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New York Sugar Market—May 24.—Cuban centrifugals, 96° test—4½c. Latest summary of the statistical position shows stocks in the United States and Cuba together of 269,805 tons, against 274,220 tons last week and 323,456 tons last year, a decrease of 53,651 tons under last year.

The week has been good for the raw sugar market, with a constant steady demand ending in a further advance of 1.32c. to 4½c per lb. for 96° test Centrifugals and corresponding advance for Muscovados and Molasses sugar. The receipts have been about equal to the meltings, and stocks of the Four Ports remain practically unchanged, but stocks in Cuba are reduced 3,500 tons. The tone and tendency at the close are to continued steadiness and eventually further improvement. European quotations for beet sugar are on parity of 4 9-16c. for 96° test Centrifugals at New York. Looking ahead the notable feature of the situation is the curtailment of supplies of cane sugars. Based on estimated receipts of cane sugars from date to the end of August and on the same meltings as during same period last year, it will be necessary for American refiners to draw on Europe for 140,000 tons beet sugars in addition to the amount which may be required at New Orleans. This should give them on August 31st the same stock as last year, viz: 175,000 tons, which will be as small as they would wish to hold at that time."—Willett & Gray's Statistical.

The following notice was posted by the American Sugar Refining Company: "Commencing today, and until further notice, we will discontinue offering five-pound cartons of fine granulated sugar. We can still supply the five-pound cotton bags, packed in 100-pounds sacks and in barrels"

Stocks in Europe last dates, 1,491,000 tons, against 1,709,500 tons the previous week, and 1,569,893 tons last year. Total stocks of Europe and America last week, 1,765,220 tons against 1,996,829 tons the previous week, 1,883,589 tons last year at the

same uneven dates, and 1,862,115 tons at even date. This indicates reduced stocks and increased consumption, as compared with last year—all favoring a strong market for the next few weeks.

An interesting account of the Kew Gardens of London, which are probably the finest of the kind in the world, will be found in this number. They are often referred to in public prints; still very few know of their extent and the great variety of rare plants that are to be seen there.

The appearance of the bubonic plague in San Francisco is much to be regretted, as three-fourths of the trade and travel to and from Hawaii is with that port. Had vigorous measures been taken, immediately on the discovery of the first case, to combat this insiduous disease and prevent its spreading throughout the city, there would have been little chance of having its virus planted in the numerous Chinese colonies of the city and throughout the state. Only the most vigorous treatment can destroy the bubonic virus, after it has once gained a foothold in any port.

At Constantinople they have adopted a plan of campaign against the rats in warehouses that is claimed to be entirely successful. They use carbonic acid gas, which, being heavier than air, sinks into the rat holes and suffocates the rodents. In some localities this might prove to be the best method to adopt here.

The last mail brings advices of the death of General J. Y. Gilmore, for thirty years editor of the Louisiana Sugar Bowl, the oldest paper devoted exclusively to the sugar interest in the United States. He was a native of Pennsylvania, and migrated to the South shortly before the breaking out of the Civil War. Soon after its close he returned to Louisiana, established the "Sugar Bowl," which he edited till his death. His paper has always been a welcome visitor to our sanctum. At the time of his death he was commander-in-chief of the Louisiana Division of United Confederate Veterans.

A meeting of the sugar planters and managers of plantations was held in this city on the 4th instant to discuss the labor question under the changed conditions brought about

by annexation. Nearly every plantation in the group was represented, either by the agent or manager. No definite action was taken on the matter, nor has any report been given out for publication. The following is the list of those present at the meeting:

Managers from Island of Hawaii—Messrs. Moore, Paauhau; Horner, Kukaiau; J. A. Scott, Wainaku; Moir, Honomu; Hind, Kohala; Ross, Hakalau; Watt, Honokaa; Forbes, Kukuihaele; Lidgate, Paauilo; Hewitt, Naalehu.

Managers from Maui—Messrs. Ahlborn, Lahaina; Wells, Wailuku; Gjerdrum, Hana; Baldwin, Paia; Pogue, Kihei; Lowrie, Spreckelsville; Hocking, Nahiku; Haneberg, Olowalu.

Managers from Oahu—Messrs. Chalmers, Waimanalo; Bull, Heeia; Weight, Kahuku; Goodale, Waialua; Renton, Ewa; Low, Honolulu; Ahrens, Oahu.

Managers from Kauai—Messrs Walters, Lihue; Conant, McBryde; Fairchild, Kealia; Ewart, Kilauea; Cropp, Koloa; Morrison, Makaweli; Faye, Kekaha.

Agents and Owners—Messrs. C. M. Cooke, president, and C. Bolte, secretary Hawaiian Planters' Association; W. M. Giffard, J. B. Atherton, E. F. Bishop, Geo. H. Robertson, Jas. B. Castle, F. M. Swanzy, F. A. Schaefer, Paul Isenberg, C. F. Hart, Paul R. Isenberg, J. F. Hackfeld and A. Isenberg.

Beet Sugar.—The latest reliable report of the sugar beet crop of the United States for 1899 places it at 72,944 tons. All estimates made during the year varied from 140,000 to 160,000 tons. This illustrates the uncertainty that attends the new industry, even when assisted with state bounties and a high national protective tariff. It can only be established after long and patient experimental and educational work, the same that other new industries have had to pass through. Still it is destined to succeed, slowly for the first few years, until the beet growers have learned how to cultivate their crops, and the factory men how to extract the sugar. It will also need a permament protective tariff. Under these conditions, a few years hence, there will be no better paying agricultural industry in the United States than the beet sugar industry, but the beet growers should also be shareholders in the sugar factories, as far as is possible.

The sugar planters in Trinidad, one of the West India islands, who dispose of their cane to central factories, are having trouble on account of the low price which they receive for

it. The Trinidad Gazette says: The cane-farming industry here is likely to receive a check. Now that estates have started to grind, there has been some difficulty between the farmers and attorneys and proprietors. Some of the latter, it is said, have decided to give only nine shillings per ton for cane, whilst others are inclined to value the product at a little more. The cane-farmers refuse to accept nine shillings, arguing that besides having to devote more care and attention to their holdings, during the drought, the price of sugar in the home market is better than last year. They are of opinion that the object of the manufacturers is to lessen the price year after year.

Sugar From Plague Stricken Ports.—Dr. Doty, health officer of New York, said regarding the vessels now on the way from Honolulu to New York:

"If these ships were loaded at Honolulu under the direction of the American Health Commission, which took charge of the epidemic three months ago, they will be allowed to discharge their cargoes after undergoing the usual quarantine. The scheme of the American officers there is to make vessels anchor in midstream, out of the reach of the rats, and take their cargoes. Certificates are issued to all vessels that take cargoes in this way and it is safe to allow masters bearing such certificates to discharge their cargoes when they reach an American port. The American Commission has been at Honolulu for three months now and it is a pretty sure thing that these sugar ships have complied with its regulations."—New York Journal of Commerce.

[Note.—All sugar shipped at the port of Honolulu was loaded under the strict regulations of the quarantine authorities.]

The next total solar eclipse will be May 28, 1900. The duration of totality ranges from one minute and thirty-six seconds, in Portugal, to one minute and six seconds, in northern Africa. General scientific expeditions will proceed to Algiers, on account of its low cloud ratio and ease of access. An eclipse committee in London is getting up a grand excursion party.

There is a firm market for raw at an advance of 1-16 on all grades, established by sales to the American Sugar Refining Company. There is also a strong market for refined, quotations for which have been advanced five points.

THE McBRYDE PLANTATION.

The American Sugar Company, whose estate is located on the lee side of the Island of Molokai, has disposed of its sugar mill, which was recently brought out from New York on the steamer Horda, and landed at Kaunakakai. It has been purchased by the McBryde Sugar Company, which has lately been incorporated and commenced operations on its fine estate, located on the south side of the island, its lands extending from Koloa to the Hanapepe river, which separates it from the Makaweli estate. The mill was made in New York by Stillman & Co., and is one of the largest and most powerful mills on these islands. It is equipped with all the late labor-saving devices, which allow its work to be done with fewer attendants than some other mills of its size require. The price paid for it is $325,000. The McBryde Company are very fortunate to secure this opportune bargain, as are also the American Sugar Company in finding a purchaser that will relieve them in the dilemma they were placed.

The McBryde Plantation starts with a very flattering prospect ahead. It has a large area of mountain, forest and arable land—in all some eighteen or twenty thousand acres, about half of which is believed to be suitable for cane. It has also a perpetual mountain stream, and a number of fine artesian wells, capable of irrigating an extensive area of cane land. This estate, being located on the lee side of the island, is sheltered from the harsh northerly winds which prevail during the winter months. As this company purchased the Eleele sugar estate, which has cane fields that annually yield twelve or fifteen hundred tons of sugar, it has an income from the start to meet current expenses. Its harbor is also capable of being improved, so as to enable large vessels to visit the port. Altogether the prospects of the plantation are very flattering, and give promise of making it an estate equally as productive and valuable as that of Makaweli.

Superiority of Oranges.—A well informed writer on oranges pays the following tribute to Florida oranges: "If the Californians could only furnish us with an orange that has less skin and more juice—well, then consumers of the country would have nothing more to say. How highly these virtues in the oranges are appreciated is shown in the magnificent prices paid for Florida oranges –figures about double paid for the California product."

ARTESIAN WATER SUPPLY.

Editor Hawaiian Planters' Monthly—Dear Sir: I take occasion to allude to your very opportune editorial in the last (May) number of your journal upon the subject of our water supply, and to venture, what appears to me to be an immediately necessary explanation. In referring to the unfortunate collapse of the American Sugar Co. and the Kamalo Sugar Co., you very properly state that "the only cause that has led to this result is the lack of water for irrigation purposes. Molokai has an abundance of arable land but no streams. Wells were sunk in different localities which gave excellent fresh water, * * * * but later on, the water in these artesian wells become too brackish for cane cultivation, and the work on the American plantation had to be abandoned." It is the following paragraph, however, to which I particularly wish to call attention, in which you say "it would seem possible from this that what has happened on Molokai may in future decades be repeated on our other islands, where artesian wells now supply abundant fresh water." It is necessary to emphatically distinguish between the water proposition as it was apparent in the said localities on Molokai, and the water supplies of other districts upon the several islands. To persons who looked at the matter of the rainfall upon Molokai, and the underground discharge of the water to the sea, it was apparent that the great body of that discharge was going to the sea on the side of the island facing the island of Maui, and, owing to geological desiderata, nothing more than some *vagrant* water would be found slowly working its way to the ocean under the lands of Kaunakakai. Before the American Sugar Co. was incorporated, I strongly put before the promoters the dire improbability of finding water. A little sweet water (vagrant water) was found, as predicted, but the final results have only too clearly demonstrated the soundness of the views that were based on the geological aspects of the situation, and have shown that the rainfall is wasting into the sea on the other side, where it was also stated that water *would* be found.

Mr. Editor, the situation on Molokai (there are other localities also where water will not be found) must not be confused with other locations. The geological reasons are just as ample and definite for the presence of a relative abundance of water in locations like Ewa, Lahaina, or Haiku as they were emphatic against the probability of water in the said locality on Molo-

kai. Also the reasons, on geological grounds, which indicated that water would be found in the above mentioned, and in other localities are a guaranty not only for the abundance, but likewise for the constancy and continuity of the supply. Where water is found today, it will continue to be found, and in the same aboundance, conditional upon the same rainfall that has heretofore obtained. The rainfall is our only source of fresh water. The rainfall varies with the years, consequently the volume of available water. In a publication some four years ago, I put the average of the annual precipitation upon Oahu at 625½ billion gallons, and the volume of dutiable water that was wasting into the sea at 163 billion gallons The results that have followed the sinking of more wells and the use of more water in irrigation, and especially as these have been accentuated by the past two relatively dry seasons—I say these results indicate that the calculations made four years ago may turn out to be more nearly correct than I at that time ventured to think. Before the rains of last month came some of our wells were getting shaky; since the rains Prof. Lyons has reported the response of the wells to the new mountain supply. Some wells, even upon the best watersheds, are more sensitive than others, which is due to the fact that given localities, like Ewa district, are resting upon the back of the extreme convergence of discharge, whilst other localities, and the wells within them, are more upon the other edges of the watershed. In any district, however, if the draft upon the water runs close up to the volume of supply the wells will show it, and some will show it sooner than others. I return, however, to the statement that where water is found in aboundance today it will always be found in the same aboundance, providing the rainfall continues the same as heretofore.'' To suggest that the rainfall may not continue as heretofore, (providing we do what we can to maintain it, is beside the question, and I will not waste time upon it. I am absolutely sure that the supply of artesian water will keep up in all those localities where its abundance is ample and before our eyes. If more land continues to be brought under irrigation, that does not lessen the natural supply of water. It may, and it must, lead to a more scientific and economic use of the supply. Personally, I am quite sure that the volume of water that is being used in given localities today is capable of rendering double its present duty—that is it can be made to furnish double the present equivalent of sugar.

