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SUGAR PRICES FOR MONTH ENDED AUGUST 10, 1908.

1908.		Centrifugals.	Beets.	Parity.
July	10.....	4.39¢	11s 5¼d	4.42¢
"	11.....	4.39¢	11s 2¼d	4.36¢
"	13.....	4.36¢	11s 3d	4.37¢
"	14.....	4.36¢	11s 2¼d	4.36¢
"	15.....	4.36¢	11s 1½d	4.35¢
"	16.....	4.36¢	11s 2¼d	4.36¢
"	17.....	4.36¢	11s 3d	4.37¢
"	18.....	4.36¢	11s 0¾d	4.33¢
"	20.....	4.27¢	10s 11¼d	4.31¢
"	21.....	4.27¢	10s 10½d	4.29¢
"	22.....	4.27¢	11s	4.32¢
"	23.....	4.26¢	10s 10½d	4.29¢
"	24.....	4.17¢	10s 8¼d	4.25¢
"	25.....	4.17¢	10s 6¾d	4.22¢
"	27.....	4.17¢	10s 6d	4.21¢
"	28.....	4.21¢	10s 6¾d	4.22¢
"	29.....	4.25¢	10s 9d	4.26¢
"	30.....	4.25¢	10s 8¼d	4.25¢
"	31.....	4.25¢	10s 5¼d	4.20¢
Aug.	1.....	4.25¢	10s 6d	4.21¢
"	3.....	4.20¢	10s 6d	4.21¢
"	4.....	4.20¢	10s 6¾d	4.22¢
"	5.....	4.20¢	10s 3d	4.16¢
"	6.....	4.125¢	10s 2¼d	4.15¢
"	7.....	4.125¢	10s	4.11¢
"	8.....	4.125¢	10s 2¼d	4.15¢
"	10.....	4.08¢	10s 2¼d	4.15¢

The report of various sugar statisticians during the current month would indicate that for the next two months the statistical position of sugar is very sound.

Reports from Cuba indicate favorable weather for the growing crop, of which no estimates of value can yet be made, but an increase of production there and in the other West Indies is expected.

Mr. Licht regularly reports favorable weather for the beet crop, and the rumors of injury by drought early in the spring, seem not to be justified.

Messrs. Willett & Gray in their "Weekly Statistical" of August 6, say :

RAWS.—The market developed weakness toward the close of the week under review.

The early transactions were few, the basis established being equal to 4.20c. for 96° test Centrifugals, which is no longer obtainable. Holders showed more disposition to sell and are now willing to accept 2¾c. c. & f. for 95° test Cubas, possibly 2¾c. c. & f. 96° test, equal to 4.11c. to 4.17c. landed, basis 96° test, but are met with indifference by the refiners who are well supplied for the immediate future and find the outlet for their product much smaller than wished for.

The movement of refined in Europe, also, is disappointing, and, with prospects of the new beet crop improving, quotations for beet sugars have declined 6d. to 10s. 2¼d. for old crop, the parity of 4.15c. landed for Centrifugals and a decline of 3d. to 9s. 9d. for new crop (October-December), parity of 4.04c. for Centrifugals.

Reports from Cuba continue favorable for the growing crop.

Several cargoes of Javas afloat and for July-August shipment have recently been placed, the last reported price being at 11s. 6d. c. & f., equal to 4.24c. landed for 96° test, but it is believed that a lower price has since been accepted. Very few of the cargoes afloat are still unsold.

Our special cable of yesterday from Java reported that it was yet too early to estimate the total outturn of the present crop and that rain continued to interfere with the harvesting. The exports, however, are much larger than for the same month last year, amounting to 159,000 tons to America and Europe, 69,000 tons to Eastern countries and 11,000 British Columbia; these include 152,000 tons with United States options, thus insuring a good supply for the American refiners in September, the month of largest distribution of refined sugars.

Indications point to a larger world's stock of sugar on September 1st than was anticipated earlier in the season, thus there is now no reason to look for extremely high quotations, but, should

the demand for refined suddenly increase to large proportions, some recovery in prices would be in order.

At the close a cargo of St. Croix sugars afloat, pressed for sale, was placed on basis of 2.44c. c. f. & i. 96° test, equal to 4 $\frac{1}{8}$ c. landed, establishing $\frac{1}{8}$ c. decline for the week.

Czarninow, Macdougall & Co. report, under date of August 7, as follows:

During the first days of the week our raw sugar market remained unchanged, with more buyers than sellers at 4 $\frac{1}{4}$ c., which was the closing price of the previous week. After the holidays the European market opened steady, and ours showed signs of a slight improvement, which, however, did not materialize because of a sudden collapse in European beets, which declined on the 5th inst. to 10s. 3d., and close at 10s. 0 $\frac{3}{4}$ d. for August. These declines doubtless arise from European holders having lost hopes of the expected American demand and from the very favorable weather for the growing beet crops, all of this resulting in bringing the prices of old and new crop closer together than they have been for a long time.

New crop Beets, October-December delivery, dropped from 9s. 11d. to 9s. 8 $\frac{1}{4}$ d., a decline of 2 $\frac{3}{4}$ d. against a decline of 5 $\frac{1}{4}$ d. in old crop. As the lowest price for beets in the present year was 9s. 9d. on February 19th, and this was when the Cuban crop was at its height, it seems very improbable that the decline can extend more just now when the consumption is in excess of production, and especially if it is borne in mind that under present labor conditions, the beet grower cannot produce the article as cheaply as in former years. This seems to be confirmed by the slight decline in new crop this week as compared with the decline in old crop.

There was some Cuban sugar on the market at one time at 2 $\frac{3}{4}$ c. c. f., basis 95°, and Porto Ricos at 4.17c., but refiners showing no interest, holders withdrew the sugar from the market for the time being. There is no doubt that when refiners become buyers again they will be able to pick up some small lots at very near the parity of the present low level of the European market.

There are not very large blocks of sugar on offer from anywhere, which is quite fortunate for the market.

Refiners, with very few exceptions, having secured the largest portion of their requirements up to the end of the year, are not in favor of a decline in raws; but for the same reason that their stocks are ample for their immediate needs, they do not have to buy, and under these circumstances, any sugars forced for sale must bring low prices.

Even after the recent collapse in European prices, the parity of 10s. 0 $\frac{3}{4}$ d. is 4.12c. duty paid, or 2.77c. c. f., basis 96°, for Cubas, and if the refiners had the active demand all looked for at

this time of the year there would not be any necessity for prices to go below 4.17c. until later in the season.

The main cause for the unsatisfactory condition of the market is the absence of the demand which had been anticipated for the refined article and which, for some cause or another, has not put in its appearance, and many now fear is not going to do so until after the new crop sugars come into play.

Java shipments in July were 160,000 tons, much more than expected. The Javas afloat with United States option are 200,000 tons, against 91,000 tons last year.

European quotations today are: August, 10s. 0 $\frac{3}{4}$ d.; September, 10s.; New Crop, October-December, 9s. 7d.; January, 9s. 8 $\frac{1}{2}$ d.

The market closes weak at above prices.

NOTES.

HAWAII MISREPRESENTED.—In a well written and interesting article entitled "Michigan's Advent in the Sugar Industry," published in the *Detroit Free Press*, and largely republished in various sugar journals, Mr. F. R. Hathaway, Secretary of the Michigan Sugar Company, reviews the history of the beet sugar industry of the United States, and therein makes statements in reference to the Hawaiian sugar industry and the privileges that the Territory of Hawaii enjoys which should not go unchallenged. Mr. Hathaway says:

"The conditions growing out of the late war with Spain have compelled the domestic sugar producers to fight for their very existence. It has been one continuous struggle. Hawaii was the first to profit by the war. Prior to 1898 free trade between these islands and the United States depended on treaty. In that year the islands were annexed to our country and our tariff laws extended to include them. This condition existed until 1906, when Hawaii was granted a privilege not enjoyed by any other State in the Union. Duties collected on goods entering Hawaiian ports and excises collected within the islands are returned to the island treasury to relieve local taxation. Under this principle duties collected at Detroit, Port Huron and Sault Ste. Marie, as well as all excise taxes collected within the State on liquor and tobacco should be transferred to our State treasury at Lansing.

DINGLEY LAW RESULTS.

Certainly neither Hawaiian annexation nor the transfer of national revenues to the island treasury was contemplated by Con-

gress when considering the Dingley bill in 1897. This legislation has worked wonders for the islands. Their crop of sugar has doubled. However advantageous this may have been to Hawaii, it is questionable whether it has been financially profitable to the United States. The duties remitted are greater than the total value of all goods sold by us to the Hawaiians. In other words, the United States could have afforded to give the Hawaiians all the goods shipped by us to them, provided they in turn, would have paid the regular rate of duty on sugar shipped by them to us."

Whether such statements were made through gross ignorance or with an idea of misleading we are unable to state, for there seems to be a disposition on the part of the beet sugar interests to misrepresent and distort anything and everything relating to the sugar interests of Hawaii.

We understand that the customs revenues of Porto Rico and the Philippines are returned to those countries, but it has never been so in the Territory of Hawaii.

It may interest Mr. Hathaway to know that nearly 80 per cent. of Hawaii's imports are from the United States. Notwithstanding the large proportion of free importations, she has paid since annexation the tidy sum of \$10,000,000 in round numbers into the National Treasury to help run the general Government. The amount of customs revenue paid in per capita by the people on the mainland of the United States in 1907 was \$3.89; the average amount paid by every man, woman and child in Hawaii on an estimated population of 200,000, for the same period, was \$7.30. While Hawaii's contribution may be small compared with the National expenditure, she is certainly doing her full share in bearing the burden when she pays out of her own pocket nearly double her per capita proportion.

