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It is stated that the Bermuda lily is threatened in its home. An editorial writer in the New York Evening Post, who is familiar with the Bermudas from frequent visits to the islands, says of this prolific flower, which has been cultivated by the acre on Bermuda soil, that "of late years disease has been affecting the crop more and more seriously, until the superintendent of the public gardens was constrained to make an investigation."

The government entomologist of Victoria, Australia, has imported from Western Australia several new varieties of lady birds, which are said to pray on the noxious insects of that colony. These lady birds have been distributed through the colony, but no reports have yet been received from them. Australia is proving to be very rich in its supply of these useful insects, and the more that is known of their work, the more they are sought for.

As a general rule, the great object of the planter should be to give his plants liberal and healthy start; to select good seed, to cultivate according to natural conditions, and so secure a strong and hardy cane, capable of successfully resisting the attacks of ordinary foes. The chief safeguard against insects and disease is the strength that springs from perfect

health. Hence, it is the health of plant life that should be the cultivator's chief care.

Sugar has remained quite firm in New York for the past month, the quotation having been 4¼ cents for Cuban centrifugals. The sugar war still continues, the principals in it being the American Sugar Trust on one side and Arbuckle and Doscher Refineries on the other. The margin between raws and refined is three-fourths of one cent per pound, so that there is no actual loss to the refineries—only a reduction of the profits to a lower figure than the Trust formerly realized.

Bouchereau's annual statement of the Louisiana sugar crop for 1898 has been received, and as usual is full of information relating to the cane industry of that state. Besides a full list of the plantations and planters in that state, it furnishes information regarding the price of sugar during the year, and the crops of every cane sugar country, including Cuba, Porto Rico, Philippines and other countries. It is a very useful hand book for any one engaged in the sugar industry, and ought to be in the library of every planter.

The steps taken in Java for the suppression of a new disease among canes, known as "stubble disease," have been entirely successful. The disease caused grave misgivings among the planters, who feared that it would result in the ruin of the staple industry of the island. The process of suppression consisted in rooting up and burning the affected canes, and in cases where whole fields of canes were diseased they were promptly cut and crushed, the begasse being burnt. The resultant juice from these premature grindings was naturally of an inferior quality, but the planters readily made the sacrifice to prevent the spread of the disease.—Exchange.

Some years ago, the Colonial parliament of New South Wales abolished the duties on sugar imported from foreign countries. The result has been the closing of the sugar factories and the partial destruction of the cane sugar interest in that colony, by the importation of European beet sugars. Recently parliament has restored the duty of fifteen dollars per ton (£3) which will probably have the effect of reviving the industry to some extent, though the sugar men have not

full confidence in the change, as the colonial ministry, like that of the mother country, consists of the free trade party. Under a protective system, New South Wales built up a very prosperous trade, supplying her own population, and exporting largely to non-producing sugar countries.

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THE SUGAR WAR IN CHICAGO.

Chicago has of late been the chief battleground in the contest between the Havemeyers, or American Sugar Refining Company, and the Arbuckles and the Doerschers, its rivals.

The price of "outside" sugar has been cut one-eighth of a cent below trust price, reaching almost the lowest quotation on record. The cut was accompanied by developments that showed the existence of a little trust among the wholesale grocers to support the Havemeyers, and also that a new Richmond was in the field in the shape of a beet sugar supply.

The circumstances leading up to the cut are these: Arbuckle Bros. and the Doerschers own sugar refineries on the Atlantic seaboard that have a daily capacity of 5,000 and 8,500 barrels, respectively. Both plants were started less than six months ago and both invaded Chicago with their goods early in the fall.

The American company was ready for them. In September, seeing that rival goods were to be offered, its representatives visited the jobbing trade and suggested that a contract be signed by which any amount of sugar, up to a stated quantity, might be purchased by the jobber at a given price and that a low one. This was to cut the ground from under the rivals, but it was made only to its factors.

The latter are all the wholesale grocers, except two or three, whose arrangement with the American Sugar Company provides for a rebate of from one-eighth to one-sixteenth from the list price, to be made periodically.

The Arbuckles and Doerschers, when they entered the Chicago market, made a cut in prices. It did not bring the expected increase in sales, as the jobbers were able, under their contract, to draw on the Havemeyers for sugar at the same prices.

The contracts began to expire a short time ago. Before the date was reached the Havemeyers' representatives met the factors and extended the agreement. When the Arbuckles

and Doerschers found this out, they announced a cut and coupled it with the notice that they would do business with the retail trade. They followed it up with a further cut.

The local houses of Arbuckles and Doerschers were bombarded with business. Salesmen for the jobbers and wholesalers came in to report that the market was taken away from the trust and that all the retailers in Chicago were dealing with the opposition. No attempt was made to meet the price.

Within the last week or two 15 carloads of beet sugar have arrived in Chicago. This sugar was sold below the "trust" price, and it is said arrangements are being made to handle the output of a half dozen factories built and building in neighboring states.

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THE U. S. SUGAR TRADE FOR 1898.

The past year has been one of unparalleled prosperity, and never before in the history of the United States has the volume of trade and commerce been so large, says the American Grocer. The excess of exports of domestic products over imports of merchandise amounts to $650,000,000 while the excess of imports of gold will reach nearly $140,000,000. The volume of trade, as measured by the bank exchanges, exceeds that in any former record. The total exchanges for 1898 to December 30, are $41,739,956,739.38, against $33,427,027,471.-39 for 1897. The railroads report a heavier tonnage than ever before known. The farmers have been paying off their mortgages and have been free buyers in almost every line of merchandise, so that Western manufacturers and traders report a degree of activity and prosperity never before witnessed.

SUGAR.—The year has been one of history making and changes. The acquisition of the Hawaiian Islands, Porto Rico, and the Philippines; the protectorate over Cuba are big with import for the sugar industry. It is to Cuba the United States may look for an increase in the supply of cane sugar. Already the industry there is reviving, and, no doubt, will be rapidly extended as well as in Hawaii.

Next in importance is the war between the American Sugar Refining Company and the independent refineries, now exceedingly bitter. The result has been a competition which has reduced the margin between the raw and refined product to a point below the cost of refining. It has caused irregular markets, led to independent refiners going direct to the whole-

sale trade, brought about the innovation of package sugar, and is fraught with all the evils attendant upon open competition. It is no advantage to consumers to buy goods at a price which causes loss to an enormous industry and demoralizes trade.

The fluctuations in raw sugar have been narrow during the year, and within variation of half a cent per pound on muscovado, and three-fourths of 1 cent per pound on centrifugals. The average cost of centrifugals for the year was 4.24 cents, against 4 cents (the lowest price) and 4¾ cents (the highest). Muscovado averaged 3.70 cents for the year, with 3½ cents the lowest and 4 cents the highest. Granulated sold between the range of 5 and 5½ cents, averaging for the year 5.28 cents list, or 4.97 cents net cash, against 4.50 cents in 1897.

Willett & Gray's Statistical figures that the difference between raw centrifugals and granulated was .73 cents in 1898, against .946 cents in 1897; .908 cents in 1896; .882 cents in 1895; .889 cents in 1894; 1.13 cents in 1893; 1.035 cents in 1892; .778 cents in 1891. The present difference is about 40 cents per hundred between centrifugals, 96 test, and the net cash price of granulated, or barely the cost of refining in the most modern and best-equipped refineries.

The beet sugar industry has progressed, there being factories in California, Oregon, Utah, New Mexico, Nebraska, Minnesota, Wisconsin, Michigan, New York, with an aggregate daily capacity of 11,900 tons of beets.

The Louisiana cane crop of 1898 is estimated at 270,000 tons, against 310,447 tons in 1897.

The total receipts of raw sugar from January 1 to December 29 were 1,349,465 tons; deliveries, 1,413,144 tons—a decrease as compared with 1897 of 266,084 tons. The meltings by refiners were 1,480,000 tons, against 1,582,000 tons, a decrease of 99,000 tons. The estimated consumption of the United States through all ports, including all sugar (foreign and domestic) for the year, 2,096,263 tons, an increase over 1897 of 136,117 tons.

With the industrial conditions so flattering, the commerce of the country extending, the currency on a sound basis, and the United States a creditor nation to a large amount, we can see no reason why the year upon which we have just entered should not be the most productive and prosperous in our history.

CONCERNING HONOLULU HARBOR.

The paramount question on the water front is the enlargement of the harbor. The pessimist stands with folded arms and says, "It can't be done." The optimist replies, "It can and must be done." To drive a few piles, and extend one or two piers a hundred or more feet farther out into the bay, will prove but a temporary shift, tending only to increase the trouble. All the open space now in the harbor is needed for warping and handling the huge steamships which the demands of commerce are constantly enlarging, by adding a few feet to the depth and many more to the length. This harbor space is needed and should not be encroached upon. Some plan besides that of lengthening the present piers must be adopted without delay, and when settled on, ways and means provided to commence the work, and year by year carry it on, gradually increasing the wharf accommodations, and relieving the congestion which is threatened within a very short time, if this work is not done. Nothing prevents some practical plan being adopted at once, except a lack of determination to tackle it, and provide in the best way for the extension of wharves as the shipping increases.

Pearl Harbor has been suggested as the only solution of this question. But as that has been formally ceded to the United States for a naval station, it is a question whether the territorial government of Hawaii can interfere with the rights now possessed by the general government, in undertaking to establish docks and piers for commercial and trade purposes in its waters, although there is ample room there for both. Nor is it certain, even if permission were granted, how long it would be before it would be revoked. To wait the action or permission of the general government of the United States, as regards wharf improvements in its waters, might prove to be very embarrassing, a waste of time, and perhaps of money expended. The demands of commerce require permanent improvements that are not likely to be interfered with.

Leaving Pearl Harbor as beyond the sphere of present discussion, the question arises, how can we make Honolulu harbor serve the increasing demands of commerce for more wharf and storage accommodations, especially for coal, lumber, spars, lime, sugar, cattle, live stock, hay, etc., which need spacious or permanent provision, apart from the ordinary demands of trade and shipping, and if possible, away from the

busy streets of the city. Honolulu harbor must be prepared for any demands of trade and shipping, and the sooner we are prepared, the more certain it is that trade will come. It is here that the commerce of this ocean is seeking admission for a recruiting and storage place, and this demand will continue to increase as our facilities are provided for it. There is ample room, if proper use is made of the conditions as they exist.

