CONTENTS.

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SUGAR PRICES FOR MONTH ENDING JANUARY 10, 1908.

			Centrifugals.	Beets.
December	13,	1907.....	3.85¢	9s 8¼d
"	20,	"	3.85¢	9s 9d
"	27,	"	3.85¢	9s 11¼d
"	28,	"	3.94¢	9s 11¼d
January	3,	1908.....	3.92¢	10s
"	10,	"	3.90¢	9s 10½d.

Willett & Gray in their *Weekly Statistical* of December 19, state:

The features to be noted for the week are continued improvement in the financial conditions, although not as rapid as had been anticipated; the beginning of the Cuba crop and rapid manufacture of sugar in Porto Rico, the reduced estimates of the European beet crop and the general improvement in sugar conditions and prices throughout the world.

First sales of new crop Cuba centrifugals were made to the extent of some 250,000 bags for January shipment at 2½c. per lb. c. & f., 96° test basis, equal to 3.86c. per lb. duty paid.

Sales of Porto Rico new crop Centrifugals were made for about 1,200 tons for December shipment at 3.85c. per lb., 96° test.

The crop season began in Cuba December 12th, with four centrals grinding, since increased to seven.

Last season the beginning was on November 20, with 1 central working.

In another place we give the details of the reduced estimate of the European beet crop by countries.

The reduction, being less than expected, caused a reaction to 9s. 7½d. in beet quotations, but was followed by a recovering market, the close being firm at 9s. 8¼d.

New Orleans continues selling domestic cane at 3⅝c., 96° basis. The crop, as noted elsewhere, shows no positive signs of diminution from first estimates.

At the close, after a very good business, the market is quiet and steady, with prices full up for early January shipment, but just a little uncertain for later shipments.

Russia offers a good deal of speculative interest just now as to its influence on the markets of the future. What is done already is suggestive of what may be done in the following campaign.

Great Britain, by its action in Brussels Convention, is become again the dumping ground of all the surplus sugars of the world, and Russia is quick to take advantage of the same. Although Russian sugar cannot enter Britain until after September 1, 1908, yet London buyers have already accumulated supplies of same for delivery at shipping ports in time to arrive on September 2, 1908, thereby influencing at once the marketing of the beet crops which begin in September-October, 1908.

Although but 300,000 tons Russian sugar exports are to be allowed, and of this amount a considerable amount should go to outside territory, leaving, as some estimate, but about 160,000 to 200,000 to go to United Kingdom per annum, still Russia shows such strong desire to sell ahead that the effect of Russian shipments to the United Kingdom are already estimated as equal to 6d. decline in nominal quotations for some months preceding September, 1908.

This seems to be about as close an estimate of the effect of Russia joining the convention as can be made at this time.

Of course Russian sugar cannot come into the United States, because of our countervailing duties against bounty-fed sugars.

EUROPEAN BEET CROP.

Mr. F. O. Licht cables us specially from Magdeburg, December 13, 1907: "Estimate Germany 2,135,000 tons, against previous estimate of 2,225,000 tons, which shows a decrease of 90,000 tons."

"No change in weather conditions."

December 17, 1907: "Estimate the beet crop of all Europe 6,575,000 tons sugar." (The outurn last year was 6,717,000 tons.—W. & G.)

December 18, 1907.—In reply to our enquiry, Mr. F. O. Licht has cabled us the following details of recent estimates by counries:

	Estimate Nov. 15th., Tons.	Estimates Dec. 13 and 17. Tons.
Germany	2,225,000	2,135,000
Austria	1,400,000	1,460,000
France	775,000	725,000

	Estimate Nov. 15th. Tons.	Estimates Dec. 13 and 17. Tons.
Belgium	250,000	235,000
Russia	1,380,000	1,410,000
Holland	175,000	175,000
Other Countries	430,000	435,000
Total	6,635,000	6,575,000

PHILIPPINE ISLANDS.

Two commissioners are leaving Manila for Washington, D. C., to assist in obtaining tariff concessions at the present session of Congress. Reciprocity with Japan is the best solution of this problem. Japan and China can take care of all the sugar likely to be raised in the Philippines.

Czarnikow, Macdougall & Co., under date of December 20, report:

The sales of new crop Cubas referred to in our last report have been confirmed, and a considerable amount of additional business has been done this week. Actual figures are not obtainable, but it is estimated that the total sales of new crop sugars for January shipment will aggregate 50,000 tons, all of 2½c. c. & f., basis 96°.

Last season the Cuban campaign opened in October, with sales of new crop for January shipment at 2⅜c. This was followed in late November by sales of sugar for December shipment at 2 7-16c. c. & f. By 4th December the market had advanced to 2½c. c. & f. for December, while January shipment was sold at 2 7-16c. c. & f., February at 2⅜c. c. & f., and March at 2 5-16c. c. & f.

As will be seen from the following table, grinding this season is considerably behind what it has been at this date in recent years: Centrals Ginding.

	1907.	1906.	1905.	1904.	1903.
November 29.....	None	2	None	3	None
December 6.....	None	18	None	17	5
" 13.....	None	58	6	45	18
" 20.....	7	91	26	76	37

We have a cable this morning stating that 13 estates are now at work.

European Beet markets have been variable. After declining 1½d. for December and January deliveries, and 1d. for later months, they have more than recovered the decline. Today's f. o. b. quotations are: December, 9s. 9d.; January, 9s. 9¾d.; May, 10s. 2d.; August, 10s. 3¾d.

Mr. F. O. Licht has given out new crop figures, in which he estimates Convention countries at 4,730,000 tons, and all Europe

at 6,575,000 tons. As compared with his November estimate, these figures show 95,000 tons less for Convention countries and 60,000 tons less for all Europe. The Factories' estimate, issued this week, gives 4,585,000 tons for Convention countries and 6,150,000 tons for all Europe.

The terms of the proposed Convention with Russia are that in addition to her usual exports to Finland and by land to Northern Persia, Asiatic Turkey, etc., she may export to countries where Convention sugars compete, a maximum quantity of 300,000 tons up to August, 1909; also, a yearly maximum of 200,000 tons in the four subsequent years. This would give a total in six years of 1,100,000 tons, but the total for the entire period must not be over 1,000,000 tons.

It is reported from Sanitago, Chili, that the Chilian Congress has reduced the Import tax on all kinds of sugar by 50 per cent. This represents a reduction of nearly ½c. per pound on raw sugar (present rate is .9274c. per pound) and should cheapen the refined commodity to consumers and thereby increase the demand. As Chilian refiners draw largely on Peru for sugars, the chances are that there will now be less Peruvian sugar available for export to the United States and Great Britain.

Java exports from May 1st till November 30th amount to 840,000 tons, against 681,985 tons in 1906 and 786,797 tons in 1905. Of this the Atlantic ports have received 244,000 tons and New Orleans 12,500 tons. One or two additional cargoes may come this way unless United Kingdom should prove a more attractive market. In January and March 10,857 tons of the previous crop were received at the Atlantic ports. This makes the total receipts for the year from Java 267,357 tons.

The receipts for the week at the three Atlantic ports were 15,988 tons, made up as follows:

	Tons.
Cuba	2,234
Porto Rico	....
Other W. I.	458
Brazil	....
Hawaiian Islands	5,677
Philippines	....
Java	5,210
Various	2,409

PHILIPPINES.