Since the Reciprocity Treaty was adopted, the people of the United States have received the enormous sum of \$215,000,000 for exports to Hawaii, products grown on American farms and manufactured in American factories. The average Hawaiian planter (or planting company) must equip his plantation with a \$500,000 mill, the materials for which come from America and are protected by heavy duties; in many cases, he must install pumps and pipe lines, made in America, costing, say, another half-million, and likewise protected; he must expend many thousands of dollars in railroads, engines, cars, live stock, etc., and which, for the most part, enjoys similar benefits of protection as those accorded to sugar. After his plantation is once started, he must buy his fuel oil from California fields, the material for the renewals of his machinery and equipment from Eastern factories; his hay, grain, flour, and a thousand and one articles which constitute the major portion of the cost of producing sugar,—all from the United States.

Another important consideration is the value of Hawaii's carrying trade to the American merchant marine. In accordance with the existing navigation laws, all merchandise shipped to and from the Islands must be carried in American vessels representing a total investment of not less than fifteen millions of dollars. Much is being said and written in regard to the decline of the American carrying trade with foreign countries. The total foreign commerce of the United States carried in American bottoms during 1907 was valued at \$318,331,026; the total value of imports and exports from and to the Territory of Hawaii carried in American vessels for the same period was \$44,572,958. In other words, the value of little Hawaii's commerce was 14 per cent. of the entire foreign commerce carried under the American flag for the year 1907.

The total value of the commerce of the United States with its non-contiguous territory (Alaska, Porto Rico, Tutuila, and Hawaii), exclusive of gold and silver shipments, was \$63,340,079 for 1907, of which Hawaii's share was \$43,178,957, or nearly 70 per cent. of the total.

We take this occasion to return thanks to one sugar journal that failed to swallow all that Mr. Hathaway said. The "Louisiana Planter," in commenting upon that part of the article which we have criticised, says:

"While this may look like a little sharp practice on the part of the Hawaiians to get the general Government to take care of them in this paternal sort of way, we must remember that the Hawaiians are first cousins of the Michigan sugar people and with them trace their ancestry directly back to their New England forbears."

To which we might add that it would seem the Michigan sugar people have failed to inherit some of the estimable qualities of their broad-minded, truth-loving New England ancestors.

BET SUGAR STATISTICS.—During the course of a speech in the House of Representatives at this last session of Congress, Mr. Fordney of Michigan, made some interesting statements in regard to the beet sugar industry of the United States, which we quote. He said:

The beet sugar industry in the United States has not had the advantages of adequate and continuous protection, even during the life of the Dingley Tariff. The industry is constantly menaced by such acts of Congress as opened to Cuban sugar freer access to the markets of the United States and the threats of increased importations of free sugar from the Philippines. In the face of these untoward circumstances remarkable progress has been made in the industry even in the past few years. In 1899 there was invested in the beet sugar industry in this country \$20,141,710. Employment was given to 1,970 workingmen, who

received annual wages aggregating \$1,092,207, and the value of the aggregate product was \$7,323,857. In 1904 the aggregate capital invested in the industry had nearly trebled, going up to \$55,923,489. The number of workmen had increased to 3,963 and the aggregate annual payments to \$2,486,702. The value of the aggregate products for that year was \$24,393,794, and for the year of 1907 over \$40,000,000.

The adoption of Cuban Reciprocity, which treaty reduced the import duty upon sugar coming into the United States from Cuba 20 per cent. below the rate fixed in the Dingley Tariff law, caused the construction of beet sugar factories in the United States to halt and the capital invested in those already built to tremble with fear of further disaster to that industry by the agitation of Free Trade with the Philippine Islands.

That the enactment of Cuban Reciprocity has been most disastrous to the United States is proven by a review of our exports to and imports from Cuba for the past eight years, which covers a period four years prior and four years subsequent to the enactment of that treaty. As an illustration, our exports to Cuba for four years prior to December 27, 1903—which was the date of putting Cuban Reciprocity into effect—averaged in round numbers \$25,000,000 per year, and for the four years succeeding the adoption of that law our exports averaged \$40,000,000 per year, while during the same period our imports from Cuba amounted to about \$40,000,000 annually, and for the succeeding four years more than \$86,000,000 annually, and the 20 per cent. reduction of duty given to Cuba cost the United States Government in the past four years more than \$40,000,000. So that in order to secure a market in Cuba in the past four years for an increase of \$60,000,000 in our exports we were compelled to take more than \$183,000,000 increase of Cuban imports and make her a present of \$40,000,000 in cash.

PHILIPPINE SUGAR EXPERIMENTS.—In a recent number of the Philippine Agricultural Review, which is a publication issued by the Bureau of Agriculture of the Philippine Islands, it is stated that in the early history of the Bureau of Agriculture it was planned to replace the antiquated sugar mill on the experiment farm with a modern, up-to-date outfit and make it an object lesson in sugar milling in the Philippines. Before this was accomplished, however, the work animals used on the sugar plantations throughout the islands, especially in Negros, had died from rinderpest and surra to such an extent, also the price of sugar fell so low, that it was decided that before encouraging the people to engage in the extensive production of sugar, a constant and reliable market should be found for it.

An attempt was made to secure a reduction or abolition of the Dingley Tariff on Philippine sugar entering the United States, as a substitute for the former Spanish market enjoyed by the

sugar produced in the Philippines. This question has now been under consideration by the United States Congress for more than two years and there seems no hope for immediate relief in this direction. It has, therefore, been planned by the Bureau of Agriculture to discontinue the production of sugar on a commercial scale at this farm and devote the work to plat experiments dealing with the comparative merits of varieties, value of fertilizers, yield tests, irrigation, diseases and injuries. A small portion of the farm will also be set aside for general experiments with Philippine Agricultural products, such as abacá, maguey, corn, sweet potatoes, forage crops, and especially leguminous plants to be used as rotation crops in connection with sugar growing. This work will be pushed right through from the beginning by planting native beans and other tropical legumes between the rows of second and third ratoons which do not promise to give a sufficient yield of cane to justify harvesting. The scrub cane which grows upon the land will serve as a trellis on which beans can run.

EGYPTIAN SUGAR.—The cost of manufacture in 1906-7 was \$5.046 for every sack of 220 pounds ($2\frac{1}{3}$ cents per pound), against \$5.002 for every 220 pounds ($2\frac{1}{4}$ cents per pound) in 1905-6, the rise being due to the increased price of labor and raw sugar. This cost does not include the expenses of packing, etc., which are equal to 67 centimes ($12\frac{9}{10}$ cents) per sack of 220 pounds. The retail price of sugar in Cairo and Alexandria, in the shops, is: Brown sugar, $3\frac{2}{3}$ cents per pound; white cane sugar, granulated, $3\frac{2}{3}$ cents; refined sugar in loaves, $3\frac{4}{5}$ cents; refined sugar in squares, 4.992 cents per pound; pulverized sugar, 4.599 per pound. The average sale price of the company was 38.74 francs (\$7.48) in 1907, against 37.82 francs (\$7.30) in 1906, per sack of 220 pounds.

DEVELOPMENT OF THE INDUSTRY.

To understand the conditions of the sugar trade in Egypt, it must be remembered that the cultivation of sugar cane was begun there in the reign of Ismail Pasha. He brought the cane from Jamaica in 1850, and the manufacture of sugar was begun in 1855. The Khedive's property later passed into the hands of a Government commission called the Daira Sanieh, which increased the number of factories. At that time the low price of cotton gave a great impetus to the cultivation of sugar cane. Only raw sugar was manufactured by the Daira, the greater part of which was sent to the United States to be refined; so that for its supply of white refined sugar Egypt depended upon France and Austria. In 1903, it had nine factories in Egypt—six in upper Egypt and three in lower Egypt. Land in upper Egypt was not then supposed to be fit for the cultivation of cotton.

Later the whole sugar industry of the country passed from the Daira to an English syndicate; and then to the French company. This company did not flourish—partly due to the fact that the high price of cotton influenced proprietors of land to stop raising sugar cane and to grow cotton, even in upper Egypt. The area devoted to sugar cane was reduced in 1906 by one-half. In 1906 a reorganization of the company was brought about, and the company is now doing as well as could be expected. It is hoped that in time its undertakings will be profitable. It practically has the sugar industry of Egypt in its hands. Only four of its factories are now working.

FORMOSAN SUGAR.—Consul Julian H. Arnold, of Tamsui, transmits an extended report on the sugar industry of Formosa, from which the following principal points are taken:

The primary object in the development of the industry is that Formosa may be able to supply the sugar consumption of Japan, to do which it must increase its production sevenfold its present output. With the efforts being put forth, together with the erection of modern sugar mills, which is being effected as speedily as possible, the island is on the way to accomplish this.

In 1900 the first modern crushing mill was erected by an American company, at the instance of the Formosan government, which proved so successful that it was then decided to encourage the manufacture of sugar in the island by modern machinery on a large scale, and although there are still 500 of the small native stone mills in operation, they are being absorbed by the large companies.

An American company recently completed the erection of a 500-ton mill and is now erecting a 1,000-ton mill at Ako and a 1,200-ton mill at Koshiken, the latter being the largest mill erected, thus far, in the island. Five Americans are employed in superintending these erections. Another mill has purchased 120 miles of American rails and a number of American locomotives for its cane trams. In connection with a large mill being erected by a Germany company, both American and German locomotives will be used on its trams. Still another mill, the machinery for which has been supplied by a Scotch company, has American building equipments and locomotives.

WORLD'S SUGAR INDUSTRY.

CONVENTION AT BRUSSELS—CROP AND PRICE FLUCTUATIONS.

Consul-General Henry W. Diederich, of Antwerp, makes the following review of the sugar trade of the world, the extent to which Belgium participates, and the acreage which Europe has devoted to sugar beets for this year's crop:

An event of great interest to the future of the sugar industry occurred in 1907, viz., the renewal of the Convention of Brussels for a new period of five years and the conditional adhesion of Russia to the new agreement.