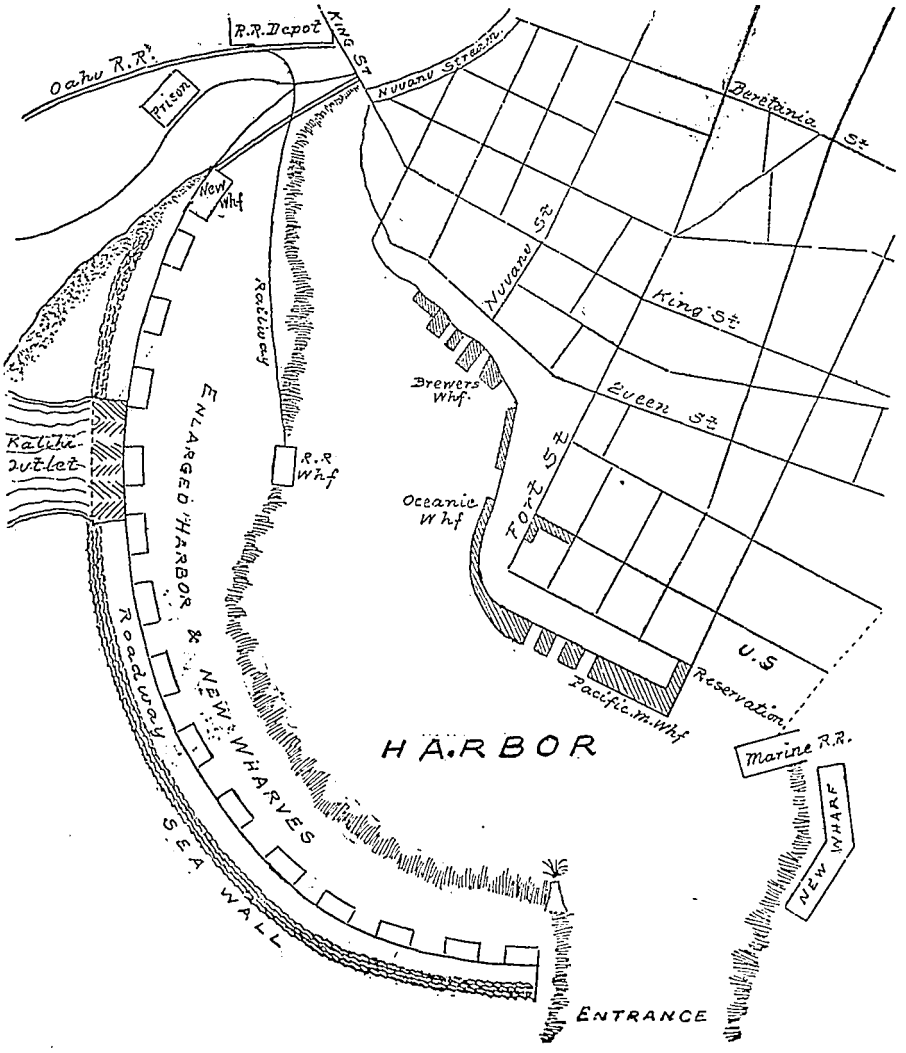
On the makai or westerly side of the harbor, which still remains as it was when discovered in the early years of the present century, there is abundant space for wharf construction. Access to it may be had by opening a macadam road from King street, one hundred feet wide, along the base of the Iwilei bluff on which the prison stands, then bridging over a space of three or four hundred feet to allow the ebb and flow of water to and from the Kalihi basin, if this be deemed necessary. From this bridge on, new wharves may be constructed without interruption to near the present lighthouse, which might be removed 400 or 500 feet farther down the channel. The coral stone, mud and sand excavated for construction purposes, would all be needed in these improvements, and for a broad roadway, running makai of the wharves the entire distance from the harbor entrance to King street. The length of this road would be nearly or fully one mile. Instead of a series of piers, it may be deemed best to have a circular quay, though the latter would furnish only one-third of the wharfage that piers would give. Should lava rock be encountered in the construction work, such places might be made into piers. The general belief is that the entire reef consists of coral rock, easily worked with modern appliances. The area reclaimed for wharf purposes would probably be from three hundred to five hundred feet in width, the entire distance from the Iwilei bridge to the harbor entrance.

The roadway back of the new wharves should be made broad —perhaps one hundred feet in width, planted on the outer edge with palms or other trees that thrive in salty localities. This, in time, might become a favorite drive or promenade. Outside of this roadway a sea wall should be constructed, rising two or three feet above the level of the road, to serve as a protection in case of high tides or southerly gales—similar to the wall at Waikiki, just before the entrance to the park.

No reference has been made to the title or ownership of the

reef, which should be the property of the government. If it is private property, the sooner that the government acquires the title, the better for the public interest, as well as for the future trade and prosperity of the islands.

The map which accompanies this article has been made by Artist Roberts and will serve to give an idea of the plans of improvement proposed.



QUEENSLAND'S TROUBLES WITH SUGAR CANE.

The Queensland Sugar Journal of December last, states that the Rappoe or Rose Bamboo cane, which has been a great favorite in that colony for fifteen years or more, fails to yield the large crops it formerly gave. No statement is made as to whether it is the plant cane or the rattoons, which fail to give the expected returns, but it is probable that the failure applies to both. Formerly the Bourbon or Lahaina was the great favorite, but this gave out after several years' cropping, and did not yield the large returns formerly obtained from it. The following extract is from the Sugar Journal:

"For some years past the feeling has been gaining ground that the popular and profitable Rappoe or Rose Bamboo cane is, in some districts at least of Queensland, approaching exhaustion, and that the time is not far distant when it will be numbered with the Bourbon and other canes that have been, so far as general cultivation in this colony is concerned, unless entirely new strains are introduced from abroad. Even then it is an open question whether much of our land is not stale, so far as this particular variety is concerned. The experience in at least one district during the past season appear to give confirmation to the above feeling. If a cane begins to lose its stamina, to get sickly, and constitutionally weak, no greater danger can be run than a season of heavy rains, or other conditions unfavorable to its full and free development. With a strong healthy cane such conditions may do some damage, but with a weakly cane they make for utter annihilation of the crops. Such was generally believed to have happened in the case of the Bourbon cane in the latter end of the seventies, and partial destruction this year has certainly been the fate of the Rappoe in the Mackay district."

The trouble with the Queensland planter is probably not in the cane, but in the care taken of it and in the nourishment given to the Bourbon and the Rose Bamboo. Both are fine canes, but they need thorough cultivation and good fertilizers. Both have been cultivated here for many years, and both respond generously year after year, when fed with the proper food in the way of fertilizers, such as they need. Planters everywhere the world over, are learning that canes, like work-animals, respond liberally to the food and care given to them; without it, both will become "sickly" and "constitutionally weak."

SUGAR REVIEW FOR 1898.

(From the International Sugar Journal, for January, 1899.)

The year just closed has by no means been wanting in rather special features and incidents, and the eventual development of one or two of these, which rather intimately affect the future of the world's sugar market, will be awaited with some degree of anxiety. It is satisfactory, however, to be able to record a more healthy situation of matters as regards the relations between demand and supply, and an increase of steadiness in all markets in proportion as all concerned began to recognize the greater soundness of the statistical position of sugar.

The year opened with some dullness; a portion of the advance in prices which had been established in December, 1897, was lost, and it was not until the beginning of February that a certain amount of animation, due to the French and German official figures of stocks being lower than had been anticipated, became manifest. This proved only temporary; a feeling of unsettlement respecting the outcome of the existing political complications produced dullness and want of enterprise, which again gave way in April to greater firmness and activity, due primarily to the almost certain eventuality of war between the United States and Spain, which it was thought would result in the probable locking up of a considerable quantity of sugar in Cuba, and the American refiners being consequently compelled to enter the European markets as purchasers. The outbreak of the war, with the ultimate stoppage of supplies from Cuba and the Philippines, together with a partial failure of crops in Southern India, brought about a period of still greater activity, though June witnessed a slight relapse from the advance in prices which had been established in the previous month. American buyers ceased to operate, and all parties apparently preferred to wait until the probable outcome of the Hispano-American war and also of the Brussels Conference should become more clearly evident. All this time the statistical position was distinctly improving, and this fact undoubtedly exercised a strong influence in preventing any undue depression in prices. For various reasons, August brought a distinct improvement, and an advance in prices of all sugars set in and continued, with but slight fluctuations, to the end of November. The general con-

sensus of statisticians as to the probability of a smaller beet crop than that of the season just closed, the likelihood that the December-March crop in Cuba would not exceed the figures of 1897-98, and the conviction, now becoming general, of the satisfactory nature of the statistical position, fully account ed for this improvement. In the middle of December an unexpected increase in the estimated figures of the European beet crops resulted in a rather smart fall in prices of beet sugar both for present and future deliveries. The effect of this complete surprise to all concerned will probably pass over into the new year.

One thing which seems difficult to explain is the persistent caution which has characterized the movements of buyers both in this country and in the United States, the result of this attitude being that there have been no violent fluctuations of any kind during the year under review, although there have not been wanting occasions when speculators might have been expected to operate. The general unsettled state of European and American politics must be credited with some of the want of confidence and even apathy shown. The comparatively even tenor of the course of the market has also been largely due to the ease with which the different factors in the necessary calculations could be estimated, but this must not be expected to continue. We are entering a period of uncertainty as to the future, and it may be anticipated that speculators, who prefer to fish in troubled waters, having more chance afforded them for their operations, will again play a more important part.

One of the special events of the year, the assembling at Brussels of the Ninth Sugar Congress to consider once more the question of the international abolition of sugar bounties, has resulted in disappointment. It may be considered that its ultimate practical failure was assured. The stumbling-block was again France, which managed to obtain the concurrence of Russia in declining to allow any discussion of the large indirect bounties conferred by their systems of internal fiscal legislation. But the British government, had they simply authorized their delegates to declare that this country was prepared, in the event of the failure of any satisfactory arrangement for abolition of bounties, to levy countervailing duties on all sugars that enjoyed a bounty, direct or indirect, might have solved the whole problem; the Conference would have very quickly adjourned, and the representatives would

have returned to help their respective governments to consider how they could best face the new situation. England held the key of the position, and to this inexplicable unwillingness to apply the only remedy must be attributed the final collapse of the negotiations. Some hopes are still cherished of an ultimate outcome of the well-meant efforts of the Belgian government, which it is asserted are being continued, but it is to be feared that for the present the net result of the active exertions of the representatives of our Colonial producers and the British refiners must be found in the admission, distinctly made by responsible members of our government, that countervailing duties are not an infringement of the principle of Free Trade as laid down by its founders, along with the hope, which this admission encourages, that the responsible advisers of the Queen may yet be brought to act on their convictions. Meantime, the further discussion of the question of the abolition of sugar bounties must for the time be regarded as once more relegated to the Greek Kalends. The activity displayed by the many prominent advocates of the suppression of these bounties, and the full discussion of matters which has been carried on in the columns of The Times, and many other journals has, however, undoubtedly resulted in enormously strengthening the conviction that bounties are an evil in themselves, and injurious to the very industry they are intended to foster. Even a large number of thick and thin Free Traders are now willing to admit that everything, except one thing, viz: the application of the one effectual remedy of countervailing duties, should be done to get rid of them. This remedy they (plus loyal que la loi), persist in regarding as calling in Satan to cast out Beelzebub.

Although the Brussels Conference must be allowed to have occupied a notable place in the occurrences of the past twelve months, inasmuch as it has at least served to define more clearly the position and to bring into marked prominence the fact that Great Britain at present holds the key of that position, yet it has unquestionably been the United States which have provided the great sensation of the year as regards sugar matters. And as time goes on it will become more and more clearly evident that the Great Republic is henceforward the principal factor in all considerations regarding the eventualities and future of the world's sugar market.