The crucial significance of the water supply in relation to

our sugar crop is apparent to everybody, and everyone knows what it would mean if the supply gave out. It is also very desirable that no such impression should become current, and merely because misfortune has followed undertakings in certain specific locations. For such reasons I have thus ventured to allude to your otherwise very excellent editorial, and because it is necessary to place beyond question the infallibility of the supply in those districts where it is now abundant, unless Nature herself utterly reverses her present procedure.

I am, Mr. Editor,

Yours very truly,

WALTER MAXWELL.

Bureau of the Hawaiian Sugar Planters' Association.

Remarks.—Dr. Maxwell's communication relative to the supply of artesian water on Oahu will be read with interest, his opinion being that it is practically inexhaustible, so long as the annual rainfall continues abundant. There can be no question that he is correct. That these subterranean reservoirs are supplied solely by rainfall is proved by the data of rise and fall kept by the government. Our remarks in the May number of the Planter were intended to show the necessity of a closer watch over the waste of water, chiefly from the rice plantations, on which a continual flow has been kept up without regard to the amount required for use and with little or no restrictions. This is where more watchfulness is called for, and should be strictly enforced by law. There are about 400 artesian wells on Oahu, and the total number continues to be augmented. While we admit that the rainfall in former years was amply sufficient to keep our wells in good condition, the time may not be far distant when a halt in well-boring here must be called. The annual rainfall on Oahu, and probably on all the islands of our group is unmistakably decreasing, as every one who has lived here for three, four or five decades must be well aware of. Were the full records of rainfall during the early years of the nineteenth century obtainable,—say from 1810 to 1850—they would show years when 40, 50, and perhaps 60 inches fell annually, while now the average for the past four years has fallen below 25 inches, and for 1897, Mr. W. R. Castle's table in the last Monthly, shows the year's rainfall was only 13.67 inches, and for 1899 18.42 inches is reported. This change has been brought about almost wholly by the denuding of our mountain ranges on all the islands of our group, the ill effects of which are only now beginning to be felt.

THE EUROPEAN SUGAR BOUNTIES.

Whatever opinion may be entertained in this country on the above question there can be no doubt as to the feeling of uneasiness prevailing in the principal sugar-producing countries of Europe, firstly, as to the fact of the present system being fiscally and economically unsound, and secondly, that the dangers connected with this unsoundness are not likely to be diminished in view of the developments, that are taking place in two directions. One of these is the rapid growth of the beetroot industry in European countries that at present are to a large extent, and only a few years ago were entirely supplied by one or other of three great exporting nations, Germany, Austria, and France. In the latter country especially is this feeling of insecurity most widely spread, because the exporters there are threatened with the ultimate total loss of markets to which only a few years ago they sent large quantities of sugar, and of all the three it is suffering the most from the developments above referred to. And the certain ultimate enormous expansion of the Cuban production, though, for reasons that are becoming patent to everyone, it will undoubtedly not take place so suddenly and in such magnitude as had once been thought, is another menace to the export sugar trade of Europe, which will untimately be thrown out of the United States market. The sugar manufacturers themselves are the most immediately concerned, but their reply to all warnings is the "nonpossumus," and they cling obstinately to the support of the bounties which have been the direct cause of their unnaturally inflated production.

The clearer heads of the financial departments of the respective governments are, however, fully awake to the desirability of keeping a close eye on the dangers that threaten the great industries and the consequent reflex action on the respective treasuries, and the pourparlers that have lately taken place, about the main facts of which there can be no reasonable doubt, are distinct evidence of this. In this connection the following remarks of Mons. Legier, editor of the Sucrerie Indigene et Coloniale, will not be without interest:

"On the other hand, those who are aiming at the suppression of the bounties tell us through the papers that it is the French government which has taken the initiative for a resumption of the negotiations after the failure of the Brussels Conference. Now these proceedings on the part of the French Government

may appear doubtful when we consider with what persistence and authority the principal French delegate, speaking in the name of France, rejected the propositions of the delegates from other countries, and maintained the principle of the right of each country, and especially of France, to object to the control of the others as regards internal regulations. It is this line of conduct on the part of M. Sebline, our delegate, which was also that of our then government, that rendered nugatory all the deliberations of the International Conference at Brussels.

"Since that time, however, another government, composed of different elements, has assumed power, and opinions on economic questions are no longer those of the government which saw the inception of the Brussels Conference. It is one of the charming features of our political regime that the efforts made by one minister for the good of the country are defeated by his successor, also for the highest good of the country. The different views of the present government may cause it to look in a different way on the fate of our agriculture and our industry.

"But while the men are not the same, the economic conditions are also changed from the point of view of the future of a new international conference. The arrangements of certain countries regarding sugar have been modified; Roumania, Italy, Spain, now possess a sugar industry in full process of development, and the day is at hand when the exports which France is still making to the greater part of the countries of Europe, and in particular to those just named, along with those of the principal European producing countries, will become nil. What will then be done with this surplus sugar? The bounties on export will hence be necessary so long as the present arrangement of duties on consumption is maintained, however small the rate. Now it appears that the present state of our finances does not allow us to make the least reduction in these duties. In this case it is necessary to maintain the status quo, and we hope that the present government will be inspired by the ideas of its predecessor, in spite of the difference in political color which already distinguishes it."—Int. Sugar Journal.

It may be mentioned that missionaries and persons going out to the German tropical colonies are instructed in botany and plant-raising at the Central Experimental Station in Berlin. Such enlightenment and instruction is what the natives in all colonial centres stand greatly in need of, and it might be taken over by Britishers with advantage.

FEMALE SUFFRAGE IN THE UNITED STATES.

The Woman's Journal, in a recent issue, gives the following information regarding the extent of women's suffrage in the United States: "In four states—Wyoming, Colorado, Utah and Idaho, with an area, but not a population, 47 times that of Massachusetts, women have precisely the same rghts of suffrage as men. In these States women habitually vote, and both men and women vote in a larger ratio to population than in the Eastern States. The result is so satisfactory that no one dreams of changing the law, and women are elected to various offices. In one State—Kansas—women have full municipal suffrage. In two States—Montana and Louisiana—Women have the right to vote on all questions submitted to taxpayers. In 24 States women have the right to vote on school questions or in the choice of school trustees. In Oregon a woman's suffrage amendment will be voted on next June. Outside of this country, women have full suffrage with men in New Zealand, Australia, and the Isle of Man. In England, Scotland and Ireland women have full municipal suffrage; and in the provinces of Canada they have municipal rights. What is especially significant is that everywhere public sentiment supports the rights given."

THE SUGAR INDUSTRY IN PORTO RICO.

The production of sugar is at present estimated at 60,000 tons, but with the reduction of the import duty into the United States, this may be easily raised in a few years to 200,000 tons, by the extension of cultivation and the introduction of modern machinery.

The methods of manufacture at present in use are, as a rule very primitive, the exceptions being confined to some six factories which are tolerably well mounted with double crushing, but not one of them possesses a cane cutter, a machine which is thought so much of in Louisiana, Cuba, the Hawaiian Islands, and Mexico. The cutter which gives the best results and is most in use, is the Krajewski-Pesant, but there is not a single one in Porto Rico. The greater part of the factories have only single crushing with three iron roller mills, some have even wooden rollers. The mode of evaporation in use in all the smaller factories is the old open train system of Pere Labat. No factory possesses a laboratory, and it is impossible

to ascertain with any exactitude either the extraction or the production of sugar and molasses. No account is taken of the sugar in the canes entering the factory, or of what goes out. The lime is added without any scientific rule.

There is a Central Factory belonging to an English syndicate which is tolerably well equipped, producing raw sugar, but it is not up-to-date with the scientific progress which has been made during the past few years. The planters who deliver cane to this central factory receive 5% in sugar on the weight of the cane. ,

There are two seasons for planting, spring and autumn, the former from February to May, the latter from August to December. The spring-planted cane can be cut in from twelve to fifteen months, the general rule is fifteen months, and from three to four cuttings are made before replanting. There are canes however which have lasted as long as eleven years.

The cultivation also is very primitive, no manure being used.

According to the figures which I have been able to obtain, it may be calculated that the ton of sugar, including production and manufacture, costs about 42 American dollars.

The sugar produced is of a yellowish-grey color, and that coming from the cetrifugals does not polarise more than 95 to 96. That produced by the old system does not polarise more than 89.

Rum is made from the molasses, and it takes 2½ gallons to make one gallon of rum of 25 Cartier or 68 Gay Lussac. The composition of the molasses is from 38 to 40 per cent of sucrose and 26 to 30 per cent of glucose for those coming from the vacuum pan working; those from the open pan working are much richer in sucrose.

The fuel employed is sun-dried bagasse, and special furnaces are not used.—E. Delafond in Sugar Journal.

Judge Hazen, a brother of Mrs. Dewey's first husband, is quoted as saying that if the people of this country do not desire to place the destiny of a nation in the hands of a woman it will be best to let theAdmiral remain where he is. Doubtless Mrs. Dewey is a bright, capable woman, and quite familiar with public affairs in Washington, but it would be decidely ungenerous and unjust to imply that Admiral Dewey would be ruled by his wife. And yet we do not know why a woman cannot be a good adviser, nor why the boudoir may not supply as good a cabinet as the "kitchen."

CUBA AND BRITISH WEST INDIES.

A penetrating side-light is thrown upon the Cuban situation by the Blue Book lately issued by the Royal Commission on the Condition of the British West Indies. The condition of Cuba differs from that of the British colonies only in that Cuba is largely dependent on the sugar industry, whose depression is the cause of the general impoverishment and not infrequent desolation in the West Indies. Impoverishment and desolation are strong words, but the report of the Royal Commissioners does not permit the employment of milder ones. In most of the British possessions, say the Commissioners, sugar-cane products constitute (and the same remark applies to Hawaii) seventy-five per cent of the total exports, and the ability of the population to purchase what they do not produce depends upon their being able to find a profitable foreign market for what they do produce. During the present generation this profitable foreign market has been taken away. Other agricultural industries, as every one knows, have suffered fearfully, but the sugar industry has suffered more than any of the rest. In fifteen years the price of unrefined sugar has been reduced from $5 a hundredweight to $2.20. The distress occasioned among the producers is not attributed to want of skill or enterprise. The primary cause is found in the sugar bounties given by Germany, Austria, and France, and—in a much less extent—to the Government aid given to the sugar industry in the United States by the tariff system. The Chairman of the Commission urges that the British Government shall place a duty upon sugar imports from other countries equal to the bounty those countries give. This would either force those countries to abandon their bounty system, or else would compel British consumers to pay a normal price for sugar produced in the colonies. Nominally this proposition is a deviation from the freetrade principle, but really it is an attempt to establish for all industries the "fair field and no favor" which is the fundamental aim of free-traders. The bounty system does violence to the principles of free trade, and the British consumers ought not to wish to profit by the distress of the colonial producers occasioned thereby.

How to Have Ripe Orange all the Year Round.—The following communication was sent to the Director of the Public Gardens, who kindly forwarded it as likely to be of interest:

"And through the year this is the way I did it. I had an orange tree in my kitchen garden last year in full bearing, and when the fruits were about the size of a pigeon's egg I went to work and took off all leaving 30, I then dug a trench 18 inches deep around the tree just under the outer leaves where the rain falls and had the trench filled with pen manure, and then covered up, thus forming a ridge about a foot high around the tree, and shortly after the tree began to blossom on one side only, and put out 38 oranges on one branch. Shortly after I saw more blossoms appear on the next branch to the young fruits, and 21 more came out. Since then the tree has been constantly blossoming and fruiting out young oranges, one course after another right around the tree. I was however careless in noting what month it was last year when I started the work; all I know is, the first 30 oranges were ripe in December, the 38 were ripe at the end of March and the 21 I am eating now; and I am able to show any man today four different sizes of fruit, and blossoms on the tree also. I don't know if this is an exceptional case, being the first tree I have tried, but I think it worth mentioning and also worth trying.—Journal of the Jamaica Agricultural Society.