The Convention first took effect on September 1, 1903, and is to remain in force until August 31, 1908. It was to be renewed after that time from year to year, if one of the contracting parties did not renounce it before September 1, 1907. The British Government manifested the intention not to adhere to this renewal unless it was to be exempted from the obligation of penalizing bounty sugar. At first it seemed as if this decision would jeopardize the existence of the Convention. However, under the pressure of the interested governments, an agreement was signed on August 22, 1907, prolonging the international union for a further period of five years and conceding to the United Kingdom the free importation of bounty sugar under certain guaranties for the reexportation of the same. However, this act had to be ratified by the parliaments of the different governments interested, and in addition Germany demanded as a condition that Russia agree to the Convention.

THE RUSSIAN AGREEMENT.

This result was also reached at the end of the year, thanks to a limitation of the right of exportation being conceded to Russia, which country was in return authorized to maintain its interior legislation and its own system of indirect premiums. On December 19, 1907, a second additional agreement was signed in Brussels, assuring the adhesion of Russia to the Convention and granting to that country its quota of exportations, fixed for the respective seasons as follows: Three hundred thousand tons for 1907-8 and 1908-9 together and 200,000 tons for each succeeding season up to and including 1912-13. However, the total figure for authorized exportations during the six years (beginning September 1, 1908) must not exceed 1,000,000 tons.

The right of exportation thus provided for and limited comprises all exports excepting those to Finland, to Persia (by the Caspian Sea or over the frontier), and to the other Asiatic countries directly bordering on Russia by the frontier. Only Turkey was put in this class, because, while it borders on Russia, it is

on the same footing as most other countries. These two additional agreements have been ratified by the different countries.

RANGE OF PRICES.

During 1907 fluctuations in prices kept within moderate limits. In the spring prices rose a little under the influence of the scarcity of raw sugar on the principal European markets, where it serves as a basis of transactions for future deliveries. This scarcity was caused by the heavy shipments made to the United States in October-December, 1906, and later by large purchases made by German refiners, in view of an eventual compromise concerning which the negotiations proved fruitless.

The sowing of beet-root seed was about the same as that of the preceding year, which was fortunate, as the crop of the season 1906-7 had been very large. In 1907, however, the weather conditions for the development of the beets were very unfavorable during the entire summer. At the beginning of September the crop seemed to be backward, and both an agricultural and industrial deficit was expected. Under this apprehension the prices quoted on September 6 were the highest reached during the year, viz., \$4.95 and \$4.78 for October-December.

AMOUNT OF DEFICIT—WORLD'S PRODUCTION.

Later came a period of fine weather, during which the beet root made great progress, which resulted in the crops being scarcely less abundant than those of 1905 and 1906. Prices fell rapidly, as the results of the harvest and of the manufacture created the impression that the deficit of the production in Europe would only reach from 100,000 to 150,000 tons. The world's production was as follows:

	1907-8.	1906-7.	1905-6.
European Beet Sugar:	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>
Germany	2,132,000	2,239,000	2,418,000.
Austria-Hungary	1,440,000	1,344,000	1,510,000
France	725,000	756,000	1,090,000
Belgium	235,000	283,000	329,000
Netherlands	175,000	181,000	207,000
Russia	1,410,000	1,440,000	968,000
Other countries	435,000	467,000	410,000
Total for Europe...	6,552,000	6,710,000	6,932,000
United States beet sugar.	410,000	433,000	284,000
Cane sugar	7,203,000	7,361,000	6,742,000
Total	14,165,000	14,504,000	13,958,000

The deficit of the universal production is thus figured at 340,000 tons. However, it must be borne in mind that in the 7,203,000 tons given as the production of sugar cane (figures given by Willet & Gray), the Cuban crop is estimated at 1,200,000 tons, as against 1,428,000 tons in 1906-7. [The last Cuban crop amounted to about 900,000 tons.] But, by reason of the drought which prevailed in Cuba during the first months of the year and which was very injurious to the cane, the deficit seems to have been much higher than estimated by the statisticians, and, according to private opinions, it should be estimated at from 400,000 to 500,000 tons. This brought about a better state of affairs, and the year closed with prices at \$4.68.

BELGIAN STATISTICS—FUTURE CROP PROSPECTS.

The price of spot Belgian sugar, exportation, 86 to 92 degrees, during the year 1907 varied between \$4.20 and \$4.87. The following table shows the quantities of sugar consumed in Belgium during the last two seasons:

Classifications.	1906-7. <i>Tons.</i>	1905-6. <i>Tons.</i>
Sugar subject to internal revenue tax of 20 francs (\$3.86).....	73,474	72,804
Sugar subject to customs duty of 15 francs (\$2.90)	3,267	3,179
Sugar for the manufacture of jams, etc.....	3,656	3,480
Sugar for the manufacture of sweetened vegetables	32	27
Sugar for the manufacture of condensed milk..	46	98
Denatured sugar for cattle.....	235	176
Total	80,710	79,764

The consumption of sugar in Belgium subject to the revenue tax of 20 francs (\$3.86) comprises 1,916 tons of raw sugar; 22,164 tons of crystallized sugar, and 49,394 tons of refined sugar.

The Belgian exportations of raw beet sugar in 1907 amounted to 101,169 tons, against 124,978 tons in 1906; 94,230 tons in 1905, and 190,800 tons in 1904; the record crop of the past decade was 306,336 tons in 1900. Last year's sugar exports from Belgium were lessened, both from a smaller production and the absence of orders from the United States.

As to the future sugar beet crop, it has been recently ascertained that the acreage sown to beets has been reduced about 3 per cent. on the average, as the following table will show::

	Acres.	Per cent. decrease (—) or increase (+).
Germany	1,068,111	— 3.6
Austria-Hungary	816,088	— 1.8
France	504,868	— 3.6
Holland	119,671	— 5.5
Belgium	123,549	— 5.4
Sweden	79,140	+ 5.8
Denmark	37,050
Italy	108,680	+12.8
Spain	74,100	—24.4

No one can foretell how these beets now growing in the fields of Europe will turn out in the campaign of 1908-9.

THE DETERMINATION OF SUCROSE IN MEGASS.

In 1905 Messrs. H. & L. Pellet published experiments¹ on the determination of sugar in megass which led them to the conclusion that the conventional process of analysis, i. e., a single extraction with boiling water for fifteen minutes gave results that were too low. They recommended the use of Zamaron's² process in order to obtain reliable results. The question has recently been thoroughly reviewed by Primsen Geerligs³ in Java, who finds:

1. That the conventional process gives results harmonious with those obtained by alcoholic extraction in a Soxhlet apparatus.
2. That Zamaron's process gives results higher than obtained by either process mentioned in 1, above.
3. That the difference is due to the prolonged digestion in Zamaron's process, extracting hemicelluloses from the megass which affect the polariscope reading.

The conclusions reached by Messrs. H. & L. Pellet must have come as a great shock to all sugar house chemists, implying, as they did, that the whole control work of years past was incorrect, and it is a matter of great comfort to find the opposite opinion held as a result of direct experiment by so high an authority as Mr. Primsen Geerligs.

N. D.

1. International Sugar Journal, No. 79.

2. See this Journal, XXIV, 9.

3. Java Archief, 1908. 3.

ON VARIETIES OF CANE, WITH SPECIAL REFERENCE
TO NOMENCLATURE.

BY NOEL DEERR AND C. F. ECKART.

Some years ago one of us¹ issued, from this Division of the Hawaiian Sugar Planters' Association Experiment Station, a Bulletin on the present subject; in the present Bulletin it is our object to place on record our further experience in this matter, which we are inclined to think is of no inconsiderable importance.

Of late years the interest in varieties grown from the seed has been so great that there has been danger of neglect of the older varieties, the nomenclature of which is in a state of great confusion. Now that the practicability of growing pedigree seedling canes is firmly established, and is being successfully carried on in more than one experiment station, it is a matter of great importance that workers in one part of the world should know what canes their colleagues in another have in mind when one of these is referred to.

To this end we have made a careful study of all the literature we have available, and have combined the results of such studies with our own personal experience.

We shall be ready to receive corrections and further information from any part of the world, and if a sufficiency of such information should be vouchsafed us we shall be willing to collate and publish what we shall have received.

THE YELLOW OTAHEITE CANE AND ITS ALLIES.

Under this heading we propose to collate the literature of the Sugar Cane dealing with cane or canes known under the terms "*Lahaina*," "*Bourbon*," "*Lousier*," "*Otaheite*," etc.

The earliest reference to this cane that we have found occurs in Wray's "*Practical Sugar Planter*," of date 1848. He states:

1. That the account of the origin of the "*Bourbon*" cane is not very satisfactory, the generally received opinion being that it reached the Island of Bourbon from the Malabar coast, originally being a small-sized, soft, juicy cane, which became much improved by cultivation.

2. That the "*Tibboo Leeut*" of Singapore is identical with the "*Bourbon*."

3. That the "*Otaheite*" canes are two,—the yellow, or straw colored, and the purple striped, or ribbon.*

4. That the Otaheite was taken direct from that island to the West Indies, Calcutta, and the Straits, and that the *Tibboo Leeut* was introduced to the Straits from Otaheite by way of Manila.

* For the moment this purple striped cane is not being discussed.

Definitely recorded instances of the introduction of this cane we have found as follows:

1. To the island of Bourbon at an early date, thence to Martinique about the middle of the 18th century, and from this island to Cayenne and other of the French possessions in the West Indies.

2. By Sir John Palfrey directly from Otaheite to Antigua in the 18th century.

3. By Captain Bligh, directly from Otaheite to Jamaica in 1796.

4. It is generally stated that the "Lahaina" cane was introduced to the Hawaiian Islands by Captain Pardon Edwards, of the ship George Washington, and that it was brought from the Marquesas Islands; this we will show later is a mis-quotation, and that the Lahaina cane came also from Otaheite.

Recently recorded notices of this cane.

Fawcett,² in a detailed descriptive list of canes growing in the Jamaica Botanical Gardens, mentions, among many others, the "Lahaina," "Queensland," "Keni Keni," "China;" he does not in any way identify them, but remarks that they possess the best characteristics of the white cane.