Reports from Washington state that Mr. Taft will endeavor to get Congress to pass a law reducing or abolishing the duties on a limited quantity of sugar and tobacco when imported into the United States, the stated object being to give the islands a better power of bargaining with the Chinese and other customers through having an alternative market here. As regards sugar,

it is doubtful if the interests that would be affected will withhold their opposition because of the fact that the proposal applies only to a limited quantity. The special interests that might see danger in this entering wedge are the Louisiana planters, the domestic Beet growers and the sugar producers in the Hawaiian Islands and Porto Rico, representing in the aggregate a total production of 1,400,000 tons non-dutiable sugar.

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*SUGAR MARKET, 1907.**

The year opened quietly with spot market at 3.56c., basis 96°, and Cubas for January-February shipment selling at 2.19c. c. f. These prices made non-privileged sugars worth no more than 1.86c. c. i. f. and led to sales of San Domingos for transhipment from New York to United Kingdom. Even these prices did not hold, for, under pressure of increasing offerings, Cubas sold at 2.12c. c. f. for February shipment and Porto Ricos at 3.48c. c. i. f. Louisiana closed a disastrous campaign in which the average yield was much below that of the previous season, and New Orleans consequently reappeared in the market for foreign sugars and made moderate purchases of Cubas at 2.15c. c. f. The month had opened with 122 Centrals at work in Cuba, but by 29th January 179 Centrals were grinding and receipts of new crop at the chief shipping ports had reached 254,000 tons. The accepted estimates of the Cuban crop were at this time 1,300,000 to 1,400,000 tons. The storing of a cargo of Javas, 4,800 tons, and of 700 tons Cubas showed that importers regarded existing prices as abnormally low and due to temporary excess of supplies from Cuba.

In February, the market became still worse and some sellers who had the temerity to ship a cargo of Cubas, without previously placing it, found that, once afloat, the best obtainable was 2.06c. c. f. and their acceptance of this reduced the market to that level. Considerable quantities of Cubas for both February and March shipment were sold on this basis, and Porto Ricos for shipment were sold as low as 3.38c. c. i. f., basis 96°. During the depression some Cubas sold at 2.03c. c. f. These low prices provoked resistance on the part of Cuban sellers and their attitude forced buyers to pay 2.12c. c. f., basis 96°, at which (on 28th February) they bought large quantities for second half March shipment. This was the turning point of the market. Considerable purchases of Cubas and Porto Ricos were made for European as well as local account prior to the advance, and these transactions helped the recovery.

* Czarnikow, Macdougall & Co.'s Circular of December 27, 1907.

The improvement which started in the last days of February made further progress in March, and in the first week of that month there were large transactions in Cubas, first at 2.18c. c. f., basis 96°, and later at 2.25c. c. f. This was followed by a lull, during which, under pressure from belated sellers, prices reacted to 2.15c. c. f., but this was only temporary, and before the close of the month there were large transactions for April shipment at 2.25c. c. f., and May shipment sold at 2.28c. c. f. Reports from Cuba spoke of poor juice, and this led to less sanguine crop estimates, and although refiners were having very heavy direct receipts they began providing for future wants by accumulating stocks. By the end of March the Cuban production stood at 1,017,000 tons. On the 5th March the Canadian tariff was passed. It reduced the duty on B. W. I. sugars, basis 96°, from .550c. per lb. to .525c. per lb., while retaining the duty on non-preferential sugars at .835c. per lb., the effect being to make the preference to B. W. I. sugar .310c. per lb. instead of .285c. per lb. as formerly.

By the first week in April some Cuban Centrals had finished grinding, and by the end of the month the number at work had fallen from 186 to 82. The market advanced as production declined, and the month saw business done in Cubas for shipment at 2.46c. c. f., basis 96°, and in spot Centrifugals at 3.76c. landed. Messrs. Guma-Mejer gave out an estimate of 1,350,000 tons for the Cuban crop. Preliminary estimates of Beet sowings were issued by Mr. F. O. Licht, indicating an increase of 2½ per cent. for all Europe. A record week's receipts of 76,891 tons occurred this month at the Atlantic ports.

At the beginning of May it was estimated that the melting requirements of the Atlantic ports from May to December, inclusive, would be 1,500,000 tons, and that 300,000 to 400,000 tons sugar would require to be drawn from Java and or Europe. About the middle of the month our principal buyer began making purchases of new crop Javas for June-July shipment. A strike of New York longshoremen, at a time of heavy receipts, proved a serious drawback to the market, refiners refusing to buy because they could not take care of the sugars they already owned. By the end of the month, the number of Centrals at work in Cuba had diminished to 10 as against 97 at the same time a year ago, and Cubas for shipment had advanced to 2.56c. c. f., basis 96°, and spot Centrifugals to 3.92c. landed. Unfortunately, a prolonged and general spell of unseasonably cold weather checked the demand for refined, and cast a wet blanket over the raw market.

The first fortnight in June brought a continuance of heavy receipts, chiefly to New York, where the effect of the strike was yet being felt. Unseasonable weather and poor demand for refined still prevailed, and made refiners restrict their meltings. Cuban crop estimates were increased to 1,425,000 tons. This combination of adverse conditions caused the market to react to

where it had been two months earlier, and brought both Cubas for shipment and spot sugars .21c. below the highest price in May, although international markets had only declined .06c. in the same time. This latter decline was probably due to the disturbing influence in Europe of the announcement by the British Government that it would withdraw from the Brussels Convention in September, 1908, unless the requirement were waived that it should penalize bounty-fed sugar. Towards the end of the month prices here recovered most of the earlier loss.

July opened with slightly easier markets both here and in Europe, the decline being .031c. per lb. and 3d. per cwt., respectively. Early in the month considerable purchases of Javas were made by refiners at 10s. c. f. for August-September shipment. Towards the end of the month the market improved under the influence of unfavorable weather reports from Europe and diminishing stocks here. A large business was done in Cubas for shipment at .06c. advance, and Porto Ricos in store were sold at 3.94c.

August began with reports that the weather conditions in Europe in July had unfavorably affected roots and had made the Beet crop a fortnight late. The Cuban position was considered strong, it being estimated that not more than 80,000 tons, available for export, remained unsold. Rains continued to be very much wanted in the island. Towards the middle of the month financial disturbance both here and in Europe exerted an unfavorable influence. In the United States the unusual prevalence of unseasonable weather, during the summer, had made all fruits scarce and costly, and had lessened their use for domestic as well as commercial canning. Refiners were finding the demand for their product far short of what it should be in August, and the market for raws became lifeless. Cubas, instead of advancing, declined .06c. On 20th spot sales were made at 3.89c., basis 96°. Europe reported unfavorable weather and before the close of the month Beets had advanced 3¾d., but the only change here was an advance .03c. on spot sugars which sold at 3.92c. The Brussels International Convention agreed to extend for another five years the five years' agreement which came into effect on 1st September, 1903.

September opened with higher markets in Europe, but United States markets made little response. Porto Ricos for shipment were sold at 3.95c. c. i. f. By the end of the month a desire to realize became apparent and 3.95c. was accepted for some stored sugars previously held for 4c.

October began with markets flat both here and in Europe. Final figures of the 1906-07 Cuban crop showed that 186 Centrals had produced 1,427,673 tons sugar as against 1,178,749 tons in the preceding campaign. Phenomenal autumn weather in Europe proved to have been very beneficial to the Beet crop and that market declined 4½d. per cwt. Mr. F. O. Licht issued a crop estimate of 4,850,000 tons for convention countries and of 6,580,000

tons for all Europe. Very serious financial embarrassments arose in New York greatly to the detriment of all business. Cubas in store here were sold at 3.90c., basis 96°.