For some time past it has been clear that the support more or less openly given to the Cuban insurgents by the United

States must sooner or later lead to hostilities with Spain, and in April last, the expected war broke out and quickly resulted in victory for the Americans. Proposals of peace were made on behalf of Spain towards the end of July. The negotiations have terminated in the cession and annexation of Porto Rico, the cession of the Philippine Islands, and the renunciation by Spain of all claims to sovereignty over Cuba, and of all rights in that island. The form of government which will ultimately be established in the territories thus acquired is as yet uncertain but the matter is of no small importance to the American cane and beet sugar industries, as the question whether—and if so, when—the large sugar production of these possessions will be admitted into the United States duty free, or possibly with a preferential duty, is to the home sugar planters and beet growers and manufacturers a most serious one. while there is the further question whether or no in the event of these countries being, as is possible, held as "Territories," export duties will be levied in them for purposes of internal revenue.

Another occurrence of less eventual world-wide importance, but which possesses special interest of its own in the consideration of matters on the other side of the Atlantic, is the annexation of the Hawaiian Islands, which—in spite of the protestations of a not inconsiderable party, who were of the opinion that the United States had no mission to annex or colonize, and that to do so was a violation of the constitution, at all events as defined in the long accepted Monroe Doctrine—was at last formally completed in July last. It may here be remarked that the labor question may even yet constitute a difficulty that may operate in the direction of retarding the development of the sugar industry in these islands. Competent men are not wanting who declare that the contract system of labor, which involves a penal clause, and on which the continued prosperity of the Hawaiian Islands undoubtedly depends, cannot be tolerated in the United States or any of its dependencies. It is to be expected, however, that the gnat of contract labor will ultimately follow the camel of annexation, as the important interests concerned may be relied on to work this out as effectually as they have done in the case of the evasion of the law against the combinations known as "Trusts." There was a rumor current that in view of the changed situation, the American Sugar Refining Co. was intending to erect a large factory on one of the islands, but the

arrangement eventually come to has resulted in the Company contracting for more than two-thirds of the entire crop for a series of years, the remainder being reserved for the refinery at Crockett (California), owned by the Hawaiian planters and their friends. The effect of the change has been to send up the shares of the Hawaiian companies, who are expecting to make large profits in the future; it is to be hoped that the "boom" will not be carried so far as to end in disaster.

The fact that, to our mind, stands out most boldly from the changed state of matters in connection with the transfer to the United States of all these wonderfully productive sugar growing countries is this, that we shall have to consider, and that at no distant date, whether in the long run the hitherto victorious beet sugar industry, with or without bounties, can continue to retain its predominance in face of the results which will follow the introduction of far better implements and apparatus and the most modern improved processes which is certain to take place in Cuba, Porto Rico, and the Philippines, and to be more extensively adopted than hitherto in the Hawaiian Islands. That we are confronted with probable developments of a possibly somewhat unexpected character, admits of no doubt whatever. And it will be well for all concerned to endeavor to weigh carefully the chances as to the precise nature of these developments, and how far circumstances may conspire to favor or retard them. As far as the matters above alluded to concern the United States alone, those interested in the production and distribution of sugar there might well be left to look after themselves in a country where legislation is so easily brought to bear on questions of commercial importance and interest, though we think both the cane planters of the South and the beet growers and manufacturers of other portions of the Union—the latter very especially—have legitimate cause of complaint in connection with the sudden addition of the large duty-free supplies from Hawaii and (probably) Porto Rico, leaving aside for the moment the possibilities that may result from the acquisition of the Philippine Islands and eventually of Cuba. At a meeting of the Louisiana Sugar Planters' Association, called for the 8th December last, a couple of papers—one by Dr. H. W. Wiley of the U. S. Department of Agriculture, the other by Mr. Henry A. Brown, of Westport Point (Mass.), well known to our readers as an accomplished sugar expert and a regular contributor to the "Sugar Cane" for many years—were to

have been read and discussed, but the meeting was unavoidably postponed. Fortunately for our present purpose, it was decided to publish these two valuable and instructive papers in "The Louisiana Planter," the official organ of the Association and from them (to be found in the issue of The Planter dated December 10th, on "The Probable Effect of the Annexation of Spanish Colonies on the Sugar Industry of the United States") we propose to quote the summary conclusions arrived at by each of the very competent writers.

Dr. Wiley thinks that for some years, at any rate, Cuban sugars will pay duty, and his figures of production and consumption lead him to the conviction that the proportion of sugar imports to consumption will not be materially increased by the addition of the duty free imports from the other new acquisitions. The conclusions at which he arrives are:—

"That the annexation of the Hawaiian Islands, Porto Rico, and the Philippines will have no directly damaging effect on the cane and beet sugar industry of the United States. That an American protectorate over Cuba, not involving the free admission of Cuban sugar, will result in the practical cessation of beet sugar imports from Europe, but will not adversely affect the sugar industry in this country. That the possibility of an American protectorate in Cuba resulting eventually in Cuban annexation or in a customs union will deter capital from investment in sugar factories in this country, and thus indirectly the results of the Spanish war will become a check to the expansion of the sugar industry in the United States. For this reason it is not to be expected that there will be any marked increase in sugar production in this country for several years to come. That the final annexation of Cuba or the foundation of a customs union with her would be a severe, if not fatal, blow to the existing sugar industry in the United States, and that it is doubtful if it could continue to survive. The rapid increase in population during the next hundred years might, however, secure the revival of the industry within the present limits of the United States, though this is a consideration too remote for practical application at the present time."

Mr. Henry Brown lays special stress on the point that, neither Hawaii, Porto Rico, nor the Philippine Islands being States of the Union according to the Constitution of the United States, but only dependencies or "Territories," Congress has power to levy import and export taxes and duties

for the support of the government of such territories, and he expresses the opinion—

"That if Congress fails to levy exports taxes upon the sugars sent to us from the Hawaiian Islands, the Philippine Islands and Porto Rico, it will not only fail to make proper provision for the support of our governments in those islands, by making them self-supporting as far as possible, but it will neglect to protect home sugar producing industries, by means that take nothing from the people or the Treasury of the United States, but actually relieve both people and Treasury, while protecting the great and growing sugar producing industries of the United States. Such a blunder of Congress would injure but not destroy our sugar industries by any means. American enterprise will conquer even such neglect of a great American industry."

As regards the increase in production which he admits is likely to take place under the new conditions, he does not think that the American home industries have at present much to fear from the acquisition of the Philippines, Porto Rico, or Cuba (partly because he assumes that export duties will be levied in those countries), but he does think that the impetus given to the Hawaiian production will render the Hawaiian Islands a dangerous competitor unless an export duty is levied on their sugars. He says:—

"Hawaii will prove a powerful competitor by reason of her enormous capacity of sugar production per acre, and the fact that with the 'Sugar Trust' to back planters in Hawaii in order to control Hawaiian sugars, the acreage may be increased or even doubled by employing irrigation leads to the conclusion that instead of the 223,110 tons of Hawaiian sugars sent us in the year ended June 30th, 1898; we must expect 300,000 or more tons per annum, which may be increased to 400,000 or more tons, all of which is likely to be controlled by the 'Sugar Trust,' and used to govern this market so far as it will be possible for that company to do so. Let no one imagine that the American Sugar Refining Company intends to handle the Hawaiian crop for fun or love, or to keep up the price of sugar when it suits its purpose to cut prices. The effect of greatly increased imports of Hawaiian sugar, sure to come, and of the handling thereof by the 'Sugar Trust' will be injurious to the sugar industry of the United States, unless the cost of such sugars is increased by levying on export duty thereon in the

country of production. This is sure to be opposed by the above-named company, but should obtain nevertheless."

Mr. Brown also calls particular attention to the increased cost of production which will attend the eventual manufacturing of an improved class of sugar in the Philippines and in Cuba. He sums up his views on the whole subject as follows:

"Briefly summarized, 'The Probable Effect of the Annexation of Spanish Colonies upon the Sugar Industry of the United States' will not be by any means destructive unless American producers choose to sit down and lose their grip, but there will be no walk over for our sugar industry in the future, and in fact there has been none in the past. If the sugars of the Philippines and Porto Rico are sent to this country free of any export tax, as well as free of duty on arrival, the effect must be to some extent injurious, but not destructive of the home industry by any means; there is far more to be feared from Hawaiian sugars and their handling by the American Sugar Refining Company, hence an export tax on Hawaiian sugars sent to the United States is imperatively required as a necessary protection for American sugar producing industries, quite as much as tariff protection is required for refined sugars by the American Sugar Refining Company, and quite as much as a tariff or import duty is required either for protection or revenue, on importations of sugar or any other article of commerce entered for consumption in the United States in competition with home producing industries of this country.

"Consumption of sugar in the United States has nearly doubled per head and has more than doubled in quantity during the past eighteen years ending June 30th, 1898. The increase in consumption has been more rapid than the increase of home production. The increased influx of duty free Hawaiian sugars has been readily absorbed, and large quantities of European beet sugar have been used to meet our demands for consumption. The cane sugars from Porto Rico and the Philippines will have little effect on home production in view of increased consumption in the United States. With all other foreign sugars continued dutiable, and an export duty or tax levied on sugars from the Territory of Hawaii and the Spanish islands in our possession, the sugar industry of the United States, backed by American ability, capital, energy and skill can and will compete successfully with the new sugar producing dependencies or territories. I claim that the sugar producers in the United States have a right to the pro-

tection indicated, and that Congress should grant it. If the right must be fought for, then fight for it in Congress until such adequate protection is secured. All consumers of sugar in the United States are deeply interested in protecting the American sugar industry, lest they fall into the hands of foreign sugar producers, and be quickly forced to pay far higher prices for sugar, which has become an article of food necessity to every family and every individual in the United States."

It will be seen that these two very capable authorities agree tolerably closely in considering that under the most favorable supposition with regard to the political and fiscal arrangements, the interests of the American sugar industry will suffer indirectly, but under the supposition of the establishment of a customs union with Cuba or the annexation of that island, they will receive a fatal blow. Also that anyway the importation of European beet sugar will practically cease. This means that the amount of the beet sugar which is already flooding the British markets, and invading those of India, Japan and China, will be largely increased, in other words, that the struggle between beet and cane sugar will be further intensified, and that the entire sugar industry of the world will again suffer from over-production, and the ever recurring crises will become more frequent, more fatal, and more far reaching in their effects. The British Colonies, more particularly those of British Guiana, Mauritius, and the West Indies, will thus be placed in a more alarming position than ever, while the advantages which the first and last of these are now enjoying from the operation of the new American countervailing duties, bid fair to disappear in a very short period of time.

The competition between the American Sugar Refining Company and the independent refineries, more especially the large Arbuckle and Doscher Refineries lately established, is undoubtedly a matter of considerable interest, but previous experience of similar occurrences indicates that, in spite of occasional rumors of compromise which have not been verified, the struggle may last for one, two, or even three years. A settlement of a similar nature to the one arrived at on the last occasion, viz: the absorption of the independent refineries by the "Trust," is hardly so probable in the present case. Meanwhile the United States consumer seems on the whole to be profiting by the competition. The saying of one of the wittiest American writers that "all things are possible in a

republic" should not be forgotten in connection with this matter.

