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PLANTERS' MONTHLY

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HAWAIIAN SUGAR PLANTERS' ASSOCIATION.

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The annual meeting of the Hawaiian Sugar Planters' Association will open on Monday morning, November 28, at the room of the Association, in Nuuanu street in this city. All members of the Association, and others interested in the agricultural development of these islands, are invited to attend. A full attendance is desired.

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Every time the sugar factory at Lehi, Utah, makes a run in twenty-four hours of over 400 tons of beets, the employees, it is said, receive a 10 per cent. advance on their wages. Last month, the employees had five days to their credit in which the run exceeded 400 tons, and were paid the advance as agreed.

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T. E. Hayward, of Pittsford, has one of the finest prune orchards in New York State His crop amounted to 12,000 pounds. They were shipped to a commission merchant in New York City in 1,500 baskets, each containing eight pounds, for which he received between \$800 and \$900. The average cost of freight, picking, and other expenses amounted to about 23 cents a basket, leaving a profit of 37 cents a basket, or a total of upwards of \$500.

Coffee is very largely adulterated. Of a number of samples collected in different parts of London, 43 in all, no fewer than 22 were labelled "French coffee," and nine of these "contained from 62 to 93 per cent. of chicory, etc., averaging 70 per cent of other substances than coffee," and in the 43 samples the average amount of coffee was just 50 per cent. And yet, so strong is the aroma of coffee, that very few, except experts will detect the adulterated on drinking it, unless the pure is tested at the same time, and many will not even then.

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The bark *St. Katherine*, which recently arrived at Puget Sound from Baltimore with a cargo of hard coal, has been chartered to load a cargo of Puget Sound coal for Honolulu, and thence with sugar to New York via Cape Horn, this being the first reported charter for the 1899 Hawaiian sugar crop for the East. An effort is being made to secure the ship *E. B. Sutton* also in Puget Sound to load Hawaiian sugar for New York. There will be little sugar for export from Honolulu until after January 1, 1899.

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Dr. Walter Maxwell of this city has been appointed by the Secretary of the Department of Agriculture in Washington, to be an honorary special agent in Hawaii. It will be his duty to report to the Secretary on the scientific aspects of Hawaiian agriculture, including the cultivation of sugar cane, coffee, fruits, vegetables, live stock, etc. The annexation of Hawaii to the American Republic naturally brings us into close relation with the national government, and we shall gradually share the many benefits to be derived from it.

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The *Oakland Times* says that the Alameda Sugar Company have had to contend with considerable pectine in their beets. "This season is the first one in which there has been enough pectine in the beets used to seriously retard operations. It is attributed to the long period of drought." For some special reason the farmers that furnish beets for the Alvarado factory will not average eight tons to the acre. Many of the journals are discussing just now whether there is an advantage in having a flat price or one depending upon a standard with sliding scale.

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A Barbadoes paper has the following: "Our great local desideratum is efficient reaping machinery. It cannot be too

much emphasized that our antiquated methods are too wasteful. We do not want refineries unless we can command markets for their product, nor do we want central factories—single product factories—that can only turn out crystals of a high grade for special markets but our real want is quick reaping machinery capable of reaping down our fields when sweetest with saccharine, factories that will enable us to begin our sugar-making at the right time, and to finish, at least, before serious deterioration in yield has set in.”

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Contracts have been completed for the sale and transport of the Hawaiian sugar crops of the years 1899, 1900 and 1901. Of the total crop, 100,000 tons of 96° test, will go to the two refineries in California. 100,000 tons will be shipped to New York, via San Francisco and the Southern Pacific Railroad. The rest, consisting of dark grades, will be sent via Cape Horn. The total crop of 1899 is estimated at 250,000 long tons, provided the average weather conditions prevail here. The present arrangement is expected to continue for three years from Jan. 1, 1899, subject to change.

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The sugar fight which is on between the great sugar kings is becoming interesting. Not satisfied with cutting the price on refined sugar below the actual cost of refining, Mr. Havemeyer, who is actually the trust, has carried the war to the stock exchange, and sugar stock has slumped until it is well down toward par. Mr. Arbuckle and Mr. Dorscher are making a stiff fight, but the opposition is thought to be too strong for them, and those who are well informed expect to see one thing or another, either that both will be crushed and ultimately forced out of business, or else the trust will absorb them both. —N. E. Grocer.

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The following shows what a progressive woman can do: Miss Annie Dennis, of Talbotton, Ga., U. S. A., is about twenty-five years old. She has a fine estate of 1,000 acres, on which she has a stock farm, a dairy, an extensive piggery, vineyard, and a canning and preserving establishment. She personally directs the work on the estate, and has made a notable success in every branch. She began farming seven years ago, and since then has taken more than 100 prizes at fairs with various products of her farm. She ascribes her success to a long

course of study in agricultural problems, and to the utilization of every proved scientific method in her farming operations."—*Farm News*.

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This monthly is printed on types set up by the Mergenthaler Linotype machine, which is probably the most perfect imitation of hand work that has ever been invented in any machinery. It picks up the types, sets them in the order required, spaces out the lines uniformly, then casts them in blocks and distributes the types in their proper places, to be picked up again as before, all done in one-quarter of the time, labor and expense of hand composition. It is no wonder that this automatic type-setter is superceding the old-style of hand composition, and is being introduced into every country, and in printing all languages. The profits to the inventor—a French Canadian—and to the company engaged in making the machines, are enormous, the dividends for the year just ended having been two millions of dollars. The inventor well deserves the reward.

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Willett and Gray's Statistical of Oct. 27 gives the latest mail report received to date, as follows: "Sales include the 5000 tons of Hawaiian sugars which have been held in warehouses until they could be sold at the full market value of other sugars of the same polarization. Heretofore on account of these sugars paying no duty, refiners have been accustomed to expect, and sellers been willing to make concessions of about  $\frac{3}{4}$ c. per lb. The fact of the Arbuckle refinery paying full value shows the advantage to importers of the increased buying competition for raw sugars. The sugar trade generally in absence of local stocks of sugars to quote will be more deeply concerned in following the course of the foreign sugar trade markets. The last sales to-day, including several cargoes of Centrifugals for arrival, a cargo of Javas and cargo of Centrifugals in store, were made at 4 5-16c. per lb. for 96° test, showing an advance of 1-16c. per lb. for the week."

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A Mexican paper states, that Mexico produces from 70,000 to 90,000 tons of sugar, which are consumed entirely by her own population of about 14,000,000. Cane is grown on 2,800 estates and farms, which manufacture sugar, syrup, and aguardiente. In Cuba, 500 factories have produced 1,000,000

tons of sugar, so that in Cuba, with four and a half times less the number of centres of production, more than ten times the quantity of sugar produced in Mexico, can be made. In Mexico sugar is produced by the most antiquated and routine systems; the larger factories, where the system is mixed and to some extent modernized, are all situated in districts from 2,600 to 3,300 feet above sea. These conditions are quite abnormal as regards cultivation of the cane, which only with difficulty develops proper ratoons. At this altitude the cane grows slowly, the fields easily become over-run with weeds, the expenses of irrigation, owing to the dry climate of this elevated zone, are very heavy, and great care is necessary to be able to work to profit. In the coast region the climate is warm and moist, irrigation is not necessary, the cane grows very quickly and matures in less than a year, while vigorous ratoons can be cut during from eight to fifteen years; under these conditions the field expenses are insignificant, and these conditions are identical with those of the best lands in Cuba."

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The London Times, of a recent date, states: "Sugar is very heavily taxed in the countries where bounties prevail. As a consequence the consumption of sugar in those countries is by comparison extremely limited. In England, where there is no tax, the consumption per head of the population is 73 lbs. In France, where the duty is £24 a ton, the consumption is 28 lbs. per head. In Germany it is 26 lbs. and in Austria it is as little as 17 lbs. Now in the markets of these countries beet sugar, fostered by bounties, practically holds the field. But it is far from certain that in default of bounties beet sugar could compete anywhere with the produce of the cane. On November 30, 1896, we stated that 'the total production of beet sugar for 1894 was estimated in round numbers at 5,000,000 tons, at a cost of £9 a ton. The price realized for beet sugar was £8 15s. a ton, representing what would under ordinary conditions have been a total loss to the beet-sugar industry of £1,250,000.' But this loss was turned into a handsome profit by the operation of the bounties. Hence, if the bounties were extinguished, beet sugar would be in 'a parlous state,' and cane sugar would once more be able to compete with it, even at present prices, on advantageous terms. In other words, the countries which now supply themselves at home with beet sugar at great cost would, through the normal operation of demand

and supply, obtain cane sugar from abroad at no greater cost. If the duties were lowered at the same time, the consumption would be vastly increased."

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### *ORIGIN OF ARTESIAN WELLS IN THE HAWAIIAN ISLANDS.*

It is now about twenty years since the first artesian well was drilled on Oahu. As the discovery and early history of this immense water supply is known to but few, it may be well to put on record the efforts made to obtain it, as well as the discouragements encountered, with the ultimate success, which has so greatly increased the agricultural resources of Hawaii nei, has made many comfortably off, and a few quite wealthy, who, had it not been for the discovery, might to-day be in as straitened circumstances as they once were.

Some twenty-five years ago, when the need of more water began to be felt, especially for irrigation purposes, the question of subterranean reservoirs was often spoken of, attention having been drawn to it by the streams of fresh water seen pouring into the sea between high and low water marks, in numerous localities along the shore, near Diamond Head, at Ewa and along the Koolau coast, not to speak of the large flowing streams from underground sources at Kewalo, Ewa, Moiliili and other places, all of which, from prehistoric times, have furnished the native Hawaiians living near by with their daily supplies of pure fresh water. Here was the most convincing proof that there must be some subterranean and abundant reservoir.

In 1875 the writer had correspondence with a party in California on the subject of well-boring, which was then attracting considerable attention. In the spring of 1876, Mr. Charles Oester arrived here, as the agent of a hardware firm dealing in pumps and artesian well-boring tools. He brought with him a set of well-boring apparatus, to dispose of for the firm which he represented, and offered to undertake any work, if encouragement was given him, relying chiefly on aid from the Hawaiian Government, as it was thought the government would willingly assist in such a commendable undertaking. The following notice of him appeared in the Hawaiian Gazette, then edited and published by the writer of this article:

“Mr. Charles Oester, who is interested in one of the iron establishments in the State of California, arrived in the last steamer from San Francisco, bringing with him several thousand dollars worth of tools and appliances for boring artesian wells. The question has often been raised, as to whether on these islands, so far away from the Continent, artesian wells would be practicable, and by some it is regarded as very doubtful. But there is no question that such wells, if they can be found to work successfully, would be of immense benefit to the country. There are many tracts of land, on all the islands, that are now devoted to pasturage, furnishing a scanty subsistence to horses, cattle and sheep, and which cannot by any means be irrigated from existing streams of water. We may mention as examples, the elevated plains between Ewa and Waialua on this island, the west half of Molokai, and tracts on Maui, including the isthmus between East and West Maui, and the long fertile plains of Waimea and Mana on Kauai. All these districts would be immediately rendered available for agricultural purposes, if only provided with artesian water, and the capabilities and wealth of the country thereby immensely enhanced. We are informed that Messrs. James Makee and W. H. Cornwell of Maui and Jno. H. Coney (at that time owner of Honouliuli Ranch at Pearl Harbor, now the Ewa Mill Estate) have expressed a willingness to bear half the cost of experimental wells, located one on the Maui Isthmus, and the other on Oahu, provided the government will pay the other half. This is an offer which does not often present itself, and we urge on the government the importance of taking such steps as may be necessary to settle this question. \* \* \* Mr. Oester is confident that water can be found here at the depth of 250 to 500 feet, at an expense of not exceeding three or four thousand dollars. At any rate, the boring of an artesian well, even if it proves unsuccessful as regards water supply, will afford a valuable insight to the geological structure of the country, of which very little is now known.”