November opened with a dull and lifeless market. The western Beet factories were in full operation and the Louisiana cane crop had begun. Louisiana 96° Centrifugals, which had sold on 1st at 3.69c. were selling on 21st at 3.25c., the decline being accentuated by monetary troubles. On 27th Cubas in store here were sold at 3.62c. New York refiners bought 50,000 tons Louisiana sugars to fill the gap in supplies pending the receipt of new crop Cubas, and by the end of the month the New Orleans market had recovered to 3.37c. for refining grades, basis 96°.

On 4th December the market was shocked by the regrettable news of the death of Mr. H. O. Havemeyer, who for more than a generation, has been the most notable figure in the sugar business of the United States. Old crop Cubas were sold at 2.37c. c. f., basis 95°, and later at 2.43c. c. f., same basis. By the 13th four estates had started grinding in Cuba. Large sales of new crop Cubas for January shipment were made at 2.50c. c. f., and some new crop Porto Ricos were sold at 3.85c. c. i. f. Mr. F. O. Licht gave out amended estimates of 4,730,000 tons for Convention countries and 6,575,000 tons for all Europe.

During the year the prices of Cubas, basis 96°, have ranged between 2.03c. and 2.69c. c. f., and the prices of Porto Ricos between 3.38c. and 3.95c. c. i. f., a range which exceeded that of any international sugar market. As usual, the minimum price was recorded during the height of the Cuban production, when weekly receipts at the six principal Cuban shipping ports were 65,000 tons, and were proportionately large at the smaller ports. Even had Cuba stood alone, her production was far in excess of immediate market wants, but over and above the Cubas were Porto Rico and Hawaiian Islands' sugars to be cared for. The resulting pressure of supplies inevitably brought prices down to a point totally unwarranted by general market conditions. This is nothing new in the history of Cuban prices, and it will be repeated every year until Cuban planters and shippers adopt some system whereby the offerings of their sugars will be regulated by demand, and not by supply, for it is apparent that when a market needing only 40,000 tons weekly is pressed to take 60,000 tons weekly, the result to prices must be disastrous. The year had an exceptional series of events affecting the sugar market. The first was a severe and prolonged drought in Cuba, which, while it enabled grinding to be continued till every field was cleared, and thus augmented the year's supply, made the outlook poor for the present and next crop. The second was a cold and most unseasonable spring and summer throughout the greater part of the United States, and a resulting limitation to the consumption of refined. Lastly, a money panic and a period of monetary stringency extending over several months and not yet ended, which

seriously checked the demand for all commodities, sugar included, owing to the restriction of credit.

These events curtailed the call for Javas and Beets. The Atlantic ports received 10,800 tons old crop Javas early in the year, and 244,000 tons new crop during the last six months. New Orleans received 12,500 tons new crop in August. Only 6,780 tons Beet were imported during the year. If the coming year proves normal as to climate and credit it should be favorable to prices of sugar, for the supplies in sight are not excessive and there is nothing to induce fears of increased sowings of Beets in Europe, for the fields can be turned to better account with other crops.

The following table gives the prices, at the beginning of each month, of Spot Centrifugals, duty paid, of Centrifugals c. & f. from Cuba, and c. & f. from non-privileged countries; also of Beets f. o. b. Hamburg:

1907.	Spot. Duty paid. Cents.	Cubas. c. & f. Cents.	Non-pvgd. c & f. Cents.	Beets. f. o. b.
January 2nd	3.56	2.19	1.85	8s. 9¾d.
February 1st	3.48	2.12	1.78	8s. 9d.
March 1st	3.42	2.06	1.72	8s. 11¼d.
April 2nd	3.61	2.25	1.91	9s. 3d.
May 1st	3.76	2.44	2.10	9s. 5¼d.
June 1st	3.90	2.56	2.22	10s. 0d.
July 1st	3.87	2.47	2.13	9s. 8¼d.
August 1st	3.94	2.59	2.25	9s. 9d.
September 3d	3.92	2.56	2.22	10s. 2¼d.
October 1st	3.95	2.59	2.25	9s. 7½d.
November 1st	3.90	2.54	2.20	9s. 3¾d.
December 2nd	3.62	2.31	1.97	9s. 4½d.
December 27th	3.85	2.50	2.16	9s. 11¼d.

IMMIGRATION.

The House Committee on Immigration has recently favorably reported Representative Hepburn's bill suspending for six years the prohibition of the importation of solicited European laborers into the Territory of Hawaii. The text of the bill is as follows:

"Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That nothing in the Act entitled "An Act to regulate the immigration of aliens into the United States," approved February twentieth, nineteen hundred and seven, shall be taken, for a term of six years from the appeal hereof, to exclude from admission to the Territory of Hawaii, as contract laborers as defined by section two of the said Act, European aliens who have been induced or solicited to migrate to the said Territory of Hawaii by offers or promises of employment within the said Territory, held out to them by the

said Territory or by the board of immigration of the said Territory, or the officers, members, or agents of such board, or to exclude from admission to the said Territory European aliens whose tickets or passages have been paid for with money of, or who have been assisted to migrate by the said Territory, or its board of immigration, or the officers, members, or agents of such board, even though it is not affirmatively shown that such European aliens' tickets or passages were not paid with money contributed to the said Territory, or its board of immigration, by individuals, companies, partnerships, or corporations: Provided, however, That nothing contained herein shall be taken to exempt European aliens induced or solicited or assisted to migrate to the said Territory, in the manner hereinbefore described, from examination and exclusion from the said Territory under any and all of the provisions other than those hereinbefore specifically mentioned of the said Act of February twentieth, nineteen hundred and seven.

"Section 2. That nothing contained in the Act entitled "An Act to regulate the immigration of aliens into the United States," approved February twentieth, nineteen hundred and seven, shall be taken, for a term of six years from the approval hereof, to prohibit any person, company, partnership, or corporation from contributing to the said Territory of Hawaii, or to the board of immigration of said Territory, money to be used by the said Territory, or board of immigration, or the officers, members, or agents of such board, in paying the transportation, or assisting or encouraging, by printed or published advertisements or otherwise, the importation or migration into the said Territory of European aliens in accordance with the provisions of section one hereof; or to attach to the contributing of money by any person, company, partnership, or corporation to the said Territory, or its board of immigration, for use in the manner hereinbefore described, or to the doing by the said board, or its officers, members, or agents, of any of the cast herein authorized any penalty or forfeiture."

Under the construction placed upon the immigration law as amended in 1907, it is impossible for the Board of Immigration of the Territory of Hawaii, to continue the importation of European immigrants as heretofore, namely, by subscriptions solicited from individuals and corporations. The Attorney General's construction of the law has been that under the Act as amended no prohibition is placed upon the payment of an alien's passage by a State with its public funds, or by individuals directly or through the agency of the State, if their action is in good faith individual; and that the advertising done by a State or Territory must be limited to setting forth the inducements offered to immigrants by conditions existing within the State; although a recent opinion holds that the assurance of employment by State agents is also within the inhibition of the statute.

These various constructions have effectually put a stop to emigration from Europe to Hawaii, for the reasons that such immi-

gration must be assisted, and it is impossible for the Territory, under present financial conditions to carry on the immigration from public funds; and none other than the incorporated interests are in a position to contribute for this purpose.

While special legislation and exemptions for insular territories by Congress are, as a rule, not favored, it has become more and more apparent to the Federal legislators, especially to those who have visited the outlying territories, that general statutes which apply to the mainland, are often inapplicable, and injurious, to the insular possessions of the United States.