Savings banks hold the reserve fund of the workers, the prosperity of whom may be gauged by the rise and fall of deposits. Recent statistics printed by the New York State Banking Department reflect the general trend in the direction of prosperity of the industrial classes, who deposited in savings banks, in 1899, $259,258,288, and withdrew $217,465,083. There was an increase of $71,336,283 in the amount due depositors. The total resources of the savings banks have passed the billion-dollar mark, amounting to $1,000,209,099.51 on January 1, 1900. It is to be hoped that the postal savings bank in Honolulu will be kept up as a permanent institution. Its usefulness has been proved beyond a doubt, and it will increase from year to year, as it gains the confidence of the poorer classes.

A Remarkable Cow.—The following from an Australian paper will interest cattlemen: "A noteworthy milking record has been established by the Red Poll cow Crocus, which belonged to the famous Norfolk dairy herd at Whitlingham. She gave birth to her third calf on May 11, 1890, since which date she continued uninterruptedly in milk till September 28, 1899, a period of over nine years, her milk yield in the last week of

her life being at the rate of 43¾ lbs. or nearly 4½ gallons. During the nine years four months that she was continuously in milk she yielded altogether 50,428 lbs., or nearly 23 tons of milk. Over the last five years the average quantity of butter fat in her milk was as high as 4.3 per cent. Her live weight when sent to market, after being on grass feed for the last six months of her life, was 10 cwt, 1 qr, 11 lbs. In the nine years since her last calving she gave something like 45 times her own weight in milk, and her average production during that period was 5,403 lbs. of milk, or considerably over 500 gallons per annum. For a moderate sized cow this is a remarkable performance which has aroused much interest amongst the breeders of Red Polls."

Navel Oranges.—A Correspondent of the New York Sun says that, contrary to general belief, navel oranges have been known in certain countries for many years. He says: "Too much, however, is made of its supposed discovery. I bought navel oranges in Bahia, where they were plentiful in the market, in 1865. They must have been known there a great many years, and could not at all have been the curiosity discovered by accident at a much later date."

Sugar Cane Cutting.—In the Agricultural Exhibition recently held at Cairo, I remarked a new apparatus destined to do great service to the sugar cane industry, owing to the great economy it will introduce in labor. Mons. Pierre Raymond, a French engineer, has thought of applying the principle of the mowing machine to the harvesting of the sugar cane and has built a very ingenious machine which he has patented. In this machine a series of circular saws rotate along the surface of the earth cutting down the canes with great rapidity. It is called "Egyptienne" and can also be used for cutting down cotton shrubs, sorghum, maize and small trees. It can be driven by animal or steam power.—M. Georges A. Ed, Belgian Consul at Cairo.

Louisiana Rice Shipped to Hawaii.—Since the bubonic plague brake out in Honolulu, 28,000 sacks have been shipped via San Francisco to the Hawaiian Islands. Thus a new field has been opened for one of our most important products.

"A movement is on foot for the formation of an association for the promotion, throughout the empire, of the sale and use of cane sugar as against beet sugar, and a meeting to discuss the matter is intended to be held shortly at the West Indian Club Room, Howard Hotel, Norfolk Street, Strand. We heartily wish the movement success, both from the point of view of benefitting our West Indian colonies, and of what we still maintain to be a fact, the superior sweetening power of cane sugar." The above is from the London International Sugar Journal, and there can be no doubt that it reflects the opinion of the best judges in England. The fact that all the beet sugar raised and imported into the United States is mixed with cane sugars by the refiners prevents its being detected by consumers, and consequently it is consumed as cane sugar.

As his share of the $20,000,000 quarterly dividend of the Standard Oil Company to 16th March, Magnate John D. Rockefeller received a small check for $5,000,000. The balance of the money—or most of it—has gone into the hands of Mr. Rockefeller's cousins and uncles and aunts, and other bearers of the Rockefeller name; so, while Mr. Rockefeller hasn't got all of it himself, he has at least the compensating consolation of knowing that it is still in the family.

Willett & Gray's Statistical, in referring to the manipulation of sugar stock in Wall street, says: "Of course, there is no settlement of the sugar war, or prospect of any, and when sugar is high enough to suit the manipulators, it will go to the other extreme again, making possibly quite low quotations about the time of the next dividend, June 4." In the meantime, the distributers of sugar are anxiously striving to get a profit on the article—some with success, others without. Much more depends upon the man than the method.

Co-Efficient of Juice Extraction.—A correspondent of the Sugar Cane thus explains it: To avoid misconception, let us state what is understood by yield and co-efficient. Take, for example a cane juice containing 16 per cent sugar with a loss in the bagasse of 1.42 per cent, then this 1.42 per cent equals 8.8 parts of juice. If we now suppose that the cane contains 12 per cent of cellulose then, of the 88 parts of juice, 8.8 are lost and therefore 79.2 are obtained by the factory. These 77.2 we call the yield obtained by crushing. If this is calculated in per cent on 100 parts of juice we obtain the juice extraction coefficient of 90.—La. Sugar Planters' Journal.

THE WEST INDIAN SUGAR CONFERENCE.

In continuation of our notice in the May number of the annual meeting of this assemblage at Barbadoes, we insert papers read by Prof. Albuquerque on the improvement of the sugar cane by chemical selection, and one by Prof. Bovell.

"The next point to which I have to invite the attention of the Conference is the question as to whether it is practicable to enrich any given variety of cane by selecting tops for 'seed cane' from those canes which actual analyses of juice show to be richest in sugar.

"Planters have been blamed for not having already improved their canes by this method, and against the probability of the method proving a success has been urged that the richest canes in a field are often simply the ripest or best nourished, that tops from such richest canes have less germinative power and are more liable to fungoid attack in the young stage, that careful observation has failed to detect bud variation in the sugar cane, and that the high variability of the sugar cane produced from seed shows that seed is a far more satisfactory and probably the only way of increasing the weight and richness of the sugar cane.

"Glancing briefly at what has been attempted in this direction, Messrs. Thompson and Edson at Calumet in Louisiana carried on some experiments for about three years and in their report they considered that they achieved some success. On a very small scale an attempt has been made by Mr. Bovell and myself at Dodds Botanic Station over three crops, but as our method (a complusory one with us up to the present) is very unsatisfactory, we are not surprised that the attempt has been a failure. During the first year's experiments the result was that the plants from the richer canes gave the crop with juice richest in sugar: but the results were reversed in the second and third years. For the plants from the 'rich' canes produced canes both lower in tonnage and poorer in sugar than those from the 'poor' canes. The experiments were only carried out on small single plots.

"At Mauritius Monsieur Bonname gives the results of experiments carried out for two years and these results are negative.

"Looking at the matter from a theoretical standpoint one cannot help thinking that canes produced from the buds of a parent cane, are likely even if grown under precisely similar conditions (if it were possible to do so) to manifest slight differences in their various properties, such as the length of their joints, the amounts of sugar and other substances in their cells, the germinative power of their buds and so on; one would expect that the canes so produced from buds while exhibiting no striking variation from the parent would oscillate

as it were in their properties about the mean formed by the parent plant, and that by selecting the canes richest in one of those properties (say sugar production) the canes produced from the buds of the daughter canes, would oscillate in their properties about a new mean (that of their mother canes) and a mean silghtly higher than that of what I may call the grandmother cane. And one would expect that by a repetition of this process of selecting the richest from which to propagate, the average richness of the variety would be increased. Admitting that it is possible for the sugar cane to contain more sugar than it does now, it does not, in order to test the theoretical possibility of this enrichment, seem necessary to me to shew as suggested those striking variations known as bud variation: the essence of the idea lies in a gradual integration of small differences, and not in a change *per saltum*. But even if it were necessary, we know that bud variations do, though rarely, occur in the sugar cane, from the drawing and striking specimens now exhibited by Dr. Morris at this Conference.

"From a practical point of view, however, there is a very great difficulty in carrying out the experiment satisfactorily; and that difficulty is,—admitting that in a given variety of cane some individuals posses greater inherent sugar-producing powers than others, how are we to find them? What test shall we apply? For the cane which on any given day has the richest juice may not be the one with the richest potentialities. It may, as has already been urged, be simply the richest because better exposed to light, better nourished from its position in the stool, etc. If on the other hand we do not simply select plants from the richest individual canes, but as suggested by Mr. Kobus select our plants from the stool displaying the highest average richness, may not this again be due to this stool being riper from having germinated a little earlier than neighboring stools, or being riper from some other accidental cause not inherent in the cane from which it sprung? I confess I do not see any way out of the difficulty and can only hope that by combining all methods, i. e. of selecting the similarly situated richest canes from the richest stools, and doing this with a large number of plants that on the average we may succeed in hitting on a much larger proportion of the inherently richer canes. Dealing with the objection that plants from these richer canes will germinate badly that a smaller proportion of them will germinate than from ordinary plants, I should say use a variety of great germinative vigor. There is no doubt a limit beyond which a cell of a cane plant can no longer produce sugar and live: a limit of sugar contents beyond which the protoplasmic functions of the cane cell would be so interfered with, so reduced in vigor, that the plant would die or at least

be unhealthy; but assuming that the variety experimented with has a fair margin of protoplasmic contents, and so a fair margin of vegetative vigor to be encroached upon, I do not see why the percentage of sugar should not be increased and yet the plant retain sufficient germinative power for practical purposes. All that would be wanted in the ripe cane (in the experimental stage) would be just sufficient germinative power to produce with care and irrigation a healthy plant: this is of course simply in the experimental stage. When the variety in experimental cultivation had been sufficiently (or as far as practicable) enriched, it would be probably planted out in the estates from unripe or less ripe plants, and therefore from plants that retained more protoplasm and greater germinative power than plants from ripe canes."

Remarks of Mr. Francis Watts (Jamaica): I should like to pay my tribute of respect and admiration to those gentlemen who have been engaged professionally in the work of manurial experiments in the colony of Barbadoes. There is no part of the world where sugar cane is grown to-day, where the name of Professor Harrison is not known and held in the highest respect. In my own experiments and work connected with this subject, I have always and at all times received the fullest help and assistance from him, and I am quite sure that the same remark would apply to all those who have had to seek advice from him, either when he was resident in this colony, or since he has been at British Guiana. Professor Harrison says that when he first came here, he had the task of finding out what the sugar cane was. It was at that time an unknown quantity, and it is to Professor Harrison, largely, that we know and are able to state with reasonable certainty what the sugar cane is, and what can be got out of it. [Professor Harrison: The credit of working that out is not due to me so much as to my predecessor, Mr. Francis.] That in no way detracts from the merits of his own hard work. I think it is very largely due to Professor Francis and Professor Harrison that we know what the sugar cane is, and I think it is largely to the latter gentlemen that we have now seedling canes. Perhaps Professor Harrison will again tell us that he did not discover the seedling cane, but I believe I am correct in stating that he was the first to make it a valuable adjunct in experimental work. With regard to the paper read by Professor d'Albuquerque, I do not know that there is much for me to add. I think that most persons who have done this kind of work have come to the conclusion that it is difficult to obtain suitable plots, to be used as control plots, and that we must have ample assistance if we are to deal with an enormous number of such plots. That megass can be analysed we know, but that it can be preserved readily and

easily for experimental work, is quite another matter. My experience is that it is a difficult and precarious matter to preserve megass so that the analyses may be put forward by the chemist with confidence. With regard to preserving juice, I may say I have used carbolic acid, mentioned by the two previous speakers, and it has almost invariably given satisfaction. In those cases in which it did not give satisfaction, I think failure was due to the presence of an enzyme in the juice. There is a matter that came under my notice—namely, the peculiar behavior of the sugar cane in its relation to phosphates. It was found in the early experiments at Barbadoes that in some cases the addition of phosphates to the manure applied actually reduced the yield of sugar. At Antiqua, my experience was very similar, and it is an occurence I am unable to explain. Perhaps those who have had wider experience may be able to explain the reason. There is no doubt that the main factor of cane manure is nitrogen, and to the practical man to whom it means pounds, shillings and pence, the correct management of nitrogen is an important factor in determining his profit or his loss. In considering the varieties of canes to be grown and the kind of fertilizers to be applied, there is no doubt that much thought must be given to the surroundings of the station, and the conditions of the colony. When the small station at Antigua was started, experiments were first of all made with the Bourbon cane. It was soon found that this cane was attacked by a variety of diseases which rendered it extremely unsuitable for cultivation. We lost a large proportion even with the greatest care. But other varieties of cane withstood, to a certain extent, the ravages of the diseases. That these other varieties would entirely withstand disease, was too much to hope, but that they could withstand them to a great extent is clear. No doubt, that is a factor which will differ in every colony according to the conditions under which the canes are grown and cultivated. The extreme importance of experimental station work requires that these matters should be carefully dealt with. It is admitted that experiments of this kind are perhaps less carried out in the colony which I have the honor to represent, than in some of the others, because of the preponderance of other products in relation to the sugar cane crop. But I have no doubt that in the near future and with the encouragement of the Imperial Department of Agriculture, we shall be able in Jamaica to add our quota to the amount of information which it is the duty and function of the Department to acquire and utilize.

