crystals from the molasses, or residue. The dry sugar is then bagged, weighed and ready for market. The refuse, or molasses, from the first sugar is reboiled to obtain the second grade of sugar; the refuse from this is again reboiled to obtain the third sugar, and from this grade the celebrated Demerara rum is made, each ton of sugar producing twenty-five gallons of rum. It will thus be observed that not a drop of the juice is lost to the manufacturer during the entire process, while the otherwise useless cane refuse becomes a valuable fuel. No doubt it will be of interest to many to know that the machinery used in the improved factories of to-day cost in many instances over \$300,000 to put on the pre-

mises so that the production of sugar is not without considerable outlay.

The average estate in this colony has from ten to twelve hundred acres of cane under cultivation, while many of them would exceed two thousand acres. This area of cultivation is divided up into small fields of from five to twenty acres, the work of planting being only necessary every four years, while the crop is an annual one, the canes requiring full twelve months to come to maturity. To bring the crop to this state, to harvest it, and manufacture it into sugar, require necessarily a large number of laborers. These are chiefly East Indian (coolie) indentured immigrants brought out from India under a five-year contract, and at the joint expense of the government and the planter, in the respective proportions of one-third and two-thirds. They are guaranteed free houses, medical attendance, and return passage after ten years' service. You find on some estate large numbers of free black laborers, and a few Portuguese and Chinese. The laborers are divided into gangs, which are known as follows: first, the shovel gang; second, the weeding gang; and third, the creole gang, employed to transport plants from field to field, manure, etc., In the first squad are the men, the other two generally women and children not able to work in the shovel gang. The duties of the weeding gang are not confined to the weeding on dry land by any means; to see the coolie women wading past their middle in dirty trench water clearing out the weeds to allow the punts to pass is not at all a rare sight. I said to one of them "Aligator bite coolie," to which the young madam replied, "Me no 'fraid alligato," and that was the truth, for both alligators and snakes are plentiful in the trenches. Another gang that I did not mention before is the "cane-cutting gang," composed of free black laborers. Notwithstanding the fact that at least 5,000 coolies are brought out from India for the estates annually, labor is always scarce, but more so since the gold industry of the colony has been developing so rapidly; and of late, the "Ballata enterprise" has grown to large proportions, taking away many of the estates' black laborers. The amount of money paid out weekly to the laborers of an average estate is about \$1,500. This is paid to a total of 1,500 souls (men, women and children), and the cost of

their living is estimated at \$1 per week for each adult. The rate of wages for indentured immigrants is 25 cents per diem for a man, and 16 cents for a woman, they having to find themselves out of this sum. Many, of course, can earn double this amount by hard work. Pay day is Saturday afternoon, and such a collection of celestials as gather around the pay table is a sight not easily forgotten. Market day is also Saturday, and so from the pay desk the laborers proceed to the public road, where a double row of dishes are spread out, containing all the wares and merchandise likely to catch the East Indian's eye, from rice to a bright American print. The water supply of the estates for both navigation and irrigation is obtained from a fresh water canal, which runs along the rear of most of them. A sluice gate is constructed on the dam of this canal, and when water is required it is opened and the water pours into the trench. The transportation of canes from all parts of the fields to the buildings is done entirely by punts drawn by mules. The main navigation trench runs up the center of cultivation, and is intersected at short distances by cross trenches; thus the canes cut at a distance of often five miles or more from the factory are transported to their destination by water.

The drainage system is most complete, but has no connection with the navigation; if the drains are full the gate is opened at low water and thus emptied, care being taken to see that it is closed before high tide.

Nearly all of the estates front on the sea, and a source of constant trouble, anxiety, and expense is the breaking in of their sea-dams; only a short time ago one of the largest estates had a bad break that cost them over \$50,000 to repair, besides the damage done to the crops. Some, perhaps, of the readers of this letter would like to know what the value of a Demerara sugar estate is, and also what it costs each one to produce, manufacture, and make ready to ship a ton of sugar. Now, as I have all along gone on the average principle, it will be as well to stick to it, so we will take an estate as it stands to-day in complete working order, and with 1,200 acres of cane in cultivation, and find that the market value of that property would be about \$180,000, the value of the crop being that of the estate, or in other words, the crop of 1,800 tons of first



sugar at \$100 per ton gives you the above value. It is estimated that the cost of producing each ton of sugar, interest on capital invested alone exempt, is from \$65 to \$70. When the market realizes this price the second sugars, rum, and molasses are regarded as profit.