No better reasons for the introduction and passage of the bill above quoted can be given than are found in the annual report of the Secretary of Commerce and Labor, under the title of "Insular and Mainland Immigration Contrasted." Secretary Strauss visited Hawaii during 1907, and after investigating conditions here his report should have considerable weight. The report states:

"Legislative regulation of immigration would present a relatively simple problem if the United States were a small and compact nation, whose industrial operations were so generally alike as to be susceptible of a uniform system of regulation. But the industries and occupations of the people of the United States are greatly diversified and are carried on under widely varying conditions. Moreover, instead of being confined to a single contracted area, the jurisdiction of the nation extends to such distant and far separated possessions as Alaska, Panama, Porto Rico, Hawaii, Guam and the Philippines. These outlying possessions not only differ from the body of the continental territory as to their position and needs with regard to labor, and immigration, but they differ likewise among themselves. It is not to be expected, therefore, that a particular policy of restriction in the matter of immigration, especially designed to meet the situation on the mainland, should be perfectly adapted to the needs of insular communities. Each of these communities has its own industrial problems to solve, and the conditions in each should be considered before it is brought within the operation of a general rule. The need of differentiation in the regulation of immigration I believe to be obvious for the reasons stated. The need was brought home to me with great force when, during the past summer, besides actually viewing the administration of the immigration laws along the borders of Canada and on the Pacific Coast, I personally visited the Hawaiian Islands, and saw for myself something of the effect of these laws upon the occupations of the people. As a result of this experience, and of the best consideration I have been able to give to the subject, I believe that the attention of Congress should be directed to the question of immigration into the insular possessions of the United States, to the end that the special conditions peculiar to these several possessions individually may be taken into account,

and expressly provided for by legislation. I have elsewhere pointed out, speaking of the contract labor laws, the need of clearly defining how far States and Territories may go in advertising the inducements they offer for immigration, and in securing funds for the prepayment of passage money of foreign laborers. A clear expression of the legislative will on this point is especially desirable with reference to insular immigration."

CONGRESSMAN LITTLEFIELD ON HAWAII.

At the Lake Mohonk Conference, held in October, 1907, a number of addresses, relating to Hawaiian subjects, were delivered, some by members of Congress who recently visited these Islands. The address of Congressman Littlefield is particularly interesting and will bear republication. It is as follows:

In 1899, for the first time in the history of a constitutional government, republican in form, the civilization, legislation and economic conditions of a temperate zone were undertaken to be superimposed as an experiment upon a tropical country, with tropical products, tropical economic conditions, inhabited by a tropical people, having, so far as they had any civilization, a tropical, an Oriental civilization; because, in 1899, this republic engaged in the experiment of governing three tropical countries—Hawaii, Porto Rico and the Philippine archipelago.

I am not altogether able to agree in the proposition that the Philippine archipelago has today, or ever has had what we understand to be a Constitution. There is a most profound and substantial and fundamental differentiation between Hawaii and Porto Rico, and the Philippine archipelago. Hawaii is of us; they are a part of the United States. When the American flag, the representative of the great Republic, ascended the staff accompanied with the Hawaiian flag, the representative of a then small republic, the Hawaiian people in a moment, in the twinkling of an eye, became the inheritors of privileges that had cost the Anglo-Saxon race billions of treasure and rivers of blood. They at once acquired the Constitutional rights and privileges under which we all live. And Hawaii is now, and undoubtedly always will remain, an integral part of the United States, and every citizen thereof and every dollar of property therein has the protection of fundamental Constitutional guarantees.

On the contrary, the Philippine archipelago and Porto Rico belong to us. They are our property, and they do not now have, and unless the policy changes they never will have, Constitutional rights and privileges, as we understand a Constitution. And there is a very profound and substantial differentiation. If it

be meant that some of the rights and privileges that inhere in the Constitution of the United States have by Congressional enactment been conferred upon the residents ,or the citizens of Porto Rico and the Philippine archipelago, because they are not citizens of the United States under the rulings of the court, if it be meant by the language that they have a Constitution in name, that they have some of the rights, and some of the privileges in this constitution which are embodied in the Bill of Rights, and are a part of our Constitutional heritage, that they have these by Congressional enactment, I agree that that is a correct legal statement of the proposition. Unlike our Constitutional rights and privileges they can be deprived of theirs at any time. In this respect the distinction is profound and fundamental. But I never have yet heard it asserted by any competent authority that it is not within the power of this same legislative body that conferred the rights upon this dependent people to withdraw them therefrom if it sees fit so to do, and I have had some association with this question, both from a legislative and a Constitutional point of view. I have been familiar with it from the time when Judge Magoon, now acting as Governor of Cuba, undertaking to put that government, under the Platt amendment, upon its feet, so that it can stand thereon with more or less stability (probably less), who was then the chief law officer of the Insular Bureau, held that the Constitution of the United States extended to the recently acquired possessions *ex proprio vigore,* by virtue of its own force and power. In other words, popularly speaking, the Constitution followed the flag. I was also a member of the House when about three months later he announced to the Insular Bureau the fact that the Constitution did not follow the flag—a conclusion reached, perhaps, by reason of the exigencies of the situation. I may say in passing that both of these opinions were fairly good illustrations of dialectical constitutional argumentation—large words, but very adequately expressing the situation.

Now let me call your attention very briefly to a few important considerations that enforce the profound distinction existing between Hawaii and the Philippine archipelago and Porto Rico, and in passing I might say that the United States did not create in Hawaii necessarily the ability and capacity for self-government, because everything that exists in that territory today was in full flower of its development before the United States annexed it and made it a part of the United States—a development by virtue of their own self-government. And I may also say that the people of Hawaii have had since 1899 a full-fledged territorial government exercising every power and every right, and every privilege that is exercised by any person sitting before me except the privilege to vote for the President of the United States and to elect members of Congress, and the Governor and Secretary of the Territory. They have a right to have it said that they have exercised that power with a very fair degree of conservatism and patriotism under all circumstances.

I was a member of the House of Representatives when the sainted and lamented William McKinley sent to that House one of his most memorable messages in which he said that it was the plain duty of the representatives of the people of the United States to give to the people of our new possessions—of Porto Rico and the Philippine archipelago—the same equality of taxation that prevailed throughout the balance of the United States. I remained a member of that House. I may say now that I believed in that declaration then, and I believe in it now. In that same message, I think, was contained this language, more or less perhaps of an amplification of the idea, quoted by your president in his very admirable speech that he made at the opening of this Conference, "The Philippines are ours, not to exploit, but to develop, to civilize, to educate, to train in the science of self-government. This is the path of duty which we must follow or be recreant to a great trust. The question is not, Will it pay; but, Will we do what is right?" It is quite clear that any discrimination against them in taxation, and especially in tariff taxation, would be an exploitation. I remained a member of that Congress until I saw the Congress of the United States, the House of Representatives and the Senate, concurring therein, enact a piece of legislation that was a deliberate and express and a premediated violation of that admonition of the President of the United States, when it discriminated against Porto Rico by imposing a tariff against her products of fifteen per cent. to remain thereon until Porto Rico could be able to declare that she could raise sufficient revenue, so she would not need the fifteen per cent. duty, to aid her in carrying on her governmental affairs; and the deliberate and express premeditated purpose, the declared purpose of the Porto Rican legislation was to lay the foundation and establish the precedent under and by virtue of which the discriminating tariff now exists against the Philippine archipelago. I believed then and I believe now, not only that plain duty but Constitutional rights required us to treat the people of Porto Rico and the Philippine archipelago as we treat all citizens of the United States. Believing so then I voted so then, and believing so now I vote so now. I want to state, if I may, my conception of a Constitutional right. I fully believe in the expression found in the Scriptures that "God made of one blood all nations of men to dwell on all the face of the earth," and when I believe it I believe it means all nations—white men, Caucasians, black men, yellow men, or red men; from my conception it means all men. I want to say to you, in my judgment and with my conception of Constitutional law, that Constitutional law in its highest sense and its profound scientific signification is founded upon fundamental eternal right; and fundamental eternal right, natural rights, were not conferred upon people, as the case may be, by virtue of any written Constitution, but the Creator invested His creatures with natural inherent, fundamental, inalienable eternal rights, and he invested all men equally alike. They do not enjoy