Delteil,³ in describing canes cultivated in Bourbon and Mauritius, gives as synonyms "Batavian" (in Bourbon), "Yellow" (in Mauritius), "Bourbon" or "Otaheite" (in the West Indies), "Singapore," "Leeut" (in Singapore).

Stubbs,⁴ who has made a detailed study of the varieties collected at Audubon Park, splits the White, Green and Yellow canes into a number of groups. In Group II of his classification appears:

No. 10. Yellow, from Cuba.

No. 11. Blanca de Otaheite, from Cuba.

No. 12. Loucier, or Lousier, from Mauritius, via Cuba.

Of this group Dr. Stubbs writes:

"It is difficult to find any difference between them on our soil. . . ."

"The leaves are covered with little prickles. . . ."

"They all came originally from the island of Tahiti (=Otaheite) or Madagascar."

In Group III of the same class appear:

No. 13. Portier, from Cuba.

No. 14. Lahaina, from Hawaii.

No. 15. Keni-Keni, from Jamaica.

These are stated to be the same cane, and to have originated from the Marquesas Islands. It is to be noticed that Dr. Stubbs does not mention the presence of prickles on these canes.

In Group IV are the China and Green Elephant, both from Jamaica, which are stated to be closely allied to the canes in Group III, but to differ essentially in habits of growth and ratooning.

In Group VIII are the Cuban and Sacuri, also from Jamaica.

Harrison and Jenman,⁵ in describing the canes growing in the British Guiana Botanical Gardens, give as synonymous: Bourbon, China II, Cuban, Lahaina, Bamboo II. Otaheite. They describe, but do *not* identify, in any way, canes under the names of Keni-Keni, Jamaica, Elephant, Singapore, China.

Comparing the statements we have collated above, all of which come from trained and experienced observers, contradictions in nomenclature are numerous. Thus, following Stubbs, "Cuban," "Otaheite" and "Lahaina" are three different canes, whilst according to Harrison and Jenman they are identical; again, Stubbs identifies Lahaina and Keni-Keni, while Harrison and Jenman separate these canes into two varieties; further, Delteil and Wray agree in the identity of Singapore, Bourbon and Otaheite, but Harrison and Jenman divide the first named from the last two.

This confusion can, we think, be readily accounted for on the supposition that there are *two*, or more, similar but distinct canes originating in the island of Otaheite; these canes have been introduced into all cane-growing districts, and have been exchanged from district to district; in this way the names given to these canes have multiplied, and the name proper to one variety has become attached to another; and in all probability where these canes are cultivated the two or more varieties may be growing in the same field as one variety.

We were led to this conclusion from a study of the literature of the cane, and this view is confirmed in the account of the Origin of the Lahaina Cane which we give below.

Origin of the Lahaina Cane.

Lahaina is a district in the island of Maui, in the Hawaiian Islands, whence this cane was distributed over the group, and eventually to many other cane-growing districts.

Its origin is succinctly told by Mr. D. D. Baldwin in a letter appearing in the *Hawaiian Planters' Monthly*, for May, 1882, and the information there throws much light on the question discussed above, and goes far to prove that there are at least *two* varieties of Otaheite canes.

Mr. Baldwin states that in 1854 Capt. Edwards, in the ship George Washington, brought *two* varieties of cane from Otaheite (*not* from the Marquesas); these two varieties are now (1882) known as Cuban and Lahaina, the "Cuban" also obtaining the name "Oudinot." To the "Cuban" was also applied the term Kenikeni, from the native term Kinikini—numerous, in reference to the prolific nature of the cane.

Mr. Baldwin thus distinguishes between these two canes.

Lahaina. Long straight leaves of light color, heavily aculeated, or covered with prickles at the base, with small round prominent buds.

Cuban. Leaves of darker green, bending down in graceful curves, with no prickles, and large triangular buds located in little cavities on the side of the cane stalk.

Mr. Baldwin further states that in 1861-2, Cuban was the favorite cane, and that it afterwards gave way to Lahaina, the latter possessing these advantages: Rapid growth, deep rooting, hard rind when mature, superior richness of juice, firm, compact fibre, making the trash easy to handle, and enhancing its value as fuel.

That it is possible that there are two varieties of this cane is, we submit, a matter of no inconsiderable interest. The yields obtained from the Lahaina cane in the Hawaiian Islands are unsurpassed elsewhere, and under the name of Bourbon and Lousier this cane, or canes, still remains under extended cultivation in Demerara and Mauritius, and in the former district it has formed the basis of comparison in the extended trials, the results of which have been annually published by J. B. Harrison.

This view that the cane called Bourbon does not represent an unmixed strain is not now put forward for the first time; on entirely different lines of reasoning, and chiefly based on field observations, J. H. Hart,⁶ in Trinidad, has expressed the view that the Bourbon cane in Trinidad includes many varieties of yellow cane.

Irregularities in Nomenclature.

Delteil³ states that the term Otaheite is in Bourbon applied to a purple cane, and Fawsett² also classifies a purple cane under this name. Soltwedel⁷ illustrates the Loethers (Lousier) cane of Java as a brown cane, and in this he is followed by Kruger.⁸ Alfred Watts⁹ described the Lousier as grown in Pernambuco as a "dark red cane, with a very dark green, almost black, stripe, scarcely visible, turning brick red when ripe, with hard rind and very heavy." This description applies to the cane discussed below under the name "Cavengerie." Stubbs separates the Bourbon as sent to him from Trinidad from the Otaheite, etc., and identifies it with "Light Java," etc. (see below), but in a letter one of us received from him in 1903 he writes: "I have long since been convinced that the Bourbon cane I have is not the Bourbon alluded to by several of the correspondents." Cousins¹⁰ separates the Bourbon and Otaheite canes, and writes, "..... the White Transparent or Mont Blanc cane (which would appear to be identical with the so-called Otaheite cane introduced by Captain Bligh.....)." Tiemann,¹¹ referring to canes in Egypt, writes, "This red cane springs apparently from the Bourbon, or else is identical with it."

Portii¹² is described in a report of date 1869, from the Royal Botanic Gardens of Mauritius, as a chalky gray colored cane, spreading in habit,—highly spoken of in the Straits. It is spoken of as likely to be one of the best sugar-producing canes in the colony (Mauritius). Portii is stated by Stubbs to have come to

Cuba from Mauritius, and thence to Louisiana; this is evidently a case of name transference from one cane to another, as Stubbs positively identifies Portii as the same as Lahaina.

Suggested Nomenclature.

In all cases we think that the original home of a variety should be used in naming a cane, and for this reason we prefer Otaheite to Lahaina, Bourbon, Louzier, etc., although these names are firmly established, and will probably remain so in the respective districts where they are in use.

THE "BATAVIAN" OR "TRANSPARENT" CANES.

Under this heading we propose to collate the literature of the canes known as White and Purple Transparent in the British West Indies, as Rose and Dark Bamboo in these Islands, and also known under a great variety of names.

The earliest mention of these canes occurs, so far as we know, in Wray,¹³ who writes: "The Batavian canes with which I am acquainted are of four descriptions, viz: the yellow violet, the purple violet or Java cane, the 'transparent' or ribbon cane, and the Tibboo Batavee or Batavian, of the Straits."

"The yellow violet,' so designated in the West Indies, differs from the Bourbon in being smaller, less juicy, correspondingly harder, of slower growth, and of a foliage much darker and more erect. The yellow violet does not require so rich a soil as the Otaheite, but contents itself with that of an inferior description."

Of the "purple violet" or large black cane of Java, he writes that the very upper joints sometimes exhibit faint streaks which become imperceptible in the lower joints, and that frequently the cane is encrusted with a white resinous film; in the Straits the Malays call it Tibboo Etam, or Black cane.

Of the transparent or ribbon cane he writes that it is much smaller in size than the Otaheite ribbon; that it is of a bright transparent yellow, with a number of blood red streaks or stripes.

Delteil³ gives as synonymous Otaheite (in Bourbon), Belouguet (in Mauritius), Purple Batavian, Purple Violet, Tibboo Etam, and Tabor Numa. Stubbs⁴ first group of white, green or yellow canes includes as synonyms La Pice, Panache, Le Sasseur, Tibboo Mird (from Manila), Bourbon (from Trinidad), Crystallina, Green, Light Java, Hope.

In Group V of the same class is placed Rose Bamboo, received from Hawaii. The separation of Rose Bamboo from Tibboo Mird is remarkable, as at this Station these canes are identical, the Tibboo Mird we have having been received directly from Louisiana.

In Group II of the striped canes, Stubbs gives four identical canes,—the Red Ribbon, Striped Mexican, Batavian and Home Ribbon; Dr. Stubbs states that this variety came originally from

Tahiti, and that it is usually known as the Otaheite Ribbon cane.

In Group III of Stubbs' third class is the Black Java, stated to be a sport from the Red Ribbon, and to be identical with the Louisiana Purple cane.

In Harrison's and Jenman's list of canes under cultivation in the British Guiana Botanical Gardens the following synonyms are given:

Red Ribbon—Seete—Striped Singapore.

White Transparent—Caledonia Queen—Mamuri—Rappoe.

Purple Transparent—Java—Purple Mauritius—Queensland Creole—Meera.

From our own experience in Demerara, Mauritius and Hawaii, we have no hesitation in saying that it is impossible to differentiate between the White Transparent or Caledonian Queen of the West Indies, and the Rose Bamboo of Hawaii and Mauritius; in addition, a cane grown to a limited extent in Mauritius under the name Striped Bamboo is identified by one of us as identical with the Red Ribbon, Striped Louisiana, etc. In Fiji the Striped Bamboo is known as Mauritius Ribbon.