Soon after the arrival of Mr. Oester in 1876, an interview was had with two members of the Cabinet, to ascertain whether any assistance would be given by the Government to a well-borer, who would be willing in such case to follow their instructions, should any be given. One of the ministers, who had the reputation of being a scientist of some note, began

immediately to raise objections to any experiment of the kind here, saying that it was of no use to try to obtain flowing fresh water by means of artesian borings anywhere on these islands, the formation of which was of so recent volcanic origin. The conditions here he said, were the very opposite of what were required in artesian basins. No argument, however, could convince him that he might be mistaken, and possibly a small body of water might be found sufficient to pay the cost of the experiment, and settle a very important question. The visitors who had called on the ministers for assistance in this experiment, (of whom the writer was one), received no encouragement in that quarter and left the government house very much disappointed and surprised with the views expressed.

The Legislature was in session at this time in Honolulu, and there had been several petitions and some complaints from the native Hawaiians, whose water rights had been encroached on, and the water diverted to cane and rice fields, which from time immemorial had been used solely for taro and other native products. At times this debate was very heated, and threatened to become a vexed question, unless some compromise was made regarding it. The subject was finally referred to a commission, and a sum voted to meet any expenses that might be incurred in investigating the agricultural resources of the islands.

Here seemed to be an opportunity to secure funds for at least one experiment in searching for artesian supplies so greatly needed. So after the Legislature had adjourned, another visit was proposed to the Minister of Finance, to ascertain if a portion of the amount voted to investigate the sources and amount of water available for agricultural purposes, might not be expended in sinking an artesian boring as deep as the amount available would allow. As this was strictly within the province of the commission—to search for new sources of water for agricultural purposes,—it was thought that no objection could possibly be offered against it. In company with Mr. Oester, the writer again called on the Minister of Finance, and urged that the water commissioners appointed under the resolution of the Legislature, be instructed to have a well bored in any locality that they might select, strong emphasis being laid on one point, that if water should be found, it would not only settle the question of a supply for the planting interests and the native Hawaiians, but also for the city of Honolulu, which needed more water, but knew not

where to obtain it. The minister, however, would listen to no arguments. His mind was made up. "There is no such thing as an artesian supply here. These islands rest on porous lava and coral foundation. If there are caverns underground, they are filled with sea water. If any rain water reaches the caverns, it becomes salt water at once. I shall never allow one dollar of the public funds to be spent for this object." And none was spent. The commissioners made a junketing tour through the islands, and reported that there was abundance of water, if it was only carefully looked after. It is not to be wondered at, that Mr. Oester, returned to San Francisco, his efforts having met with such official rebuffs.

In the spring of 1879—several years after the first public agitation of the subject in the Hawaiian Gazette—Mr. James Campbell, (who had lately purchased from Mr. Coney the Honouliuli ranch at Puuloa), while on a visit to California, made the acquaintance of Mr. James Ashley, (father of Geo. W. Ashley of Bishop & Co.'s bank.) a professional artesian well borer, and was invited by him to visit San Jose, where he was then engaged in well-boring. Mr. Ashley explained to Mr. Campbell the principle of the artesian well, and the conditions necessary to insure its success. Mr. Campbell became very much interested, and was convinced that his land at Pearl Harbor, backed as it was by the Waianae mountains, furnished very similar conditions to those where Mr. Ashley was operating. If water can be had in San Jose, he said, it surely can be got somewhere at Puuloa. He at once made up his mind, and was willing to take the chances in the venture, cost what it might. Without further delay, he proposed to Mr. Ashley to go to Honolulu, making a generous offer for his services, and as soon as his contract at San Jose was finished, he accompanied Mr. Campbell, arriving here in June, 1879. The tools were soon taken to Puuloa, and on a low flat of land near the dwelling, the drill was set to work. It being only a hand apparatus, the experimental work progressed slowly, though no serious obstacle was met. After several days of patient drilling, at a depth of 240 feet, a basin of water was tapped, from which a stream burst forth, flooding the surrounding ground. Imagine the delight of Campbell and Ashley, as they witnessed the clear, sparkling water, which had been confined in its subterranean prison for centuries perhaps, waiting for this opportunity. The riddle was now solved, and the joyful news soon spread. The wise-acres, who had declared the

scheme to be a fool's errand, were silenced at last. A well near by this, bored for Mr. Campbell, was among the first used by the Ewa Sugar Company, and has been flowing for over twenty years doing good service in all this period.

This briefly tells the story of the pioneer effort made to obtain artesian water on Oahu; and to Mr. James Campbell alone belongs the credit of having had the boldness to solve the problem, which ministers and capitalists either ridiculed or were unwilling to solve, or "to allow one dollar of the public funds to be spent for such folly."

A few months later (1880), as stated by Judge McCully in his account, published in Thrum's Almanac, "several gentlemen combined with Mr. Marques to bear the risk and expense of artesian wells on different pieces of land with which they were concerned." Mr. Marques' well was the next one bored, and an abundant supply of water was obtained in April, 1880. Soon after, several were bored in the same neighborhood. In each following year new wells have been opened, till now the number on Oahu must be nearly 300.

The large number of these wells now in operation in this group attest the immense value of the discovery made here, through the enterprise chiefly of one man. They are located on each of the islands, and though they are not all flowing wells, they are of use for irrigation. Those in the city, owned by the government, are now the main source of the water supply of its inhabitants, numbering not far from 40,000. Has it ever occurred to the reader,—what would Honolulu have done in such a dry season as the present, with no other supply than that obtained from the Nuuanu stream, which at times is scarcely fit for use?

The reader will note, in the extract quoted from the Hawaiian Gazette, published 22 years ago, the reference made to the land where the Ewa and Oahu plantations are now located—then a barren waste, worth only a few dollars per acre, also to the sandy plains between East and West Maui, which were then valued low, and sold "for a song," but are now covered with the waving cane-fields of the Spreckels and other plantations; also to the Waimea and Mana plains on Kauai, then also barren, but now producing the heaviest cane stalks in the group. And still more noteworthy is the reference to the west end of Molokai, which few people believed could ever be reclaimed, or watered with an artesian supply. On each of these treeless plains the artesian water has made a most wonderful

change. The lines referred to were printed before the discovery of this bountiful water supply, which has transformed portions of Hawaii into a perfect paradise, or in the language of scripture, into "a land flowing with milk and honey."

H. M. WHITNEY.

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*THE SUGAR WAR AND MARKET IN NEW YORK.*

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Two articles will be found in this issue describing first the Sugar Refinery fight in 1890 with the Philadelphia refineries, when Colonel Spreckels sold his Philadelphia Refinery to the Trust, receiving stock in the latter, to the amount of nearly if not quite double what his refinery had cost him. The other article refers to the fight which is now going on in New York between the Sugar Trust and the six independent refineries, two of which have only recently gone into operation. It is stated that the Trust has lowered the price of refined sugar to a figure below its cost of refining, but not below what sugar can be refined for by the new refineries with their improved machinery. But the Trust, if it has the large reserve capital reported on hand at the last annual meeting (\$34,000,000), can run at a loss for some months, without seriously affecting its standing, or until the opposition refineries are compelled to shut down or sell out. It is merely a battle for the survival of the strongest.

Willett and Gray's statistical says—"The new Doscher refinery is an unknown quantity until it finds its place, and the current saying 'that refined and raws will be selling at the same prices for a time' may not prove so improbable as it seems. Another week should throw light on the selling plans of the Doscher's. In any event cheap refined sugar is a blessing and the consumption of it is increased more than generally supposed. With the outlook such for raw sugars that no important decline is likely, there should be an unusually good demand for refined at prices leaving a loss to refiners as at present. However, it will be a long time before any settlement, arrangement, or other mode of stopping free competition will be arrived at. The sugar war has scarcely begun."

This refinery fight does not affect the price of raw sugar in New York, which is governed chiefly by the condition of the European market. The latest reports of the beet crop now being harvested show a prospective falling off of 300,000 tons from last year's crop, and it may be still larger, as the weather

in Europe has been unusually bad for harvesting. In addition to this deficiency of the new crop, the old crop of last year, in other words, the stock on hand October 30, is less by 280,000 tons than at the close of the previous year. These two shortages will undoubtedly cause an advance in the price of raws, which must continue for some months at least. As the new Hawaiian crop will be marketed early in the coming year, the indications now are that it will have the benefit of the rising market.

In connection with the foregoing, the following from London "Sugar," will be read with interest here:

"The harvesting of the new beet crop in Germany has begun at a few points, and it is reported that the roots had been found singularly wanting in sap. The protracted dry and hot weather prevented a favorable development of the crop; and as similar conditions prevail in other countries on the continent, the sugar situation is considered very strong. With an estimated shortage in the world's output of from 6,000,000 to 10,000,000 metric hundredweight and a probable increase of 5,000,000 to 6,000,000 in the consumption, it is claimed that the recent moderate rise in prices must be followed by further considerable advances later in the season. For the more remote future the prospects of the German sugar industry cause much apprehension, the cloud hovering in the background being the threatened development of cane sugar growing in the new American possessions under the influence of Yankee capital and energy. The newspapers refer to the subject frequently in a pessimistic tone, and the prediction is even made that the German sugar industry will in due time experience a wide-reaching and disastrous crisis."

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#### *NATIONAL AID TO THE SUGAR INTEREST.*

In a recent number of the Demerara Argosy, are comments on the large yields of some of the plantations in Hawaii, which have for twenty years had the benefit of their sugar admitted free into the United States, while England grants no subsidies or bounties to any of her colonies for their sugar products. The comments made, which we insert below, are very truthful, and while all Europe and America assist their sugar industries, those of the British colonies are allowed to languish, with the prospect of soon becoming practically extinct. We quote from the Argosy:

“No one will dispute the correctness of the writer’s opinion when he says that, ‘had the cane sugar industry in the West Indies received the same national assistance that the European has had, there can be no doubt that the situation would now be very different.’ Our own Mother land has never at any time given the least assistance to her sugar planters to enable them to experiment in the field and in the factory; but, on the contrary, has kept them on the stretch, year after year, to maintain an existence against the rivalry which the subsidized foreign beet sugar was able to maintain in the English markets. There has not been a farthing left to the cane planter to devote to experiments,—it was more than some of them could do to keep their fields in cultivation. In our own Colony, the resolute spirit of the planters of twenty or thirty years ago would not allow them to give up the fight without a desperate struggle for supremacy, and vacuum-pans and other new machinery were introduced to improve the quality of sugar and increase the quantity of juice extracted from the cane, and for a time the cane held its own against the beet. But this only strengthened the determination of foreign countries to stamp out the cane-sugar industry at any cost, and bounties were increased accordingly, by which, material assistance was given to the beet growers to proceed with agricultural, mechanical and chemical experiments towards the improvement of the beet and the better utilization of its juice.

“Again our planters had to equip their factories with the newest machinery, and the triple-effect and other inventions had to be supplied to supersede the less effective evaporators; and for a time the enemy was kept at bay; but only for a time, for the bounties were again increased, and it became evident that no matter how thoroughly the planters might provide their factories with the latest and most economical type of machinery, the foreign Governments were resolved to increase the bounties so as to render it impossible for cane sugar to maintain a rivalry with beet sugar in the English market.