them equally alike to be sure. The Constitution of the United States, consummated in 1787, was not a discovery of fundamental principles, it was not the assertion and creation of eternal, fundamental, inherent rights; the only thing that gives to it the title to be called the Chief of the great achievements of human reason, is the fact that there was in 1787 crystallized in the form of a written Constitution, inherent, profound, eternal rights, wherein they were guaranteed to us beyond the power of any legislative body, by a majority, however large, hysterical or vicious, to infringe or impair. This is the great glory of the Constitution of the United States. And from my conception, wherever the power exercised by the government existing by virtue of the Constitution of the United States is exercised, and wherever people exist that owe allegiance to that government exercising and operating under that Constitution and controlled by it, those people under those circumstances are entitled to the full guarantee of all the rights provided for and guaranteed by the Constitution of the United States. And for that reason you will infer that I did not agree with the conclusions of the Supreme Court of the United States, when they held that we had acquired territory that belonged to us, inherited by a people bound to our allegiance, subject to our control, bound to be controlled by us, owing allegiance to the government of the United States, but not vested by virtue of that allegiance or by that control, with the fundamental, inherent, constitutional rights, the principal of which was the right of uniform taxation. And that is the foundation of the whole proposition so far as its economic features are concerned in connection with the United States and the Philippine archipelago. It was a violation of the declaration of the President of the United States of what was our plain duty, and in my judgment, a violation of their constitutional rights and privileges. I had the privilege and I improved it on the floor of the House of Representatives, of expressing my views thereon in a somewhat extensive manner, undertaking to demonstrate, from my point of view, that we could not legislate in violation of that provision of the Constitution; but a majority of one of the Supreme Court, with inconsistent and antagonistic reasoning, no three men of the Court being able to agree upon the reasons by which they reached their conclusions, finally held that we could so legislate; and we have since that time so legislated, hence the Philippine tariff. But so far as I am concerned, the law stands with me as I believe it was then, and what I believe to be our plain duty. I shall continue individually in my humble way, so far as my voice and my vote is concerned, to follow my view of what I consider our plain duty is. And we will not have any tariff war between the Philippine archipelago and Porto Rico and the United States if I have my way about it. It will be entirely eliminated.

Now I want to say a few words on some features involved in the Hawaiian question. I do not think the only question in Hawaii is the Japanese or the Chinese question, although I agree

that that is one very important question. I want to say, first, that there is a Hawaiian question. It is a melancholy and a painful and a pathetic reflection, that the Hawaiian race, lovable, teachable, mild, hospitable, gentle and kindly, is one of the most conspicuous illustrations of a fundamental historical fact, that the contact of an aboriginal race with the superior race, if you please, always results in the absorption by the aboriginal race of the vices and the vicous elements of the civilization vastly faster than they succeed in acquiring the virtues. That is a very uncomfortable and disagreeable fact. I think it is a well-recognized thing in connection with this question. I do not go so far as to say that the fact that the Hawaiians are fading out very rapidly is not to be attributed in some degree to the great onward march of civilization and the presence of a stronger race, and not attributed as a whole to the unfortunate suggestions to which I have referred. Although I have not the slightest question that the missionaries that vistied those islands some sixty years ago were of at least two characters. Now there were some that were missionaries of the Cross, entitled to all praise and great credit for the good they accomplished, and there were others of an entirely different character, and they were fully as numerous. As near as I can find out, they were much more insistent and effective than were the missionaries of the Cross themselves in Hawaii. Now that may account somewhat for the unfortunate decimation of the race. But this should be said: When Congress created a territorial government and vested the people of Hawaii with the privilege and laid upon them the responsibility of governing themselves, about eighty or ninety per cent. of the people of Hawaii who took that responsibility were native Hawaiians. The immense majority of the people that have been governing Hawaii since 1899 are native Hawaiians. Good or bad, well or ill, no matter what their dispositions and characteristics may be, they have been exercising this privilege under these circumstances. Ninety-five per cent. of the property that now pays the taxes of the territory of Hawaii, that maintains its schools, that builds the roads, that supports its judiciary, that pays all the principal expenses, is owned by less than five per cent. of the population, and about ninety per cent. of the people having practically no stake in the property involved, have had, and now exercise, the responsibility of assessing the taxes for the other people to pay, and the privilege of disbursing the taxes raised under those circumstances. There are very few Anglo-Saxon communities that can safely stand that test, where the electorate knows practically nothing of the property to be assessed, and the money to be disbursed by public expenditure, according to the wishes of those who feel no burden of raising the sums disbursed; and it is to be said to the credit of these people that they have exercised that trust up to date in a reasonably successful, patriotic and intelligent way. They have accomplished in that respect more than I should certainly have expected them to accomplish.

Now, just a word in relation to education *per se.* I have called attention to the fact that they had education in Hawaii before the Stars and Stripes floated there. We visited the schools of Honolulu, which I suppose are among the finest of the islands of Hawaii. Now it is true that there is very little of what is called race prejudice in Honolulu; but it is not true that there is not a recognition of the fact that there are races in Honolulu. We visited the public schools maintained at the public expense. And I have not any doubt there were found there, as stated by Brother Bates, at least sixteen different nationalities. But I noticed one thing; in all these schools from ninety to ninety-five per cent. of the scholars attending the public schools in Honolulu were either native Hawaiians, Japanese, Chinese, or Portuguese, and not five per cent. of them Caucasian, or white people. It ought to be said that the great bulk of the white people in Honolulu, not necessarily because of any race prejudice, but possibly because of the natural selection that develops under these circumstances, send their children to the college at Oahu at a cost of from $75 to $100 per scholar; and nearly all of the scholars in Oahu are white scholars. All other races are admitted, but as a rule they do not go. That tends to furnish more or less of a solution of the race question, so far as children are concerned. I have not the slightest doubt but that the children in Honolulu, whether they are Japanese or Chinese, or Portuguese, or mixtures of the whole or either, and the white children associate on terms of perfect equality, yet when it comes to the question of education they largely segregate themselves and go to different schools. I want to say just another word about the schools of the island. It ought to be said for Hawaii that the schools in that territory today cannot be excelled by the schools in any section of the great country in which we live. I saw there the finest public school building I ever saw, with the finest up-to-date appliances, with everything that was convenient and handy and even luxurious. And we had the great pleasure of listening to an exercise performed under the direction of a distinguished white gentleman in charge of that school, (eighty or ninety per cent. of the scholars having very little white blood in their veins), that I have never seen equalled, and never expect to see excelled. And this was the character generally of the schools throughout the islands.