As regards the West Indies and British Guiana, in face of the express declaration of all the experienced men examined by the Royal Commission, and of all the best authorities on the subject in this country, and also of Mr. Chamberlain's practical admission to the effect that countervailing duties constitute the only possible salvation of the sugar industry in those parts, the British Government has confined itself to half measures of grants in aid and loans which, however liberal some appear to think them, are absolutely of no effect as a permanent relief. And as far as the grants lately made to St. Vincent, Barbadoes, &c., are concerned these are only barely sufficient, if indeed they are that, to make good the disasters caused by the fearful hurricane of the 11th September. A summary of the Government measures, as drawn up by the West India Committee, will be found in "The Sugar Cane" for September (page 450), and the opinion held by those best qualified to judge in regard to the efficacy of these measures may be gathered from the numerous articles and reproductions of correspondence on the subject which have appeared in nearly every issue of "The Sugar Cane" for the past nine or ten months. The action taken by the Government in establishing an Imperial Agricultural Department for the West Indies and British Guiana under the personal supervision and control of Dr. Morris, C.M.G., &c., late Assistant Director of the Royal Gardens at Kew, formerly resident in an official capacity in that quarter of the globe, must not be overlooked, and it is quite possible that if such a proceeding had been adopted years ago something much more effectual might have resulted than can now be looked for. But this measure is quite powerless to stem the tide of adversity or conjure the crisis which threatens the existence of the staple industry. While the grass is growing the cow is starving, and desirable as the establishment and development of "minor industries" and the improvement of the sugar cane undoubtedly are, these can only be the work of time, while the need of a remedy is urgent, immediate and imperative. The effectual remedy is only to be found in the adoption, by the Government of the United Kingdom, of countervailing duties on all sugars receiving bounties, direct or indirect, and we do not hesitate to assert that this is the only means of salvation for the world's sugar industry, the only measure that can bring about for it the

conditions of a permanently sound and prosperous existence. We may just allude, in passing, to the proposition for the incorporation of the West Indies with Canada, which certainly has a more practical foundation than the wild rumors of a desire for annexation to the United States. The results of the Hispano-American war have, it is to be hoped, effectually disposed of any such ideas as the latter, if indeed they ever existed in the minds of serious persons; the weak point, however, in the proposition for incorporation with Canada is, that the present rate of consumption in that country would only dispose of about some two-thirds of the West Indian production, still we shall not be surprised if something definite should come out of the proposal.

Turning to Mauritius—we find a very similar state of things to that which has for a long time obtained in the West Indies, though in this case the evil is of more recent origin. Some two years ago, the quantity of Austrian sugar reaching India began to affect very seriously the prices obtainable in that country for the Mauritian product, and measures were at once taken by those interested to bring the question under the notice of the British Government in connection with the report of the West India Commission. The importation of Austrian sugar into India has gone on increasing, and has very materially damaged the interests of the Mauritian sugar planters, for whom that country has long formed the great and most natural market for their production. The sugar industry in the island has long been in an unsatisfactory condition, the yield obtained by the machinery in use there being much below what could be got by superior apparatus. Some help was obtained by the reduction of the expenses consequent on the holding of large estates, through the parcelling out of land among small planters, mostly Indians, who work very economically, so that at present probably one-fifth of the whole area under cane cultivation is either owned by these small cultivators, or worked by them in shares with the owners, the cane being crushed at the factories of the original proprietors. But this was quite insufficient to remedy the situation, brought about mainly by the competition of the bounty-fed sugar, and applications for an Imperial guarantee for a loan, and also for a direct loan, made to the Colonial Office, were unfavorably received, and on being renewed, were again unsuccessful. Active measures have now been taken in conjunction with those in India who were so seriously effected

by the competition of the European sugars, to bring the matter fully under the notice of both the Queen and the Governor-General of India. At a meeting of the Mauritius Chamber of Agriculture, some two months back, petitions to Her Majesty and to the Viceroy of India, were adopted, after eloquent and impressive speeches by Mr. Quintin Hogg and Sir Virgile Naz, K. C. M. G., which went to the root of the matter. These petitions received some 7,000 signatures, and were forwarded by the Governor, who gave them the sanction of his support. The principal feature of the petition to the Queen was the request for the enactment of countervailing duties on bounty-fed sugars imported into the United Kingdom and India, or the exclusion of such sugars from those markets, while the one to the Viceroy laid special stress on the close connection of the Mauritius with India, and the fact that nearly three-fourths of the population of the Island are either native born Indians or immediate descendants of such, and that the request for countervailing duties is supported by the Indian Chamber of Commerce and the Chamber of Agriculture of Upper India. The crop now being taken off will be one of the largest ever grown in Mauritius.

As regards the importation of beet sugar into India, it is stated that it has grown from 246 tons in 1895-96 to 47,287 tons in 1897-98, and the representatives of the Indian sugar industry, recognizing the imminence of the danger, which has already resulted in the closing of several refineries in Bengal, have made urgent representations to the Indian Government and demanded that the question of imposing countervailing duties should be considered without delay. For some time efforts have been made under government and local supervision for the improvement of the agricultural and manufacturing processes in the sugar producing districts, but of what avail can these be if the artificially stimulated European industry is to be allowed to swamp the home production. It is indeed a very discreditable reflection on the economical and fiscal ability of the possessors of India and their government, that the very country which was probably the original home of the sugar cane and the seat of the first production of sugar should be threatened with the extinction of that production, which can be historically shown to have existed for over two thousand years.

The sugar industry in the Australasian Colonies, although prosperous enough from the point of view of increasing output

as regards Queensland, is not in what can be called a satisfactory position. As far as New South Wales is concerned, the industry must be regarded as declining, owing to the progressive reduction of the protective duty on imported sugars. The danger which, in our opinion, the sugar planters and manufacturers of Australia have to face lies in the fact of their production exceeding the home demand, and the consequent necessity of exporting some portion and thus being compelled to meet the competition of the bounty-fed beet sugars of Europe, which indeed have already invaded some of their own markets. Then again there is the fact that the operation of the Sugar-Works Guarantee Act, which has rendered possible the erection of several large central factories, cannot be considered a success. Much sugar has been produced, the net cost of production has been considerably reduced, many cane farmers have made a good profit out of the new cultivation which they have been able to take up, but the mills have mostly failed to meet their obligations for repayment, and a number have not even paid the interest on the loans which enabled them to be started. It is possible, indeed probable, that the Queenslanders will be able to deal with this matter, and it must be allowed that they are actively alive to the adoption of new processes for obtaining increased yield and are continually and intelligently studying the problems connected with cultivation and manufacture. But the matter of over-production we regard as very serious, and it is interesting to hear that offers of Queensland sugar are being made in the United States, though there is a possibility that the American Treasury officials may consider that these products are subject to countervailing duties, and so the excess production may have to be "slaughtered" in the London markets. Queensland, it may be remarked, is going in for coffee growing. At the Richmond River Experiment Farm (N. S. W.), experiments are being made with varieties of cane obtained from New Guinea, in the hope, which appears likely to be fulfilled, of obtaining some rich and vigorous sorts which would resist the diseases of rust and "gumming."

From Egypt the reports indicate general prosperity and successful progress. The factories had to contend with defective cane owing to the occurrence of frosts, nevertheless the extraction was so good, and the economical treatment so much improved that the defect in the canes was more than made good, and a capital profit realized. The adoption, at Rodah,

of a system of thorough washing or lixiviation of the bagasse, has been thoroughly successful. A full account of this system will be found in "The Sugar Cane" for May (pp. 241-247) and November (pp. 569-571). There are some eighteen factories and refineries now in operation, nine of which belong to the Daira Sanieh. At one of the factories belonging to the Societe Generale d'Egypte the Say-Gramme process of electrolysis in clarification is being tried.

In Natal matters have gone more to the satisfaction of the planters than last season, and in spite of some losses from drought it is said that the crop will reach 25,000 tons. To make head against the ravages of the locusts, which lately caused such fearful destruction, a cane called the Yuba has been largely adopted, which is said to have the advantages of being locust proof and frost proof and of ratooning freely, keeping down the weeds and requiring little manure. Its disadvantages are that it is difficult to crush and requires special treatment in the manufacture.

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AGRICULTURE OF THE SUGAR CANE.

[When acknowledging the receipt a year ago, of Dr. Stubb's admirable work on the "History, Botany, and Agriculture of Sugar Cane," we promised to make extracts from it for our readers. A recent issue of the Jamaica Bulletin contains selections from the Doctor's book, accompanied with comments from the pen of the Government Chemist on that island, Francis Watt, which includes some of the paragraphs which we had marked for reprinting. Mr. Watt's comments are so appropriate that we insert them with the extracts as printed in the Jamaica Bulletin.—Editor Planters' Monthly.]

RAINFALL.—It is generally estimated that an annual rainfall of about sixty inches is most advantageous for the growth of cane. This amount should be well distributed over at least ninety to one hundred days, of which about forty-five inches should fall during the wet or growing season, and about fifteen inches during the dry. However, annual rainfalls of double this amount occur in parts of Reunion and Guiana where they make large crops of cane; but as remarked elsewhere, such canes are always green and give low sugar contents. On the other hand, cane is grown now most successfully in countries with a very small rainfall by irrigation. Indeed, it may be said, that when the temperature and soils

are suitable, that cane grown by irrigation is the most remunerative. The largest crops, ripened artificially by the withholding of water, are obtained, and the output of sugar per acre in such countries is enormous. (1)

Cane growing by irrigation has given yields surpassing the highest records of the best sugar countries. The presence of humidity in the air deemed heretofore necessary to successful cane growing, was but a means to prevent evaporation and to maintain moisture, conditions most suitable to the wants of the cane. In irrigated districts, little or no humidity of the air exists.

DRAINAGE.—Nowhere on earth is drainage more essential than in the alluvial districts of Louisiana, and while many plantations may be considered well drained, the average planter has not yet fully appreciated the necessity for multiplying open ditches to the extent of forcing his soils to their fullest capacity. This is evidenced by a trip over the State and observing the varying distances between ditches which obtain in different plantations.

Only in very dry seasons can badly drained lands be made to yield large crops. Since these unfortunately occur only at long intervals, the average yields on such lands are far below their natural capacity. On badly drained lands neither fertilizer nor cultivation have their full effects, hence the discordant opinions which frequently prevail among our planters, from the use of the same fertilizer or the same method of cultivation. From the experience of this Station it is almost impossible to be "over-drained," provided the work of draining be intelligently performed. It is well for every planter to study his system of drainage, examine his ditches, see if they be deep enough, wide enough and sufficiently abundant to carry off our heaviest rainfalls and retain the "bottom or ground water" at a constant depth below the surface. Excellent results can be obtained with open ditches, provided they are numerous, deep and wide.