Prof. Bovell read the following paper on green manuring as a means of fertilizing cane lands:

Turning into the soil certain green crops, raised with that

object, is one of the oldest means of improving the fertility of cultivated land. It has been in use over two thousand years. During that time it has formed a most useful adjunct where the supply of farmyard compost is insufficient.

Many advantages result to succeeding crops from plowing in succulent vegetable substances, such as furnishing the upper layers of the soil with the fertilizing material brought up by the long penetrating roots characteristic of the plants used for this purpose, improving the physical condition of the soil and increasing the humus contained therein.

For many years it was observed that the results obtained with one particular order of plants, viz: beans and peas (Leguminosae) were greater than any other. By degrees it was ascertained that the superiority of these plants over others was due to the fact that after their growth the soil contained a larger amount of nitrogen than could be accounted for by the vegetable matter of the plants and roots. This having been ascertained, the question then arose, where did this excess of nitrogen come from? Was it pumped up by the roots from the subsoil, or was it obtained from the atmosphere? Sir John Lawes and Sir Henry Gilbert—the fathers of agricultural experiments—in England, and Monsieur Boussingault in France, pronounced emphatically against the latter possibility; while Monsieur G. Ville contended that certain plants did acquire free nitrogen from the air.

For a time the question remained unsolved, some scientists holding one view, some another. Finally, however, the matter was definitely settled by Professor Hellriegel, who by elaborate and carefully conducted experiments, conclusively proved that leguminous plants had the power of absorbing free nitrogen from the atmosphere by means of bacteria contained in the tubercles or nodules on their roots. The manner in which these bacteria assimilate the nitrogen has not yet, I believe, been fully ascertained, although many distinguished men have been, and in fact still are engaged in studying it.

The existence of this special power of the Leguminosae, should greatly encourage those engaged in the production of agricultural crops.

As is well known the atmosphere contains nitrogen to the extent of four-fifths of its volume, and when it is considered that there is lying on every acre about 3,000 tons of nitrogen, never to any appreciable extent decreasing, it is imperative upon us to try and utilize some of this inexhaustible supply, instead of paying, as we do in Barbadoes, some seventeen cents per pound for it in the form of sulphate of ammonia, or nitrate of soda. How this may best be done is a matter for careful consideration and experiment.

While both leguminous and non-leguminous plants enrich the soil, in proportion to their size, in humus-forming material, the leguminous, as stated above, add in addition a large supply of nitrogen; consequently it is desirable for the planter to grow such crops as will effect this object.

In many parts of the world, advantage has already been taken of this discovery with remarkable success.

An analysis of the hay of the velvet bean, made at the North Dakota Experiment Station, showed it to contain 5.3 per cent. fat, 16 per cent. crude protein, 20.7 per cent. fibre and 41.8 per cent. non-nitrogenous extract. As a fertilizer the velvet bean compares very favorably with the unknown cow pea and the Spanish pea nut. Comparative analyses of the vines, fallen leaves and roots of these three plants, were made at the North Louisiana Experiment Station, to determine the amount of nitrogen contained in each crop. For the velvet bean it was found that one acre of the vines, leaves and roots, contained 154.2 pounds of nitrogen worth $23.15. An acre of pea nuts contained 193 pounds of nitrogen, worth $28.95, while the 108.5 pounds of nitrogen in an acre of cow peas was worth $16.26. Similar analyses have been made at the Alabama Experiment Station. There a yield of 8,240 pounds of cured vines and fallen leaves, and 1,258 pounds of roots, including about 3 inches of stubble, contained 201 pounds of nitrogen, worth $30.15. There was 2.29 per cent. nitrogen in the cured vines and 1 per cent. in the air dried roots.

AGRICULTURAL PRODUCTS OF NORTH CHINA.

The principal provinces in northern China are Chihli and Shantung. The province of Shansi, to the west, is separated by a range of mountains from Chihli, and the climate is in some respects quite different: but there is a general similarity between the regions specially mentioned and the remainder of the northern part of the Empire. The country has an alluvial or loamy soil, and is usually capable of producing good crops when there is an adequate raifall, which, however, not infrequently fails. At such times there is always a risk of a general famine, such as took place in the years 1877-78, when millions perished.

Perhaps the most important crop is wheat. It grows all over northern China, with but slight differences in manner of cultivation, due to local climate. In a few districts, spring wheat is grown; but as a rule the ground is plowed for wheat in the autumn after the other crops have been housed, and as soon as there is a good fall of rain. The wheat is put in with a drill, as are almost all other crops.

The Chinese are very expert in the use of manure, which

they dry in the spring and pulverize; and it is always for sale at the river markets at a price varying with the locality. This manure is brought to the fields in carts and is poured into the seed drill with the seed, so as to make a little go a great way. The practice of drilling everything is sometimes a wasteful one, as there is almost always (with their imperfect machines) a much larger quantity of seed put in the ground than can live in the limited space intended for it, and much of it has to be pulled up later by hand. If the wheat gets a good start in the autumn, it looks well all winter. It is much helped by the rains and especially by the snows, which generally occur at intervals through the winter.

Much of the land is made to yield two full crops a year, and after the wheat has been gathered in June, the land may be planted in beans or sweet potatoes, maize, or some other late crop. But it is recognized as the better plan to let the ground lie fallow until after autumn harvest, when wheat may be put in again, as the increased yield compensates for the loss of the extra crop.

The Chinese well understand the principle of rotation of crops, and for the most part are governed by it, with some conspicuous exceptions. But it is a general fact that they are indifferent to the quality of the seed planted, and though they realize that the middle of the ear yields better seed than the ends, they pay no attention to such a selection, it often being considered a fine economy to sell the round, full grain and to keep the withered and imperfect ones for planting.

The wheat usually ripens about the beginning of June, when the stalk is either pulled up by hand or the straw cut (with a small sickle not more than 4 inches in length) very near the root.

The Chinese thrashing floor is the center of incessant activity after the wheat harvest begins. The ground has been previously prepared by wetting and rolling with heavy stone rollers over straw, by which means it is made at once hard and smooth. The wheat is thrashed out by the passage of the stone roller over it, and the winnowing is generally done, not by mill—although the Chinese have such an implement without screen—but by throwing the grain and chaff into the air with shovels, by which crude process most of the chaff is eliminated—at least a sufficient amount of satisfy the Chinese demands.

It is very difficult to ascertain the product of any Chinese crop per acre, or "mou." All measures in China, like all weights, are extremely variable. The farmer will tell you that his land yielded so many pecks, but it may be incidentally learned that the "peck" of that region is but a third as large as the one used in another district near by. Acres, bushels, pecks, pounds, etc. have no fixed value; so that comparisons are difficult. The yield of wheat may be set down as

"two bags," but how much a "bag" may hold is wholly uncertain, as they are made of all sizes, to contain from 100 catties up to perhaps 150. The catty, or Chinese pound, according to treaty, is $1\frac{1}{3}$ pounds avoirdupois; but this is a merely ideal relation, hardly ever realized. For these reasons, all statistics as to the productiveness of Chinese land are to be taken with considerable allowance.

The great mass of the village population do not use white flour as an article of ordinary diet; but on feast days, during the wheat harvest itself, and during the new year's holidays there is a marked exception to this rule.

Next to wheat, probably the most important food crop is millet, of which an enormous quantity is grown everywhere. White rice does not grow in northern China. It is found in Tientsin and Pekin, but not to any extent in the interior. Millet is planted as early in the spring as the rains will allow. It is drilled into the ground, worked by plowing between the rows while it is small, and later by hoeing.

The Chinese hoe is a clumsy implement. It has a surface more than 6 inches square, and its function is to cut weeds in two and to stir the soil from beneath, without to any extent removing it. The plow is always small, with but one handle, the moldboard having a very few inches of surface and being always designed for surface work only. The plows are frequently drawn by men and women. No Chinaman has the smallest conception of such a thing as deep plowing and he would be horrified at the idea of turning all the valuable surface soil underneath. The harrow is not unlike the kind we used a hundred years ago, and the farmer often has a brush drag for a convenience. He depends upon the winter frosts, however, to do most of the work of pulverizing the lumpy soil, and in the spring it is always easy to get the ground which was plowed in the fall into shape for planting.

In Chihli Province the land tax (which is perhaps the lightest in the world) is paid in money; but in Shantung, as in the central provinces, it is paid in grain, which is required to be delivered at some convenient spot, measured, and shipped on small river boats to Pekin. In Shantung, millet is used for the payment of the land tax.

What is called "tall millet" bears no relation whatever to the grain last mentioned. It is very similar to the sorghum, or sugar cane, so extensively grown at one time in the Middle and Western States. It is planted about the same time and under the same general conditions as millet; but it grows to from 10 to 15 feet in height, and when it begins to attain its growth it everywhere hides the horizon, so as to make it difficult to find one's way about, there being not even a fence to show the boundaries between farms. It thus becomes a convenient refuge for thieves and outlaws, who can readily hide in its endless recesses and defy pursuit. The natives call it

"collian." In this plant, nature has furnished one of her best gifts to the forestless plains of northern China. The blades are stripped from the stalks while green and cured for fodder. When ripe, the tops are thrashed for the grain. The stalk of the sorghum is so full of silica that it is invaluable for making hedges and for the roofs and sides of buildings. When used for the latter purpose, the stalks are covered with very thick layers of mud, and withstand the heaviest rains for a long time. When they finally rot, they can be removed, and what is left is used for fuel. Finally, after the stalks are cut and removed from the fields, the roots are pulled up and stored for fuel, and thus every vestige of the plant is made to serve some useful purpose.

It should be understood that the mass of the Chinese people burn no wood, on account of its cost, and the use of charcoal is confined to the well-to-do. At a distance from coal mines, coal is hardly an article of commerce, except at or near the banks of rivers. All the cooking and heating of the k'ang, or stove bed, without which no Chinaman in the north can exist, is accomplished by burning the stalks of the crops and the weeds and straw he has gathered. The combination of all of these forms of fuel, however, is inadequate to do the heating and cooking required, so that the dwellings of the Chinese are never really warm after the autumn frosts have begun.

Indian corn has undoubtedly been introduced into China during the present dynasty. It never grows to a great height, and the yield is probably not a quarter as large per acre as in the United States; but it is useful to take the place of other crops in a dry year, since it can be planted much later than either kind of millet. It is now thoroughly established as one of the standard crops of northern China.

Barley is grown to some extent, but the aggregate yield is probably not large.

Oats are found in the mountain regions of Chihli, about Kalgan, and in various parts of Shansi.

In the poor soil near the mountains, one sees a great deal of buckwheat in small patches. It is an index of the state of Chinese markets that foreigners living in northern China, where there is probably a thousand times more buckwheat grown than all the foreigners could possibly use, experience so much trouble in getting hold of it when wanted that they invariably send to California, rather than be disappointed by having their Chinese orders unfilled.

Besides the millet already mentioned, other kinds are raised, such as the glutinous millet, usually cultivated only in small patches for home consumption, because it makes a certain dumpling which is much prized. The varieties of these small grains are so numerous that it is a proverb that not even a farmer can repeat all the names.

In the many regions subject to inundations, there is a kind of upland rice which is planted when ordinary crops would be drowned out, but this belongs rather to central than to northern China.

Sesame is grown to some extent for the manufacture, by a rude process, of an oil much used in cooking. Sesame seeds are used to improve the flavoring of the ordinary wheat cakes baked in ovens or on hot stones.

Sweet potatoes are found throughout this entire region sometimes of an excellent quality. They are perhaps the cheapest form of food accessible to the poor and are easily cultivated, being propagated from shoots set out after the rains have begun.