What is Hawaii from a really substantial business point of view? What is any community or country from a business point of view except the great substantial industry or industries that furnishes or furnish its backbone, without which it cannot live. There is very little of consequence on the Island of Hawaii except the sugar industry. There is nothing alse being carried on there of any moment except, perhaps, the raising of pineapples, and a successful machine works. There are forty-nine corporations engaged in the manufacture of sugar in Hawaii, representing a capitalization of about $66,000,000. They have increased their output since 1899 nearly 50 per cent. They have increased their

profit thereon only one per cent. It is a tropical country; it depends absolutely upon a tropical product, and that tropical product is sugar cane. And the natural selection of human forces has demonstrated that it can only be raised successfully by tropical labor. In my judgment (I was there only about a month) a white man cannot work in any part of the territory of Hawaii as he works in the temperate zone, where you and I live. He cannot produce the same results. He cannot work in the cane fields. Of the laborers on those plantations they had only 26 unskilled Anglo-Saxons; they had 20,957 Japanese; they had 1,914 Chinese; they had 2,288 Portuguese. What does that mean? It simply means that the Japanese, Chinese and Portuguese are the only people who can successfully cultivate sugar cane.

I want to give you just a few statistics about the kind of labor and the amount received so you can appreciate the economic conditions that exist. The rate of monthly wage in Hawaii paid to Japanese and Portuguese, is about $19 per month. And in addition to that they get house rent, their fuel, their water, and their medical attendance free. I have investigated the rate of wages paid in the United States for farm labor. The rate without board I found was $22.14 per month, and in Louisiana, the section of the United States that competes with Hawaii, the rate of wages paid is $18 per month as against $19 and more per month in Hawaii with house rent, fuel, water and medical attendance thrown in. And it seems to me that under these circumstances the Hawaiian laborer, the Japanese, Chinese and Portuguese gets full more compensation than the laborers in the same industry in the United States. It ought to be said for the men engaged in the sugar industry, the corporations, that they have, in my judgment, exercised a liberal, progressive and patriotic attitude in connection with the question of the introduction of the right kind of labor and its proper utilization in Hawaii.

A great deal is said in Hawaii about the introduction of small farms and small holders. Do you realize the fact that about 80 per cent. of the land that is susceptible for the cultivation of sugar cane is now under cultivation? And do you realize further the fact that all land that is arable in the archipelago is simply that surrounding the mountains, which was thrown up during volcanic upheavals, and running up to the foothills of the mountains from the seashore, one, two, eight or ten miles as the case may be, and that when you get outside of that zone, practically nothing cane be cultivated or tilled to advantage in the Hawaiian archipelago except sugar? I haven't time to speak of the extent to which other agricultural products, such as pineapples, coffee, etc., can be raised.

Why do not we have this labor Americanized? It is not being rapidly Americanized. The Japanese are a great factor in it. It is said that we are not Americanizing the Japanese very rapidly. That is true. The Japanese do not seem to be ashamed of the country from which they come, and up to date I have not

learned of any very good reason why they should be ashamed thereof. On the contrary, they have a right to be gratified by the fact that they come from a country known as Japan, because there is no other country in any other land, civilized or uncivilized, Pagan or Christian, and I do not bar from that comparison the Republic of the United States of America, that can show the same degree of industrial economics and warlike development compared with the preceding period that the Japanese have shown during the last fifty years, and they are entitled to the credit of it. Every Japanese has the opportunity in Hawaii to attend the public schools; they have also their own schools. There is a prejudice in Hawaii over the fact that they have their Japanese schools, but I take this ground upon that proposition. I have no objection to the children of the Japanese being educated in Japanese history and being familiar with Japanese traditions, and if it be true that the education of these children in English history and then knowledge of our country, and its achievements and its developments, is not able to satisfy them of our superiority, I am perfectly willing, so far as I am concerned, to yield the palm to them. Let them adhere to their country. But this ought to be said; the atmosphere in Hawaii is not favorable to the Americanizing of either Japanese or Chinese. No person will become Americanized or become part of our country unless he is able to localize himself in some part thereof; and by that I mean, to acquire a status in the country, to become attached to the soil, to own real property therein. I could not find in Hawaii any enthusiasm over the proposition that a Japanese should be allowed to buy an acre, two acres or ten, or that the Chinese should be allowed to do the same thing.

I agree perfectly with all the gentlemen who have addressed the Conference upon the great proposition that with the proper application of American ideas and American notions we will get the proper results; but we must create the conditions that will produce the results; and when they are created, we may expect the result to follow.

CONDITIONS IN CUBA.

Consul-General James L. Rodgers, writing from Habana, sends the following account of the present financial and agricultural conditions in Cuba:

The business interests of Habana and, so far as is known, of the island of Cuba generally, heartily approve of and laud the action of the provisional government in the matter of the proposed loan of the Government funds for the purpose of relieving the business situation at a time when money is needed for the

sugar crop and fruit harvest and for tobacco planting—causes which heretofore have always commanded a prolonged credit from the banks. The terms of the proposed loans are considered eminently fair by the business men, and if the banks will take the $5,000,000 offered there should be no trouble. What will be done about it by the bankers is as yet unknown, but it is reasonable to suppose that there will be acquiescence in whole or in part, since the matter is of vital consequence to everybody.

In respect to business conditions, which are so largely dependent upon the sugar crop, there are many conflicting theories. One can hear the prediction that last year's total of 1,441,687 tons—a gain of 211,951 tons over 1905-6—will be greatly reduced, and, again, attention is called to the statement of the Department of Agriculture that the tonnage will be but little, if any, less, and that the price will more than offset any loss. However, the prevailing impression is that the tonnage will be less by perhaps 15 per cent., and that there will certainly be no diminution in price.

Even with such a result there is in evidence a continuation of great prosperity, and business interests generally do not seem to pay much heed to the gloomy prediction of some of the sugar-producing class. The optimism so developed has therefore been encouraged by the provisional government's action, and great pride is taken in the condition of a treasury which makes possible such substantial and timely support of the Republic's industries.

PARTIAL DETAILS OF SUGAR PRODUCTION.

The following are the official statistics as to Cuban sugar production during the year 1906-7 as compared with 1905-6. Only a few of the plantations have estimated their yield.

	Production.		
Province.	1906-7.	1905-6.	Increase.
Pinar del Rio	33,651	25,332	8,319
Habana	183,655	164,230	19,425
Matanzas	394,572	343,897	50,675
Santa Clara	520,423	479,638	40,785
Camaguey	52,788	38,145	14,643
Oriente	256,598	178,494	78,104
Total	1,441,687	1,229,736	211,951

No return has yet been made of the acreage, so comparison in that respect to account for the great increase can not be given. It is known, however, that there has been of late much new planting. The province of Santa Clara, which surpasses all others in production, obtained its returns from 56 "centrals" and 14 "ingenios"; Matanzas from 40 centrals and 14 ingenios; Oriente (Santiago de Cuba) from 17 centrals and 11 ingenios; Camaguey

(Puerto Principe) from 3 centrals and 1 ingenio; and Pinar del Rio from 5 centrals and 2 ingenios.

The greatest single production was 48,962 tons from the Central Chaparra in Oriente Province, and the next, 40,671 tons, from the Central Boston, in the same province. Each of the 45 centrals and ingenios had a production of over 10,000 tons, and the smallest output of any mill was 360 tons. The average production of all centrals and ingenios in the island was 7,792 tons, which indicates the magnitude of the establishments, both as to averaged and plants, and implies large capital invested and required.

No statements have yet been made as to the volume of the by-products, such as molasses and alcohol, nor has any accurate estimate of the value of the sugar production been given out.

Sugar conditions in the coast regions are excellent. Abundant rains have occurred, rendering a fine cane crop, which is well matured and will soon be ready for cutting. It is estimated that the tonnage from this section will considerably exceed that of last year. In the interior sugar-growing State of Morelos opposite conditions prevail. Rains have been scarce and the majority of the cane has failed to come to maturity. Here the crop is reported to be the lightest in years and is expected to fall 30 per cent. below that of last year.