Then came the planters’ complaint to the Imperial Government and the appointment of a Royal Commission, which in its report gave the statements of the planters unqualified corroboration. That the planters in this Colony have maintained the struggle so bravely and resolutely for so many years, redounds to their credit, and might well obtain for them from the Imperial Government the help that those deserve who

have shown a manly determination to help themselves. The time has come when they can no longer spare money for even small improvements on their factories, every farthing of any profit in the year's crop being required for the more pressing demands for "renewals," labor and drainage. That the Colony could hold its own in the English markets if the bounties were abolished,—there is no reason to doubt. And it would be able to do this the more easily, if the local government were to give more liberal encouragement to the experiments in cane cultivation which have been going on for some years in the Botanic Gardens under two of the best qualified cane 'experts' in the empire. The Hawaiian phenomenal yields have been brought about greatly by experiments in cultivation; and if money enough had been voted by our own Government for the proper conduct of the local experiments, there is good reason to believe, that by this time, we should have had our estates supplied with a cane, giving at least fifty per cent. more juice than is at present obtained from the variety in general cultivation. The land of the Botanic Gardens is unsuitable for the experiments, but this fact the Government has refused to recognize,—to the great detriment of the sugar industry."

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#### *CHANGES IN PLANTATION MANAGEMENT.*

Several shifts have been made in the management of sugar plantations lately. Mr. W. J. Lowrey is transferred from Ewa to Spreckelsville, and has assumed charge of the Hawaiian Commercial and Sugar Company's estate, from which Mr. G. M. Boote retires, and will probably return to Louisiana, his former home. During the time that he has been in charge at Spreckelsville, he has improved the plantation wonderfully, leaving it with the largest crop in sight that has ever been raised on it.

Mr. W. W. Goodale, lately of the Onomea Sugar Co., of Hilo District, has been appointed manager and has taken charge of the new Waialua Sugar Plantation on this island, which has absorbed the Halstead plantation. From the fields of the latter, about two thousand tons of sugar will be ground early in 1899, and probably one thousand acres of new land will be broken up and put into cane for the following year. The lands of this new company extend along the foothills ten miles or more, and as the Oahu railway runs through the entire

length, the traffic of the road and the rapid improvement of the plantation must progress hand in hand.

Mr. John Moir, late manager of the Honomu Plantation on Hawaii, has taken charge of the Onomea Sugar Co.'s plantation, which includes Papaikou and Kapaa estates. He has been connected with these for ten or more years, and has proved himself qualified to assume the management of the Onomea Company's estate, and maintain its high reputation.

Mr. George F. Renton, late manager of the Kohala Sugar Plantation on Hawaii, has been appointed to succeed Mr. Lowrey at Ewa, and has taken charge. He is considered in every respect the equal of the successful manager whom he succeeds, and if it is a possible thing to do, will increase the annual output of this favorite estate to a regular twenty thousand ton crop. Grinding on this estate will commence early in December.

Mr. Wm. Puller, of Pepeekeo, Hawaii, has been installed as manager of Honomu Plantation. He has been connected with plantations on Hawaii, for a number of years, and is said to be well qualified for the position which has been assigned to him.

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### *THE SUGAR REFINING INDUSTRY.*

The competition between the American Sugar Refining Company and the new independent refineries is active, and has resulted in so reducing the margin between the cost of raw sugar and refined that it barely covers the cost of refining. Possibly a net profit of one-sixteenth of a cent per pound may be secured by refineries having every new improvement. The present cost of 96 degrees test centrifugals is  $4\frac{1}{2}$  cents; of standard granulated, 4.72 cents net, leaving a difference of 47 cents per hundred pounds. The cost of refining varies from 40 to 60 cents per hundred, the difference being governed by the conditions, equipment, and location of the refinery.

It was inevitable that independent refineries should spring up, for any industry which can return 12 per cent, per annum dividend invites competition. Independent of this, the present struggle is one result of a conflict of interests between coffee roasters and sugar refiners, the former entering the field as producers of sugar, and the latter resenting the move by engaging in the coffee trade.

The action of the American Sugar Refining Company is in many ways highly commendatory. It has never used its

power to exact an unreasonable profit. Since its organization and up to the summer of 1898 its net profit was one-third of one cent per pound. Certainly a company which has given the people a higher grade of sugar and of more uniform quality than ever before enjoyed, and at a less cost than is paid by the people of any other nation, cannot be fairly accused of abusing its power, and much less of being called a monopoly.

But still greater benefits have resulted to the public from the competitive action of the American Sugar Refining Company, for from the moment those interested in sugar refining became identified with coffee-roasting, they immediately reduced the margin between raw and roasted coffee to a fair profit, and promptly stopped the extortionate profit-making which had made one firm multi-millionaires. They exacted a fair profit and saved the public millions.—America Grocer.

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### THE EWA PLANTATION.

The late manager of this prosperous sugar estate, in his annual report to the company, which has just been distributed to shareholders, gives a most flattering statement of the prospects for 1899 and 1900. "The coming crop," he says, "will consist of 2143 acres, of which 1485 acres are plant cane, 518 acres long ratoons, and 140 acres short ratoons, and should yield about 20,000 tons." The crop for 1900, he also states, will be taken from 1600 acres of plant cane, and 650 acres of long ratoons, besides some short ratoons. This will be a large advance over any previous crop, being a total of 2250 acres for the year 1900. As the crop just harvested was taken from 1530 acres of cane, together with 1044 tons of seed cane sold to the new Oahu Plantation, the increase of acreage given for the growing crops of 1899 and 1900 shows a most flattering prospect for the next two years. The capacity of this fine estate has evidently not yet reached its limit, and in the hands of the new manager, who has had twenty years experience with cane, the shareholders may rest assured that Ewa will still keep in the front rank.

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The Grocery World of Philadelphia, publishes details of a newly perfected machine for packing sugar. At the present time the sugar-packing machine owned by the Arbuckles is far and away ahead of any other now on the market. The new machine has passed the experimental stage, and works perfectly and costs much less than the Arbuckle Bros.' , while it will perform four times the work. Arbuckle Bros.' apparatus, while very effective, is exceedingly cumbersome.

*MEMORIAL PRESENTED TO THE UNITED STATES COMMISSIONERS BY HAWAIIAN SUGAR PLANTERS' ASSOCIATION SEPTEMBER 8, 1898.*

To Hon. Shelby M. Cullom, John T. Morgan, Robert R. Hitt, Sanford B. Dole and Walter F. Frear, United States Commissioners.

Gentlemen:—The Hawaiian Sugar Planters' Association, an unincorporated body, organized for the purpose of conserving the agricultural interests of the Hawaiian Islands, and containing among its membership representatives of nearly all the leading agricultural enterprises of the country, respectfully presents for the consideration of your Honorable Commission the following statement of its views upon certain vital issues which are involved in the action of your Honorable Body:

FORM OF GOVERNMENT.—The Planters' Association is an agricultural and not a political body, but experience has demonstrated in Hawaii as well as elsewhere that the form of Government has much to do with the prosperity or otherwise of agricultural as well as other industries.

We do not understand that the question of statehood for Hawaii is one for present serious consideration and do not therefore discuss that question.

We are given to understand however that two forms of Government have come before you for consideration, viz: a Government by Commission, appointed by the President, modeled upon the present Government of the District of Columbia; and second, a territorial form of Government in which the chief executive officer shall be appointed by the President, the subordinate offices being filled locally; with a territorial legislature elected by the people of the territory, having control of local legislation, subject to the paramount power of Congress, the present territorial Governments of Arizona and New Mexico being the proposed model in a general way.

OPPOSED TO GOVERNMENT BY COMMISSION.—We respectfully suggest that Government by Commissioners appointed by the President will not be for the best interests of all concerned, for the following reasons:

1. We are given to understand that the Government of the District of Columbia is well liked by the conservative citizens of Washington and that it gives to the people of that city an honest Government economically administered.

We submit that there are reasons why such a Government may be successful in Washington which do not apply to Hawaii, viz:

(1) The Government of the District of Columbia is directly under the eye of the President.

(2) It is directly under the control and supervision of Congress, many of the members of which are property owners and permanent residents in Washington and all of whom are residents of the city during a large portion of the year.

(3) It is subject to the constant scrutiny and criticism of the daily press of Washington, copies of which daily meet the eye of the President and members of Congress as well as the Commissioners.

(4) Congress each week devotes a day to the affairs of the District of Columbia, being practically its Board of Aldermen and local Legislature.

Every one of these conditions, in so far as they relate to Hawaii, will be reversed if a Government by Commission is established here.

(5) Instead of being directly under the eye of the President, so that he will have intimate personal knowledge of the difficulties to be met and the remedies required, the Commission will be removed to a distance of over 5,000 miles, with infrequent mail communication, it frequently taking six weeks and over to send a communication from Honolulu to Washington and obtain a reply.

Even if cable communication is established, the distance and expense of telegraphic communication will prevent the sending of cable messages except in bare outline and concerning subjects of great importance.

(6) Instead of Hawaii being personally and intimately known to members of Congress, it and its needs and conditions will be but a name to the vast majority of them.

(7) Instead of the needs and desires of the public as expressed through the public press, meeting at frequent intervals the eyes of the supreme power, such expressions of opinion will practically be seen by the members of the Commission only, as purely local papers receive but scant attention away from the locality in which they are printed, especially when they must necessarily be several weeks old before reaching Washington.

It is not to be expected that Congress would or could give to Hawaii the amount of time and thought that is now devoted

by it to the local questions and issues arising in the District of Columbia.

The practical result of Government by Commission in Hawaii would be that it would be good or bad, according as the character and ability of the individual Commissioners varied, with the practical certainty that however good the Commissioners might be individually, their rule would be more or less arbitrary and in accordance with their own views instead of being in accordance with the desires and needs of the people of the Territory.

This would be likely to be much more the case in Hawaii than it has been in the Western territories, for the reason that communication and supervision would be so much less in the case of Hawaii owing to the greater distance and infrequency of communication.

2. We understand that some of our fellow citizens have been in favor of at least a temporary government by Commission. We are willing to admit that if such a form of government were provided for the next few years, it might, and probably would, to a great extent, eliminate the bitterness of feeling which has grown out of the transition of Hawaii from a monarchy of a territory of the United States; by preventing elections and the consequent probable continuity of present party differences which have in the past and probably will for some time to come divide along race lines, and embrace on the one side those who have favored, and on the other those who have opposed a monarchical form of Government.

But admitting all this, it is submitted that if a government by Commission is once fairly established here it will be far more difficult to replace it by some more representative form of government than would now be the case, and that the benefits to be derived therefrom are insufficient to offset the evils and disadvantages of such system while they are not great enough to compensate for the loss of local control of the local government.

Another and weighty reason why government by Commission should not be established is that, although the full electorate of this country is not up to the highest standard of American citizenship, still we submit that the ultimate object and aim of republican government should be to make all territories eventually self-governing and that this can be accomplished only by training the people into self-government by

actual participation therein to the full extent which the safety of the general government and the local territory will allow. Government by Commission only, would tend to make the people of Hawaii less, instead of more capable of eventual self-government.

We therefore respectfully urge upon your Honorable Commission that your recommendation to Congress be not in favor of a government by Commission.

**TERRITORIAL FORM OF GOVERNMENT FAVORED.**—We respectfully urge upon your Honorable Commission that you recommend to Congress the adoption of a form of territorial government which may involve as wide a degree of local control as the safety of the general government and local interests will allow.

We respectfully suggest the following as being some of the most important points concerning which local control may be given within the boundaries suggested:

1. That, while the chief executive officer of the territory should be appointed by the President, he should be a bona fide resident of the country holding property interests therein, and that all subordinate officers should possess like qualifications.

We submit that this is thoroughly in line with American precedents and policy and in support thereof respectfully refer to the platforms of the three national parties adopted at their last general convention in 1896, viz:

From the Democratic platform:

“We favor the early admission of all the territories giving the necessary population and resources to entitle them to statehood, and while they remain territories we hold that the officials appointed to administer the government of any territory, together with the District of Columbia and Alaska, should be bone fide residents of the territory or district in which their duties are to be performed.”

From the People's Party platform:

“We favor home rule in the territories and the District of Columbia.”

From the Republican platform:

“All the federal officers appointed for the territories should be selected from bona fide residents thereof, and the right of self-government should be accorded as far as practicable.”