Tobacco is another plant which China owes to the West, although that fact has long been forgotten. It can not have been introduced more than two hundred years, but its use has become practically universal. Foreigners think it too mild, but the Chinese are attached to it. It is smoked in long pipes holding very small quantities.

The Chinese raise a great amount of beans of various kinds, the principal of which is a coarse black bean, fed to animals and used for making a crude oil, which is in great demand. The bean cake left after the oil has been extracted is an important article of commerce, especially from the port of Niuchwang, where beans occupy a large part of the cuitivable land. The cake is sent to the south, where it is greatly prized as a manure for sugar cane and for other crops. Although they are entirely ignorant of any value to be attached to nitrogenous foods, the Chinese make large use of beans of various sorts in their own diet, and in some regions the proportion of soil devoted to them is very great.

The peanut is extensively cultivated throughout northern China, and is said to have been an importation from abroad. It flourishes best on sandy soil, of which there is an unlimited supply. When the nuts are matured, the farmer knows no other way of getting them all than to pass the whole superficial area of his farm through a wire screen. Even then there are many nuts left in the ground, which are gathered by hogs turned loose for the purpose. The peanut oil is an important and increasing article of commerce, and the profit from the crop is said to be greater than from almost any other.

Opium is grown in considerable areas in various parts of northern China, but statistics of the production are not available. In some regions the quantity is probably increasing, while in others it seems to be practically stationary. The profit is larger than on food crops, but the injury done by the withdrawal of so much productive land amid such a dense population is very great, albeit entirely unappreciated by the Chinese.

None of the crops thus far mentioned is of greater importance than cotton, which is found in certain districts in the provinces here referred to. It grows on the light soils, but not on the dark ones, and occupies a very important place in Chinese economy. If the spring is a particularly dry one, the cotton crop can not be planted at all, or if it is put in the lack of rain may destroy all the seeds. A year in which there is an amount of moisture sufficient for the grain crops is too wet for the best cotton, and, on the other hand, a year when food crops are a failure may be a good one for this great staple. The cotton plant is very unlike the stalwart growth of the cotton States of America, being often only a foot or more high. The boll is not much larger than an English walnut, and the amount of the staple in each is trifling. Yet almost all the clothing for the hundreds of millions of the Chinese race has come from this insignificant source.

During the cotton-picking season, hundreds of thousands of women and children are in the fields at work. It is for most of them the only opportunity to make a little extra money during the whole year.

Most of the processes through which the cotton is put before it is ready to be worn bear a marked resemblance to those in use in western lands a hundred years ago. The gin is a clumsy little machine in which two rollers press upon the cotton to squeeze out the seeds. It is not ideally effective, but it is a fact that expensive foreign devices for the same purpose have frequently totally failed when tried with Chinese cotton. The "scutching" is done by means of a taut bow, upon the string of which the fiber is snapped dexterously. Spinning is not unlike our own primitive methods. The fabric is invariably narrow, often not more than 12 or 15 inches wide, always of uncertain length, and of variable quality. The manufacture of cotton is at present in a transitional state, owing to the general introduction of Japanese, Indian, and, more recently, Chinese machine-spun yarns, which, while much less durable than those made in the old way, are so much cheaper that millions of women, and men also, are deprived of what previously afforded them a small but certain dependence.

As market gardeners, the Chinese excel. They have the infinite patience which is able to tire out the hosts of insect foes always lying in wait for the farmer, and they have a large variety of vegetables which they assiduously cultivate. They are very fond of melons, and these are so cheap and abundant as to bring them within reach of the poorest people.

The Chinese have for ages understood the art of grafting. Their orchards are a source of great profit, and are tended with ceaseless patience and care to protect the crop from insects, birds, and the still more dreaded human thieves. Fruit

is always picked before it is ripe, to lessen the danger of losing it altogether and to make it easier of transport. Now that railways have been introduced to some extent, there is no reason why fruit crops should not be brought to a profitable market. At Chefoo, the late Dr. Nevins did much to introduce fruits of fine flavor and to teach the Chinese how to care for the orchards. The results have been evident within certain districts, but to an extent for less than would have been the case in any western land.

Chinese agriculture, like everything Chinese, illustrates the talent of this race for doing almost everything by means of almost nothing. They fatally lack initiative; but if new methods are forced upon their attention, they may be persuaded to adopt them, and, once having done so, they will not again give them up. Efforts to introduce American cotton and other foreign seeds have generally been a failure, owing to the reluctance of the Chinese to use them, and especially to the fact that the seeds themselves do not produce the results which they did in their native soil. The cotton plant grows to a luxuriant height, but it has no bolls. The same has sometimes been found to be the case with Indian corn from foreign seeds, which yield a magnificent stalk, but few or no ears. Whether this would be a universal experience is not certain, but there is every probability that the seed would have to be imported at least every few years.

JAMES W. RAGSDALE,
Tientsin, October, 1899. Consul.
—Am. Consular Reports.

IRRIGATION IN SOUTH AFRICA.

The following paper was read at a recent meeting of the Cape Colony Agricultural Association in South Africa by Mr. C. J. Watermeyer, and is interesting, as showing the way it was carried on there before the war:

"So much has been written, or spoken, on the subject of irrigation that it is with considerable diffidence I have undertaken to read a paper on the subject. I can only hope here and there to emphasize a point, and possibly present it in a new light. It is needless to expatiate on the importance of irrigation for our native land, where we and our children have to make a living, and any subject which will make the living easier, and more conducive to the prosperity and well-being of the whole community, is of infinitely more importance to all parties than the political strife with which the country has rung for some years now, to the exclusion of more useful matter. It will readily be conceded that irrigation, and irrigation only, is going to be the salvation of this country. Gold mines and diamond mines are all very well in their

way, and undoubtedly place means in our hands to develop that auxiliary without which irrigation and large production would be abortive. I mean railways. Railways and irrigation must go hand-in-hand. It will avail us nothing to cover South Africa with a network of railways, loading the community with a staggering burden of debt, if there is nothing for the railways to carry. A singe train will take away the yearly output of more than one farm, consequently the producing capacity of our farms must be so increased that there is sufficient for the trains to carry all the year round. Sufficient to pay for interest, working expenses, and sinking fund. The only factor which will bring this to pass is irrigation. Sooner or later the mines are bound to be worked out, or have to be worked at such a depth that there is no profit. What in the meantime have we done with the golden shower poured into the country through the mines? Sunk in reproductive works or squandered? We have only to look to other mining countries to perceive how completely mining has sunk into the background, become a settled industry, and carried on like any other reproductive business; whereas agriculture has come to the fore; and the proceeds of agriculture overtop the mining products by a hundredfold. This is the position we must strive for, strain every nerve to attain, and which can only be attained by means of irrigation.

We cannot disguise from ourselves that we live in a poor country, poor, I mean, agriculturally; and poor as to the amount and distribution of rainfall. Undoubtedly we have in parts some of the richest soil in the world, capable of growing products of unsurpassed quality. Equally undoubtedly this soil only occurs in pockets or small tracts, separated by wide stretches of stony semi-desert, barely rich enough to support stock of any kind to a limited extent. The general chemical composition of the soil is poor too, as is unfortunately too conclusively proved by the able paper read by Dr. Hahn at the Grahamstown Exhibition. Have we any means within our power to remedy this? Nature comes to our aid, there is no waste in Nature, but what she takes away from one part she offers to another. If we scorne her gifts she carries them to the sea, there gradually building up new productive lands for future generations. A striking proof is given in the delta at the mouth of the Nile, one of the richest tracts of soil in the world. There, for ages and ages, Nature has been at work, denuding the high table lands of Central Africa, and carrying the soil in solution in the Nile waters to form a new and rich land at the mouth, supporting a teeming population. Here, too, she offers us her gifts, though not to such a large extent, which we in too many cases indolently and scornfully allow to pass our doors, without putting out a finer to arrest a tithe of it. One instance I can give where

Nature's gifts have been utilized, and at the expense of a few hundred pounds, have diverted the river course, uselessly pouring into the sea; and that by means of a weir deposited on the land. There, where some years ago a bare Karoo flat, supporting a few sheep existed, you now see rich lucerne fields, and luxuriant fields of grass, supporting large herds of cattle, ostrichs, and fattening sheep. I allude to Varkenskop. True, the proprietor had the rare advantage of the ground on each side of the river lying lower than the river course. But he had the energy and foresight to make use of his opportunities, and has succeeded, at very small cost, in turning an ordinary dry Karoo farm, worth only some shillings a morgen, into one of the most valuable farms in Middelburg, worth pounds. No doubt there are many other farms, in different parts of the country, where the same can be done.

Now I come to the mode of irrigation, and the site of irrigation works. Are we to go in for large reservoirs to catch up the rainfall, or confine ourselves to our river courses; and by what means to get the water out of the river? I must own I am opposed to large dams dependent on rainfall. A dam of sufficient size is very costly, there is always the risk of breakage and leakage, and also the uncertainty of our rainfall during a series of years. Presuming the site of a good one, the catchment area large enough and the soil below the site on which the water can be used sufficient and rich enough for cultivation; the question remains—Can you store sufficient water to return interest on cost, and cost of maintenance on dams and furrows? I am inclined to think not, if a series of years are taken; and I believe my contention will be confirmed by the only moderately large dams we have, in Beaufort West and Van Wyk's Vley. Another point merits most serious consideration, and that is the holding nature of the soil is porous, and percolation considerable. All over the country we find fairly large dams made immediately above a spring with the object of strengthening the flow, invariably successful; which proves that a considerable amount of percolation takes place, confirmed by the fact that as the dam gets lower, the flow of the spring diminishes, and when the dam is dry, no more than the original flow obtains. Now, this point requires very careful study. However, promising the site may appear, it often hoppens that the ground will not hold water. I have had practical proof of this. I intended making a large dam for irrigation purposes, and had a site on my farm showing every evidence of an ideal site. The soil, a hard "brak" lime conglomerate, into which you could hardly force a pick. When rain fell the pools of water stood until evaporated, or drunk up by stock. The verdict of my neighbors was, you could not have better ground for holding water, "de dam zal water hou zoo als een schotel." I found

the cost would run to more than I cared to spend, and instead, made a small dam for drinking purposes; with the result that this "schotel" is dry in little more than six weeks after getting full. Whilst exercising the greatest care in the choice of the site of a large dam the same might happen. Undoubtedly someone, miles below, might get the benefit of the water by a sudden accession to the strength of the springs; but the object of the dam would be defeated. Evaporation, which, with our powerful sun and strong dry winds, is great, must also be taken into consideration, which has to be calculated not by inches, but by feet, in the year; amounting to between 12 and 14 feet at such a comparatively cool spot as Val Stadens River reservoir. I could advance many more reasons against large dams, such as silt; however carefully provided against every dam is bound to silt up in course of time, to which our high winds, raising thick dust storms, add not a little, and which could only effectually be obviated by dredging at a prohibitive cost. Leakage from furrows, when of any length, which has caused the lamenable failures of the promising irrigation colony at Mildura, in Australia, where very large sums of money have been spent, costly pumping plants erected, and the whole promising scheme brought to naught by such an insignificant little animal as the crab and his congeners. The water is distributed in furrows for a long length, through porous sandy soil, which the little pest takes advantage of, and amuses himself by starting irrigation through holes in the furrows on his own account throughout the whole length.

"But my paper is running to an inordinate length; I have not touched yet on where I think we must go for water for our irrigation works: our rivers. An artesian well supply I leave out of the question altogether. It is futile to look for true artesian waters until the only known geological strata which bear artesian water is found and traced. No water can rise from underground unless the level of the supply is higher at some point than the spot where the water is tapped, and contains sufficient water to keep above that level. If not, the flow must cease after a time.

"Rivers without water is one of the accusations brought against South Africa; true for eight or nine months in the year, but fully atoned for during the remaining months, when huge volumes of water find their way to the sea in otherwise dry rivers. I recently crossed the Orange river twice at Norval's Point when the river was in full flood; there was an immense body of water, rich with thousands of tons of silt, flowing gaily away to the sea, the banks of the river not more than six feet above the level of the water, and where, without any dam across the stream, by simply cutting a canal, as much water as you pleased could be drawn off to enrich lands

and grow crops far away from the river. Whenever rain falls though hundreds of miles away, the sulplus water must eventually find its way into the river, and through the river into the sea.