BEET SUGAR INDUSTRY.

EUROPEAN DISCUSSION OF THE EFFECTS OF THE BRUSSELS CONVENTION.

In a report from Liege, Belgium, Consul H. Abert Johnson says it seems that the beet sugar situation this year is far from satisfactory, and that both the farmers and the sugar manufacturers have good grounds for uneasiness. His trade details follow:

The beet crop is decidedly short and the percentage of sugar, which it was hoped would be rather larger than usual, proves to be much below the average heretofore obtained. The period of sugar making will be short, and, as prices are disastrously low, it is expected that more than one sugar factory will be obliged to suspend operations for next year. The effects of the Brussels sugar convention have not, so far, been as favorable to the indutsry as had been anticipated.

There appears to be some hope that through the acceptance of the terms of the Brussels convention on the part of the Russian Government prices may take a more favorable turn. Such a result, however, although within the range of possibility, can hardly

be counted upon as a probability. On the other hand, it is reported that at a recent meeting of the Société des Agriculteurs du Nord (a farmers' organization of France) the following resolutions, already agreed upon by the syndicate of sugar manufacturers of France, concerning the additional act of the Brussels conference, had been adopted:

First, considering that the renewal of the Brussels convention could only tend to further aggravate the already precarious position of the French sugar manufacturers, the committee of the sugar syndicate is of the opinion that the ratification of the additional act should be made subordinate to the acceptance of the Brussels convention by all the sugar-producing nations of Europe and to the lowering of the French excise tax on sugar to the level adopted by Germany.

Second, the committee expresses the wish that the French Government would take steps to introduce a system of giving bounties for what is termed denatured sugar that serves as food for cattle.

THE ANALYSIS OF WASTE MOLASSES.

In the chemical control of the manufacture of sugar, as in many other lines of industrial chemistry, methods of analysis for control and comparative work must be accepted, not for their precision alone, but for the speed and accuracy with which they may be performed.

For complete control of the manufacture of sugar, all raw material, finished produce and waste should be either accurately weighed or measured and accurate analysis made at each stage of the process.

With proper appliances and due care in analysis, the amount of sucrose entering the boiling house, and the weight and polarization of the sugar produced, can easily be obtained. To accurately determine the amount of sucrose in the waste molasses, however, is not such a simple matter. The large proportion of impurities, invert sugars and coloring matter, together with the lack of suitable clarifying reagents, introduce errors of such magnitude as to seriously affect the value of the results.

In order to compare the value and the extent of the errors of the different reagents, and if possible to select a method of analysis in which speed and accuracy may be combined to yield results suitable for mill control, members of the Hawaiian Sugar Chemists' Association were asked to coöperate with the writer in the analysis of a sample of waste molasses. It is to be regretted that only a few even answered the request, and of those who signified their willingness to undertake the work, only two sent results.

Carefully prepared samples of waste molasses were sent to these members with the following instructions:

SOLUTION *"A."*

Weigh five times the normal weight of molasses and dilute to 500 c. c.

DIRECT POLARIZATION.

Take 25 c. c. of solution "A," clarify; make up to 100 c. c., filter and polarize in 200 m. m. tube. State number of grams or c. c. of reagents used, and the comparative ease with which the solutions were read, using as clarifying reagents:

I. Sub acetate of lead solution, avoiding excess.
II. Neutrale acetate of lead solution.
III. Sub acetate of lead with the addition of acetic acid.
IV. Sufficient chloride of lime to produce a distinct yellow color and then add 10 c. c. of neutral acetate of lead.
V. Take 25 c. c. of solution "A," make up to 100 c. c. and add sufficient dry subacetate of lead to clarify.

RESULTS.

I.

Using Solution of Sub Acetate of Lead.	Polarization.
A. 10 c. c. of Sub acetate, reading distinct.....	7.9
B. 9 c. c. " " " " "	7.9
C. 9 c. c " " " " "	7.9
Average	7.9

II.

Using Neutral Acetate of Lead.	
A. 10 c. c. Neutral acetate, reading difficult.....	7.30
B. 7½ c. c. " " " "	7.21
C. 6 c. c. " " " "	7.65
Average	7.39

III.

Using Sol, of Sub Acetate of Lead, with the Addition of Acetic Acid.	
A. 10 c. c Sub acetate and 3 drops 30% Acetic acid, reading distinct	7.80
B. 7 c. c. Sub acetate and 10 drops 30% Acetic , acid, reading distinct	7.66
C. 9 c. c. Sub acetate and 14 drops 30% Acetic acid, reading distinct	7.70
Average	7.72

IV.

Using Chloride of Lime and Neutral Lead Acetate.	Pol'n.
A. 3 Grams. Chl. of Lime & and 10 c. c. Neut. Lead Acetate, reading difficult	7.3
B. 1.5 Grams. Chl. of Lime, and 10 c. c. Neut. Acetate, moderately distinct	7.54
C. ? Grams. Chl. of Lime and 10 c. c. Neut. Acetate, moderately distinct	7.70
Average	7.51

V.

Using Dry Sub Acetate of Lead.	
A. 4 Grams Dry Sub Acetate, reading distinct....	7.95
B. 1.8 " " " " "	7.38
C. .. " " " " "	...

Each method has certain distinct advantages over the others, yet in each case there still remain disadvantages and errors which cannot be entirely ignored.

Readings were obtained varying from 7.21 to 7.95, the direct polarization of the molasses thus ranging from 28.84 to 31.80, difference of nearly three per cent. Not only is the variation due to the different reagents, but also to the quantity of reagent used. In No. 1, practically the same amount of sub acetate was used by the different observors, and the same reading obtained. By varying the quantity of sub acetate the following readings were obtained:

No. c. c. Sub Acetate.	Observation.	Reading.
5.	Moderately distinct	7.5
7.	Distinct	7.65
9.	Distinct	7.90
11.	Clear	8.10

A comparison of the different readings show that the use of a solution of sub acetate of lead, while yielding a light colored, easily polarized filtrate, give results entirely too high, due to the formation and precipitation of levulosate of lead, and the large volume of the precipitate formed. This error increases with the amount of reagent used.

The use of Neutral acetate of lead reduces these errors, and the readings obtained were naturally lower. The solutions are dark colored, however, and in some cases the amount of coloring matter is so great that a satisfactory reading cannot be obtained even with a 100 m. m. tube.

A solution of sub acetate of lead with addition of acetic acid has the same advantages and disadvantages as the use of Neutral acetate, and the results obtained vary with the amount of acetic acid added.

Chloride of Lime with Neutral Acetate of Lead hardly gave satisfactory results, as the readings in all cases were obtained with difficulty, and the volume of the precipitate objectionable. An excessive amount of either or both reagents resulted in a dark, poorly clarified solution.

The use of dry sub acetate of lead, was comparatively the most satisfactory of the reagents used. A moderate amount of reagent gave a clear filtrate and distinct reading with the polariscope. The results are slightly higher than those obtained by the use of Neutral lead acetate, and increase with the amount of reagent used. B. with 1.8 grams of dry acetate obtained a distinct reading of 7.38, while A. using 4 grams obtained a reading of 7.95. As .26 grams of the dry sub acetate was equivalent to 1 c. c. of the solution of sub acetate used, A. used the equivalent of 15 c. c., which is nearly twice as much as was necessary for good clarification.