In the lower sugar districts these ditches should be at least as close as 100 to 152 feet, and deep enough to hold the bottom water at least three feet below the surface.

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(1) Should there be a revival of the sugar industry in the West Indies the irrigated districts of Jamaica offer great facilities for cane cultivation. With the abundant streams of the island the irrigated areas might be greatly increased. It is highly important to remember that the mechanical or physical condition of the soil of irrigated districts must be carefully attended to, through tillage and thorough drainage must accompany irrigation.—F. W.

The expense and attention annually required for the preservation of open ditches and the loss of land incident to them, together with many other disadvantages would force all of our planters sooner or later to adopt tile drainage, but for the great first cost, and to the absence of fall in the lands by which the tiles can clean themselves.

IRRIGATION.—The Louisiana sugar planter of today is confronted with low prices and unreliable labor, depleted soils and reduced yields, reciprocity treaties and increased imports, monopolistic trusts and monied combinations, prolonged droughts and injurious rainfalls. He must therefore call to his aid every means which will remove the obstacles to maximum crop production. Next to drainage, irrigation is perhaps the most needed factor in the problem of annual large crops. A full crop is rarely obtained oftener than once in five years, and eighty per cent. of the failures are assignable directly to droughts. Irrigation, therefore, eliminates the great element of chance from our planting operations, and together with good drainage makes the planter nearly independent of the freaks and idiosyncrasies of the weather.

The results from irrigation of cane have been uniformly successful and satisfactory, sufficiently so to justify the assertion that the profits of irrigation were very large in tonnage and with no sacrifice of the sugar content of the cane.

In establishing irrigation ditches, the reverse of drainage ditches must be observed. In the latter the line of lowest level from the levee to the swamp, is found and followed, while in establishing the main irrigation ditch the backbone, or line of highest elevation, is carefully determined and pursued. This ditch transports the water through the plantation. From this ditch on both sides water may be drawn into the lateral or quarter drains, following still the lines of highest elevation.

From these laterals, water may be drawn into the lowest parts of the field. Our plan in irrigating was to fill the middles of the row nearly full, permitting the water to remain all night and drawing it off in early morning through the drainage ditches. By accident, however, it was found that cane would stand a complete inundation for forty-eight hours, with the water at a temperature of 72 degrees, while the maximum temperature recorded in the station master's weather bureau was 90 degrees F. No fears should be entertained of injuring the cane by too much water, for a reasonable time, say two

days, in applying it, provided that when it is drained off, it is well and quickly done, in other words, the land is well drained.

Water can easily be drawn from the adjacent river or bayou, by nearly every sugar planter in the State. The erection of a boiler, pump and syphon will be needed to life it over the levees. Nowhere, possibly, can a systematic irrigation plant be established and maintained at a less cost than in Louisiana, and our very variable seasons demand it as an adjunct to every plantation that aims to make maximum crops every year.

SUGAR SOILS.—From what has already been said, those soils which contain the largest fertility, and have a large water-holding capacity, are best adapted to large crops of cane. Requiring so much moisture, the cane, like all the grass family, does best upon clayey or heavy loam soils unless artificially aided by irrigation. Even then the soils must be sufficiently retentive to prevent a too rapid downward percolation of supplied water, or else the profits will be exceeded by the costs of too many irrigations and the washing away of the soluble plant food.

Included in "fertility" is a large amount of humus or vegetable matter which is the controlling factor in determining the amount of fine earth and moisture in a soil. Tropical soils, subject to heavy rainfalls, are almost universally adapted to the growth of sugar cane, since the heavy rains induce a luxuriant growth of vegetation upon such soils, and this vegetation, in its transition into humus, furnishes simultaneously organic acids which decompose the soil particles into very fine earth. Hence such soils, in the course of time, become rich in organic matter and very finely divided earth, the latter supplying the mineral and the former the nitrogenous food, and both (but particularly the humus) retaining that excessive moisture so essential for healthy cane growing. (2) Perhaps the heaviest acre crops of sugar in the world are taken from the soils of the Hawaiian Islands. There are four large islands in this group, whereon sugar is grown in large quan-

(2) At the same time it must not be forgotten that the high temperatures of the tropics lead to rapid decay of organic matter, so that, unless a sufficient amount of vegetable matter be returned to the soil, there is a danger of the humus being reduced to so small an amount that the soil becomes unproductive or worn out; obviously this risk is greater in tropical than in temperate climates, but at the same time, the difficulty is more easily overcome owing to the fact that crops to be ploughed in as green dressings can be grown almost all the year round. F. W.

tities. Hawaii is a wet island, the cane crop depending wholly upon the natural rainfall. The other three use regular irrigation in the growing of cane. Dr. Walter Maxwell, Director of the Experiment Station at Honolulu, in a recent publication, gives a summary table, showing the mean of the results in the examination of the soils of the four islands, which are based upon nearly one hundred analyses, which is here given:

Island	Lime per cent.	Potash per cent.	Phos. Acid per cent.	Nitrogen per cent.
Oahu	.380	.342	.207	.176
Kauai	.418	.309	.187	.227
Maui	.396	.357	.270	.388
Hawaii	.185	.346	.513	.540

With such fertile soils, and with perfect control of the supply of water no wonder that ten tons of sugar have been made per acre.

Soils are only disintegrated rocks mixed with vegetable debris and more or less charged with micro organisms, through whose agency the food for plants is rendered available. It is not only necessary that an abundance of plant food exhibited by chemical analysis be present, but it must be an available form. The more finely divided the rock particles, the larger the quantity of available food, the greater the surface areas of its particles, and therefore a large increase in surface tension which gives an increased capacity for holding moisture. Therefore, the mechanical condition of a soil is frequently of more importance than a chemical analysis. Formerly a soil was regarded as being a mass of inert matter whose ingredients were rendered soluble by the action of air, water and chemicals. This view has given way to a knowledge recently gained by scientific investigations, that all fertile soils are swarming with microscopic organisms which are essential to the proper elaboration of the food materials in a soil for plant use.

Hence a thorough investigation of a soil involves a chemical analysis, a mechanical separation of its particles, a study of its physical properties, and a microscopic research for its bacterial content. (3)

A chemical analysis will give its contents of silica, iron, ilumina, lime, magnesia, potash, soda, phosphoric, sulphuric

(3) A recognition of these points is essential if scientfic and progressive agriculture is to prevail. F. W.

and carbonic acids; chlorine, nitrogen, etc. The total quantities of each of the above soluble in the selected solvent are given, but no definite methods have yet been devised by which a knowledge of the immediate availability of these ingredients may be obtained. Chemical analysis has, however, a high value in the hands of a trained chemist.

The particles of soils vary greatly in size as well as in constitution, and a knowledge of the mechanical formation of a soil frequently throws a flood of light upon its relation to heat and moisture, as well as suggestions upon its cultivation. It has been conventionally agreed that all particles in a soil between 1 and 2 mm* in diameter shall be called fine gravel; between .5 and 1 mm coarse sand; between .25 and .5 mm, medium sand; between .1 and .25 mm fine sand; between .05 and .1 mm, very fine sand; between .01 and .05, silt; between .005 and .01 mm, fine silt; and .0001 and .005 mm, clay. Such an analysis describes the texture of a soil and determines the crop which should be grown thereon, by comparing the water-carrying capacity of the soil with the water requirements of the crop. To illustrate, the more clayey the soil, the greater its carrying capacity, and the nearer the approach to pure sand, the more droughty it becomes. Grasses, in which sugar cane may be placed as a gigantic specimen, require at least 25 per cent. of moisture continually in the soil for best results, a condition found frequently in clayey bottoms; while some vegetables, as melons, do best on soils carrying only 4 per cent. of water and hence find congenial environments in our climate on very sandy soils.

Other crops grown in this latitude require intermediate quantities between these two extremes.

It may be remarked, on the other hand, that very large quantities of clay or sand are often equally objectionable, giving excesses of moisture or dryness, both being detrimental to the welfare of bacteria, which are necessary to soil fertility.

The conditions necessary for bacteriological existence in our soils are the presence of air and water, a favorable temperature, an absence of light, the presence of proper chemicals, and inoculation with the bacteria desired.

The bacteria best known, and in which we are mostly interested, are those taking part in nitrification, and are of three distinct types or genera: 1. Those which convert nitrogenous

* Note—mm, millimetre=.0393 of an inch.

matter into ammonia. 2. Those which convert ammonia into nitrous acid. 3. Those which convert nitrous acid into nitric acid. Each are necessary to the complete transformation of nitrogenous matter in the soil to nitric acid, the form of nitrogen chiefly available as plant food. Since nitrogen is the most costly ingredient of our fertilizers, estimated at present to be worth 15 cents per pound, it is evident that the farmer or planter should endeavor to maintain such conditions in his fields most favorable to these ferments, and thus enhance his harvests by drawing upon his soils rather than upon purchased fertilizers.

With these preliminary remarks, let us examine several typical soils of each of the sections of the sugar belt. The following are given from hundreds of analyses made in the laboratories of the stations, and are selected because they represent typical soils and have also been subjected to mechanical analyses, which are given further on. These soils represent the alluvial soils of the upper and lower positions of the cane belt of the Mississippi river, the brown loam and whitish soils of the bluff formation, and the sugar lands of the Red River deposits.

An inspection of the above and many other similar soils would lead to the conclusion that the contents of valuable ingredients in the average soils of the sugar belt would be about as follows: Lime .5, potash .4, phosphoric acid .1, and nitrogen .1 per cent. In an acre to the depth of 12 inches, estimated to weigh 5,000,000 pounds, there would be 25,000 pounds of lime, 20,000 pounds potash, and 5,000 pounds each of phosphoric acid and nitrogen. An average cane crop of 25 tons, including tops and fodder, will contain about the following: Lime 20 pounds, potash 60 pounds, phosphoric acid 35 pounds, and nitrogen 75 pounds. Hence, there is lime enough for 1,250 crops of cane, potash 333, phosphoric acid for 150, and nitrogen for 70.

There is, therefore, no deficiency of plant food in our average sugar soil, and the aim of every planter should be to extract yearly the maximum amounts, which can be obtained only with proper drainage, supply of water (irrigation) in summer, and proper preparation and cultivation of the soil.

Table No. 2 gives the mechanical analysis of the soils whose chemical analyses have been given. Additional soils characteristic of many localities are also given.

From Table No. 2, it will be seen that very few of these

soils can properly be called sandy. They are loamy silts or silty clays. Their water capacity is great, requiring special attention to drainage in order to reduce it to the amount most favorable to soil ferments. The clayey content of several suggests the propriety of breaking at exactly the right time—neither too wet nor too dry—throwing it into ridges to relieve it of excessive moisture and providing for escape of flood waters.

The Red river soils, particularly the front lands are largely composed of very fine sand with small portions of clay, while the bluffs and prairie soils are mainly silt.

Numerous experiments have been made at the Sugar Experiment Station during the past two years to determine the rate of nitrification on the different soils, and at different depths, and on soils variously treated.