It is respectfully submitted that a principle which has been

unanimously adopted by the national parties of the United States, and which has been, with few exceptions, recognized by successive administration in the practical appointments to existing territories, can properly, and in the interests of all concerned, should be, now embodied in statute form, and we respectfully urge upon your Honorable Commission that there may be included in your recommendations to Congress a provision that federal appointments to Hawaii may be in accordance with the principles set forth in the party platforms above quoted.

**THE ELECTIVE FRANCHISE.**—While we have given our reason for desiring that a representative form of Government be adopted for Hawaii instead of a Government by Commission, we believe that it would be unwise to immediately grant full and unrestricted suffrage either in the interests of the general government or the local community, or of republican government.

Prominent among these reasons are the facts:

1st. That a large portion of those heretofore eligible to the electorate have been and are hostile to a Republican form of Government, and for some time to come there is every probability that the guiding principle of their action will be to hamper and obstruct the evolution of responsible representative government rather than to assist therein.

2nd. A large proportion of those heretofore eligible to the electorate are unaccustomed, either by race instincts or personal participation, to self-government except in the most limited degree.

While we believe in the principle above stated, that the only way to train a people into the methods of representative government is to allow them to practically participate therein, we submit that it is not necessary in putting such principle into practice, to, at one step, graft upon a people who have but slight practical experience therewith, the full representative and electoral system which, in the United States, has been the growth of centuries, among a people who have become accustomed to it through generations of practical experience.

We therefore respectfully suggest to your Honorable Commission that the franchise be granted with such restrictions and checks as will further, and not obstruct, the growth of representative republican institutions in Hawaii.

The present qualifications required of electors, by the Ha-

waiian Constitution, have been evolved through many years of practical dealing with the subject matter and issues now in question, and are, we submit, ones which have proved by experience to be better adapted to the conditions which now prevail in Hawaii than any other.

On the one hand it practically allows every elector to participate in the regulation of the government, by casting a vote for members of the House of Representatives; while it provides a more restricted electorate, under conditions neither arbitrary nor oppressive, for the election of the upper House.

It is respectfully submitted that the addition of a property qualification for voters for the upper House is not un-American nor inconsistent with representative institutions.

Almost, if not every State in the original Union required a property qualification of its voters; and it is only within ten years that the last of the States of the Union, Rhode Island, abolished the ownership of property as a qualification of its voters.

It is respectfully submitted that the Congress of the United States in and of itself admits of the propriety, under certain conditions, of a difference in the electoral qualifications of the electors of its two Houses, the electors of the Senate being restricted to the members of the Legislature of the respective States, while the members of the House of Representatives are elected by the people of the several congressional districts at large.

It is submitted further that the entire American system of government is based upon the theory of checks and balances of one branch of the government over against the other, the particular method of the application of the principle being adapted by the constructors of the system to the conditions then presented to them.

It is submitted that the particular method of adapting and applying such checks and balances in the case of Hawaii should likewise be governed by the conditions now presented, and that the method now suggested contains no departure from the principles by the originators of the American system of government.

As the people of the country by immigration and assimilation become better acquainted with the American system, it can by successive stages be extended in its entirety, if it is then thought best so to do, without any violence to the orderly and businesslike conduct of the public business.

JUDICIAL SYSTEM.—We do not desire to discuss the judicial system in detail, but as the general outlines of that system are vital to the interests of every resident of the territory, we respectfully suggest for the consideration of your Honorable Commission that the best interests of all concerned will be met by the organization of a system of local courts, which shall, so far as possible, have exclusive and final jurisdiction over all local matters, so as to prevent so far as possible, the delay and expense involved if appeals may be taken to the Circuit or Supreme Courts sitting at Washington or other parts of the United States.

It is submitted that if a judicial system is adopted which allows indiscriminate appeal to courts beyond the borders of the territory it will be an absolute denial of justice to poor litigants and a source of great and unnecessary expense and delay to all.

It is submitted that the present Hawaiian system of courts has been evolved out of fifty years practical experience and if converted into a territorial system will fully answer all the local territorial needs, and we respectfully urge that you recommend its adoption with as little change as possible.

In this connection we have but three further suggestions to make:

1st. That under the conditions existing here it will be disastrous to the public interests if judicial positions are made elective and we therefore respectfully urge upon your Honorable Body that for the present they continue to be appointive.

2nd. That the jury system heretofore in use in Hawaii, under which race lines have been recognized, a Hawaiian's case, whether civil or criminal, being tried by a Hawaiian jury; a foreigner's case being tried by a foreign jury, and a case between a Hawaiian and a foreigner being tried by a jury of six Hawaiians and six foreigners, has along outgrown its original object, which was to guarantee to foreigners a fair trial, and should be abolished as unnecessary and liable to perpetuate race differences.

3rd. That the jury system heretofore and now in use in Hawaii, under which a verdict can be rendered in both civil and criminal cases by nine out of the twelve jurors, has now been in use in the country for over fifty years and has worked well.

The feeling in the country is practically unanimous in support of a continuance of the system, and we urge that you so recommend.

LABOR.—The question of the labor supply of the country is the one which most directly affects the interests which we represent, and, as this is almost entirely an agricultural country, it is the question which most vitally affects not only the continued prosperity, but the very existence of the leading industries of Hawaii.

It is a matter of common knowledge that the penal contract system which still survives here, was introduced, not at the desire of the employers of labor but as a matter of necessity in order to secure laborers.

In the earlier half of the century the leading industry of the country, and the source of its principal revenue, was the whale fisheries, the crews of the whale ships being largely recruited here.

The usual American shipping contract was utilized in shipping the sailors and in order to secure the services of the native Hawaiians, who would not ship under other circumstances, an advance on account of wages was made upon the signing of the contract.

This vicious system of an advance on account of wages, frequently amounting to several months' wages in full, became so established in the Hawaiian mind as the necessary precedent to engaging in any continuous labor, that laborers could not be obtained from among them except upon making a considerable advance on account of wages, accomplished by the same form of shipping contract used by the whalers, in order to secure the repayment or working out of the amount advanced.

In later years as the supply of Hawaiian laborers became insufficient to meet the demands of a developing country, laborers were imported from abroad, at great expense to both the Government and employers of labor in Hawaii.

For example, during the ten years from 1878 to 1888 there was expended by the Hawaiian Government in importing laborers into Hawaii the sum of \$1,019,000; while the employers of labor spent during the same period an amount only a little less than \$1,000,000.

For this sum 18,400 people were brought into the country.

Since 1888 the greater part of the expense has been borne by the employers of labor and the average annual number of laborers imported into the country has been from 3000 to 5,000.

The enormous expense of securing these laborers has required some security that the amounts advanced to pay the passages and expenses of the immigrants should be re-paid or worked out, with the alternative of ruin to the employer making the advances if such security were not obtainable.

For this purpose, and in this way, the penal contract system, which is almost word for word the duplicate of the American shipping contract used for seamen became incorporated into and has continued a part of the Hawaiian labor system.

The evils of the system and its tendency to depreciate the standard of labor as an honorable calling have been recognized and appreciated by the great bulk of intelligent people of Hawaii, and it has almost entirely fallen into disuse, except with relation to the newly imported immigrants and the securing of the advances made to and on account of them.

So great has been this tendency that the census of 1896 shows that of approximately 35,000 laborers, only approximately 10,000 were working under contract, and these almost exclusively under contracts made abroad.

We do not expect and do not ask that the penal contract system be perpetuated and have recited the foregoing facts, not for the purpose of bolstering up or continuing that system, but for the purpose merely of illustrating and showing one of the difficulties which the agricultural industries of this country labor under.

The tropical agricultural industries of Hawaii have in the past, and must continue in the future, to compete with the like industries of other countries wherein labor is abundant and far cheaper than it is here.

Contrary to usual comment and understanding in the United States, the average cost of labor in Hawaii does not vary much from the average cost of similar labor in the United States.

The average cost of ordinary field labor in Hawaii counting in the lodgings, medical attendance, wood, water and land for cultivation, almost universally furnished to the laborers, does not in any case fall below \$16 a month, in most cases comes to as high as \$18 a month, and ranges upward to \$20 and even more a month.

INCREASED NEED OF LABOR.—Under the stimulus of stability of Government and certainty of a market, it is a certainty

that the agricultural industries of the country will greatly expand if laborers can be obtained.

Three large and several smaller sugar plantations are now being organized which will probably require not less than five thousand more laborers, and the coffee industry yet in its infancy, will soon require many thousands more.

Either these laborers must be obtained from beyond the borders of Hawaii or the development of the country will be checked and existing industries hampered if not extinguished.

EXEMPTION FROM AMERICAN IMMIGRATION LAWS ASKED.—It has been the belief of some, and the hope of many more, interested in the future of Hawaii, that Annexation would bring to Hawaii a white American farming population which would solve both the labor and the political problem.

It is not the intention of this body to dispute the correctness of this theory, but if such change takes place, it will, owing to the distance from the centers of over-supply of labor in the labor markets of the United States and the expense of getting here from there, be a considerable period before such can be obtainable upon the farms and plantations of Hawaii.

Moreover, it is open to question whether any considerable number of American laborers will be content to accept the wages which the Hawaiian Agricultural industries can afford to pay, even though under the present special tariff conditions the sugar industry may be able to pay a somewhat higher rate of wages than that heretofore paid.

Meanwhile the necessities of the industries of the country are immediate and pressing.

We estimate that during the twelve months next ensuing the date hereof, the agricultural industries of the country will require not less than 7,000 laborers in addition to those now in the country.

The chief sources of labor have heretofore been China, Japan and Portugal.

By the terms of the annexation resolution, the further immigration of Chinese is prohibited and we understand that the general policy of the United States is such that there is no probability of any further immigration being allowed.

We do not propose to set our interests up as against the general policy or interest of the United States at large, nor to ask that any special privileges be granted us which are not granted to American citizens as a whole; but in view of the

fact that the entire industries of Hawaii have been built up on a certain system of labor, we do not feel that it would be asking too much or that which is inconsistent with the common good, to ask that your Honorable Commission recommend that a transition period be allowed during which the agricultural interests of Hawaii may readjust themselves to meet the changed condition of affairs, during which time the full immigration laws of the United States shall not be extended in their entirety to Hawaii.

We understand that the present immigration laws of the United States do not allow the engaging abroad of laborers to do work in the United States, and do not even allow an employer to assist an immigrant to come to the United States by advancing in whole or in part his expenses or passage money.

If American laborers can be induced to come to the Hawaiian Islands and work for wages which will leave a margin of profit to the employer, we will be the first to welcome such laborers and such a solution of the problem.

We have not in the past, however, been able to induce such laborers or any laborers to come to Hawaii except by advancing the cost of their passage, and we gravely doubt whether, at least for some time to come, laborers in sufficient number from any quarter can be induced to come to Hawaii unless their passages are advanced to them.

We respectfully request therefore that, until it can be ascertained whether or not a sufficient number of American laborers can be obtained to meet the industrial requirements of Hawaii, the extension of the full immigration laws of the United States, more particularly those portions thereof which prohibit the advance by an employer of the passage money to a laborer to Hawaii may be delayed in order that the main industries of the country may not be subjected to the severe strain and loss which will certainly occur if the entire labor policy of the country is suddenly reversed and its supply cut off before a new source of supply is opened up.

We remain,

Your obedient servants,

HAWAIIAN SUGAR PLANTERS' ASSOCIATION.

By its President J. B. Atherton, and

By its Secretary C. Bolte.

Honolulu, H. I., September 8th, 1898.

*SUGAR CONDITIONS IN 1890-91.*

(From Willett & Gray's Statistical.)