The government requires that on each estate a hospital must be provided with accommodation in proportion to the number of people employed. The doctor of the district, a paid official of the government, is required to visit this institution once in each forty-eight hours, and often, if necessary, a dispenser and nurses are employed, and the wants of the celestials are administered to; of course the place is kept thoroughly clean and well ventilated. I have had the opportunity of going through several of them, and I must say that while they are not the hospitals that we are accustomed to see, still they are all that is required, and he is a very fortunate man who has such a place to go to when necessity compels him. While looking around one of the estates the other day with the manager and when passing a small building adjacent to the hospital, I heard a voice that caused me to stop and listen, when to my surprise I distinctly heard the familiar words, "Praise God from whom all blessing flow," etc. I went and looked in the door, and to my surprise found that the familiar words and sweet music came from the throats of some twenty little coolie children, who were formed in a circle around their school mistress to sing their opening hymn, at the close of which they all greeted me with the eastern welcome of "Sallam Massa." I returned the salutation by complimenting teacher and pupils on their excellent rendering of the familiar hymn, and bid them all good morning, much pleased with my visit. The large population of the estates have to be housed according to the emigration laws, and as I have already said an average estate has a population of 1,500 souls, while some of the larger ones have over 3,000; so you can imagine this number of people living in long rows of cottages constructed to suit the ideas and customs of the occupants, generally from twenty to thirty families residing in one tenement. I hardly think that the average number of a family to be five among these people, or else I must have seen the children of several families visiting the neighbors on the occasion of my inspection of the barracks for

children seemed to be exceedingly numerous. The coolie house has a front door that opens directly on the back door, the hall is wide, but as the hallway is kitchen, dining room, parlor, bedroom, and library, it would hardly do to suggest its being diminished a little. Their little abodes from the outside are clean and tidy, and they themselves on a "race day" are dudes of no mean order, especially the women, whose wealth is carried in jewelry about their necks, wrists, ankles, and toes, while their in many cases handsome physique is clothed in bright silks and laces, which form quite a contrast to their dark brown or copper-colored complexion. The other buildings of importance found on all estates and which I have not before mentioned are, first, the overseers' quarters; this is generally a large roomy house with a front gallery on the sea side. Each man has his own room, and servants to look after it, the indispensable shower bath being in all houses, and when our friend the overseer comes in tired or wet, it is his first thought to have a good shower bath, before he flings himself down into his easy chair and orders his "swizzle" and tobacco. They are a sociable lot of fellows and can always spend a pleasant hour in each other's company after the toil of the day is over. The manager's residence is a large, handsome house, erected on brick pillars twelve feet high, this elevation makes the house cool and healthy, and gives him the space under to utilize as a carriage room, or for any other purpose; as you ascend the steps and enter the gallery you are at once struck with the home-like appearance of every thing, hammocks in this corner, and lazy chairs in the other, the whole first-floor is one large room that is often only divided by a screen, and upon the occasion of a dance the whole house seems to be thrown into the ballroom; upstairs are three or four large bedrooms and bathroom; the kitchen is generally connected by a passage way and is some distance in the rear of the house. The view from the manager's house (although much the same on all estates) is decidedly attractive to one at least unaccustomed to look upon miles of beautiful, green waving cane, bounded only by the majestic form of the cabbage palm trees and interspersed by large trenches of fresh water that keep the canes from being thirsty when under a tropical sun. Then right in front of his door is a large clump of tropical flowers, their purest fragrance

being wafted into the house by a refreshing breeze from off the sea ; while again to the right of you is the tennis court, which is kept in such good trim that it would make anyone with a speck of love for the game eager for the fray.

The manager keeps his own dog cart, and is allowed a butler, groom, cook, and messenger by the estate, and he is allowed so much for each overseer who dines at his table.