In every instance nitrification was most abundant at a depth of three to four inches, decreasing in depth until at two feet it was practically naught. In lands in good tilth, or manured with stable manure broadcast, or with a good growth of cow peas, nitrification was rapid and copious. It was more abundant on the ridge of the rows than in the middles. Drainage could almost be measured by the rate of nitrification. In badly drained soils it was almost entirely absent, while high dry ridges gave abundant evidence of the activity of the microbes. An immersion of the soil for a few hours, by a heavy downpour of rain, suspended for two days the process of nitrification. It was more abundant in soils lightly stirred than in those cultivated with the plough.

Soils stirred daily gave increased quantities of nitrogen over those stirred weekly, and more in the latter than in those stirred bi-weekly.

In fact, good drainage and frequent surface cultivations were prime factors in rapid nitrification.

Preparation of Soil.—With this knowledge of our soils we can now proceed to apply the well-established principles of preparation of all crops.

Since these soils are so strongly silty and clayey, and being level, are without natural drainage, it is manifest that they should be placed in a condition of artificial drainage, to insure warmth and necessary conditions of bacteria growth. Every operation should look to the maintenance of these conditions. Hence flat culture is unsuccessful. They should be broken as deeply as possible, to admit air to assist in drying out exces-

sive water, and most important, to give as large an area as possible for the foraging of the roots of the cane, since experiments have shown that in stiff lands but few roots pass beyond the broken soil. They should be broken as early in the fall as possible, thrown into high ridges and the middles, quarter-drains and ditches well cleaned out, for the quick removal of winter rains.

The spring should find each row in the condition of an ash bank, and the planter should endeavor to keep it so by proper cultivation throughout the season.

We break land to prevent the natural tendency of all soils to return to rocks, evidenced frequently in the hardpan just beyond the plough. We break land to destroy weeds and grasses and relieve the soil of foulness, preparatory to the growth and sustenance of the cultivated crop.

We break land to control moisture, throwing up in high ridges to relieve excessive moisture and flushing or ploughing flat to conserve the winter's rainfall for the summer's crop, on dry soils. If the work of preparation has been properly done, in accordance with the nature of the soil and the demands of climate, subsequent planting and cultivation are simple processes.

If, however, our work has been imperfectly performed then subsequent cultivation must be directed to the acquirement of tilth, which is simply obtaining the best conditions for the growth of crops.

Tilth, however, should always be obtained, if possible before planting and then cultivation would simply be a maintenance of tilth. Unfortunately such a happy condition does not always prevail. From haste. overcropping, bad weather, carelessness, and sometimes from ignorance, furrows are hastily thrown together, seed planted in cloddy soil, ditches shallow and foul. The poor stands thus obtained are cultivated more with a view of getting land in good tilth than to benefit the plant. Again, the crop, after it has reached the age when rapid and shallow culture should be practiced, is, from causes given above, left to contest with grasses and weeds the soil designed solely for it; or perhaps unfavorable seasons may keep away ploughs until weeds and grass have taken possession of the land. Then came the turn ploughs and hoes, and by heroic efforts they are buried or removed. In either event, the results are the same, the crop has not been improved by such treatment.

PLAN PURSUED BY OUR PLANTERS.—The plan usually pursued by our best sugar planters is as follows: Corn planted early and laid by early, and at lay-by sown in cow peas at the rate of one to three bushels per acre. The corn is gathered early and the vines turned under in August or September, with four to eight mule ploughs. The lands are thrown into beds or rows from 5 to 7 feet wide, the middles are broken out with double mould-board ploughs, the quarter-drains are cleaned to a depth of six inches below middles of the rows, the ditches are maintained at the proper depth. The rows are opened, the cane is planted and covered.

If every detail has been properly attended to, the soil in the rows will be maintained throughout our winters in a condition favorable to nitrification and growth. No water should at any time cover the rows even for a short while, and the drainage should be such that none should ever accumulate either in the middle or quarter drains.

The above plan, if rigidly followed, leaves but little room for improvement in the preparation of our soils for cane. (4) If the subsequent cultivation of the crop was as skilfully and scientifically performed, our acre yields would be greater and our money returns more satisfactory. The fundamental principles underlying successful agriculture everywhere may be expressed in the following: A thorough preparation of the soil, proper fertilization and shallow and rapid cultivation.

VARIETIES OF CANE.—Chapter X of Dr. Stubb's Treatise deals with the subject of varieties. After alluding to the sources from which the various canes have been collected the writer says:

These importations, together with collections of those varieties imported prior to 1885, make up the "garden of sugar cane varieties," which has been cultivated for several years with the hope that some variety would be found which would be better adapted to our wants than those now cultivated in our State. Up to date our results have not been satisfactory. Cane is a plant which yields slowly to its environments. It requires a long time and considerable patience to acclimate it. The inherited characteristics of tropical tendencies so unsuitable to our short seasons, are but slowly modified by cultivation in our climate. There is, however, a slow but gradual

(4) The introduction of systematic rotation of crops, and the regular use of green dressings with leguminous crops appears very desirable in Jamaica and throughout the West Indies.—F. W.

change in nearly every variety with each year's cultivation, and a few promise hope of ultimate benefit to our industry. But the acclimation of old varieties, with the view of obtaining those best suited to our wants, has been entirely superseded by the introduction of seedlings.

After describing their attempt to obtain seedlings from their own seed, he says:

In 1893, just as we were recovering from sore disappointment in our failure to secure either plants from seed or seed from plants, the station received from the Royal Agricultural Society of British Guiana, twenty-one of the most promising of the new seedlings originating at Barbadoes.

The seedlings from seed cane vary very greatly in almost every respect, size, color, sugar content, habits of growth, etc. Out of 500 young seedlings, perhaps only a very limited number will prove upon investigation, worthy of further propagation. This property of variation common to nearly all plants, is excessively great in sugar cane, and hope was entertained that through this property and by careful selection a cane may ultimately be obtained which will be rich in sugar and at the same time give a large tonnage—the goal of every sugar planter's ambition. For the first time in the history of our cane culture such an opportunity is presented through this property of variation of seedlings. Heretofore any marked change in varieties came from accidental bud variation, which occurred at rare intervals and were often lost by virtue of the absence of a trained and intelligent eye to detect and utilize it. By selecting at maturity from a large number of seedlings those plants whose vigor, size, and sugar content, or some other desirable property, were peculiarly marked, and propagating them, over 500 new varieties of cane have thus been introduced. From this large number further selection is being made annually, and those superior to the rest have been generously distributed throughout the sugar world in order to test them under varying conditions. Should concurrent testimony be obtained from many sources, the cane will be named and largely propagated.

The nomenclature of the varieties of cane is execrable. No sooner is a cane received in a country than it is given a local name, either that of the introducer, or the country from which it was directly imported. This is especially true in this State, where we have the Otaheite cane, Japanese cane, the Palfrey cane, the La Pice cane, etc. The canes introduced and thus

named are frequently identical with those known in other countries by old and well established names. Frequently importers ignore old names and the countries from which they come and call them by some descriptive property, more frequently color, e. g., green, yellow, yellow-striped, red-ribbon, etc. Several of the consuls in sending canes to the station, mentioned only local names or color and omitted entirely the history of the canes sent. Ever since the reception of this large number of varieties, the station has been making earnest and persistent efforts to establish the identity of many of its varieties with the prominent ones of old sugar countries, as well as seeking the original home of each one, but so far very little success has been attained. It is difficult to compare canes and eliminate individual differences even when grown on the same soil and under the same conditions. It is therefore almost impossible to decide identities in varieties when grown under such diametrically opposite circumstances as exist in Louisiana and a tropical island, e. g., Cuba. There is, however, a growing demand on the part of those scientifically cultivating cane, to have all this confusion of names eliminated, and a movement is on foot looking to a solution of this perplexing problem. It can only be done by interchanging freely all the known varieties and have them all cultivated under exactly the same environments. Could this be done at all of the botanical gardens and experiment stations within the sugar districts, it would not only afford numerous comparisons of the cane varieties under varied conditions, but, would throw prehaps a flood of light upon the important question of differentation under changed environments of the numerous varieties under test.

This station has accordingly, after consultation with those similarly interested in other countries, sent samples of all its varieties to Hawaii, Australia, and Demerara, with a view of comparing them with the varieties of those countries and establishing synonymous canes. It will also gladly exchange with any botanical garden or experiment station, the numerous varieties under cultivation here.

(To be Continued.)

DESTRUCTIVE PLANT DISEASES—DANGER TO HAWAII—STRICT QUARANTINE REGULATIONS ADVOCATED.

To the Editor of the New York Sun.

Sir:—I deem it of the highest importance that the prospective planters in our new territories be brought to realize the importance of the fact that they are entering a field untouched by the hand of the plant breeder. Tropical plants when once brought under the rational culture which has prevailed in the temperate zones for centuries will compete for supremacy on a scale that is scarcely dreamed of by the unsuspecting farmer and fruit grower. The deciding factor will, I surmise, be proper quarantine regulations of the strictest type to prevent the introduction of that horde of destructive disease which is already making its appearance in other tropical regions, which diseases are as easy to introduce as the cholera or bubonic plague, and are far more difficult to eradicate.

There are now to my personal knowledge, waiting to be imported into our new possession, a serious coffee disease in Guatemala, which would almost certainly ruin the prospects of coffee growing in Hawaii or Porto Rico; a serious insect disease in the Philippines, which already threatens the industry there, or at least causes serious damage; two or more diseases in Java of a dangerous character, and a destructive moth which attacks the fruit of the coffee plant in Reunion. The Fiji Islands have a banana disease which would prove anything but an acceptable heritage to our banana plantations. Javanese corn or maize harbors a serious mildew, and its mangoes, those peaches of the tropics, a species of most destructive curculio.

The vanila disease of the Seychelles Islands should be by all means kept out of Porto Rico and Hawaii, where this new culture has every prospect of success, and the rice insects of India, as well as the Javanese sereh disease of sugar cane, would be anything but acceptable accessions.

If the American planters could look into the future and realize the development in tropical agriculture which their advent will initiate and the dangers and stupendous difficulties from the introduction of these plant diseases, they would insist upon the passage of the strictest laws of plant

quarantine for the island possessions and the guarding of all avenues of importation by trained experts.

Proper plant quarantine and systematic plant breeding are the keys to the solution of the problems of tropical agriculture for the colonies.

Baron von Eggers and Sir Henry Norman, both representative students of tropical agriculture, the one a German, the other an Englishman, have foretold the revolution which tropical agriculture will shortly work. Neither, however, has fully set forth the dangers of plant diseases or the possibilities of plant breeding.

D. G. FAIRCHILD.

United States Department of Agriculture, Section of Seed and Plant Introduction, Washington, D. C., October 8.

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The Deming system of clarification, which is being generally adopted in sugar factories throughout the world is very warmly endorsed by all those who have used it, on account of the rapidity with which it does its work, and the economy of operating it. Among the large number of factories throughout the world that now clarify their juice by this method, it is said that not one has been found dissatisfied with it, in any respect. Its work borders on perfection. See advertisement.

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THAT ARMY BEEF.