"Here there is no question of catchment area. We all know what roaring torrents the most insignificant "loop" becomes after a thunder shower, holding in solution some of the richest soil robbed from the surface. Our object must be to arrest this water and silt and turn it to profitable use. Almost without exception, we find our different rivers crossed at intervals by dykes of solid rock. There we must arrest the water, by means of solidly-constructed river weirs. These weirs must be so constructed that they serve a double purpose. They must be high enough to impound a large body of water for use when the rivers do not flow; a channel with sluice valves, cut from the river, will carry a large quantity of water, either for immediate irrigation, or carried into large dams or tanks, where it is to be stored for future use. The weirs are constructed with large iron valves to open and shut at pleasure. When the first rush of heavy muddy water has passed over the weir, the valves can be opened, the rush of such a body of water scouring out all deposit, and closed when the water begins to run clear, to impound the remaining water, the channel valve remaining open and all the time drawing off water until the flow begins to diminish, when that, too, is closed to allow the reservoir behind the weir to fill up for future use.

"There are many sites on our rivers where such weirs could be built at a small cost, no more than £10,000, and I would strongly advocate an experiment in building a few of these, instead of rushing into large expenditure on doubtful schemes. The impounding of water in rivers is bound to be a national scheme; private parties have not the means, or, if they have, are disinclined to spend money on schemes of such a nature, when the cost runs into thousands of pounds. The water, when impounded, can be sold directly to individuals, as is done in India; or parties who benefit by the use of the water can form a trust, and pay interest and sinking fund to wipe out the cost to Government, in proportion to the quantity of land they hold benefited by the scheme. If owners have to pass mortgages on their land, any irrigation scheme introduced will remain as dead as our present Act.

"We must recognize that the conservation of our rainfall is a national necessity, it cannot remain dependent on individual effort. A special loan for irrigation works should be raised; after testing weirs of the description I have mentioned, if found successful, of which I have not the slightest doubt, and the loan must be sufficiently large to supply funds to lock all rivers found suitable after a thorough survey. We need not

be alarmed at the expense, as we have only to turn to Egypt to see how successful a similar scheme has been there; so successful, that the Government there is now spending five millions on a single dam or river across the Nile. We have heard a good deal of "riparian rights." The phrase has become a kind of bugbear, but in the Midlands, at all events, we need not trouble about it, as none of our rivers are perennial, that is to say, flowing all the year round from their source to the mouth. On such rivers riparian rights become formidable obstacles, but we have enough able lawyers and legislators to draw up a workable act. To our rivers riparian rights don't apply; where there is water in them that water has been heaven sent, and every owner of property through which the river flows can use the whole flow on his ground if he is able to. Happily there usually is enough and to spare for all. In like manner he has the sole use of any springs rising on his property, or any underground water he can tap. No proprietor below the rivers would be so foolish as to object to their being built, as every farmer knows that a considerable amount of water must percolate through the soil and find its way to the lower level, to the manifest strengthening of his supply. One great and beneficial effect of the locking of our rivers, producing large sheets of water, with consequent cultivation of large tracts of our arid soil, will be the effect on our rainfall. Evaporation will be greater and more uniform, as will also be the attraction of moisture from the clouds and humid air. Instead of heavily-laden golden rain clouds racing across the continent to deposit their priceless moisture on other lands, or into the sea, the moisture in the cultivated soil and in the reservoirs will attract them, hold them fast, and compel them to deposit part if not all of their moisture; the rainfall will be larger, more general, and evenly distributed, less torrential downpours and more "lands regens," which, I need not add, will have a marked effect in the improvement of our pasturage. This is no idle surmise, but has been abundantly proved in Egypt, where no rain fell. As the cultivation of the delta of the Nile was extended, rain began to fall in small quantities; as cultivation increased still further, more rain fell, and now rain is beginning to fall further inland, where no rain has ever been known before, either in ancient or modern times.

"Then, when we have our rivers locked, and cultivation largely extended, and a rational use made of our rainfall, most of our bones of contention will disappear, no meat or grain duties to vex the souls of our legislators, no need of protection to bolster up our manufacturers, as the consuming population will be large enough to make manufacturing pay; and South Africa becoming an exporting instead of an importing country, will flourish. May the absolute necessity of

irrigation be forcibly brought home to every one, and insistence made for a commencement, even if only on a small and experimental scale."—Cape Colony Ag. Jour.

DESCRIPTION OF FERTILIZER MATERIALS.

Indirect Fertilizers.—A stimulant or indirect fertilizer is one which does not in itself furnish directly to the soil any needed plant-food, but whose chief value depends upon the power it possesses of changing unavailable into available forms of plant-food. The stimulants or indirect fertilizers which have been most commonly employed are lime, gypsum and common salt.

Gypsum, or land-plaster, known also as calcium sulphate or sulphate of lime, in some manner aids the process of nitrification, by which ammonia and the nitrogen or organic matter are converted into nitric acid and nitrates. It also acts upon the insoluble forms of potash and other elements of plant-food, converting them into soluble and available forms; it is of value on certain soils to certain crops, such as clover, peas, lucerne and similar plants.

Quicklime or burnt lime, or calcium oxide, commonly called lime, produces changes in both the physical and the chemical character of soils. Freshly burned lime acts chemically upon soils by decomposing vegetable and mineral matter already present in the soil and changing them into forms which are available as food for the plant. Thus, lime acts upon insoluble mineral substances containing potash, etc., and converts them into soluble forms. Lime aids in the decomposition of animal and vegetable matter, such as vegetable mould, stable manure, etc., and tends to convert them into available plant-food. In using lime, care should be taken not to use too large quantities at a time, and, ordinarily, it is best to use it in connection with liberal applications of nutritive fertilizing substances. Lime can be used to advantage on freshly drained swamp-lands and also on lands newly cleared.

Common salt has an indirect fertilizing value which is mainly due to the fact that it has the power of changing unavailable forms of plant-food, especially potash, into available forms.

Danger of Using Stimulant Fertilizers.—It should be kept in mind that these stimulant fertilizers—that is, gypsum (or plaster) lime and salt,—are not used for the plant-food contained in them; hence, as used, they do not furnish needed plant-food. The chief value of their use lies in the fact that they can change unavailable into available forms of plant food. It can readily be seen that, when stimulant fertilizers are used exclusively for a term of years, the soil each year loses nitrogen, potash and phosphoric acid, which are not

replaced. The inevitable result of such treatment is the exhaustion of these important food constituents from the soil. This affords an explanation of the question often raised now as to why the application of lime does not give such results in crop yields at present as in former days. When lime was the only fertilizing material added to soils for years in succession, it was possible to produce increased crops, so long as there was in the soil enough compounds of nitrogen, potassium and phosphorous to be rendered available by the action of the lime. When, therefore, these forms of plant-food were largely removed, there was nothing for the lime to act upon, in order to increase the supply of available food material. The lime furnished no food, but simply helped the crop to use more rapidly the store of plant-food present in the soil.

Direct Fertilizers.—Direct fertilizers contain forms of plant-food, which contribute directly to the growth and substance of plants. Such materials may contain either nitrogen, or potash, or phosphoric acid compounds, or any two, or all three of these forms of plant-food.

Nitrate of soda, known as "Chile saltpeter," is found in large deposits which have been formed in the rainless regions of Chile and Peru. Good commercial nitrate of soda contains from 15½ to 16 per cent. of nitrogen.

Sulphate of ammonia is formed from waste materials produced in the manufacturing of illuminating gas or coke. Sulphate of ammonia contains about 25 per cent. of ammonia, which is equivalent to about 20½ per cent. of nitrogen.

Cotton seed meal is the product formed by removing the oil from cotton seed by pressure, after which the material is dried and ground. Cotton seed meal contains about 7 per cent. of nitrogen, 3 per cent. of phosphoric acid, and 2 per cent. of potash. The hulls of the cotton seed also possess considerable fertilizing value.

Tobacco stems are the refuse from tobacco factories. They contain usually from 5 to 8 per cent. of potash, 2 to 3 per cent. of nitrogen, and a small quantity of phosphoric acid.

Dried blood consists of blood obtained from slaughtering animals; it is prepared for market by evaporating, drying and grinding. The color varies from red to black. Dried blood contains from 10 to 15 per cent. of nitrogen.

Dried fish, scraps and ground fish consist of refuse from fish-oil works and canneries; it is dried and ground for market. Dried ground fish, of good quality, contains from 7 to 8 per cent. of nitrogen together with as much or more insoluble phosphoric acid.

Meat-scraps, tankage, etc., are slaughter house refuse, dried and ground. Good tankage contains 10 per cent. or more of nitrogen and often 10 per cent. or more of insoluble phosphoric acid.

Nitrogenous guanos are formed in dry regions. The Peru-

vian guano was rich in nitrogen, containing 7 per cent. or more. They usually contain 7 to 12 per cent. phosphoric acid and about 1 per cent. potash.

Bones consist mostly of calcium phosphate of lime, which constitutes from one-half to three-fifths of the weight of the bone. The remaining portion is a soft, flesh-like substance commonly called gelatin. It is distributed throughout the entire mass of bone, and is rich in nitrogen. When bones are burned, the nitrogenous matter is driven off and only the mineral portion or phosphate of lime remains. Bones, such as are used in making commercial fertilizers, contain 4 to 5 per cent. of nitrogen, and from 20 to 25 per cent. of phosphoric acid, about two-thirds of which is insoluble and approximately one-third available.

Bone-ash is made simply by burning bones in the open air. The nitrogen is lost in burning, and the chief constituent is insoluble calcium phosphate, equivalent to 30 to 35 or more per cent. of phosphoric acid for the most part insoluble.

Bone-black, known also as bone charcoal, is extensively used in refining sugar. After it has been used several times, portions become useless for refining purposes, and are then sold as a fertilizer. It is made by heating bones in closed vessels; the fat, water and nitrogen are driven off, and the bone-black remaining consists mainly of insoluble calcium phosphate and carbon of charcoal. Good bone-black may contain 30 or more per cent. of phosphoric acid mostly insoluble.

Bone-meal goes under various names, such as ground bone, bone-flour, bone-dust, etc.; raw bone-meal contains the fat naturally present in bones. The presence of the fat is objectionable, because it retards the decomposition of the bone in the soil, while fat itself has no value as plant-food. The presence of easily decaying nitrogen compounds in bone hastens, in the process of decomposition, to dissolve more or less of the insoluble phosphate. Bone-meal should contain from 3 to 5 per cent. of nitrogen, and from 20 to 25 per cent. of phosphoric acid; about one-third to one-fourth of the latter appears to be in readily available conditions. Raw bone-meal generally contains somewhat more nitrogen (1 to 2 per cent.) and rather less phosphoric acid than steamed bone-meal. The fineness of the meal affects its value; the finer the meal the more readily available it is for plant-food.

Phosphoric Guanos or Rock Guanos.—Guanos generally consist chiefly of the dung of sea-fowls, though the term is applied to other animal products. They are generally found in beds resembling earthy deposits. The guanos which are called phosphatic contain little or not nitrogen. Their phosphoric acid is generally in the insoluble form. These guanos come mainly from certain islands in the Pacific Ocean, and from Caribbean Sea and West Indian Islands. The phosphoric

acid in guanos is very variable, ranging from below 15 to over 30 per cent.

Rock phosphates are known under several different names which generally designate the localities from which they come, as South Carolina Rock, Florida Rock, Tennessee Rock, West India Rock, etc. Other forms of mineral phosphates are known under the names of apatite, croporlite, phosphorite, which are found in various places in America and Europe, and some of which are used in making commercial fertilizers. The rock phosphates are extensively used in making acid phosphates. When ground to a very fine flour-like powder, rock phosphates are called "floats." Rock phosphates contain usually from 25 to 30 per cent. of insoluble acid, and some as much as 35 to 40 per cent.

Acid phosphates are known under several different names, such as superphosphates, dissolved bone, dissolved rock, dissolved bone black, etc. Acid phosphates are formed by treating some form of insoluble phosphate of lime, as rock-phosphate, bone, bone-ash, etc., with sulphuric acid. By this treatment there are formed soluble phosphate of lime and gypsum (sulphate of lime) in nearly equal proportions. Superphosphate made from rock phosphates may contain from 12 to 18 per cent. of available phosphoric acid.

Thomas slag, also known under several other names, such as basic iron slag. Thomas scoria, Phosphate slag, etc. It is a by-product formed in the manufacture of iron and steel from certain kinds of iron ore containing phosphorus compounds, It usually contains between 19 and 20 per cent. of total phosphoric acid, with 6 to 7 and more per cent. of available phosphoric acid.