In a subsequent paragraph we deal more fully with the question of sports, and for the moment we take it as established by means of the authorities that we have quoted above that the self-colored light and dark canes mentioned in the preceding lines are sports from the ribbon cane identical with that described by Wray as the "Transparent Cane," and that Wray's "Yellow Violet" is the White Transparent or Rose Bamboo, and that his "Purple Violet" is the Black Java or Louisiana Purple, or Purple Transparent. We have not been able to obtain any account of the origin of the terms Bamboo or Transparent, as applied to these self colored canes here treated of; we are, however, inclined to connect them with the term "Striped Bamboo," as applied to the ribbon cane in Mauritius, and with Wray's term of "Transparent" or ribbon cane, and suggest that it was with full knowledge of the origin of these canes as sports from a striped cane that the names arose.

The Cheribon Cane.

In the literature of the cane, especially as it relates to Java, the Cheribon cane is frequently mentioned, and it has there occupied a position analogous to that occupied in the British West Indies by the Bourbon.

One of us,¹⁴ trusting to the verbal statement of a gentleman who had been for many years in Java, stated that this cane was the same as one discussed below as the Striped Tanna; this statement we now know to be quite incorrect. The description of this cane by Kruger leaves no doubt that this cane is none other than that already described as "Black Java," "Purple Transparent," and "Queensland Creole." A categorical statement to this effect, which we quote below, has lately appeared, due to Kruger:¹⁵ "In

Barbados a little Bourbon still is grown, but the 'Purple Transparent' (probably identical with the Cheribon) is chiefly planted, then the 'Ribbon Transparent' and the 'White Transparent' (which are presumably the Striped Cheribon and the White Cheribon)."

Synonymy.

To these canes have been given a great number of names, which we collect below:

Striped variety. Transparent, Striped Mexican, Louisiana Striped, San Salvador, Striped Singapore, Striped Bamboo, Red Ribbon, Seete, Striped Cheribon, Home Ribbon, Mauritius Ribbon. A cane very similar to this striped variety has been grown in Fiji, we understand, under the name of Striped or Mauritius Gingham. Its distinguishing features are the absence of bloom and its great susceptibility to gumming disease.

Light colored variety. Yellow Violet, La Pice, Le Sassier, Panachee, Rose Bamboo, Mexican Bamboo, White Transparent, Naga B, Blue, Hope, Light Java, Mont Blanc, Rappoh, Crystalina, Tibboo Mird, Green, Mamuri, Yellow Singapore.*

Dark colored variety. Louisiana Purple, Black Java, Purple Transparent, Black Cheribon, Tibboo Etam, Purple Violet, Belouquet, Tabor Numa, Queensland Creole, Purple Mauritius, Purple Bamboo, Moore's Purple.

Irregularities in Nomenclature.

Delteil³ gives Otaheite as a synonym of the dark colored variety in Bourbon, whence perhaps comes the purple cane called Otaheite by Fawcett. Cousins¹⁰ suggests that the White Transparent or Mont Blanc cane is identical with the so-called Otaheite cane introduced by Capt. Bligh into Jamaica. Stubbs' inclusion of Bourbon amongst the other synonyms of the light colored variety, and his separation of Rose Bamboo have already been discussed; he further states that the striped variety came originally from Tahiti, and is generally known as the Otaheite Ribbon cane; Wray, however, particularly distinguishes between the "Transparent" cane and the Otaheite Ribbon cane, which form Wray's description we take to be that discussed below under the name Striped Tanna. Harrison and Jenman⁵ give Merra as a synonym of their Purple Transparent; Meera is a Malay term for red, and the Tibboo Meera of Java described and figured by Soltwedel⁷ is a dull brick red cane quite distinct from the Purple Transparent. Soldwedel figures Tibboo Rappoh as a cane of a

* In Fiji the Yellow Singapore and Rose Bamboo are, we understand, distinguished from each other by a difference in the degree of tasseling, a characteristic which might possibly be influenced by previous environment.

peculiar greenish brown color, with a well marked bluish white layer of wax (?) at the node, and Tibboo Rappoh Kiang as a purplish cane.

Judging from a report¹² on new varieties of canes from the Royal Botanical Gardens of Mauritius, for 1869, Rappoh seems to be a generic term applied to canes, similar to the East Indian terms Meera—any red cane, or Soerat—any striped cane; probably one of these varieties identical with the Rose Bamboo, etc., has found its way to Queensland, where the term Rappoh has become restricted to it and it alone. In the report mentioned, the term Rappoh appears as under: "Rappoe (a worthless variety) Rappoe Maeda Rappoe Koenig (apparently a worthless variety) Aboe White or White Rappoe."

In a very early reference in the Annual of Scientific Discovery, 1851, mention is made of Crystallina, Chalk or Salangore, recently introduced into Louisiana, and superior to any other variety. Tryon¹⁶ mentions that the cane called Cheribon in Queensland is the same as that called Port Mackay (see Cavengerie below). Fawcett describes Seete as a green cane, white when ripe, and Dahl and Arendrup¹⁷ also give it as a greenish yellow, or white, cane.

Suggested Nomenclature.

The terms "Bamboo" and "Transparent" are firmly attached to these varieties, but nevertheless we think that a topographical nomenclature would be more proper. Wray, the earliest authority, does not trace this cane to Otaheite, and distinctly calls them Batavian canes, hence the terms Light, Purple and Striped Java would be suitable; in Java they are known as the White, Black and Striped Cheribon canes, and as such they are frequently mentioned in the Java "Archief." For this reason we think that "Cheribon" is the best term to apply to them, as in this way a topographical system of nomenclature is retained.

THE YELLOW CALEDONIA AND TANNA CANES.

In Bulletin No. 10 of the Division of Agriculture and Chemistry one of us wrote:

"White Bamboo, Queensland No. 7, Yellow Caledonia, and the unstriped cane which occasionally appears in a stool of Big Ribbon are closely allied; in fact, between White Bamboo and Yellow Caledonia there appears to be no difference, and after four years trial it is impossible to distinguish one from the other."

This expression of opinion with respect to the apparent identity of the light colored sport from Big Ribbon with the Yellow Caledonia or White Tanna has now been entirely confirmed. We are satisfied, however, that a consignment of cuttings received at this Station under the name White Bamboo bore the name by mistake, and should have been labeled Yellow Caledonia. The fact that

Queensland No. 7 is a seedling cane naturally separates it from the Yellow Caledonia, although under Hawaiian conditions they bear no distinguishing external features, so far as we have observed. The following may be put down as synonyms:

Big Ribbon—Striped Tanna, also possibly Gingham and Maillard.

Yellow Caledonia—White Tanna—Malabar (in Fiji)—Green Tanna.

As regards the origin of these canes, we recall that Wray states there are two Otaheite canes, the yellow or straw-colored, and the purple stripped or ribbon; this latter he describes as much larger than the ribbon cane of Batavia, and with a much darker foliage; its coloring he gives as a broad purple stripe on a greenish yellow ground, as contrasted with the blood red stripes on a transparent straw-colored ground of the Batavian ribbon cane; this description, so far as it goes, fits the Big Ribbon, and Delteil gives the following synonymy:

Otaheite Ribbon (Wray)—Gingham—Maillard—Tabor Soer-rat* (in Java).

In a verbal communication, however, to one of us, Mr. James Clark has referred to the Striped or Mauritius Gingham as being subject to "gumming" more than other varieties grown in Fiji; this would lead one to doubt the definite identification of Otaheite Ribbon with Big Ribbon. The latter as a Tanna cane is known to be especially resistant to gumming in Queensland. Mr. Clark, who is well acquainted with the Striped Tanna variety, has, to one of us, likened the Mauritius Gingham to the Striped Singapore, and mentioned the absence of bloom as its chief differing characteristic. It is therefore possible that either Otaheite Ribbon is not synonymous with Big Ribbon, or that there are two distinct canes grown under the name of Gingham. As we have found references to a cane called "False Gingham," it is possible that this is the variety grown in Fiji.

Wray also describes, but not too clearly, a cane originating from the island of Tanna, in the New Hebrides. He says, "The Tibboo Teelor (or egg cane) has long been deemed to be the Otaheite cane by the planters of Province Wellesley, but quite erroneously. It is evidently the cane described by Cook and other navigators as peculiar to the island of Tanna, one of the New Hebrides." The quotation from Cook's Voyages, quoted from memory by Wray, is given correctly below:¹⁸

"The breadfruit, cocoanuts and plantains are neither so plentiful nor so good as at Otaheite; on the other hand, sugar canes and yams are not only in greater plenty, but of superior quality and much larger."

Wray states that this cane was introduced into Manila many

* This last term is confusing, as the name simply means Ribbon cane, and is applied to any ribbon cane.

years ago, (he wrote in 1848), and thence found its way to Singapore; he remarks on its extreme cleanness and absence of itch, the curious manner in which it bulges out between the joints, its peculiarity in shedding its leaves as they become dry, and on its brittle nature. With the exception of the bulging internodes this description tallies closely with that of the Yellow Caledonia or White Tanna, and it is possible that this is the same cane that Wray describes as Tibboo Teelor, and attributes to the Island of Tanna. This island lies quite close to New Caledonia, and it is reasonable to suppose that the same varieties of cane would exist in the two islands; the name "Yellow Caledonia" then may connect the origin of this cane with the island of New Caledonia. If Wray's New Hebrides cane was called "Tibboo Teelor" or egg cane from the fact that the internodes were sufficiently oval to suggest such a name naturally it was distinct from our Yellow Caledonia of today. Concerning the origin of the term "Tibboo Teelor" we have found no information.

Of the cane known as Black Tanna we have found no synonyms.

Irregularity in Nomenclature.

Kruger⁸ describes as Tibboo Kunning or Tibboo Teelor a cane of a handsome yolk yellow coloring, with very conspicuous depressions at the eyes, and with more or less convex internodes; this cane is figured by Soltwedel, but the colored drawing does not correspond with the cane that we know as Yellow Caledonia.

THE SALANGORE CANE.

This variety is not cultivated in these Islands, and when tried experimentally some years ago at the Experiment Station was so pronounced a failure that its further trial was abandoned. It is cultivated apparently to some extent in Porto Rico, since Cook and Collins¹⁹ write, ". . . but the Salangore variety has been preferred of late years, as more resistant to disease."