[In regard to the army beef about which so much has been said, and which has been the cause of an investigation in Washington, Gen. Eagan has received from Lieut. Col. Smith, the commissary officer at Chicago, a report made by Armour & Co., who furnished the army a large part of its tinned roast beef. The report was in response to specific interrogatories from Gen. Eagan. As canned meats are largely used on our plantations, this report should be read by all interested. It says in part:—Editor Planters' Monthly.]

"Our system of preparing and putting up our roast and corned beef is by the Appert process, invented in 1809. This process has been well known to scientific inquiry since the date of its invention, but its commercial use by manufacturers and dealers in canned meats may be said to be limited to the past thirty years. Nothing has been discovered that produces superior results.

"There has never been any complaint of deterioration of

the contents of cans put up by this process. We have been putting up and selling tinned roast and corned beef for the past 25 years, and have been supplying consumers of food products for this entire period. All grocers and meat markets have these goods and have had them on sale during this length of time, and no objection has been raised to their use by consumers, nor has there been any detrimental results following their consumption. The use of these descriptions of goods is annually increasing. We have put up during the past 20 or 30 years 200,000,000 pounds.

"During the past five years we have sold to the British government for army and navy use largely in India and Egypt nearly 25,000,000 pounds, and to the French government within the past six or seven years about an equal quantity. To the republic of Brazil and to South Africa we are now annually shipping thousands of tons of these goods.

"No chemicals of any description are used by us in the manufacture of either tinned roast beef or corned beef. No scraps are used by us in the manufacture of the goods mentioned. Our tinned roast and corned beef are manufactured from what are called 'chucks' and 'plates,' being portions of the animal that are regarded as first class in every particular, and no scraps of any description are prepared or used in the manufacture of these goods. If any small pieces of meat are found in a can they are incident to the cutting of the original pieces from which its contents are taken, and occasionally are necessarily used to give the proper weight.

"No tallow is poured into the cans by us in the preparation of our tinned roast beef; the only addition to the natural condition of the beef is a small portion of beef jelly prepared especially for this use, to bind together the contents of the can.

"In reply to your question as to 'whether any packer who is furnishing refrigerated beef to the subsistence department has ever or anywhere or to any extent used any chemicals of any kind whatsoever in the treatment of the refrigerated beef; whether any chemicals whatsoever touched the meat itself,' we state that we are without sufficient definite information to answer your question respecting the mode adopted by other parties, but for ourselves we state that at no time during the past nor at present do we use chemicals of any kind whatsoever, and that therefore the refrigerated beef fur-

nished your department could not have been touched by any chemical of any description.

"Neither the meat furnished by us to your department nor that supplied by us for consumption in almost every State in the Union, has ever at any time been treated by us by any chemical process of any kind whatsoever."

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THE PROBABLE EFFECT OF THE ANNEXATION OF SPANISH COLONIES ON THE SUGAR INDUSTRY OF THE UNITED STATES.

(A paper by Dr. H. W. Wiley, prepared for the Louisiana Sugar Planters' Association.)

GENTLEMEN:—I have the letter of your secretary of November 15th, asking me to prepare a paper on the "Probable Effect of the Annexation of Spanish Colonies on the Sugar Industry of the United States."

As a basis for any valuable opinion it is first necessary to study the statistical data relating to our sugar supply. First of all the data of the period just preceding the rebellion in Cuba are of prime interest, since they show the normal condition of the sugar industry in the most important of the Spanish colonies in time of peace as affecting trade relations with the United States.

The quantities of sugar imported into the United States during the fiscal year ended June 30th, 1893, the year immediately preceding the outbreak of the Cuban rebellion, from countries which already are, or are about to become, American colonies or dependencies, are as follows:

Sugar imported into the United States, July, 1893—June, 1894:

From	Pounds.
Cuba	2,127,497,454
Porto Rico	75,484,143
Philippines	124,052,343
Hawaiian Islands	324,726,584

Comparing these data with those for the fiscal year ended June 30, 1898, we are able to see what disturbance the wars in the West Indies and the Philippines have had on our sugar supply from those countries.

IMPORTS OF SUGAR FOR THE YEAR ENDING JUNE, 1898.

Exported From	Not above No. 16 Dutch Standard	Above No. 16 Dutch Standard.	Total.
	Pounds.	Pounds.	Pounds.
United Kingdom	16,551.980	4,991.263	21,513,543
Austria-Hungary	1,046,190	696,933	1,743,123
France	.....	6,693	6,693
Germany	138,084,955	37,1 0.485	175,185,440
Netherlands	2,308,083	38,107,744	40,415,827
Other Europe	77,230	.....	77,230
British North America	935,904	.....	935,904
Central America	4,764,387	.....	4.764,387
Mexico	2,893,145	.....	2,893,145
West Indies:			
British	232,798,204	.....	232,798,204
Cuba	440,225,111	.....	440,225,111
Other West Indies	202,716,181	.....	202,716,181
Brazil	148,052,308	.....	148,052,308
Other South America	192,755,229	.....	192,755,229
China	365,973	6,794,691	7,160,664
East Indies	610,269,566	.....	610,269,566
Hawaiian Islands	499,766,789	.....	499,766,798
Philippine Islands	29,489,600	.....	29,489,600
Other Asia and Oceanica	296,058	.....	296,058
Africa	64,435,238	.....	64,435,286
Other Countries	.....	13,300,057	13,300,057
Total	2,587,832,188	100,997,866	
Total sugar of all grades			2,688,830,054

From the above comparison it is seen that since the war the Cuban imports are only one-fifth of what they were before, while from the Philippines we have secured a little less than one-fourth of the former amount. The figures for Porto Rico are not given separately but it is fair to presume that while there was no rebellion in that island; the war with Spain has greatly diminished the total imports for the year.

The data for the Hawaiian Islands show that in five years the imports have increased by over 150,000,000 pounds. Since, however, Hawaiian sugar has been admitted free of duty for fifteen years, the annexation of that group to the United States will have no further effect than to stimulate the industry and thus increase the output. Since it has been demonstrated that water for irrigation can be secured from wells sunk in the porous lava, it is certain that the area devoted to sugar culture in the islands can be greatly increased. This method of securing water, however, is costly and not capable of unlimited expansion, so that at this time we may foresee with some degree of exactitude the probable maximum output of sugar in the Hawaiian group. From the most reliable

information accessible it may be said that under the stimulus of American enterprise the Hawaiian Islands will produce for export to the present States about 1,000,000,000 pounds of sugar in 1910. Beyond this figure the increase will be very slow and it is more than probable that the figure mentioned may not be reached for 15 or 20 years. Meanwhile the consumption of sugar will increase so that by the time the Hawaiian Islands send to the present States 500,000 tons of sugar, we will be needing a great deal more than the extra quarter million tons coming from that source. The Hawaiian Islands therefore may be eliminated from the problem in so far as their product of sugar shall affect the industry here.

Before proceeding to discuss the probable effect of the annexation of the Philippines and Porto Rico, and the Cuban protectorate, on our sugar industry, it will be interesting to study the enormous variations in the importation of beet sugar which have been experienced within the past fifteen months.

The quantity of beet sugar imported into the country for the fiscal year ended June 30, 1897, was 1,865,577,495 pounds. For the year ended June 30, 1898, the quantity imported was only 175,185,440 pounds. The beet sugar fields of Europe gave a remarkable exhibition of their ability to supply with only a year's notice the entire deficit in the sugar supply of this country caused by the Cuban rebellion. In addition to this the imports for the year ended June 30, 1897, were greatly increased in anticipation of the enactment of the Dingley tariff law which went into effect July 24, 1897.

Since it was certain that the rates of duty on imported sugars under the Dingley Act would be increased, an enormous stock of raw sugars was secured under the lower duties of the Wilson tariff. The beginning of the fiscal year, July 1st, 1897, therefore, found a stock of sugar so large that practically no imports of beet sugar were made after July for eight months.

This condition of affairs is clearly set forth in the appended table showing the imports of beet sugar from Germany by months during the fiscal year ended July 1st, 1898:

Sugar imported from Germany July, 1897, to June, 1898:

MONTHS.	Not above No 16 Dutch Standard.	Above No. 16 Dutch Standard.
	Pounds.	Pounds.
July, 1897	15,212,978	not given
August, 1897	1,323	not given
September, 1897	188	not given
October, 1897	.....	not given
November, 1897	.....	not given
December, 1897	.....	210,450
January, 1898	.....	2,248,490
February, 1898	.....	1,125,495
March, 1898	.....	6,338,999
April, 1898	5,335,793	2,981,999
May, 1898	17,146,484	2,263,404
June, 1898	100,388,189	6,645,453
July to September, 1898 *		
July, 1898	126,521,405	3,512,598
August, 1898	20,309,152	6,448,165
September, 1898	35,028,364	614,604

* More than entire imports for fiscal year ending June, 1898.

In April, 1898, the stock of sugar imported under the former tariff act began to be exhausted and beet sugar again commenced to come in from Germany. Considerable quantities of refined sugar were imported during the winter and early spring of 1898. For the quarter ended September 30, 1898, as seen by the above table, nearly 200,000,000 pounds of sugar were imported from Germany—a quantity considerably greater than for the whole fiscal year ended June 30, 1898. It appears from these data that a change in the tariff has had more immediate and direct effect on our sugar trade than annexation can possibly have.

Referring again to the data directly involved in the discussion of the subject under consideration, it is seen that the normal export of sugar from Porto Rico to the United States before the war was in round numbers 75,000,000, from Cuba 2,000,000,000, and from the Philippines 125,000,000 pounds. These are the quantities of sugar which were produced and exported to the United States under Spanish rule and by Spanish methods of agriculture and manufacture. It is now certain that all these countries will be rid of the Spanish yoke. It is also already decided that two of them, viz., Porto Rico and the Philippines, will become parts of the United States and therefore their products will be admitted free of any duty. In the case of Cuba the probability is that it will remain under an American protectorate. All the teachings

of our past history, as exemplified, especially in the case of Texas, indicate that eventually Cuba will also be a territory or state of the Union. For the present, however, we must exclude this event from any immediate influence on the sugar industry in the States. In other words, it is fair to presume that for at least the next ten years Cuban sugar will pay a duty on entering our present borders.

It is also fair to presume that under American institutions the agriculture of Porto Rico and the Philippines will be improved and the production of sugar increased. These countries being parts of the United States, it is evident that this increase in production will be consumed here, so that practically all the sugar exported from those islands will find a market here.

It is not possible to give with any degree of accuracy an estimate of how great this increase will be. We do not know enough about the available lands, the vicissitudes of the climate, the conditions of labor, and the attitude of the natives towards their new rulers to make any positive statements. It appears to me, however, that for a decade at least the rate of increase in sugar production in these islands will be ten per cent. per annum.

At this rate, in 1910, the quantity of sugar exported to the States from Porto Rico will be, in round numbers, 200,000,000, and from the Philippines 300,000,000 pounds, or a total of 500,000,000 pounds.