It is of interest at this time to recall the course of the markets during the period of competition preceding the acquisition of the Philadelphia refineries by the American Sugar Refining Company. The Spreckels' refinery took the field in March, 1890, as an active competitor. This refinery was completed in December, 1889, but did not cut prices until March, 1890. The usual spring rise in sugar was kept down by competition, and the difference between raw and refined varied from 68 cents to 50 cents per hundred pounds until June 1. A sudden influx of orders greater than the production, at low values, necessitated a rapid rise in refined, until 1.17 cents became the difference between raws and refined. Later a gradual decline came until August found the refiners cutting against each other to secure business. The difference ran down and fluctuated between 50 cents and 60 cents at end of November. Raw rose in August, but refined did not follow proportionately; but when raws fell off again, refined did the same. January 1, 1891, the competing refiners were the American Sugar Refining Company on the one side; Spreckels, Franklin, E. C. Knight & Co., and Delaware (of Philadelphia) on the other. When the McKinley free sugar tariff came into effect April 1, 1891, all the refiners reduced granulated to 4½ cents per pound, against 3½ cents for centrifugals. An enormous demand for refined followed the abolition of duties, and all refiners competed with others on the other side, raising prices rapidly, and the pace was kept until October, 1891, when a sudden falling off in demand brought renewed cuttings of business, and surplus stocks accumulated in all refiners' hands. The strongest kind of competition came during the winter, and the struggle for existence came to a crisis.

For seven weeks, from January 7 to February 18, 1892, the difference was maintained at only 48 cents, and the war culminated. Late in February the American Sugar Refining Company issued \$25,000,000 new stock; the Spreckels refinery shut down for transfer to the American Sugar Refining Company. At the same time the Franklin, E. C. Knight & Co., and Delaware passed into control of the American Sugar Refining Company. Refined advanced by springs and bounds in 1892, to 1-16 of a cent per hundred pounds difference between raws and

refined. Sugar stock during the period under review was always below par. It rose in 1890 and 1891 from about \$70, to \$90 in October, 1891, and fluctuated between \$80 and \$90 to February, 1892. On completion of the war it rose rapidly, reaching par in March, 1892. From the above it appears that the competition between refiners ran with more or less violence, depending upon the demand for refined from March, 1890, to March, 1892—a period of two full years—before it was finally and satisfactorily settled. The forces which are now at issue are stronger, with larger money backing, and the end and aim of the present war is not and cannot be the acquisition of all the independent refineries. Their proportion of the business is entirely too large for absorption by purchase by the American Sugar Refining Company. Only two outcomes appear possible—a grand combination of all the sugar and coffee interests into one great concern under one management, or a working arrangement between all the sugar refineries and the large coffee roasters to cover a series of years. The sugar and coffee interests are now so intermixed that no settlement of one can be made without the other. The combination suggested is of such magnitude that at the beginning of the war it seems entirely problematical, but there is no telling what a year's competition may bring about. All rumors of settlement of the difficult problems involved—which may be put out for some time to come—will not be worth attention. Time—and a long time—only can bring the final solution. It may only come about at such time as our increase of consumption of sugar in the United States shall make a place for the new refineries without curtailing the business of the American Sugar Refining Company.

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#### *THE SUGAR WAR OF 1898.*

The sugar war now on with so much intensity in New York, has, of course, affected the price of sugar everywhere, but the real heat of the war is especially manifest at the great centre where it rages—New York. These fluctuations in price, with incidental declines, are pleasing to the consumer, but do not please the wholesale and retail trade, who naturally prefer steadiness and stability in prices. Ten years ago Spreckels entered into competition with the American Sugar Refining Co., and cut prices to such figures that he lost heavily; he

subsequently recouped these losses by selling out to the Trust.

In the present war Arbuckle Brothers are the aggressive parties. That the fight may soon be off is the wish of the trade. At present rates there is no profit to the refiners, and any further scaling of prices will mean actual loss to the refiner.

Those who claim to know, assert that Havemeyer and Arbuckle will fight it out to the bitter end. The New York Commercial thinks the war "will not have reached the crucial point until the stock of raw sugar has to be drawn upon. Then, unless the price of raws comes down in proportion to the reduction in the price of refined sugar, the refiners will have to foot the deficit, and it will be a question of who can hold out the longest."

"The Sugar Trust say the reduced prices are not in consequence of any war between the Trust and Arbuckle, but because 'when the demand for the canning business ends, the price of refined sugars is always reduced. This, taken in conjunction with the fact that the price of raw sugar is very low, is sufficient to account for the cut in prices.'"

The trade, generally, do not take much stock in this explanation.

It is still a mooted question when the Doscher people will start up, some say within two weeks. At present the management of the opposition is with the Mollenhauer, the National and the Arbuckle. The continued building of new refineries, in advance of consumption requirements, is a serious menace to the entire refining industry of the United States. The Arbuckle Bros. have not increased their production of sugar, and are still turning out equal to 1500 barrels daily, which is one-half their capacity. This refinery is not producing any softs for the market at present, but remelting them and turning out granulated only.

Willett & Gray, New York, say relative to sugar: The question now asked is how low will prices be forced. The last serious decline was in 1894. On Oct. 25 the difference between raws and refined was 85c per 100 pounds, and on Dec. 6 it had fallen to 36c, at which difference the country came in and bought enormously, raising the difference to 74c at end of year. During the memorable fight for supremacy in Philadelphia in 1891 the difference never fell below 48c per 100 pounds, but

it remained there steadily for some time, losing money to all concerned until terms were finally arranged.

This week the American Sugar Refining Co. has posted this notice in its salesroom: "We will sell sugar at the market price at day of arrival, whether quoted prices are up or down."

It is assumed that this is a plan to prevent heavy speculative buying by big handlers of sugar, an advantage to both refiners and buyers, insuring against a loss in case the market should decline before they received their sugars, and protecting refiners against heavy purchases at the prevailing low prices.

A Honolulu despatch says that one result of annexation is the enormous boom given to the sugar industry on all the islands. New plantations are being laid out and old ones increased in acreage.

The sugar question is an important one when considering the problems connected with our newly acquired territory. We have been paying out to the cane-growing districts of the tropics and to Germany and other beet-growing States of Europe, something like \$100,000,000 a year for sugar; that is, we have been consuming about \$100,000,000 more of sugar in the raw form than our refineries in their work of supplying the domestic market can buy here at home. Porto Rico, Cuba and the Philippines are sugar producing countries. Porto Rico produces about 50,000 tons of cane sugar annually, and is capable of producing from 100,000 to 150,000 tons. Cuba has produced 1,100,000 tons, and could raise 2,000,000 tons. Hawaii grows about 240,000 tons and Louisiana about the same. In the Philippines the production is about that of the Hawaiian Islands, but can be increased to 2,000,000 tons. The sugar produced by our own lands and those which but recently were Spanish, amount to about 1,750,000 tons or within a quarter of a million tons of the total American annual consumption; and it is possible to increase this to about 4,500,000 tons. To Europe this means a great increase in the production of cane sugars at the expense of European growers. Beet sugar is allowed a bounty in Germany of from \$6.03 to \$8.44 per ton; Austria \$7.24 to \$10.86; Belgium \$7.90 to \$11.39; and France \$21.71. As a consequence the growth of the European beet sugar crop has been phenomenal. In 1855 the total production of Europe was scarcely 210,000 tons and by 1895 it had increased to 4,793,000 tons or an increase of 2,185 per cent.—New England Grocer.

*EVAPORATION AND PLANT-TRANSPIRATION.*

By Walter Maxwell.

Reprinted from the Journal of the American Chemical Society.

The data which largely compose this contribution were obtained in the course of observations bearing upon the factors which enter into a system of rational and economic irrigation, and in connection with the study of certain practical questions that relate to land irrigation on the Hawaiian Islands. These data, however, have also a more purely scientific value, and may have an interest for those who are more exclusively engaged in physiological investigations.

The actual purpose of the observations which these data represent was to try to determine: first, the loss of moisture due to direct evaporation from the soil; and secondly, the relative proportion that escapes by transpiration from the sugar-cane (*saccharum officinarum*) during different periods of growth, and to note the meteorological and other factors which appear to control these phenomena.

The observations on soil-evaporation and plant-transpiration were made as follows: A given weight of the particular soil was put into two tubs, exactly 125 pounds into each tub. The tubs had perforated bottoms, over which a piece of linen cloth was laid before putting in the soil, in order to prevent the soil dropping through, or blocking up the holes. When filled thus with soil, the tubs were each set into a galvanized iron pan containing water, the water being kept up to a given mark or level, which level was the point of contact between the soil in the tubs and the water in the pans. The pans were most carefully covered with moisture-proof glazed oilcloth, to prevent any evaporation from the pans except through the tubs containing the soil. When the tubs were set in place, water was added to each pan by means of a funnel that was inserted through the waterproof covers, and in sufficient volume to saturate the soil, whose absorptive power was 48.2 per cent. on its own weight. This was done on April 15, and on April 16 three pieces of seed-cane were planted in tub No. 2, whilst in tub No. 1 no cane was planted, the latter having to record the escape of water by means of the soil, and No. 2 tub the loss by means of the soil plus the growing cane.

The tubs were placed upon a veranda, having a south expo-

sure and a strong light, but as they had to be protected against rainfall they were so located that no direct sunlight fell upon them. Near by the tubs, temperature readings were taken. The maximum and minimum thermometers gave the extremes of temperatures, and the dry-bulb and wet-bulb thermometers the indications of "humidity in the air."

It has commonly been claimed that temperature and the "relative humidity in the air" are controlling factors in evaporation. The writer, however, has believed not only that there is not necessarily a constant relation between temperature, atmospheric moisture, and the water given off from soil and water surfaces, but that there are other factors whose individual action exceeds the united influences of the factors already stated. For this reason we decided, at the time of taking the temperature and humidity readings, to determine the actual evaporation, by use of evaporators. The form of evaporator used was a small galvanized dish, one inch deep, and having a superficial area of 120 square inches. The evaporator was placed between the dry and wet-bulb thermometers, thus having the same protection against the sun and exposure to the wind. At seven o'clock in the morning 500 grams of water were weighed into the evaporator, and at the end of twenty-four hours the weight was retaken and recorded. The water was made up again in weight to 500 grams, proceeding thus daily over the whole period of time included by the experiment. In addition to the evaporator described, a second one, in each item exactly identical with the former, was used. This second one was placed in a barn. The large doors of the barn were kept open day and night, thus providing an ample circulation of the outer air, but no violent wind disturbance or sudden movements of the air. The purpose in this case was to have the corresponding conditions of temperature and atmospheric humidity surrounding the former evaporator located thirty feet distant, with the exclusion of the factor of wind. The data furnished by the two evaporators were taken and recorded in the same way, with the corresponding thermometer readings. With this brief description of the mode of observation, the data are now given. These are numerous and occupy considerable space, but the full statement is necessary in order to observe the wide range of variations. Two statements could be made with some advantage, from the data. The soil-evaporation and the transpira-

tion by the cane, however, are so bound up with the meteorological conditions that we present it as a whole:

Date, 1897.	Mean outdoor temperature.	Outdoor evaporation.	Mean indoor temperature.	Indoor evaporation.	Humidity.	Direction of wind.	Evaporation of soil No. I.	Evaporation of soil and cane No. II.
		%		%			Saturated cc.	Saturated cc.
April 16	74	27.6	78	10.4	76.3		....	....
" 17	76	27.6	79	10.6	73.8		1000	1000
" 18	75	32.0	80	13.2	90.4		800	800
" 19	76	34.0	80	13.0	73.8		1000	1000
" 20	76	37.6	79	14.4	76.3		500	500
" 21	76	36.6	79	13.4	76.4		200	200
" 22	75	31.4	80	14.0	76.4		500	500
" 23	75	32.0	79	12.2	73.8		700	700
" 24	74	33.4	77	13.0	73.7		700	700
" 25	72	27.2	76	10.6	78.9		500	500
" 26	75	30.2	78	11.2	76.3		700	700
" 27	75	27.0	76	11.2	78.9		500	500
" 28	76	32.2	78	13.6	76.3		500	500
" 29	74	29.2	79	12.6	76.3		700	700
" 30	75	31.2	77	12.6	81.7		500	500
May 1	75	35.4	78	12.2	78.9		500	500
" 2	72	28.4	76	9.6	78.8		500	500
" 3	72	34.2	77	11.8	78.9		500	500
" 4	75	38.2	79	12.6	73.7		500	500
" 5	75	29.2	79	11.4	78.9		500	500
" 6	77	35.4	79	13.2	76.4		500	500
" 7	75	34.4	81	13.4	71.5		500	500
" 8	71	19.2	78	6.8	78.9		500	500
" 9	72	17.2	79	11.0	76.4		500	500 <sup>1</sup>
" 10	73	25.6	80	10.0	81.8		300	300
" 11	75	27.2	83	12.6	79.1		300	300
" 12	73	22.2	79	10.6	76.4		300	300
" 13	75	25.8	80	12.2	71.5		300	300
" 14	76	22.2	80	10.8	79.0		300	300
" 15	74	23.0	77	9.0	85.5		300	300
" 16	73	11.0	78	4.2	87.4		300	320
" 17	73	11.0	78	6.0	84.6	S. E.	300	300
" 18	77	25.2	81	11.0	79.1	N. E.	300	350
" 19	77	32.8	80	12.6	79.1	"	180	200
" 20	77	31.3	82	13.2	76.6	"	220	250
" 21	75	33.6	80	13.0	76.5	"	180	200
" 22	75	29.0	79	10.6	93.5	"	220	250
" 23	75	30.6	78	11.6	78.9	"	300	310
" 24	76	26.2	81	12.0	76.5	"	300	310
" 25	76	27.0	80	11.6	79.1	"	340	350
" 26	73	27.2	80	12.2	76.7	"	350	360
" 27	71	15.6	79	9.6	81.8	S. E.	450	500
" 28	76	30.0	81	12.6	76.6	E.	500	550
" 29	79	31.6	80	12.6	79.1	S. E.	500	550
" 30	78	35.2	82	14.0	79.1	E.	300	310
" 31	78	30.2	82	14.2	76.6	"	300	410
June 1	78	4.63	83	14.6	76.6	"	400	450
" 2	78	30.2	82	12.0	87.6	S. E.	350	400
" 3	78	24.0	81	11.0	79.1	"	450	500

<sup>1</sup> The cane began to come up and twelve stalks were up by May 21.

Date, 1897.	Mean outdoor temperature.	Outdoor evaporation.	Mean indoor temperature.	Indoor evaporation.	Humidity.	Direction of wind.	Evaporation of soil No. I.	Evaporation of soil and cane No. II.
							Saturated cc.	Saturated cc.
June 4	76	30.0	81	13.2	76 5	N. E.	550	600
" 5	75	21.0	79	9.2	81.8	S. E.	450	500
" 6	75	24.8	80	10.6	81.8	"	400	500
" 7	74	24.0	79	9.6	79 1	N. E.	400	500
" 8	76	24.6	80	10.0	81.9	"	400	500
" 9	77	26.2	80	10.8	79.1	"	400	500
" 10	77	28.6	81	12.0	79.1	N. E.	400	500
" 11	76	23.0	80	9.2	79 1	"	450	500
" 12	77	27.6	79	10.0	81.8	"	400	500
" 13	77	36 6	82	14.0	76.6	"	400	500
" 14	76	27.2	81	11.2	81.8	"	400	550
" 15	78	29.0	80	11.0	81.8	S. E.	400	550
" 16	79	31.0	82	12.0	81.9	"	400	500
" 17	78	28.2	83	12.0	81.9	N. E.	450	550
" 18	78	30.0	83	12.2	79.2	"	400	550
" 19	78	26 0	81	12.2	81.9	"	400	550
" 20	76	22.2	82	10.6	81 9	"	400	500
" 21	76	16.2	81	8.2	84.7	S. E.	400	500
" 22	74	12.6	80	9.2	84.6	S.	400	500
" 23	75	9.2	79	6 0	87 5	"	400	500
" 24	73	6 0	78	4.2	96.7	S. W.	200	400
" 25	77	13.4	81	9.6	87.6	S. E.	100	300
" 26	75	5.6	78	4.4	93 5	S.	100	300
" 27	76	13.4	82	9.6	84.7	"	100	300
" 28	76	13.0	83	9.0	82.0	S. W.	100	400
" 29	74	13.0	81	8.0	84.7	"	200	400
" 30	80	31.0	83	10.0	79.3	S. E.	200	500
July 1	78	25.0	85	12.0	76.7	E.	200	500
" 2	77	23.0	80	9.0	87.5	S. E.	200	500
" 3	78	30.6	81	11.2	81.9	E.	200	500
" 4	80	32.0	81	11.2	81.9	"	300	500
" 5	80	31.6	85	12.6	74.3	"	400	600
" 6	78	23.0	80	9.8	84.7	"	400	600
" 7	78	27.6	83	11.2	84.7	"	500	700
" 8	77	23.6	80	9.6	84.7	S. E.	500	700
" 9	77	25.6	79	10.2	84.6	E.	400	700
" 10	77	27.2	82	11.2	79.1	"	400	700
" 11	78	25.2	81	11.0	81.9	"	400	600
" 12	79	27.6	83	12.0	84.7	"	400	700
" 13	79	29.6	82	13.0	79.2	"	300	600
" 14	78	26.0	80	11.0	81.6	"	300	600
" 15	76	27.2	81	12.0	87 7	"	400	600
" 16	76	21.8	82	10.2	87.5	"	400	600
" 17	77	28.0	80	12.0	84.7	"	400	700
" 18	78	26.2	83	11.8	81.9	"	400	700
" 19	78	23 0	81	10.6	81.9	"	400	700
" 20	76	23.0	81	10.0	81.9	N. E.	400	700
" 21	79	27.6	83	13.0	74.1	E.	400	700
" 22	78	25.4	82	12.0	74.0	"	400	700
" 23	79	29.0	82	12.0	76.6	"	400	700
" 24	79	29.0	84	14.0	71.7	"	400	700
" 25	79	20.6	84	11.2	71.7	"	400	700
" 26	80	28.0	83	12.2	74.2	"	400	700
" 27	79	28.8	83	13.2	74.1	"	400	700
" 28	79	32.2	84	15.2	76.7	"	400	800
" 29	78	25.2	83	12.0	76.7	"	400	800 <sup>1</sup>

<sup>1</sup> One stalk cane died.

Date, 1887.	Mean outdoor temperature.	Outdoor evaporation.	Mean indoor temperature.	Indoor evaporation.	Humidity.	Direction of wind.	Evaporation of soil No. I.	Evaporation of soil and cane No. II.
		%		%			Saturated cc.	Saturated cc.
July 30	77	26.0	84	12.8	76.7	E. S. E.	400	800
" 31	78	31.0	84	14.0	76.7	E.	400	800
Aug. 1	77	24.2	84	12.0	76.7	"	400	800
" 2	76	17.6	83	11.6	79.1	S. E.	400	800
" 3	79	18.2	85	11.0	76.7	"	400	800
" 4	80	23.0	86	12.0	76.8	E	400	800
" 5	78	23.6	83	11.2	79 2	"	400	800
" 6	78	32 6	83	13.8	76 7	"	300	700
" 7	77	31.0	81	12 2	81.8	"	400	700
" 8	78	30.2	81	12 6	76.5	N E.	400	800
" 9	79	31.6	84	14.0	71.7	"	400	800
" 10	79	26.2	84	13.0	71 7	E.	400	800
" 11	78	27.2	83	12.2	71.7	"	400	800
" 12	79	23.0	83	10.8	79.1	"	400	800
" 13	80	15.0	83	7.6	84 8	"	400	800
" 14	80	25.4	84	11 2	82.1	"	400	800
" 15	79	26.6	82	12.2	71.6	"	400	800
" 16	77	31.2	83	13.4	71 7	"	400	800
" 17	78	26.2	81	12 0	74.0	"	400	800
" 18	79	32.2	84	12 4	71 7	"	400	800
" 19	80	33.0	83	13 2	74.1	"	400	900
" 20	79	26.0	83	13.2	71 6	"	400	900
" 21	78	26.0	81	13.0	74 0	"	400	1000
" 22	78	26.0	82	12.0	74.0	"	400	1000
" 23	81	33.4	84	15 8	69.3	"	400	1000
" 24	80	29 6	84	15 4	74.2	N E.	400	1000
" 25	79	30.6	83	14.0	74.1	"	400	1000
" 26	79	26.4	80	12.6	76.6	"	400	1000
" 27	80	25.6	83	13.0	74.2	"	400	1000
" 28	80	26.0	83	12.0	76.7	"	400	1000
" 29	79	31.6	83	14.2	71.7	"	400	1000
" 30	79	32.6	83	13.6	71.6	"	400	1100
" 31	79	35.2	83	14.0	67.0	"	400	1100
Sept. 1	78	29.0	82	12.0	74.0	N. E.	400	1200
" 2	78	32.6	81	11.6	84.6	"	400	1200
" 3	79	32.0	84	13.6	69.3	"	400	1200
" 4	78	34.0	82	13.0	74.0	"	400	1200
" 5	79	35 0	83	13.0	71.6	"	400	1200
" 6	79	27.4	82	11.2	74.1	"	400	1200
" 7	79	31.8	83	12.0	76.6	"	400	1100
" 8	79	32.8	83	11.6	71.6	"	400	1100
" 9	79	26.2	84	9.0	72.2	"	400	1000
" 10	80	23.0	82	10.6	84.7	"	400	1000
" 11	79	39.0	83	14.6	71 6	E	400	1000
" 12	78	31.0	83	12.0	69.3	N. E.	400	1000
" 13	77	28.2	79	10.2	79.0	"	400	1000
" 14	77	30.2	79	10.0	76.5	"	400	1000
" 15	76	28.2	81	11.8	71.5	"	400	1000
" 16	75	25.0	81	11.4	71.6	"	400	1000
" 17	74	21.0	78	9 6	78.9	S. v. N. E	400	1000
" 18	74	11.4	78	7 0	81.7	S.	400	1000
" 19	73	8.2	76	5.0	90.4	S. v. W.	400	1000
" 20	77	23.2	79	8 6	81.8	N E.	300	800
" 21	78	29.0	81	10.6	79.1	"	300	800
" 22	78	31.8	82	12.0	74.0	"	300	800
" 23	78	31.6	80	10 6	76.6	"	300	800

At this date, and for reasons to be explained later, nitrogen was applied in the form of sodium nitrate, the application being made by putting 100 grams of the salt into the water in the pan, which was taken up by the cane. The effect of this application of nitrogen is seen in the increased activity of the cane, whereby a greater transpiration resulted, the evaporation in tub No. 1 remaining constant.