Cotton seed hull ashes were produced in the Southern States of America at the cotton seed-oil factories, where the hulls, after being removed from the cotton seed, were used as fuel. Such ashes contain from 15 to 25 per cent. of potash, in addition from 7 to 10 per cent. of phosphoric acid. This material is not commonly found now.

Kainit is the most common products of German potash mines. It is a mixture of several different compounds, containing 11 to 13 per cent. of actual potash, together with about 35 per cent. of common salt, also magnesia salts.

Muriate of potash, also a product of the Stassfurt mines, is the main source of supply for potash for commercial fertilizers in our market, and contain 50 to 53 per cent. of actual potash.

Sulphate of potash is a product of the German mines. The product found in the market contains from 48 to 51 per cent. of actual potash.

Sulphate of potash-magnesia is known also as double manure salt or low grade sulphate of potash. This material comes from the German mines and contains 26 to 28 per cent. of

actual potash. It also contains 23 to 36 per cent. of sulphate of magnesia.

Carbonate of potash-magnesia contains about 18 per cent. potash and 19 per cent. magnesia, both as carbonates. It is practically free of chloride. It is also a product of the German potash mines.

Wood-ashes contain more or less potash, which is present chiefly in the form of carbonate. The amount of potash in commercial wood-ashes varies from below 4 to 7 per cent., the average being under 5 per cent. Wood-ashes also contain between 1 and 2 per cent. of phosphoric acid.

The following are inferior sources of nitrogen. They are very slowly available, and should be used only where immediate effects are not sought. In some states the fertilizer laws either prohibit the use of these substances in fertilizers or demand that these goods shall be specified when used in making mixtures.

Hair is obtained from slaughter houses; it is often mixed with dried blood and other forms of animal matter. It contains about 15 per cent. of nitrogen.

Hoof-meal and bone dust are by-products containing 10 to 15 per cent. nitrogen and about 2 per cent. phosphoric acid. They are sometimes treated with superheated steam or with sulphuric acid, the treatment rending the nitrogen compounds more readily available.

Leather scraps and leather-meal are waste products of various factories. When treated with superheated steam and dried or roasted, they can be finely ground. They contain 7 to 8 per cent. nitrogen.

Farm-produced Fertilizing Materials.—Stable or farm-yard manure consists of the soil and liquid excrements of animals fed on the farm, mixed with straw and wasted products of the farm.

Horse manure is difficult to mix thoroughly with litter on account of its being very dry. It is called a "hot" manure, because, on account of its loose texture, it easily undergoes decomposition or fermentation, producing a high degree of heat. On this account it is very liable to lose more or less of its nitrogen in the form of ammonia.

Sheep and goat manure is quite dry, and is commonly the riches of farm-produced manures. Like horse manure, it undergoes fermentation easily and is classed as a "hot" manure. It is similarly very liable to lose ammonia.

Pig manure varies greatly in composition, but is generally rich as compared with other farm-produced fertilizer materials, and contains considerable water. In decomposing, it produces but little heat, and is, therefore, called a "cold" manure.

Cow manure contains, as a rule, less fertilizing materials

than any of the producing manures. It contains a large amount of water, and, in decomposing, generates little heat.

Poultry manure contains a comparatively large amount of all the different forms of plant-food, being especially rich in nitrogen and potash. It undergoes fermentation readily, and loses nitrogen unless properly treated with absorbents or preservatives.

Generally speaking, manures produced from working or fattening animals contain 90 to 95 per cent. of the fertilizing constituents contained in the food. In the case of animals which are neither increasing in weight, nor giving milk, the amount of fertilizing materials in the manure will be nearly equal to that contained in the food eaten. The foregoing statements pre-suppose that all the dung and urine are saved, a supposition that is not often true, considering the manner in which stable manure is commonly treated.

Perhaps the elements of manures least understood is the humick matter, of which ordinary manures contain from 16 to 20 per cent. The litter used in bedding stock furnishes much of this, and the quantity depends upon the nature of the material used.—Journal of the Jamaica Agricultural Society.

VALUE OF THE PHILIPPINES.

An Address by Senator Beveridge of Indiana.

"Mr. President, the times call for candor. The Philippines are ours forever, "territory belong to the United States,' as the Constitution calls them. And just beyond the Philippines are China's illimitable markets. We will not retreat from either.

"China's trade is the mightiest commercial fact in our future. Her foreign commerce was $285,738,300 in 1897, of which we, her neighbor, had less than 15 per cent. of which only a little more than half was merchandise sold to China by us. We ought to have 50 per cent. and we will. And China's foreign commerce is only beginning.

"The Philippines command the commercial situation of the entire East. Can America best trade with China from San Francisco or New York? From San Francisco, of course. But if San Francisco were closer to China than New York is to Pittsburg, what then? And Manila is nearer Hongkong than Havana is to Washington. And yet American statesmen plan to surrender this commercial throne of the Orient where Providence and our soldiers' lives have placed us. When history comes to write the story of that suggested treason to American supremacy and therefore to the spread of American civilization, let her in mercy write that those who so proposed were merely blind and nothing more.

"But if they did not command China, India, the Orient, the whole of the Pacific for purposes of offence, defence and trade, the Philippines are so valuable in themselves that we should hold them. I have cruised more than 2,000 miles through the Archipelago, every moment a surprise at its loveliness and wealth. I have ridden hundreds of miles on the islands, every foot of the way a revelation of vegetable and mineral riches. No land in America surpasses in fertility the plains and valleys of Luzon. Rice and coffee, sugar and cocoanuts, hemp and tobacco, and many products of the temperate as well as tropic zone grow in various sections of the archipelago. I have seen hundreds of bushels of Indian corn lying in a road fringed with banana trees. The forests of Negros, Mindanao, Mindora, Puauan and parts of Luzon are invaluable and intact. The wood of the Philippines can supply the furniture of the world for a century to come. At Cebu, Rev. Father Julio Segrera told me that forty miles of Cebu's mountain chain are practically mountains of coal. Pablo Majla, one of the most reliable men on the islands, confirmed the statement. Some declare that the coal is only lignite, but ship cantains who have used it told me it is better steamer fuel than the best coal of Japan. I have a nugget of pure gold picked up in its present form on the banks of a Philippine creek. I have gold dust washed out by crude processes of careless natives from the sands of a Philippine stream. Both indicate great deposits at the source from which they come. In one of the islands great deposits of copper exist untouched. The mineral wealth of this empire of the ocean will one day surprise the world. I base this statement partly on personal observation, but chiefly on the testimony of foreign merchants in the Philippines who have practically investigated the subject and upon the unanimous opinion of natives and priests. And the mineral wealth is but a small fraction of the agricultural wealth of these islands.

"And the wood, hemp, copra, and other products of the Philippines supply what we need and cannot ourselves produce. And the markets they themselves afford will be immense. Spain's export and import trade with the islands undeveloped, was $12,175,549 annually. Our trade with the islands developed will be $125,000,000 annually; for who believes that we cannot do ten times as well as Spain? Consider their imperial dimensions. Luzon is larger and richer than New York, Pennsylvania, Illinois or Ohio. Mindanao is larger and richer than all New England. Manila, as a port of call and exchange, will in the time of men now living, far surpass Liverpool. Behold the exhaustless markets they command. It is as if a half dozen of our states were set down between "Oceania" and the "Orient," and those states themselves undeveloped and unspoiled of their primitive wealth and resources. Nothing is so natural as trade with one's

neighbors; the Philippines make us the nearest neighbors of all the East. Nothing is more natural than to trade with those you know. This is the philosophy of all advertising. The Philippines bring us permanently face to face with the most sought customers of the world. National prestige, national propinquity, these and commercial activity are the elements of commercial success. The Philippines give the first; the character of the American people suplies the last. It is a providential conjunction of all the elements of trade, of duty and of power. If we are willing to go to war rather than let England have a few feet of frozen Alaska, which affords no market and commands none, what should we not do rather than let England, Germany, Russia or Japan have all the Philippines? And no man on the spot can fail to see that this would be their fate if we retired.

"The climate is the best tropic climate in the world. This is the belief of those who have lived in many tropic countries, with scores of whom I have talked on this point. My own experience with tropical conditions has not been exhaustive; yet speaking from that experience, I testify that the climate of Iloilo, Sulu, Cebu and even of Manila, greatly surpass that of Hongkong."

"Here, then, Senators, is the situation. Two years ago there was no land in all the world which we could occupy for any purpose. Our commerce was daily turning toward the Orient, and geography and trade developments made necessary our commercial empire over the Pacific. And in that ocean we had no commercial, naval or military base. Today we have one of the three great ocean possessions of the globe, located at the most commanding commercial, naval and military point in the eastern seas, within hail of India, shoulder with China, richer in its own resources than any equal body of land on the entire globe, and peopled by a race which civilization demands shall be improved. Shall we abandon it? That man little knows the common people of the Republic, little understands the instincts of our race, who thinks we will not hold it fast, and hold it forever, administering just government by simplest methods.

"Mr. President and Senators, adopt the resolution offered that peace may quickly come and that we may begin our civilizing, saving, regenerating and uplifting work. Adopt it and this bloodshed will cease when these deluded children of our islands learn that this is the final action of the representatives of the American people in Congress assembled. Reject it, and the world, history and the American people will look where to forever fix the awful responsibility for the consequences that will surely follow such failure to do our manifest duty. How dare we delay when soldiers' blood is flowing."

KEW'S FAMOUS GARDENS.

It is almost impossible to imagine a pleasanter retreat on a hot summer day than the Botanic Gardens at Kew, London. From the time that Sir William Hooker became Curator of the Gardens they have flourished exceedingly. Sir William, who died in 1865, was succeeded by his son, Sir Joseph Hooker; the present Director is Mr. Thiselton-Dyer, C. M. G., F. R. S.

There is nothing quite like Kew in all the wide world. It forms the botanical centre of the British Empire with its fifty or sixty Governments. There is only one British Empire, and there is only one such institution as Kew Gardens—nothing quite like it anywhere It is not merely that the Gardens are very large and exceedingly beautiful, though in both these respects Englishmen may well be proud of them. They have a total area of nearly 250 acres, a staff of nearly 200 hands—to say nothing of a good many first-rate hands among them —somewhere about three or four acres of glass, and to keep it all going involves a yearly outlay of £20,000. That which meets the eye or comes within the ken of the ordinary visitor to the Gardens is only a part, and by no means the most important part, of the establishment.

It is a huge Botanical Clearing House, centre of exchange, a wealthy and munificent nursing mother for all the minor establishments of the kind throughout the British Empire; it is a depot to which they can confidently apply whenever they want instructions, or plants, or seeds; it is a fountain head of information for anybody who needs it; and though, naturally enough, Kew gives the first place in its consideration to the British possessions, it is on terms of friendly open-handed intercourse with all the world, freely exchanging its treasures with any public garden anywhere under the broad canopy of heaven.

In the sanctum of the Director there are cup-boards full of correspondence in all sorts of languages, and from all parts of the world. Ceylon, it may be finds its coffee plantations being ravaged by disease, submits a specimen of the mischief going on to the experts of the physiological laboratory here, and asks for advice. A merchant in the city has received from some odd corner of the earth samples of an unfamiliar fibrous plant, or one which it is believed may yield a new vegetable dye. He can go to Kew and learn all about it—what the plant is, where it grows, and whether it has already been utilized, and with what results. India some years ago had no cinchona tree from which to extract the invaluable quinine. Kew suggested that it might very well be grown there, and sent out a stock of plants, and now India yields enormous quantities of quinine. The same has been done for other British

dependencies, and quinine, which at one time fetched sixteen shillings an ounce, sells now for four or five.

It is always spring and it is always summer and autumn in one part of the world or another, and all the year round there keep coming into this great central depot parcels of seeds and growing plants cunningly packed in Wardian cases, many of the most dainty and delicate of the denizens of earth's fairest regions turning out on the tables here perfectly fresh and flourishing after travelling perhaps many thousands of miles from the other side of the world. The invention of the Wardian case—an invention only about fifty years old—has greatly facilitated the transmission of growing plants between England and the Colonies, and helped to disseminate fruits and flowers and "economic" plants generally throughout the world. The young nurslings are enclosed in a box, well watered, and tightly shut down under glass, and many of them will thrive better in this limited space than they are found to do afterwards in the magnificent great glasshouses of Kew Gardens.