The history of this variety, so far as we have been able to trace it, is as follows:

Wray,¹³ writing in 1848, speaks in the highest terms of the variety, calling it the finest in the world; he gives as synonyms the native terms Tibboo Capor and Tibboo Beltong Berabou, and comments on the large amount of cane wax found on the stem.

A second early reference occurs in the Annual of Scientific Discovery, 1851, when it is stated that the Crystallina, or Chalk, or Salangore cane recently introduced into Louisiana is superior to any other.

Deltail³ gives as synonyms of the Salangore, Chinese cane (in Bourbon) and Penang cane; he describes it as a green cane covered with a dirty greyish brown wax, and says that in Bourbon and Mauritius planters are far from sharing Wray's opinion. Har-

risson and Jenman⁵ give as a synonym (in Demerara), White Mauritius, and describe it as much under average height, much under average length of internodes, and of nearly average girth, while Fawcett describes it as of stout, upright habit, and of rapid and luxuriant growth.

Another reference appears in an anonymous contribution dealing with Queensland canes:²⁰ "A cane which I think would do well there is the Salangore. It is of very erect habit, ratoons well, and yields a juice rich in saccharine matter, and easy of clarification. It has somewhat more fiber than the Otaheite, and grows the greatest weight per foot of any cane I have ever seen, sometimes almost two pounds weight per foot of cane."

These descriptions are so diametrically opposed that it might appear that two canes are included in the name Salangore, but this peculiarity of giving both heavy and scanty crops is thus referred to by Harrison:²¹

"Some of us will doubtless recollect the time when Mr. A. would plant a few acres of Salangore cane in the hopes of getting better field returns and richer cane juice; how these Salangores in some years flourished and raised hopes of heavy returns of sugar; how in others they unaccountably languished; but how, whether they flourished or languished, one thing invariably characterized them—miserably poor juice and consequent loss of money."

Irregularities of Nomenclature.

In the quotation from the Annual of Scientific Discovery given above, Salangore is put equal to Crystallina, and elsewhere we have quoted Crystallina as one of the synonyms of Rose Bamboo, White Transparent, etc. Purdee²² in Trinidad, provisionally named two canes there Green Salangore and Violet Salangore; of the former he says that it is not so bright as a well ripened Otaheite, is of erect habit, and is the largest yellow cane in Trinidad; its foliage is large, heavy and deciduous, and it is further characterized by a broad white rim below each joint. This description coincides closely with the characteristics of a Yellow Caledonia or White Tanna cane.

THE CAVENGERIE CANE.

This cane is given by Stubbs⁴ as synonymous with Altamatie and Po-a-ole. The cane which we have here under the name Cavengerie, and evidently the same as that described by Stubbs, is a dark claret cane, with a narrow, inconspicuous, yet well defined bronze green, almost black, stripe. This cane is, from the personal knowledge of one of us, to be identified with that known in Mauritius as Port Mackay, where it is under cultivation to a fair extent. In some parts of the Hawaiian Islands this cane is termed "Bullock Heart."

Irregularities in Nomenclature.

Kruger⁸ describes a cane known in Java as Port Mackay as a yellow green cane with very handsome prominent brown blotches where sun exposed. Alfred Watts⁶ description of the cane called Louzier in Pernambuco exactly fits the cane that we know as Cavengerie. Tryon,¹⁶ in an article on cane varieties, states that the Port Mackay of Mauritius is in Queensland called Cheribon. A cane shown to one of us when resident in Mauritius as Cavengerie, or Scavenger, and of only occasional occurrence, was a totally distinct variety from the one we know here as Cavengerie.

In these islands the name Altamattie has been incorrectly applied to a green cane conspicuous for an epidermal covering of hairs.

BAMBOO CANES.

The name "Bamboo" has been applied to a large number of canes in no way connected. In a previous paragraph we have collated the references in the literature to the Rose, Purple and Striped Bamboo; references to other "Bamboo" canes are included below.

In Harrison's and Jenman's⁵ list of canes growing in the British Guiana Botanical Gardens, Bamboo III appears as a synonym of Bourbon, and Bamboo I and II as synonymous with Meligeli and Demerara. The Bamboo described by Delteil³ and by Stubbs⁴ is by both authorities given as a synonym with the Kullore or Kulloa cane of Bengal; this cane, under the spelling Culleroah, is also referred to by Porter,²³ who describes it as a light colored cane, growing to a great height, and to be found on swampy ground. It is described as of a mixed yellow pale green and pink color by Delteil. Stubbs, in addition, calling attention to its enlarged nodes and prominent eyes.

A cane successful in higher elevations in these islands is that known as "Yellow Bamboo;" an account of the origin of this cane is to be found in the Hawaiian Planters' Monthly, Vol. VIII, p. 7, but we do not accept the conclusion there arrived at that this cane is a "graft." This variety can be described as a rather small yellow cane, with a narrow rich green leaf, the sheath of which is thickly covered with prickles. The internodes are slightly convex, and the eye small and round. The ground tissue is distinctly yellow.

RED CANES.

Wray mentions and suggests the identity of certain red canes growing in Bengal, Assam and Malacca, and states that the Malay name for these is Tibboo Merah; Kruger⁸ mentions two canes to which this term is applied, one qualified by a place name, Tibboo Merah Borneo, and one simply as Tibboo Merah; Merah is

also given as a synonym of the Purple Transparent of Demerara, and in this instance we take it that Merah is the Malay term loosely applied to any red or purple cane. Tibboo Merah is figured by Soltwedel¹¹ as a brick red cane, and from a recent visitor to this Station we understand that this is the cane also known as Merah in Queensland and Fiji.

THE STRIPED TIP CANE.

This cane is being grown with some success at the higher elevations in these islands. It can be described as a small, thickly stooling, erect cane, with dark red and pinkish green stripes, the dark red changing on exposure to a yellowish red, and the pinkish green to a yellow; the stripes are very irregular as to width and length. The sheaths of the young green leaves have light purplish margins, and are covered with long prickles, the latter rubbing off easily, and entirely disappearing as the leaf dries on the stem. The eye is large, long and pointed; nodes prominent; internodes concave, and slightly bulging out on the opposite side of the stem from the eye, which is situated at the base of a small groove extending from one-half inch to the full length of the internode. This cane is in some parts of Hawaii occasionally confused with Striped Singapore, although the two varieties bear no resemblance to each other.

A cane which has been grown in small patches on Hawaii for some years past under the name "Unknown" has been positively identified as a yellow sport from the Striped Tip, and in order to connect it with its parent has recently been named Yellow Tip* by this Station. This sport may be described as a slender, thickly stooling, fairly erect, light green cane, which toward maturity turns to a yellow. The leaf is light green, and the sheaths bear very few hairs, which rub off easily, and are entirely absent in the dried leaf. The eye is large, long and projecting, and is situated in a very slight groove; the internodes are concave, and give the stalk the general appearance of bamboo. Both the Striped and Yellow Tip canes are prolific ratooners.

THE ELEPHANT CANE.

We make no apology for reproducing the following account of the *true* Elephant Cane, due to Sir J. D. Hooker:

"This variety is only cultivated for eating or chewing. I do not think it would prove a good sugar producing cane. . . . But varieties, especially in the case of sugar canes, often improve by change of climate. Perhaps this might have the good fortune to succeed better elsewhere. The dimensions as to diameter and height which this variety attains, depends on the length of time

* This sport was first grown on Hawaii by Mr. John Watt, who planted

during which its growth continues. It requires in a good soil two years to reach 10 feet in height. After five or six years it may reach 16 to 32 feet; such specimens may be seen near native houses, where it is allowed to grow undisturbed as an ornamental plant. In the province of Mytho this variety is cultivated in humid alluvial soils on a considerable scale, but simply for sale in the bazaars and for chewing. It has the peculiarity of possessing a very brittle epidermal layer, so that instead of becoming pressed out and giving up its juice when passed through the wooden mills employed here, it breaks up into small fragments."

GREEN ROSE RIBBON.

Harrison²⁰ states that this cane, which is cultivated with success in Australia, is identical with the striped sport appearing a number of the yellow shoots appearing in a small area of Striped Tip. not infrequently in stools of Bourbon cane, and to which we refer more fully elsewhere. As synonymous²⁰ he gives Green Ribbon, Malay, Brisbane, White Striped Bourbon.

THE UBA CANE.

Of late years a cane under this name has been frequently mentioned, and is stated to be cultivated with success in Madeira and in Natal. We have found the following early references to this cane:

It was introduced into Mauritius in 1869 from Brazil, and is described as a worthless cane.¹²

John Dymond states that the Uba cane, introduced into Louisiana from Brazil, is evidently the same as the Zwinga, or Japanese cane;²⁴ it is described as a green woody cane of great vitality, and evidently suited to a cold climate.

DANIEL DUPONT.

Occasionally in the literature of the cane this name appears as synonymous with Striped Tanna or Big Ribbon. The Daniel Dupont we have at this Station is described below.

A small cane which, when freshly stripped, is characterized by a mottled green and pink coloration that on exposure turns to a green with small, brown or dirty red patches. The leaf is medium sized, light green and slightly mottled; the sheath has a purplish cast, and bears a light scattering of hairs. The eye is prominent and rounded; the internodes are convex, and bulge out slightly on the opposite side from the eye, and have little or no grooving. The ground tissue of the cane is pure white, and the rind soft, with a marked tendency to split.

The confusion of this cane with Striped Tanna is explained in the following quotation:²⁵ ". . . to the farmer on the

Clarence River it is probable that the Striped Tanna will be Daniel Dupont for the rest of his days, because it was wrongly named so when first introduced."

SPORTS.

Any one who has had to do with striped canes must have observed their tendency to throw a light colored and a dark colored sport; this tendency was some few years ago discussed at some length in the West Indian Bulletin, Vol. II, No. 4, where it is stated that a white sport obtained in Barbados from the "Red Ribbon" was undistinguishable from the "Burke," and on the authority of Mr. James Clarke of North Queensland that a white sport from Striped Singapore was to all intents and purposes identical with Rappoh.