But, sir, I find that I have still plenty of material left to write on, but I am sure you are already tired of this subject, so I must now be brief in my concluding remarks, although many, many occurrences I could tell you of might be of interest, such as a "coolie wedding;" the celebration that takes place upon ~~the arrival of the little one into this wicked world;~~ how they (the coolies) celebrate a "holy day", with syringes and pails of red paint which they squirt on themselves and any one else they esteem who may come their way, and sorry I am to say that I was disrespectfully respected by them, and a coat of mine is now for sale cheap. What a glorious big drunk took place at a "Nigger wake" the other night, and how the poor old slave was sung to rest. It was really a sight that I never had any idea could be seen outside the south of Ireland itself, but I will back these people here against any others to punish more rum in a given time and be more hideously noisy than any others. Such are a few items of estate occurrences, and only a few ; the rest must be left to the vivid imagination of my distant readers.

Before I sign my name to this lengthy chapter I have a pleasant duty to perform, and that is to say a word to you about our friend, the manager. I now speak of him not individually, but collectively, and I must say they are indeed a most hospitable lot of gentlemen ; they think it no trouble to show you around the estate, put you up for a day or a week ; take you to their jolly tennis afternoons, or to their neighbor's dance, and make you feel in your bones that you are really at liberty hall. I am sure if any of you ever have the good fortune to visit them you will cheerfully bear out my statements, and I can tell you the only way you might offend them is to decline a "swizzle," Demerara's standard drink.—*W. A. Higinbotham, in the Canada Evening Mercury, April 25.*

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## A GUIDE TO THE LITERATURE OF SUGAR.\*

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We are favored by the author with a copy of this very valuable book of reference, on the compilation of which immense labor has evidently been expended, and which is produced in the best style of modern book work. It is dedicated to John Ewen Davidson, Esq., of Port Mackay, Queensland, "as a token of esteem and gratitude by the compiler," the dedication being dated, "Royal Colonial Institute, December 27th, 1889." The distinctive features of the compilation are :

1. The titles of important publications are supplemented with brief abstract notes; works, the titles of which are misleading or defective (as an indication of their contents) are similarly supplied with notes.
2. By a system of initialing, references are given, in order to indicate the library or locality in which the books referred to may be found.
3. The comprehensive subject-index refers to the notes as well as to the titles.

The work contains more than 1,200 titles of books, pamphlets and papers relating to sugar. This number might have been considerably augmented had handbooks of chemistry, encyclopædias, etc., been included. From amongst the numerous narratives of travelers, only the more important are given, as works of this class are almost sure to contain some short reference to sugar. With the exception of Burn's "Address" and MacMahon's "Plantership," which are inserted as examples of this class of sugar books, all works dealing with sugar from the slave or anti-slavery point of view are excluded. A large class of publications, chiefly anonymous pamphlets, titles of which would lead one to believe they refer to sugar, but which on the contrary are merely controversies on free trade and protection, also are excluded, as well as Parliamentary publications, which, amounting in number to several thousands, were too voluminous for insertion in the present work, but (Mr. Roth says) may perhaps be issued separately. A collection of these in MS. has been handed to Mr. Robert Giffen and may be found in the Statistical Department of the Board of trade. The titles of six large works, which contain the titles of papers presented to Parliament are, however, given. The present compilation extends only to the beginning of the year 1885, but Mr. Roth says he hopes shortly to have ready a supplement bringing the

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\* A Book of Reference for Chemists, Botanists, Librarians, Manufacturers and Planters, with comprehensive Subject-Index. By H. Ling Roth. London: Trubner & Co., 1890.

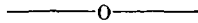
work up to date, and then, if sufficient inducement offer, to bring out an annual guide. The dates of the works catalogued by Mr. Roth range from 325 B. C. downwards. Though it is now generally believed that the ancients were unacquainted with the substance we designate sugar, it is probable they were familiar enough with sweetening compounds of various kinds. The aborigines of this colony were undoubtedly acquainted with the art of making sugar from cane juice, by a method of their own, which they may or may not have learned from the Carib invaders from the West India Islands. We have heard the late Mr. Henry Sarsfield Bascom, who, when a young man, was much addicted to what he called "running wild in the bush," say that he has seen most beautiful sugar made by the Indians in the interior, but that on exposure to the air it would almost immediately deliquesce.