It seems quite certain therefore that the quantity of sugar, including the Hawaiian product, which will come into the States free of duty in 1908-10, will be at least 1,500,000,000 pounds. Our consumption of sugar at the present time in round numbers is 4,000,000,000 pounds. At the normal rate of increase of population we will consume in 1908-10 fully 5,500,000,000 pounds. If we assume that the production of sugar in the States from beets and cane does not increase, it is seen that practically the same quantity of dutiable sugar will be imported in 1910 as at the present time. If the same rate of increase be found in the home industry which has been accorded to Porto Rico and the Philippines, our domestic production, excluding recent acquisitions, will be nearly 1,500,000,000 pounds in 1910. It is not likely, however, that such a rate of increase will be maintained, since capital will be

slow to enter the sugar industry in the States until the final status of Cuba is determined.

It is evident therefore that the quantity of dutiable sugar entering our ports during the next eleven years is not likely to be diminished and may be increased. Nor is it likely that any tariff changes threatening a lower rate of duty on imported sugar will be enacted within the time specified. The Republicans have control of the Senate for at least six years to come and whatever party may be in power, it will be only too glad to have the benefit of the duties on imported sugars to help pay the expenses which the enlargement of our territories naturally entails. A conservative view of the present situation, therefore, leads to the opinion that for at least the next decade the annexation of the Spanish colonies will not work any injury to the present sugar industry of the United States. It must be confessed, however, that the uncertainty in regard to the final disposition of Cuba and the certainty that there will be a large increase in the imports of duty free sugar will discourage the investment of capital in new enterprises. This will be especially felt in the beet sugar industry where millions of capital would have found a safe investment had the Spanish war not occurred.

It may not be amiss to say a word regarding the contingency of Cuba some day becoming a part of the United States. There is a sentiment of patriotic pride which will be greatly gratified to see the lands which Columbus first discovered incorporated in the great American Union. Territorial expansion has developed the feeble thirteen original colonies into a world power of the first magnitude. In addition to this it seems to be a plain duty of the American people to secure for Cuba a stable and magnanimous form of government. These two sentiments make an American protectorate almost certain. Should this intimate association later grow into a mutual desire for organic union, a profound effect would be produced on our domestic sugar industry. We have seen that the normal ante bellum export of sugar from Cuba to the United States was in round numbers 2,000,000,000 pounds. Perhaps there is no country on earth where sugar can be grown so cheaply as in Cuba. A soil of inexhaustible fertility, a vast extent of arable land, and a favoring climate make it impossible to fix limits to possible production. It is not extravagant to say that Cuba's crop under a strong and

active government would be easily doubled in ten years. Cuba by 1910 may have 4,000,000,000 pounds of sugar to export to the States. In this case, should Cuba be annexed, practically all of the sugar consumed would be produced within our customs limits. In fact the production of more than the total quantity of sugar consumed is not beyond the range of possibility. In these circumstances it is difficult to see how our present industry could continue to exist. It is not easily demonstrable that sugar, of 95 degrees polarization, can be produced here for less than three cents a pound. It is demonstrable that in Cuba it can be made for a much smaller price. The beet fields of California and of New York and the cane fields of Louisiana, in my opinion, would sustain a very unequal contest with the plantations of Cuba free and Americanized. The capacity, however, of even so rich a country as Cuba has its limits. We are speaking now of the wants of 100,000,000 people. Sugar is growing every day to be a more necessary article of food. It has long ceased to be merely a luxury.

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HENRY A. BROWN'S VIEWS.

Briefly summarized: "The Probable Effect of the Annexation of Spanish Colonies upon the Sugar Industry of the United States" will not be destructive by any means unless American producers choose to sit down and lose their grip, but there will be no walk over for our sugar industry in the future, and in fact there has been none in the past. If the sugars of the Philippines and Porto Rico are sent to this country free of any export tax, as well as free of duty on arrival, the effect must be to some extent injurious, but not destructive of the home industry by any means; there is far more to be feared from Hawaiian sugars and their handling by the American Sugar Refining Company, hence an export tax on Hawaiian sugars sent to the United States, is imperatively required as a necessary protection for American sugar producing industries, quite as much as tariff protection is required for refined sugars by the American Sugar Refining Company, and quite as much as a tariff or import duty is required either for protection or revenue, on importations of sugar or any other article of commerce entered for consump-

tion in the United States, in competition with home producing industries of this country.

Consumption of sugar in the United States has nearly doubled per capita and has more than doubled in quantity in the past eighteen years ended June 30, 1898. The increase in consumption has been more rapid than the increase of home production. The increased influx of duty free Hawaiian sugars has been readily absorbed and large quantities of European beet sugar have been used to meet our demands for consumption. The cane sugars from Porto Rico and the Philippines will have little effect on home production in view of increased consumption in the United States. With all other foreign sugars continued dutiable, and an export or tax levied on sugars sent to us from the Territory of Hawaii, and the Spanish Islands in our possession, the sugar industry of the United States, backed by American ability, capital, energy and skill can and will compete successfully with the new sugar producing dependencies or Territories of the United States. I claim that the sugar producers in the United States have a right to the protection indicated, and that Congress should grant it. If the right must be fought for, then fight for it in Congress until such adequate protection is secured. Every consumer of sugar in the United States is deeply interested in protecting the American sugar industry, lest they fall into the hands of foreign sugar producers, and be quickly forced to pay far higher prices for sugar, which has become an article of food necessity to every family and individual in the United States."

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GRAINING IN VACUUM PAN KEPT UNDER CONTROL BY USE OF BRASMOSCOPE.

Several years ago the official sugar organ of Bohemia published a monograph stating that the brasmoscope would eventually be used for keeping under control the working of the vacuum pan; at the same time, the subject attracted very little attention, but of late it has again come to the front and is being discussed by most of our foreign exchanges.

The brasmoscope is an apparatus giving at the same time the density, the temperature of a boiling liquor and the degree of vacuo. In reality, there are three instruments combined, viz., a thermometer, hydrometer and a vacuometer, so

arranged as to form one rather complicated appliance. The fact is, no apparatus in a sugar factory is less under the laboratory control than is the vacuum pan; one has to rely on the man in charge and criticise his ability by the results he obtains. Some advocate nearly filling the pan with syrup on the start; others maintain that this is a mistake, the syrup should be gradually introduced into the apparatus. Then, again, some experts favor rather high temperature during graining; others declare better results may be obtained by keeping this temperature relatively low. The same variance of opinion exists regarding the pressure, etc. In fact, as we have just hinted, the entire question appears to be in a very empirical condition.

Many experiments have been made and certain valuable conclusions have been drawn; of these may be mentioned that once the graining is visible, the difference between the temperature of the masse cuite and that of water no longer increases. The graining must be the cause; later, when the masse cuite increases in density, these variations increase; at last, when there remains only a so-called mother liquor in the granulated mass, the difference in temperature becomes less, and this mother liquor, no longer having sugar in dissolution, boils at a lower temperature. It is claimed that the following are important facts to keep constantly in mind: The mother liquor should never be allowed to condense beyond a certain limit, otherwise, there would form a flour-like granulation; it is important, furthermore, not to dilute beyond a certain limit; otherwise, the crystals formed would be dissolved.

The pan-man should have for his own use a register giving the quantity of masse cuite obtained at each strike, the yield of sugar and syrup, also the vacuo, density and temperature before operations of pan are completed; also the volume of concentrated juice first introduced into the pan, the volume subsequently added, the hour when the first juice commenced to boil, the hour when the graining commenced to show itself, and the hour when the pan was first emptied. Under these circumstances, the different phases can be followed. If for some reason, the pan-man cannot continue his work, a substitute may complete the operations already begun. It is important to follow almost word for word Curin's views regarding the working of the vacuum pans in Austro-Hungary,

where the triple carbonation is generally in vogue; as a result, when the juices, after evaporation, they become syrups, have a very slight alkilinity.

The appearance of the sugar obtained by the existing factories is very variable, even though they all work under very much the same conditions; this in a very large measure is due to the various temperatures at which the vacuum pans are worked. In some cases the steam cock connecting the vacuum pan and the condenser is closed, this having for its object the obtaining of a temperature of 85° C. (185° F.); in such cases the graining is not so rapid as when working at 72° to 76° C. (161.6° to 168.8° F.) In the first case there is considerable waste of steam and the efficiency of the vacuum pan is considerably reduced. On the other hand, when the evacuation steam cock remains open the formation of the grain is realized at the normal density, H. The efforts should be to keep, as nearly as possible, within close limits of the density, for now it is an admitted fact that sugar granules are in the syrup long before they are visible to the naked eye. These should consequently be fed so as to gradually force their appearance. Experience appears to favor the repeated or fractional introduction of syrups into pan, arranging so as to continually increase the density. If, after the first addition of syrup, the density is (H—1° Bal.*), after the second, it should be (H—½ degree Bal.), and after the third, become H and visible; if not, another charge is necessary, and the density then is (H+½ degree Bal.). It is from this time forward that skill is required to obtain the standard granulation. The density then should be kept at H+2° Bal., which is increased later to H+3.5° Bal. The mother liquor yields a large portion of its sugar; hence the reason that it is desirable to gradually increase the density so as to favor the molecular attraction of the crystals it contains. By the intelligent use of the brasmoscope these variations may be followed and regulated, the complete graining can be obtained in 3½ hours instead of 4½ hours, as is too frequently the case.—*Sugar Beet.*

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*Bal. is a hydrometer scale much used in Germany.

SUGAR OUTLOOK NOT SO BAD.

As is always the case, when our fears have been aroused, a calm survey of the premises discloses the fact that matters are not as bad as we at first thought.

When it became certain that the new American idea of acquisition of more territory was to be carried out, the sugar growers of the United States were seized with a panic, because all the countries to be annexed were especially adapted to sugar production.

"Sober second thought" now convinces us that, with a large annual increase in sugar consumption throughout the United States, and the present inability of our home sugar producers to raise more than about one-tenth of our annual supply of that article of necessity, no immediate fears need be had regarding competition from Hawaii, Porto Rico, the Philippines or even Cuba. Our country actually *needs* all the sugar which the countries named can produce, and as the United States treasury likewise needs all the revenue which it can get from all sugar brought from abroad (including our colonies), we need have no fear of competition from those sources.

There is one pleasant feeling about the matter, too, and that is that Americans will almost immediately supply the bulk of the sugar which our people consume. It has always been the aim of our sugar growers and of the most consistent Protectionists, to bring about that result, and as our parent country, England, has never sacrificed the interests of her home people to those of her colonies, but always taxed their products, so wisdom as well as necessity will cause the same course to be pursued by the United States Government.

The sugar industry, since the accession of enough territory to very soon produce all our people need, at once assumes an importance which it never before had attained or could have done without annexation, and it opens a wide field, too, for our American machinery builders. They should be given free access to all our colonies, and then, when there is a surplus of sugar produced at home and in our colonies, proper legislation will favor the gradual development of the home growers, while the colonies can turn their attention to coffee and other tropical products.

All the above premises considered, we honestly recant many fears hitherto expressed, and we feel that the sugar producers of the United States, from both cane and beet, have a bright future before them. However, in principle, we believe expansion is wrong.—*N. O. Sugar Journal.*