Date, 1897.	Mean outdoor temperature.	Outdoor evaporation.	Mean indoor temperature.	Indoor evaporation.	Humidity.	Direction of wind.	Evaporation of soil No. I.	Evaporation of soil and cane No. II.
		%		%			Saturated. cc.	Cane planted. Saturated cc.
Sept. 24	78	32.2	81	11.2	74.0	N. E.	300	800
" 25	77	34.2	81	12.0	73.9	"	300	900
" 26	78	29.2	82	11.4	74.0	"	300	900
" 27	76	22.6	81	10.0	79.1	"	300	1000
" 28	80	26.6	82	11.2	79.2	S. v. N. E.	300	1200
" 29	80	34.2	82	12.6	76.6	"	300	1500
" 30	78	31.6	82	12.0	76.6	N. E.	300	1400
Oct. 1	78	32.6	81	11.0	76.6	"	300	1200
" 2	74	30.2	81	11.6	76.6	"	300	1200
" 3	76	23.6	82	11.0	74.1	"	300	1200
" 4	75	14.6	80	8.2	76.5	S. v. E.	300	1000
" 5	76	14.0	80	9.0	81.8	S.	300	1000
" 6	74	15.8	80	8.0	79.1	"	300	1000
" 7	79	25.2	81	10.2	76.6	S. v. N. E.	300	1000
" 8	79	24.0	84	10.2	74.3	N. E.	300	1000
" 9	78	14.0	83	8.0	82.1	"	300	1000
" 10	76	13.0	81	8.2	79.1	S.	300	1000 <sup>1</sup>
" 11	77	11.0	81	4.2	81.9	"	300	1000
" 12	77	25.2	79	9.0	81.9	S. v. N. E.	300	1000
" 13	78	31.2	80	11.2	79.1	N. E.	300	1000
" 14	77	29.8	81	13.0	79.1	"	300	1000
" 15	75	32.6	79	11.4	76.5	"	300	950 <sup>2</sup>
" 16	75	25.6	79	10.0	76.5	"	300	950
" 17	76	19.6	79	8.2	76.5	"	300	950
" 18	76	22.2	70	9.0	79.0	"	300	1000
" 19	76	16.6	80	8.6	79.1	"	300	1000
" 20	79	27.0	80	10.0	79.1	"	350	1000
" 21	79	31.0	80	10.4	79.1	"	350	1000
" 22	78	35.6	80	12.0	74.0	"	350	1100
" 23	75	20.0	80	7.6	81.9	"	350	1200
" 24	76	10.6	79	6.6	87.5	S.	400	1200
" 25	75	8.4	79	5.6	87.5	"	350	1000
" 26	76	9.6	80	6.6	87.6	N. W. v. S.	350	1000
" 27	75	8.6	80	6.6	87.5	S.	300	900
" 28	76	15.6	79	7.0	84.6	S. v. N. E.	300	800
" 29	76	17.0	79	8.0	81.8	N. E.	300	700
" 30	78	26.0	80	10.2	76.5	"	300	600

<sup>1</sup> Second stalk of cane died.  
<sup>2</sup> Third stalk of cane died.

At this date a second application of 100 grams of sodium nitrate was made, it being observed that the vitality of the

growing cane was decreasing, which was indicated by its yellowish appearance and by a falling off in transpiration. The evaporation from the soil in tub No. 1 still remained the same.

Date, 1897.	Mean outdoor temperature.	Outdoor evaporation.	Mean indoor temp: rature.	Indoor evaporation.	Humidity.	Direction of wind.	Evaporation of soil No. I.	Evaporation of soil and cane No. II.
		%		%			Saturated. cc.	Saturated. cc.
Oct. 31	75	24.8	81	10.0	76.5	N. E.	300	700
Nov. 1	77	29.6	79	11.0	76.4	"	300	900
" 2	72	30.0	78	10.0	78.9	"	300	1000
" 3	68	32.4	74	9.0	81.6	"	300	1000
" 4	76	31.0	78	10.6	78.9	"	300	1000
" 5	77	32.0	79	10.0	76.5	"	300	1100
" 6	78	37.0	79	12.0	76.4	E.	300	1100
" 7	78	38.0	81	11.6	74.0	N. E.	300	1100
" 8	77	41.2	78	12.4	78.9	"	300	1100
" 9	76	41.0	79	12.6	76.4	"	300	1100
" 10	74	25.0	79	10.0	76.4	"	300	1100
" 11	73	16.0	77	7.4	78.9	W. v. S.	300	1200
" 12	72	15.6	78	8.6	81.7	S.	300	1100
" 13	72	14.2	77	8.0	84.5	"	300	1000
" 14	73	14.0	77	8.0	84.5	S. v. E.	300	1000
" 15	72	12.2	77	6.2	84.6	"	300	1000
" 16	72	12.6	76	7.2	81.6	S.	300	1000
" 17	74	13.0	78	8.0	87.5	"	300	1000
" 18	73	8.0	77	5.4	93.5	"	300	900
" 19	76	22.2	72	8.0	84.3	S. v. E.	300	800
" 20	68	24.0	74	9.0	76.1	N. E.	300	800
" 21	69	12.2	73	5.6	87.2	"	300	700
" 22	70	26.6	71	9.2	81.3	"	300	600
" 23	68	25.2	73	9.2	73.5	"	300	500
" 24	69	12.0	73	6.2	84.4	S.	300	500

These data were taken with the assistance of our field assistant, E. G. Clarke.

November 24, or seven and one-fourth months from the date of planting the cane, the experiment was stopped. The growth was no longer normal, due possibly to the want of room for extension of the root system, and also in part to the moistness of the soil, which was kept at the point of saturation. At this place, we shall remark that, while tub experiments afford the most exact mode of controlling certain observations, other observations which require a continuance up to actual maturity, cannot be carried out in such restricted conditions. In no case have we found a mature and normal development of the cane when grown in tubs. In normal growth in the field, the roots of the cane are found very

many feet away from the stock in their search for food and water.

Before considering further the data bearing on transpiration from the sugar-cane, we shall refer to the comparative proportions of water that were actually dissipated by the "evaporators," and the apparent relation of this evaporation to the "humidity in the air." In order to do this with convenience we shall gather the total data together in a table of averages, bringing them more easily within view:

Memoranda.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	General aver- age.
Mean outdoor temperature..	74.4	76.0	77.0	78.3	78.7	76.8	75.3	71.0	75.9
Mean outdoor evaporation..	28.5	27.2	22.5	25.8	30.0	24.3	23.5	17.3	24.8
Mean indoor temperature....	78.7	80.3	81.3	83.0	82.4	80.6	78.8	74.1	79.9
Mean indoor evaporation....	11.7	11.3	10.1	12.1	12.5	10.0	9.2	7.5	10.5
Mean humidity in the air...	77.4	80.2	83.6	77.3	73.8	80.4	80.1	83.2	79.5

If the "mean indoor evaporation" is considered with the "mean humidity in the air" it is apparent that there is a very clear and strong relationship, although this relationship is not always in a proportional ratio. The relationship is not so definite between the "humidity of the air" and the "mean outdoor evaporation." A corresponding relation is seen between the "mean indoor temperature" and the "indoor evaporation," which is as definite, and equally constant, as the connection between the evaporation and the humidity of the air, indoors. Notwithstanding these relations of the humidity in the air, and of the temperature, to the evaporation, the great difference between the "indoor" and the "outdoor" evaporation indicates that there is some other cause of evaporation whose potency supercedes the combined controlling actions of temperature and atmospheric humidity. This is set forth more strikingly by the following table:

Evaporators.	Number of days.	Mean temperature.	Humidity of the air.	Water evaporated cc.
"Outdoor" or wind exposure	270	75.9	79.5	33,480
"Indoor" or no wind .....	270	79.9	79.5	14,175

From this table it is seen that the "outdoor" evaporator, which was carefully protected against the sun, yet fully exposed to the wind, evaporated 136 per cent. more water than the "indoor" evaporator, and yet the mean temperature indoors was 4° higher than the outdoor temperature, whilst the humidity was the same. These data confirm a statement made by

us in a previous publication, that the "direction and force of the wind is a more potent factor in increasing or arresting growth and in controlling evaporation, than small variations in temperature."

It is further shown that there is not necessarily anything like a proportional ratio between the "humidity in the air," as shown by the dry and wet-bulb readings, and "actual evaporation." The factor of "wind" dominates the combined influences of atmospheric moisture and temperature. In the location of meteorological instruments for recording climatic data, this has to be borne in mind.

Moreover, in the matter of practical irrigation, it is seen that not only temperature and the relative state of moistness of the air, but mainly the exposure to wind, are controlling factors in the rate of evaporation, and the proportion of water to be used. Consequently for these reasons alone, and apart from the nature of the soil, more or less water of irrigation should be applied in certain localities than in others. On the leeward sides of these islands the temperature is several degrees higher than on the windward exposures. The winds from the south, however, are little more than prolonged calms, excepting when a sudden storm occurs, while the north or northeast winds have a high mean velocity, which causes a high evaporation. A recurrence to the detailed data already given will furnish ample illustrations of these facts.

Returning to the experiment on evaporation from the soil, and transpiration from the cane, in the tubs, we first bring the data together in a table of averages. At the head of the table we repeat the daily average for each month of the evaporation from the "indoor" evaporator, in order to note any relation between the variations of evaporations from the soil and from the evaporator. The data furnished by the "indoor" evaporator are selected for this purpose because the tubs were placed so as to be protected from the wind, thus corresponding to the exclusion of the wind from the barn where the evaporator was placed:

Time.	Indoor	No 1 tub.	No. 2 tub.
	evaporation.	Evaporation from	Transpiration by
	Per cent.	the soil.	cane and soil.
		Grams.	Grams.
April .....	11.7	15,000	15,100
May .....	11.3	12,290	13,150
June .....	10.1	9 350	15,850
July .....	12.1	12,300	23,800
August .....	12.5	12,200	31,800
September.....	10 0	9,400	30,450
October .....	9.2	9 700	30,800

Between the "indoor evaporation" and the "evaporation from the soil" a relation in behavior is clearly noted.

During the month of April the two tubs evaporated exactly the same volume of water. When the cane began to grow, transpiration supplemented the evaporation from the soil, and No. 2 tub commenced to dissipate more water, increasing the proportion in ratio with the development of the cane.

A decrease in evaporation from the soil, as in June and again in September, has not, during any period, been accompanied by a decrease in transpiration by the cane. Indeed, it has operated in the opposite direction. In September, it is seen, the evaporation from the soil in tub No. 1 was 2,900 grams less than during August; the total transpiration from tub No. 2, however, was only 1,350 grams less in September than in August. As the evaporation from the soil in the two tubs was the same, it then appears that the cane transpired 1,550 grams more in September than in August, although the total loss of water in tub No. 2 was less in September than in the preceding month. This result is quite understandable. During warm, calm, sultry weather, when the moisture in the air is relatively high, plant growth proceeds rapidly; and as the transpiration is a result of, and in proportion to, the rate of growth, more water can be dissipated by the plant under the particular atmospheric conditions which cause a decrease in evaporation from the soil.

We now call attention to one other factor over whose influence on plant-transpiration we can have a control. On September 20, the cane in tub No. 2 was losing its appearance of health and vigor; the leaves began to yellow and to curl up, as if in the first stage of withering. Of course there was no question of want of water, neither of the need of potash, phosphoric acid, or lime, since the soil is very rich in these elements. The soil, however, is very low in nitrogen, and it occurred to the writer that the growth, and consequently the transpiration, were being checked by the dearth of that ele-

ment. Therefore, on September 24, 100 grams of sodium nitrate (Chili saltpeter) were dissolved in the water in the pan under tub No. 2, containing the growing cane. This was repeated on October 31st, the growth and transpiration having suffered a second depression at that time. The apparent results of the action of nitrogen are seen as follows:

First application of nitrogen.			Second application of nitrogen.		
Date.	Evaporation from soil Grams.	Transpiration from soil and cane. Grams.	Date.	Evaporation from soil. Grams.	Transpiration from soil and cane. Grams.
Sept. 24	300	800	Oct. 31	300	700
" 25	300	900	Nov. 1	300	900
" 26	300	900	" 2	300	1000
" 27	300	1000	" 3	300	1000
" 28	300	1200	" 4	300	1000
" 29	300	1500	" 5	300	1000
" 30	300	1400	" 6	300	1100
Oct. 1	300	1200	" 7	300	1100
" 2	300	1200	" 8	300	1100
" 3	300	1200	" 9	300	1100

A third application of nitrogen was made on November 25th, the result of which corresponded with the former, but as the growth of the cane was now being affected by the crowding of the root system in the tub, further data did not appear reliable enough for use.