A previous instance of this sporting habit is recorded by Melmoth Hall,²⁶ who thus writes: "I have, in one instance, seen no less than three distinct canes from one stool of the ribbon variety—one entirely yellow, another entirely green, the others being the usual ribbon canes; from other stools in the same field I found canes either of a uniform green purple or purplish brown, all the rest springing from the same ribbon root being striped in the customary way. The cuttings from the sports perpetuate the variety, and have usually some distinctive properties, such as rapidity of growth, or sweetness of juice, notably so in the case of the yellow cane."

We think it possible that this tendency to sport is a fact of no recent discovery, and that it has probably been known, though not written about, for many years, and from Wray's original term "Transparent" applied to the striped cane we trace the terms "White Transparent," and "Purple Transparent," and with the "Striped Bamboo" connect the names "Rose Bamboo" and "Dark Colored Bamboo"; in a similar way, in Java, the same name "Cheribon" has been applied to three canes with the distinguishing prefix of "White," "Black" and "Striped."

An exactly analogous instance is afforded in the three Tanna canes, the light colored variety of which, known in these islands as Yellow Caledonia, in Mauritius as White Tanna, and in Fiji as Malabar, is now one of the more important standard varieties. At one time it was supposed that it was only striped canes that threw sports, but this is now known to be incorrect; for instance, Harrison is responsible for the following statement:²⁷ "Recent observations in our experiment fields have shown that the green canes with a cream colored or yellowish stripe, alluded to on p. 41 of my last report, are sports from the Bourbon, and that therefore the old Barbados name of 'Striped Bourbon' or 'White Striped Bourbon' is the one properly applicable to them." Also, a similar instance was observed at this Station during the reaping of the experimental plots in the early part of 1908; that such a

phenomenon is frequent is a matter of common knowledge in Mauritius.

So far as our experience has gone each light colored sport from a striped cane and each dark colored sport is identical, but the canes of the Yellow Otaheite type seem to have the faculty of throwing two distinct sports; one of these is the Light Striped Bourbon cane, referred to by Harrison, and the other is the Horne cane. In Mauritius the fact that the Louzier throws two types of sports is generally recognized, where both the green and yellow sport and the red and yellow sport (to which the name Horne has been given, after its first observer) are indifferently known as Louzier Rayée.

We think that this phenomenon is of considerable academic interest, as it is analogous to De Vries' classical observations in variation conducted with *Oenothera Lamarckiana* where he observed that from the parent plant the same sports repeatedly appeared. A further instance of variation from a self colored cane has recently come to our notice, Mr. E. H. W. Broadbent, of Grove Farm Plantation, having forwarded to this Station a green and yellow striped cane originating from a stool of Yellow Caledonia, and this we have at the present time under cultivation; this instance is of peculiar interest, as we have here a case of variation from a striped cane to a self colored cane, and then back to a striped cane, but different from the parent striped cane.

From what has been written above it is clear that at least three of the principal cultivated varieties of cane, the White Tanna, or Yellow Caledonia, the Rose Bamboo, or White Transparent, and the Purple Transparent, Louisiana Purple or Black Cheribon, are bud sports from striped canes. So far as we are aware it has never been suggested that the Lahaina (Bourbon, Louzier, Otaheite, etc.) has a similar origin, but the following account of the origin of the Louzier in Mauritius, for which we are indebted to M. August Villele, goes far to show that this cane has had its origin in this way. Mr. Villele in reply to a letter from one of us, gives the following information:

"M. Lavignac, a French gentleman resident in Mauritius in 1868 or 1869, introduced from New Caledonia into that colony the canes known as 'Branchu rayée,' 'Branchu blanche,' 'Mapou Striée,' 'Bois Rouge,' 'Tamarind,' and finally, the 'Mignonne,' a red and green striped cane. ". . . The Mignonne was planted at Ternay (Grand Port), on an estate belonging to M. Louzier, a progressive gentleman who benefitted this estate by his labors; he noticed that the Mignonne gave self colored light canes; these he cultivated, and to this variety was given the name Louzier."

SUMMARY OF MORE IMPORTANT CANE NAMES MENTIONED.

Below are collected in alphabetical order synonyms of the varieties treated of in the foregoing pages: a star indicates that confusion in regard to this name has arisen; bold type indicates the more generally known names of the canes; the places where the names are localized are given in parentheses.

THE YELLOW OTAPHEITE CANE OR CANES. . .

Bamboo II, Batavian (Bourbon), **BOURBON** (West Indies), China II, Cuban, Keni Keni, **LAHAINA** (Hawaii), Leeut, **LOU-ZIER*** (Mauritius), Portii,* Singapore,* Yellow.

THE CHERIBON OR WRAY'S BATAVIAN CANES.

Striped Variety:

HOME RIBBON (Louisiana), Mauritius Ribbon (Queensland), Red Ribbon (British West Indies), San Salvador, Seete,* Striped Bamboo, **STRIPED CHERIBON** (Java), Striped Louisiana (Hawaii), Striped Mexican, Striped Singapore, Transparent.

Light Colored Variety:

Blue, Caledonian Queen, **CRYSTALLINA*** (Cuba), Green, Hope, La Pice, Le Sassier, Light, Java, Mamuri, Mexican Bamboo, Mont Blanc, Naga B., Panachee, **RAPPOH*** (Queensland), **ROSE BAMBOO*** (Hawaii), Tibboo Mird, **WHITE TRANSPARENT** (British West Indies), Yellow Singapore, Yellow Violet.

Dark Colored Variety:

Belouguet (Mauritius), **BLACK CHERIBON** (Java), Black Java, **LOUISIANA PURPLE** (Hawaii), Meera,* Moore's Purple, Otaheite,* Purple Bamboo, Purple Mauritius, Purple Transparent (British West Indies), Purple Violet, Queensland creole, Tabor Numa, **TIBBOO ETAM** (Eastern Asia).

THE TANNA CANES.

Striped Variety:

Big Ribbon (Hawaii), Daniel Dupont,* Gingham, Maillard, Otaheite Ribbon, **STRIPPED TANNA** (Mauritius).

Light Colored Variety:

Malabar (Fiji), Green Tanna, **WHITE TANNA** (Mauritius), **YELLOW CALEDONIA** (Hawaii).

Dark Colored Variety:

Black Tanna.

THE SALANGORE CANE.

Chinese Cane (Bourbon), Pinang, SALANGORE, Tibboo Cappor, Tibboo Beltong Berabou.

THE CAVENGERIE CANE.

Altamattie, CAVENGERIE (Hawaii), Cheribon* (Queensland), Louzier* (Brazil), PO-A-OLE (British West Indies), PORT MAC-KAY* (Mauritius).

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SUGAR CANE EXPERIMENTS IN BRITISH GUIANA.*

Professor J. B. Harrison, who may well be regarded as the doyen of sugar cane experimentalists, has contributed to the last West Indian Agricultural Conference an account of his more recent studies at the Botanical Gardens, Georgetown, Demerara,

* Varieties of the Sugar Cane and Manurial Experiments in British Guiana; J. B. Harrison, West Indian Bulletin IX, 1; pp. 1 to 36.

and also of the large scale estate comparative experiments conducted on the estates of that colony.

The first part of his paper deals with results obtained with the new seedling varieties; it appears that the acreage under seedlings in British Guiana now is 32,061; the most successful varieties are apparently D. 625, B. 208, D. 145, B. 147, D. 109, since these account for 29,703 acres out of the total seedling acreage.

The acreage under the Bourbon is stated to be 41,324 and that under White Transparent 637, but both these varieties are being rapidly reduced in acreage.

The manurial experiments that have been recorded lead to confirm (in so far as relates to the conditions in Demerara) the statements already made by Mr. Harrison† as the result of twenty-four years' study of the sugar cane; he now produces further evidence showing the futility of phosphate manuring on soils which contain as much as .007% phosphoric acid soluble in 1% citric acid with five hours continuous shaking, but he adds that the soils from the study of which these conclusions were drawn were of alkaline reaction and remarks that on acid soils containing as much as .01% phosphoric acid dressings of slag phosphates may be of benefit. Many of the seedling varieties have been studied in so far as regards their behavior with supplies of readily available nitrogen, the results of the trials being summarized in the following words:

"These trials, I think, fully bear out my statement made in 1905, that every one of our new varieties requires manuring with nitrogen to give really satisfactory results; that some of the varieties have higher power of utilizing soil nitrogen than the Bourbon has; and that, while certain of them appear not to utilize manurings with nitrogen to as great advantage as does the Bourbon, others on the contrary utilize them to greater advantage."

As a corollary to the manurial experiments it is shown that, although small scale experiments with varieties give a higher return than is obtained on the estate scale, the relative order of the varieties experimented with is in general the same on the small scale as on the estate.

The comparative value of sulphate of ammonia and of nitrate of soda as sources of readily available nitrogen is one of great interest and is discussed by Professor Harrison in the light of long continued experiments; his results are all entirely in favor of the use of the ammonia salt and so far from noticing any evil effect on Demerara bearing clay soils continuously manured with sulphate of ammonia he states that ". . . tends to show that the long continued applications of sulphate of ammonia, instead of injuring the productive power of the soil have rather improved it." On the other hand he has observed a detrimental effect due to the long continued use of nitrate of soda and attributes this to de-

† West Indian Bulletin V, 6.

flocculation or puddling caused by this body on the very heavy clay soils upon which it was used.

In the examination of the soil waters in the experiment fields occasion was taken to observe the ratio of lime and magnesia in the waters from different plots with the following results:

	Calcium.	Magnesium.
Not cultivated	1	2.57
Not manured	1	2.40
Manured with nitrate of soda.....	1	1.52
Manured with sulphate of ammonia. 1	1	0.77

To those familiar with the work of Loew and his pupils on the significance of the Lime, Magnesia ratio these determinations will be of interest, but Professor Harrison is careful not to commit himself to any hasty generalization.