No one can look over the list of works included in Mr. Roth's "Catalogue of Authors" without being struck by the enormous preponderance of French and German works over those in English, whence the inference may be drawn that in those countries very much greater care and attention was devoted to the manufacture of sugar than either in England or in the United States—at least prior to the abolition of slavery and of differential duties, and to the period when the competition of beet with cane sugar began to assume formidable proportions. In the list of works we are glad to find several by writers in this colony included, though as pre-eminence among what are called the West India Colonies, British Guiana as a sugar producing country is of comparatively recent date it naturally follows that the works relating to the manufacture of sugar in the colony are also of comparatively recent date. Taking names alphabetically, the first we notice is that of Henry Field, who, in 1888, published in Demerara a lecture on "Agricultural Chemistry Applied to the Culture of Sugar Cane and Relative Estimation of the Soils in British Guiana." Next in order follows the works of the late Mr. E. E. H. Francis, F.C.S., which includes a paper on "A Chemical Examination of Blighted Sugar Canes and of the Soil in which they were grown," (1881); a paper "On British Guiana Cane Soils and Artificial Manures," (Timehri, 1882); also one on "Soluble vs. Insoluble Cane Manures," (Timehri, 1884). Next we have Mr. Edward Jenkins'

"The Coolie: His Rights and Wrongs," (1871); the "Overseer's Manual," a collection of papers by Mr. Luard and others; Mr. Neville Lubbock's "British Sugar and French Bounties," (1876), also "Wet Megass, Sun Dried and Logie Megass as Fuel," (Timehri, 1884); Alexander Mackae's "Manual of Plantership in British Guiana," (1856); Barton Premium's "Eight Years in British Guiana," (1850); Sir R. W. Rawson's "Report upon the Rainfall of Barbados and its influence on the Sugar Crops," (1874); and the late Mr. William Russell's "Report on the Agricultural Wants of British Guiana," (1875); "Farming and Irrigation," (Timehri, 1882); "Cane Mills and Megass as Fuel," (Timehri, 1884); "Reflections on the Relative Positions of Beet Sugar and Cane Sugar as Produced Respectively for Refining Purposes in Germany and Demerara," (Myreside, Elgin, N. B., 1885); Dr. John Shier's "Report on Thorough Drainage, with Special Reference to its application to the Colony of British Guiana," (Demerara, 1847); "Report on the Clarification of Cane Juice," (Dem., 1850); "Directions for Testing Cane Juice as as to determine the exact quantity of quicklime required," (London, 1851); "Report on the Clarification of Cane Juice, addressed to the Governor of British Guiana," and Mr. William Walker's "British Guiana at the Paris Exhibition," (London, 1878).

Among the anonymous publications we find, "A Day with a Naturalist," (reprinted from the *Royal Gazette* of British Guiana, June 21st, 1879), which is said to give "a good account of the habits of the cane borer and sugar weevil;" "A Review of the Case of the United States vs. 712 Bags of Dark Demerara Centrifugal Sugar," (Baltimore, 1878); "The Dark Sugar Question, a Review of the American Commissioners' Report, reprinted from the *Argosy*," (Dem., 1882). And oddly enough, under the same title, (Anonymous Publications) "The British Guiana Directory and Almanack, 1883," which is said to be in the library of the West India Committee; also, "The Overseer's Manual, or a Guide to the Cane Field and the Sugar Factory, for the use of young Planters," (Dem., 1882), which, though classed as "Anonymous," is described as containing "Instructions to Overseers," by Thorpe, (F. C.); "The Sugar Manufactory," by Luard, (E. C.); "Empoldering of Land," by Nicholson, (W. G.); "Drainage of Land," by Blake, (J. S.); "Manufacture of Rum," by Duncan, (R. G.); "Vegetable Plants," by Conolly, (E.)