It is seen that six days after the first application of nitrogen the transpiration was increased from 800 grams to 1500 grams, or nearly 100 per cent. A corresponding effect is noted after the second application. In looking back over the data in detail it will be seen that these increases in transpiration are greater, and more sudden and marked, than any such that resulted from variations in the effects of atmospheric influences. Also, that no appreciable increase in the transpiration occurred without an accompanying increase in evaporation from the soil in tub No. 1.

These observations upon the action of nitrogen in plant-transpiration appear to amply support our practical advices sent out to the managers of sugar plantations during the period of great drought last year. We advised that sodium nitrate should not be applied until after rain came, giving as our reason that the nitrogen would stimulate growth and cause increased transpiration, which would result in the rapid and greater exhaustion of the soil moisture, and a subsequent collapse of the crop, if the drought continued, which experience has shown to be liable in districts upon these islands, and for a period of six to twelve months.

Further, these observations appear to support our view, which is in opposition to the views of distinguished observers; viz. that nitrogen (and not potash or phosphoric acid) is the vital and controlling element in the life and growth of plants. All constituent elements are necessary to this growth, but nitrogen seems to be supremely so. Our view in this matter rested upon the consideration, that nitrogen is a vital and essential constituent of protoplasm; that protoplasm is a component substance of all structural cells, whose development and increase are the explanation of plant-growth. All vegetable organisms contain protoplasm. The higher forms have this nitrogenous, fundamental substance admixed with large proportions of non-nitrogenous matters; but the incipient forms of life have been regarded as little more than drops of the protoplasmic fluid.

At the end of seven and one-fourth months the cane in tub No. 2 was taken up and divided into roots, stems, and leaves, whose proportions of water-free material were as follows:

Roo's. Grams	Stems. Grams.	Leaves. Grams	Total weight. Grams.
31.8	53.9	483.2	568.9

The water evaporated from the soil in tub No. 1, during seven and one-fourth months, was 83,140 grams. The water evaporated by the soil, and transpired by the cane in tub No. 2, during the same period, was 167,250 grams, thus showing that the cane transpired, during the period between the dates of planting and cessation of growth, 84,110 grams of water. As the total amount of the dry material produced during the period of growth was 568.9 grams, it is thus shown that for each gram of water-free sugar-cane material produced, 147.8 grams of water were transpired.

It is understood that this experiment is not intended to represent what actually takes place when a crop is grown in exposure to sun and wind. In the field, evaporation decreases as the crop protects the ground from the sun and wind. In these observations the soil in each tub was kept in the same state of exposure, the cane in tub No. 2 being tied up in order not to shade the soil. As the evaporation from the growing crop increases, this increased transpiration is in greater proportion than the decrease in the soil evaporation. The actual evaporation from the cane growing in tub No. 2, during the several months, was as follows:

Month.	Age. Months.	Transpiration. Grams.
April .....	..	..
May .....	1	860
June .....	2	6,500
July .....	3	11,000
August.....	4	19,800
September .....	5	20,050
October .....	6	21,100

From these data we obtain guidance in practical field irrigation. We note the relative proportions of water that the cane can make use of at different stages in its development. To apply the same volume of water at the time of planting, and during the early period of growth, that is required by the cane of increased bulk and development, incurs a great loss of water and of the soil constituents that water removes. The transpiration-equivalent of other plants differs very greatly from that of the sugar-cane.

Hawaiian Experiment Station, Honolulu, H. I.

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A NEW ERA FOR AMERICA.

Hon. John W. Griggs, Attorney-General of the United States, in the course of a speech outlined the policy of the nation in the following eloquent language:

Lift up your eyes to the heights where, glory-crowned, the genius of American liberty points to a future pregnant with prodigious good to all mankind; to fresh fields for the extension of American trade and commerce—new openings for the investment of American capital; wider scope for the active energies of American young men—to more frequent glimpses of the American flag to voyagers over the oceans; merchant shipping multiplied manifold in the harbors of the world; with a navy large enough and strong enough to enforce our just demands and the rights of American citizens as promptly and efficiently as Dewey enforced the views of the Government in Manila Bay; an army large enough to serve the reasonable requirements of seventy millions of people without putting the Administration to the risk of quick and terrible disaster in case of sudden war; the maintenance of our foreign diplomatic service upon a footing commensurate with our power and importance, so that it will no longer be necessary to seek for Ambassadors and Ministers among those only who are blessed with private income sufficient to maintain a proper establish-

ment abroad, without regard to the salary attached to the office.

The country demands now a branch of statesmanship new to Americans—the proper method and measures for the control and government of colonial dependencies, and the adjustment of colonial interests and affairs to the interests of the home Government—a field wherein partisan politics should not easily be allowed to enter, but where broad and enlightened State policy may have full scope to work out plans whereby all the blessings of essential liberty and twentieth century civilization may be assured to the peoples that are to be under our paternal care, and reciprocal benefits may be obtained for our own countrymen.

These new duties and new relations will add fresh dignity to American citizenship; will raise the sense of official and political obligation as they increase responsibility. They will take the people out of the treadmill rounds of domestic politics—where issues are too often artificial and transient. New thoughts, new questions, new fields, fresh hopes, broader views, wider influence—all these will come, as well as troubles and disappointments, and temporary failures and discouragements, which will but serve to call forth renewed energy and effort until they are overcome.

Who can set bounds to the expansive spirit of American enterprise? Only forty years ago an American periodical declared that the banks of the Missouri River were the shores at the termination of a vast ocean desert over one thousand miles in breadth, which it was proposed to traverse, if at all, with caravans of camels, and which interposed a final barrier to the establishment of large communities, agricultural or commercial. That desert now blossoms like the rose, and parallel lines of iron rails bear the produce of immeasurable acres of fertile lands east and west to the markets of the world. The ambitious energy of American enterprise can take its choice to-day of delving for gold in the frozen wastes within the Arctic circle or of tilling the generous soil of islands washed by tropic seas, where in the heat of the day they rest in the shade of the palm trees, all under the protecting guarantee of our flag.

This has been a year unequalled for progress and accomplishment. The hand of man has not fashioned nor his eye foreseen the work that has been wrought. Call it fate, the pro-

gress of events, providence, God, what you will—it has been a leading upward and on the drawing forward by irresistible impulses of this people to a place at the front of the world.

To Captain Gridley, at his post on the deck of the flagship *Olympia* on that memorable May morning, came the quiet word of command as Dewey said, "You may begin firing, Gridley." The guns that responded sent forth death and destruction, but in the light of their flashes was revealed a new hope and a better life for millions for whom therefore the sun of liberty and civilization had never shown except through the murky clouds of semi-barbarism and superstition.

And so this nation enters upon a new era. Do not doubt but that she will be equal to the responsibility. I believe in the capacity of Americans to govern—to govern themselves and to govern others. I set up no dogma of infallibility, but, expecting mistakes and delay and disappointment, I believe that the boundless capacity and the splendid courage of America, with her high sense of justice, her appreciation of the rights of man, will in the new duties placed upon us work out marvelous good for the people that have come under our guardianship, and greater glory for our country.

And how we have been blessed already! All the old root of bitterness between North and South removed! What years and years of political effort could not do was done in a moment, when our standards were set toward a foreign foe, and the consummate tact and grace of our Republican President refused to make any distinction between Federal and Confederate, but put Lee and Wheeler side by side with Kent and Shafter—"Yanks" and "Johnnies" all keeping step together to the music of the Union. Stout old John Adams standing in the royal presence, the first accredited Minister of the new Republic to the mother country, speaking like the noble gentleman and wise statesman that he was, said to King George:

"I shall be the happiest of men if I can be instrumental in restoring an entire esteem, confidence, and affection, or, in better words, the good old humor, between people who have the same language, a similar religion, and kindred blood."

It has been the happy result of this war to have brought back, forever, we trust, that entire esteem, confidence, and affection—the good old humor—between the people of the North and the South, as in the days when Adams and Hamil-

ton and Jay labored and conferred in fraternal harmony with Patrick Henry and Thomas Jefferson and the Pinckneys about our country's interests.

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*MALARIAL DISEASE IN TROPICAL COUNTRIES.*

On the 10th of August, 1898, Prof. Dr. Robert Koch, the eminent bacteriologist, delivered at Berlin an important and highly interesting address, embodying the results of his study of malarial diseases in tropical latitudes. The following synopsis of his theory and conclusions is translated from a published report:

"Malaria, said the eminent scientist, is the most formidable enemy which we have to encounter, the most serious obstacle to the settlement and development of our colonial possessions in the Tropics. We shall never enjoy the possession of our colonies until we have vanquished this disease. The first step toward successful resistance is a thorough, accurate knowledge of its origin and the methods of its dissemination.

"Malaria is distributed all over the globe. In its milder forms it is found in this country in the form of swamp fever. It appears in a still more severe type in Mediterranean countries, but worst of all in the Tropics. Its most violent and malignant form is the black-water fever (vomito). The exciting cause or germ of malaria in all its forms is unquestionably a parasite in the human blood, which was first discovered and demonstrated by Italian scientists, and the functions of which are now definitely known. It appears as one of the easily recognized rings in the red corpuscles of the blood, which enlarges, splits into fragments, and within a few hours produces more than twenty young parasites, which are distributed among the corpuscles and thus disseminate and extend the infection throughout the blood.

"Professor Koch has succeeded in proving that malaria, in its different stages of development, which are characterized by an intermittently rising and subsiding fever, corresponds exactly with the development of the parasites; so that by examination of the blood the progress and stage of the disease can be definitely ascertained. He has further succeeded in demonstrating the exact moment for the effective administration of quinine, which does not kill the microbe, but definitely checks and limits its power of reproduction. This discovery

was highly important, for as a result of it the physician can, with reasonable certainty, provide that the disease shall be cured and not run to a fatal result. Of course, the convalescence may be long and uncertain, for relapses which leave the patient weaker and weaker are liable to occur so long as there remain parasites in the blood. Against them no sanitarium, no elevated location, offers any certain remedy; but it is, on the other hand, a consolation to know that recovery after a case of malaria may be rapid, and that the disease effects the constitution less seriously than other fevers of equal temperature and duration.

"Malaria is not contagious. The means of its distribution have been sought for in the air and water, but Koch believes that blood-sucking insects are largely responsible for its dissemination. Wherever mosquitoes exist malaria will prevail. Where there are no mosquitoes, cases of malarial disease occur only when the infection has been previously received in a malarial locality. The exact relation of mosquitoes to malaria still lacks, however, exact and conclusive scientific demonstration. Analogies are found where blood-sucking insects convey disease germs, as, for instance, the tsetse fly, and especially the Texas fever among cattle, where, as is well known, the disease germ is carried by a tick, or insect.

"No race of men is immune from malarial disease. Negroes living on the coasts of tropical countries are practically so, but negroes of the same race from mountainous districts coming to the coast are susceptible to the fever. The former have, according to the opinion of Dr. Koch, acquired immunity through slight malarial attacks during infancy or youth. But, as there is this naturally produced immunity, it must be possible to produce an artificial one.

"On this point Dr. Koch insists that in the case of malarial disease, the exciting cause of which is definitely known, the conditions are much less difficult than in the case of other diseases, the germs of which are not known, as, for instance, hydrophobia and cattle plague (rinderpest), in respect to which a certain degree of immunity has nevertheless been attained.

"The first essential step in combating the disease is for the patient to leave immediately the malaria-infected district, and be protected against mosquito bites by prophylactic doses of quinine. Professor Koch believes that through his studies of malarial disease in the localities where its most intense and virulent forms prevail, the way has been opened to new lines of study, and new limits set to the dangers of the disease itself. He closed his address with these words: 'To overcome this malady is equivalent to the peaceful conquest of the most beautiful portions of the globe.'"—Am. Consular Reports.