Latterly it has been observed in British Guiana that on the long cultivated heavy clays canes wilt and wither soon after the dry season sets in although the subsoil is saturated with water and the surface soil contains sufficient moisture to keep the plant in a healthy condition of fairly active growth. The cause of this wilting has been studied by Professor Harrison by means of exhaustive examinations of the soil waters, collected from different parts of the colony; he found that nearly all these soil waters were alkaline and that the alkalinity was due to carbonates of sodium and the double carbonate of sodium and magnesium; during the dry season the subsoil water ascends by capillarity and becoming concentrated in the surface soil has a harmful effect on the plant and is the cause of the wilting above mentioned.

The conclusions drawn by Professor Harrison as the result of his studies of the soil waters are those expressed by him:

1. That the general reaction of fertile heavy clay soils in British Guiana is, as a rule, slightly alkaline.
2. That the slight alkalinity may be one of the reasons why sulphate of ammonia usually gives better results than does nitrate of soda when these manures are applied in heavy dressings.
3. That the alkalinity enables nitrification to take place readily in the soil during the existence of favorable meteorological conditions.
4. That the alkalinity, replenished as it is by that of the soil-water brought up capillarily during dry seasons, enables sulphate of ammonia to be used year after year without injuring or souring the soil.
5. That the alkalinity of the soil-water is increased by cultivation and its attendant increased plant-growth, and apparently also by the action of chemical manures on the soil.
6. That in the course of long-continued cultivation the permanent alkalinity of the capillary water of the soil tends to become excessive, with consequent falling-off in the crops

7. The marked alkalinity and the high contents of salts of magnesium and of sodium chloride of the ascending subsoil water act detrimentally on growing crops during dry seasons and may be the cause of much of the cessation of active growth, of the wilting, and of the burning of crops soon after the commencement of and during dry seasons.

8. The alkalinity of the soil-water as far as it is not due to dissolved calcium carbonate tends to act detrimentally on the flocculation of the heavy clay soils, and when assisted by the alkali set free from dressings of nitrate of soda tends permanently to reduce the productivity of the soil where the latter substance is applied in large quantities continuously as a manure.

9. That possibly some of the readiness with which certain varieties of tropical plants which have been under intensive cultivation for many years, now appear to fall victims to drought and to fungus attacks is due to defects in the soil and in the soil-waters, the results of long-continued cultivation without adequate deep drainage.

10. The application of heavy and repeated dressings of gypsum seems to be advisable on land the subsoil water of which shows permanent alkalinity to a marked extent. Possibly the use on such land of concentrated superphosphate or of slag phosphate may prove to be advantageous.

N. D.

AGRICULTURAL ADVANCEMENT IN PORTO RICO.

Prof. D. W. May, special agent in charge of the Porto Rico Agricultural Experiment Station, in his annual report for the year 1907, states that the people of Porto Rico are studying now as never before, the resources of their country and the possibilities of its soil and climate. Some of this comes from the enterprise displayed by the planters from the states, who are investing their money and building homes for themselves in Porto Rico. The striking feature displayed there now, as contrasted with conditions under the old regime, is the diversification of the agricultural and other crops produced on the island. Under Spanish rule coffee and sugar were the great staples and no effort was made along the lines of development in any other direction. The Station, while giving more or less attention to sugar cane, takes up many other crops which can be produced successfully in the island, including among those, coffee, tobacco, fiber plants, cotton, forage crops, live stock, cattle, pigs, poultry, etc.

The exports of sugar from Porto Rico during the fiscal year reached nearly fifteen millions of dollars in value, which is more

than five millions in excess of all other exports. Prof. May believes that the area devoted to sugar cane will likely increase somewhat for several years still, but the production per acre is likely to increase considerably more. This latter conclusion is based upon the fact that better methods of cultivation are being practiced and canes carrying a higher percentage of sucrose in the juice are being planted. On the experiment station a number of seedling canes are growing which contain from 15 to 19 per cent. sucrose in the juice. The present average in Porto Rico is far below this, averaging perhaps about 10 per cent. The developing of these new canes will prove of immense benefit to the island. It is said not only is the yield stronger, but the seedling canes are apparently more thrifty, possessing greater vitality and a greater capacity for resisting disease. The largest sugar company on the island has two men working in coöperation with the station in developing and disseminating these seedling canes.

In regard to the matter of fertilizing, experiments are being made with cow pease and various other legumes, and in time it will doubtless be found what particular legume will be the best adapted to the fertilization of the Porto Rican soils.

In the matter of cane planting in Porto Rico, some attention has been given to determining the method of planting. The general practice in the island to plant close, say five by six feet. The station's experiments have been carried on with hill planting, five by five feet apart to ten by ten feet apart, the latter approaching the Cuban method of Dr. Zayas, and Porto Rico is also planting in continuous rows. For the first planting the close rows give the heaviest yields, but as these experiments have only recently been inaugurated in the station, there is as yet no adequate data as to what the later crops will produce.

Prof. May says that fertilizing canes in Porto Rico will pay in nearly all cases, but that owing to the variations in the soil it is impossible to give any definite plan. The fertilizer should be applied early and it is especially advisable to start the canes off with a readily available fertilizer. An early start and a strong one means a great deal to the cane plant.—Louisiana Planter.

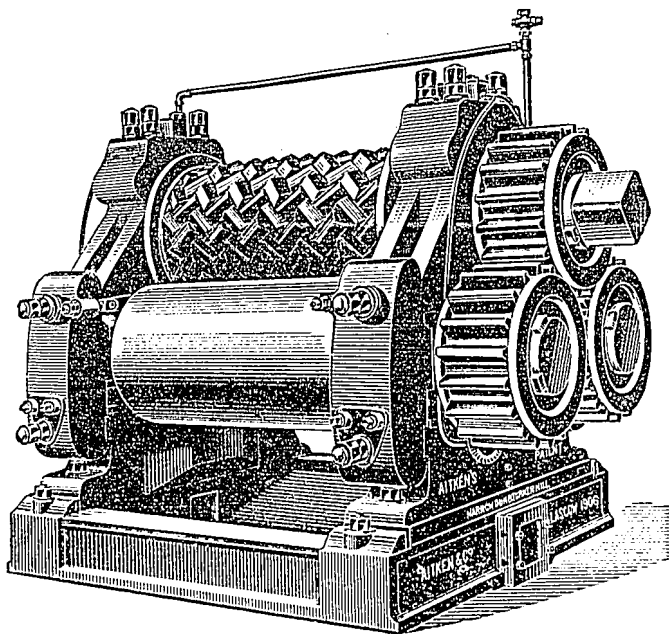
THE "DIAMOND" PATENT CANE CRUSHER ROLLER.

A new type of sugar mill roller designed not long ago and which has now been in operation for two seasons in various cane sugar countries with most successful results, is the "Diamond" Patent Cane Crusher Roller, invented by Mr. H. W. Aitken of Glasgow. As it is stated to have met with considerable success

wherever it has been tried, we propose to give here a short description of it and to set forth its principal claims for recognition.

The "Diamond" Patent Roller replaces the usual top roller in a first crushing mill. The crushing surface of the roller is of such a form that a very strong grip of the canes is taken as they enter the mill, so that slipping is impossible and an absolutely uniform feed is maintained. The surface of the roller is embedded in the canes as they pass over the trashturner plate, the crushed canes being carried along with the roller with practically no strain on the trashturner bar. The roller thoroughly splits and breaks up the canes as they pass through the mill, extracts an increased percentage of juice, and puts the crushed canes in the best condition for the absorption of maceration water and for the easy extraction of juice by the second mill.

In designing the "Diamond" Patent Roller, Mr. Aitken aimed at producing a roller that would enable the first crushing mill to take an absolutely certain and uniform feed when grinding either large or small quantities of canes, and at the same time one that would put the bagasse in the best state for imbibition. Mr. Aitken would have been satisfied to have attained these results only, and did not anticipate any further advantages following the adoption of his patent roller. In actual practice, however, it has been



proved beyond doubt that the "Diamond" Roller not only increases the extraction of the mill, but that it does so with about two-thirds of the power required with ordinary rollers.

Mr. Koesveld, Administrator of Barongan Estate, Java, writing on 1st June, 1907, says:

"With better crushing than before it is now possible, with 'two-thirds of the former revolutions of the mill rollers, to 'mill the same quantity of canes with the 'Diamond' Roller; 'a mill 30 in.x60 in, can with ease do 12,000 piculs (730 tons) of cane per 24 hours."

The splitting and breaking-up action in the "Diamond" Roller extends along its entire length, and no canes entering the mill can escape this action. A perfectly free outlet for juice as it is expressed from the canes is also secured. There is no sparkling of juice with the "Diamond" Roller, and it does not take up any of the crush-cush or pulp of the cane.

Practical experience with this roller has also shown that the capacity of the mill can be increased to practically any extent and that the latter continues to work with the greatest regularity and smoothness, liability to break-downs being correspondingly lessened.

Although the functions of a "Diamond" Roller are similar to those of a Krajewski crusher, it has been found advantageous in milling plants having Krajewski crushers which work to their full capacity to fit a "Diamond" Roller in the first crushing mill. A special design of "Diamond" Roller is now also made for fitting in the second mills of triple crushing plants. These facts show the great importance that is now attached to securing a perfectly regular feed to the mills.

An important feature in the "Diamond" Roller is the special quality of steel of which it is made, and which experience has shown to be most suitable for this type of roller.

A well-known expert in Java, in reporting on the "Diamond" Patent Roller summarizes its advantages as follows:

It offers a large increase in capacity; with it the crushing is better than with smooth rollers; the first mill runs quieter and there is therefore less risk of breakage. The second mill receives better prepared bagasse which causes it to choke less frequently, and therefore has also less risk of breakage. Imbibition begins immediately after the first roller. It has a good grip and never slips, and does not squirt the juice; it crushes better down to the lowest layer, and does not take up any of the pulp or juice.

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