The most valuable portion of the book is practically the index, in which the various works are classified subjectively, under such headings as "Bibliography, History, etc.," "Statistics and General Economy, etc.;" "Geographical Distribution," (under which the countries referred to are arranged alphabetically); "Chemistry," "Analysis," "Saccharimetry," "Vegetable Sugars, their origin, etc.," "Beet Sugar," "Cane Sugar," (with subdivisions under such headings as "Sugar Canes," "Cane Juice," "Cane Cultivation," and "Cane Sugar Manufacture"); "Parasites," and "Distillation." By this means a planter may perceive at a glance what works relate to particular subjects.—*Demerara Argosy.*



### ABOUT EUCALYPTUS.

From the very best authority we learn that we have made a mistake in planting the blue gum—*eucalyptus globulus*—to the exclusion of other kinds, and especially of the *eucalyptus corynocalyx*. This latter variety of the "gum family" is a quicker grower than the blue gum, and stands dry, hot weather better, and is called the "sugar gum." It grows readily from seed, the same as all others, and makes better wood for all purposes. Is excellent for railroad ties, telegraph poles, etc., and will last for years buried in the ground.

The *eucalyptus facifolia* is said to be the finest flowering tree in the world, which bears a flower of a gorgeous crimson hue. About a dozen of these trees can be seen, covered with flowers, in Pasadena. The sight is a rare one, and well worth seeing.

Baron Von Mueller, a noted botanist of Australia, says in his book, "*Eucalyptographia*:"

"This *eucalyptus* is one of the most splendid of recent acquisitions to horticulture, and was introduced into the botanic gardens of Melbourne in 1860, where it flowered a few years afterward, while yet only in a bushy state. Hardly anything more gorgeous can be imagined than the forest of *eucalyptus facifolia* about the end of January or the commencement of February, (which in our country would be, of course, July and August) when the brilliant trusses of flowers diffuse a rich red over the dark green foliage of the whole landscape occupied by the tree.—*California Farmer.*

# PLANTERS' LABOR AND SUPPLY COMPANY.

INCORPORATED MARCH 1882.

OFFICE—HONOLULU, HAWAIIAN ISLANDS.

ANNUAL MEETING IN OCTOBER OF EACH YEAR.

OFFICERS ELECTED OCTOBER, 1889.

A. YOUNG,	-	-	-	-	-	-	-	-	-	<i>President.</i>
J. B. ATHERTON,	-	-	-	-	-	-	-	-	-	<i>Vice-President.</i>
P. C. JONES,	-	-	-	-	-	-	-	-	-	<i>Treasurer.</i>
W. O. SMITH,	-	-	-	-	-	-	-	-	-	<i>Secretary.</i>
F. M. SWANZY,	-	-	-	-	-	-	-	-	-	<i>Auditor.</i>

TRUSTEES ELECTED OCTOBER, 1889.

A. Young,	J. B. Atherton,	H. F. Glade,
H. P. Baldwin,	F. A. Schaefer,	P. C. Jones,
F. M. Swanzy,	R. Halstead,	W. O. Smith.

COMMITTEES OF THE PLANTERS' LABOR AND SUPPLY CO.

APPOINTED OCTOBER, 1889.

LABOR—G. N. Wilcox, W. Blaisdell, W. H. Purvis.  
 CULTIVATION—E. M. Walsh, W. H. Rickard, J. K. Smith.  
 MACHINERY—J. N. S. Williams, A. Dreier, P. C. Jones.  
 LEGISLATION—W. R. Castle, H. F. Glade, T. R. Walker.  
 RECIPROCITY—C. R. Bishop, F. A. Schaefer, C. M. Cooke.  
 TRANSPORTATION—R. A. Macfie, Jr., J. Marsden, W. Blaisdell.  
 MANUFACTURE—H. P. Baldwin, O. Isenberg, A. S. Wilcox.  
 LIVE STOCK—R. D. Wallbridge, T. S. Kay, J. N. Wright.  
 FORESTRY—C. Koelling, J. H. Paty, V. Knudsen.  
 FERTILIZERS—H. Morrison, W. W. Goodale, J. K. Smith.  
 VARIETIES OF CANE—W. Y. Horner, L. A. Thurston, J. M. Horner.  
 FRUIT CULTURE—E. C. Bond, T. R. Walker, W. O. Smith.  
 COFFEE AND TEA—J. M. Horner, P. C. Jones, W. W. Hall.  
 TOBACCO—F. M. Swanzy, H. F. Glade, G. N. Wilcox.  
 RAMIE—H. Deacon, J. B. Atherton, W. R. Castle.