Plants, by the way, do not always take kindly to these great conservatories. They sicken and pine, and it is found necessary to maintain at Kew a small cosy structure, familiarly known in the Gardens as "the hospital." In the great houses it is extremely difficult to maintain the atmosphere at an equable and genial temperature. The plants suffer from the inrush of cold winds through the opened doors, and from the impact of the heated air on the under side of their leaves, but perhaps some day the prisoners in the glass-houses at Kew may have their homes warmed in the manner adopted for sick prisoners at Wormwood Scrubbs, where the cells are heated by hot air carried in at the top and sucked out at the bottom. This would warm the upper sides of their foliage just as the sun does, and no doubt be better for them. As it is, the more delicate plants frequently have to go into hospital, or they would die, as indeed many of them do outright.

At the south end of the Gardens is the Great Palm House, which was built in 1845, at a cost of £33,000. It is 362 feet long, 100 feet broad and 66 feet high, and contains nearly an acre of glass. Inside it is easy to imagine oneself in a tropical forest. Palms, tree-ferns, and others of like kind flourish here; and the visitor may note the date-palm, the betel-nut, the cocoanut, the upas-tree, the bamboo, the cotton-plant, the coffee-shrub, the tamarind and the clove. East of the Palm House is the lake, and westward stretches an avenue through the Arboretum nearly three-quarters of a mile long. This is known as Syon Vista, the Duke of Northumberland's estate being within view on the opposite bank of the Thames.

The famous Rhododendron walk, which is one of the chief sights at Kew, runs parallel with the Thames, and is situated

near the northwest corner of the Arboretum. The variety of colour here displayed—seen at its best, perhaps, in June—is to those only acquainted with the somewhat stunted shrubs common in private gardens, a revelation of unexpected beauty. In its way, the Rhododendron Walk is as famous as is the avenue of horse-chestnuts in Bushey Park, though it has not attained the dignity of being identified with any particular Sunday. The Arboretum used to be separated from the Botanic Gardens proper by a wire fence; and until a few years ago, to the unscientific male visitor, the chief distinction lay in the fact that in the former smoking was permitted, where as in the Gardens it was prohibited.

The "Arboretum"—the original Royal Pleasure Grounds—is a kind of nursery in itself. Here for the past two centuries, experiments have been made in the acclimatisation of trees and shrubs from various foreign countries, and all our parks and public gardens have been enriched and beautified by the additions that this portion of Kew Gardens has made to our botanical wealth. At one extremity of the Arboretum there is a considerable plot of ground parcelled out in squares snugly shut in by thick hedges of privet and holly. Here are nourished thousands of young foreigners, by-and-by to be planted out in the open grounds, but, at present, too delicate to stand our biting winds. Near this nursery are the filter beds, by which all the water supplied to Kew Gardens is filtered. It is drawn in from the Thames to the great lake in the Arboretum, pumped up into the filter beds, then forced up into tanks in Richmond Park, and thence supplied to Kew by gravitation.

To distinguish it from others, the Museum at Kew Gardens is known as museum No. 1, consisting of three floors and Italian in style, the building faces the Palm House, the large and picturesque lake lying between the two structures. The Museum was begun in the early fifties, and it was extended in 1881, so crowded had it become with the vegetable economic products and preparations of scientific interest sent for exhibition within its walls. Foods, drugs, fibres, timber, are among the varied and carefully classified specimens, and in some cases the processes of manufacture are illustrated. It has been well said that the aim of the authorities is to explain in this Museum everything of interest to botanists, which the plants, while alive, cannot set forth.

So many are the attractions of these beautiful Gardens that it is difficult to select any particular house for special notice. Popular favor has indicated the Water-lily House as certainly one of the most interesting. It is situated near the large Palm House already referred to, by the pond at the south end of the Gardens. The tank is 36 feet in diameter, and contains many rare varieties of water-lilies. From the center rises a

fine Papyrus plant. In addition to the numerous lilies, the Sacred Bean of Egypt, the Telegraph Plant of India, the Sensitive Plant, and other curiosities, are to be found in the house, which is well calculated to arouse the interest of even the most ignorant visitor. The famous Victoria Regia Water-lily, of which so much is heard, grows in another building.—Cassel's New Penny Magazine.

THE CANE MOTH BORER.

By H. Maxwell Lefroy, Barbadoes.

For the last 100 years and more, Sugar Cane has been attacked in the West Indies and elsewhere by Moth borer. It has been present in this Island for many years and as recently as 1894 a Commission sat on this question in Barbadoes. At this time Moth borer is undoubtedly very plantiful, and I wish today to point out the remedies, whose adoption generally would, I think, considerably reduce the damage caused by this insect. You are familiar with the results of this insect's work in the shape of "Deadheart Canes" and also mature canes so riddled with Moth borer that they are not worth grinding. Besides the direct harm, Moth borer aids the "Rind fungus." The Commission of 1894 states clearly, that up to December, Rind fungus only gets into such canes as are eaten by Moth borer. The conclusion seems inevitable that so long as few measures are taken, you must be content to lose quite 20 per cent. of your sugar. Yet the remedies for this insect are so simple, that I wonder that such an enemy is allowed to play havoc in cane fields.

There are four stages of Moth borer. The egg, caterpillar or "worm," the chrysalis, the full grown moth; the caterpillar does the harm, the chrysalis is a resting stage, and the moth is solely for egg laying. Eggs are laid on the leaf, often about half way from the tip, just where the leaf bends over. These eggs are round and are laid in patches, one egg overlapping another like the tiles on a roof. The number of eggs in one egg patch is variable, as few as 6, and as many as 57 having been found. Taking the average of 80 lots, the number is found to be 20. When first laid they are creamy white; they become orange in a few days, and before hatching are a deep orange-brown, with a black spot.

In 6 days from the time of laying, out come the caterpillars. They are small, moist creatures and require shelter. They walk down the leaf, and may go into the substance of the leaf if they want food; when they arrive at the spot where the leaf joins the stem, they go in, either between the sheaths of the leaves, or into the substance of the leaf-sheath. For 10 days or more they stay in the outer part. Then they go

straight in and eat out the heart. As a result the cane dies. For over a month, (33-35 days) the caterpillar eats, then it changes to the chrysalis, which is a resting stage; this stage lasts 7 days and then out comes the month; the caterpillar takes care to make a hole in the cane for the month to get out at; so the chrysalis as well as the caterpillar can be found in the cane.

The moths live for two nights only; they fly at night and lay eggs; their eggs number at least 150; that is to say, one moth will lay at least 150 eggs, and then it dies. The whole time then from the laying of the eggs to the end of the moth's life is:

Egg	6 days.	One the Leaf.	
Caterpillar	35 days.	(at most)	in the Cane.
Chrysalis	7 days.		
Moth	2 days.	Flying about.	
Total	50		

Now knowing this it is possible to suggest a remedy. The remedy is so obvious and so simple that no one thought of suggesting it. What is the most unprotected stage of this insect? The eggs; there the eggs are, laid before your eyes, on the leaves of the cane. Collect them and burn them. Send boys around with knives to look for these egg patches. Let them cut off the leaf with the eggs on, and bring in all they get. Pay them at so much per 100 patches of eggs; as a reasonable price to begin on, I suggest 8 cents per 100 lots of eggs. Through the kindness of J. R. Bovell, Esq., I can show you some figures. A boy at Dodds was sent to collect eggs. In one day he examined 2,900 holes and got 240 lots of eggs. Those eggs had been laid within 10 days; this shows how numerous is the pest, and how easily he can be fought. If a boy in one day can get 240 patches of eggs, undoubtedly the work of such boys will be of great value and must tend to enormously decrease the number of moth borers.

This remedy is only available for young canes; it must be applied at once then. Other remedies include two good ones: First the use of lights; hang out lanters over a pan of kerosene or molasses. The moths see the lights and instead of laying eggs, come to it and are caught in the molasses. A box of this kind costs 4s., the lantern costs 5s. The best lantern, of three which I carefully tested, was the Dietz lantern. Put the lights to leeward of the patches of nearly ripe cane.

Secondly. Cut out dead hearts. In cutting out dead hearts it is essential to begin early enough. I find that dead hearts are now being cut out or will be cut out in May or June. The object of cutting them out is to destroy the caterpillar of the moth borer; but this will, in 7 weeks from the time of egg-

laying, have turned into the moth, which will fly about and lay eggs. Then dead hearts must be cut out before this can happen. Cutting out must begin in February to be of any use, and the shoots cut out must be cut out quite low down below the surface of the ground. If it is remembered that the sole object of cutting out dead hearts is to destroy the caterpillar or chrysalis of the moth borer before it can turn to the moth, you will see the necessity of cutting out soon, cutting out low down, and killing the worm or chrysalis in the dead heart you cut out.

I am convinced, as the result of visit to different estates, that the amount of damage done by this insect is underrated; and I am positively certain that if the eggs were regularly collected and destroyed, the pest, in one season, would be greatly diminished, and, in a few, would be of no practical importance; there would be less fungus, and no unsound canes or dead hearts. If every one in the island was bent on this, the prosperity of the island would be greater, and the sugar that now goes to support millions of hungry moth borer caterpillars, would be found, where it should be, in the boiling house.—Barbadoes Ag. Gaz.

CRISIS IN THE SUGAR INDUSTRY IN RUSSIA.

It is said that the sugar manufacturers are expecting the total destruction of their industry. Several large factories have already suspended payment, and probably further large failures will follow. Those engaged in the sugar industry have therefore decided to ask the Government to strengthen the working capital by a loan of 10,000,000 to 15,000,000 roubles. According to these symptoms the sugar industry must indeed be in a very critical position, and precisely for that reason there can be little hope of a loan from Government.* The ten to fifteen million roubles could only temporarily stave off liquidation. Money is really of no avail in this case, for the fundamental principle of the industry is rotten; the only effectual means would be a complete reorganization. The "Normirung" of sugar (i. e., the regulation of the sale and export within annually fixed limits), which was introduced by the Russian Minister of Finance, and was intended to secure the existence of the sugar factories, is a failure and ought not to be allowed to continue, at any rate in its present form. The immediate consequence of the "Normirung," as the facilities for the disposal of the article seemed so favorable, was that new factories sprung up like mushrooms. In their greed for profit, the manufacturers threw all care to the winds, and prices of sugar went

*Since the above was written the Minister of Finance has declined the request.

up so swiftly and immediately that the Minister of Finance was obliged to threaten to reduce the customs duty on foreign sugar. The amount of the production naturally rapidly increased, while the normal figure for the inland requirements of the empire only slowly increased. There remained no other outlet for the "surplus" sugar than the foreign markets. In 1897-98 the production was 40,000,000 poods, of which the home market absorbed 31,000,000 poods, leaving 9,000,000 poods to be exported. In 1899-1900 the production may be estimated at 55,000,000 poods, while, according to the figure established, only 35,000,000 poods are allowed for consumption, so there remains 20,000,000 poods* to be exported. These so many million poods exported mean, however, a dead loss to the manufacturers, because prices abroad are so low that they do not cover the cost of production. In England, to which the Russian sugar principally goes, the pood fetches 2r. 25 kop., whilst here the average cost of production amounts to 3r. 50kop. per pood. Without the excise duty the pood of sugar costs 4r. 25kop., and when brought on the market, 6r. Every pood of sugar sold abroad thus brings the manufacturer a loss of 1r. 25 kop. The manufacturers had raised the prices as much as possible, so as to cover by the inland sales the losses incurred in the foreign markets. When, therefore, the Minister of Finance lately reduced the limits of prices for sugar, and the losses incurred through over-production were continually increasing, a crisis was inevitable. The conclusion to be drawn from the present state of affairs is that the more the sugar industry is surrounded by protective regulations the greater will the overproduction become. The conditions of competition, artificially supplied by the "Normirung," render nugatory all its good intentions. The endeavor must now be to bring about again an equilibrium between production and demand, which is probably not to be effected in any other natural way than by the disappearance of a portion of the factories called into existence by greed of gain.—Petersburger Herald.

The quantity of sugar in beet ran originally from five per cent. to seven per cent. Man, by his intelligence, ingenuity and enterprise, has made it to reach in some cases as high as 21 per cent. or even more, that is to say, he has at least doubled it. There must, of course, be a limit to what man can accomplish in the improving of plants, but we do not think the limit has been reached with cane, and if an equal amount of intelligence, ingenuity and enterprise, as the growers of beet have applied, were brought to bear on the still further increasing of saccharine matter in sugar cane, the returns from the sugar cane estates might be very largely increased with no increase of acreage or field labor.

*About 327,500 metric tons.