Varying the quantity of dry sub acetate, the following readings were obtained:

Grams. Dry Sub Acetate	Observation.	Reading.
1.50	Moderately clear	7.31
2.00	Distinct	7.42
2.50	"	7.70
3.00	"	7.83

In this case, as there is no error due to the volume of the precipitate, the increase in polarization is due to the formation and precipitation of levulosate of lead, and is controlled by the amount of the reagent added.

CLERGET'S DOUBLE POLARIZATION.

Procedure.

Make five determinations, using 50 c. c. of the filtrates used for direct polarization. Place in 100 c. c. flasks, add 10 c. c. of dilute Hcl. (Spr. Gr. 1.16) heat to 68-70° C. for ten minutes, rotating the flask occasionally, cool, make up to 100 c. c. and polarize at the same temperature as the direct readings were made. Multiply the reading by 2 and find per cent. sucrose by the formulae $S = \frac{100\ s}{142.4 - \frac{1}{2}\ t}$

S = Sum of direct and inverted readings.

t = Temperature at which the readings were made.

RESULTS.

		A.	B.	C.	Average.
I.	Reading distinct	9.04	8.79	8.72	8.85
II.	" difficult	8.88	8.86	8.80	8.85
III.	" distinct	8.82	8.70	8.62	8.71
IV.	" difficult	8.94	8.80	8.91	8.88
V.	" moderately clear ..	8.79	8.84	...	8.81

The inverted readings in all cases were obtained with the same degree of accuracy as the direct readings. We find the true per cent. of sucrose in the solution varying from 8.62 to 9.04, showing the original molasses to contain from 34.48% to 36.16% sucrose.

DILUTION.

Take 25 c. c. of solution A (two portions), clarify with sub acetate of lead, using the same number of c. c. for each portion; dilute one to 50 c. c., filter and polarize in 200 m. m. tube; dilute the other portion to 200 c. c., polarize in 200 m. m. tube (if possible use 400 m. m. tube).

RESULTS.

Reagents Used.			Dilution. 50 c. c.	200 c. c.
A.	10 c. c.	Sub-acetate of Lead	16.0	...
B.	9 c. c.	do	15.95	3.85
C.	9 c. c.	do	16.18	3.87
	Average		16.04	3.86

CONCENTRATION.

Polarize four solutions, using 10, 20, 30 and 40 c. c. of solution A and clarify them with 4, 8, 12 and 16 c. c. of sub acetate of lead; make up to 100 c. c., filter and poralize in 200 m. m. tube.

RESULTS.

					A.	B.	C.	Average.
10 c.c. Sol.	4 c.c.	Sub-acetate,	to 100 c.c..		3.05	3.10	3.20	3.117
20 do	8	do	do	..	6.20	6.28	6.45	6.310
30 do	12	do	do	..	9.39	9.51	9.75	9.55
40 do	16	do	do	..	12.60	12.79	13.13	12.84

Taking the average readings and dividing them by the amount of solutions used, we have the series .3117, .3155, .3185 and .3200. The increased ratio is due to the error caused by the volume of the precipitate. Spencer and Crook obtained similar results with Cuban cane molasses. Pellet, Freburg and Deerr found that there was practically no difference in the readings at different concentration. Pellet is satisfied that the lead precipitate entrams sugar while Deerr shows by experiments that the dilutions of the solution increases the rotating power of the sucrose therein, thus counterbalancing the effect of the volume of the precipitate.

The degree Brix of the molasses obtained by the pyknometer was 86.8, while the total solids obtained by drying with pumice stone or rolled filter paper, varied from 79.47 to 80.52%, the average being 79.96%.

From the results obtained the apparent purity of the molasses ranges from 33.2 to 36.6 and the true purity from 43.1 to 45.2. In other words, one is able to obtain nearly any desired purity simply by choice of the clarifying reagent and the amount used in analysis. Evidently, therefore, in order that the results of the analysis of molasses have even a comparative value, it is necessary that all determinations be conducted under exactly the same conditions. The dilution of the molasses should be the same, the same clarifying reagent should be used, and as far as possible the quantity of reagent used should be the same. For control work, the true value of the molasses should be determined by Clerget's method of double polarization, and the total solids by drying.

HORACE JOHNSON.

LINING OF DITCHES AND RESERVOIRS TO PREVENT SEEPAGE LOSSES.

A recent bulletin of the College of Agriculture of the University of California, by Elwood Mead and B. A. Etcheverry, gives an account of investigations and experiments carried on to determine the relative merits and expense of lining reservoirs and irrigation ditches with various materials to prevent leakage.

Such experiments should be of interest to many of the plantations conducting irrigation systems so expensive that every drop of water obtained, either by pumping or by long lines of ditches, must be made to do its full duty.

The introduction and conclusions of the bulletin are as follows:

The water which sinks into the soil from ditches and reservoirs is one of the chief sources of waste in irrigation. In gravelly soils, or where ditches cross gypsum strata, the losses sometimes amount to more than half the total flow. Measurements on a large number of ditches, made by the Office of Experiment Stations, show an average loss on main canals of about one per cent. for each mile that water is carried; on laterals the loss amounted to between 11 and 12 per cent. per mile; while on some California canals the loss in a single mile was 64 per cent. The water which escapes is often worse than wasted. It collects in the lower lands, fills the soil, drowns the roots of trees and plants, brings alkali to the surface, and is a prolific breeding place for mosquitoes.

On large and costly aqueducts or important storage works, linings of cement, concrete, or asphaltum may be employed without the expense being prohibitive. But the great bulk of these losses occur on lateral ditches and small storage basins where some simpler and cheaper method of making the surface impervious to water must be found; and if ditches can be lined with this substitute by methods which can be carried out by farmers or unskilled laborers, a great improvement in irrigation practice and a marked increase in the duty of water will be brought about.

Muddy water soon silts up muddy ditches, but where the water is clear seepage losses are likely to be permanent and some sort of lining to stop this becomes an important matter. As water drawn from wells or reservoirs is always clear, methods of preventing seepage are live problems where water is pumped or stored. Measurements made in 1906 on a storage reservoir having a surface of 10,000 square feet showed a seepage loss of 1,000 cubic feet per day. The reservoir is filled by a windmill and this loss was 10 per cent. of the average quantity pumped each day—a loss too heavy to be borne. The problem of this reservoir owner is the problem of hundreds of irrigators. Unless this leak in the reservoir can be stopped, the attempt to irrigate by pumping will be a failure; but the owner can not afford the expense needed to line the reservoir with concrete or asphalt, because the value of the water stored will not justify this expense. Puddling has been tried, but there is not enough clay in the soil, and no other material or process has been tried sufficiently to make it safe for him to adopt it. His problem is, therefore, to find some cheap and valuable material or some process which he can utilize at small cost which will make the reservoir hold water. There are an unusual number of raw materials found in California which promise well, and the richness of the mineral wealth of the arid region leaves little doubt that other things besides cement and clay will come into use to prevent the leakage of reservoirs and ditches. The purpose of this investigation is to determine what is the relative merit and expense of both those expedients which have been tried and those which seem worthy of a trial. * * *

EXAMINATION OF DITCHES LINED IN SOUTHERN CALIFORNIA.

About 1880 all surface waters in southern California were being diverted and used. The heavy profits derived from irrigation and the rapidly increasing price of orange land since then caused a great demand for additional water. The development of the country depended on water, which was, and is even more so at present, the most important question for that locality. All available water supply must be developed and all waste prevented. This meant the rapid development of underground waters by wells and tunnels and the storage of flood waters, and explains the large number of wells yielding probably a good deal more water than the flow of surface water in midsummer.

It was here naturally that the loss of water due to seepage was first felt. Every drop of water saved meant increased prosperity. The value of water increased rapidly after 1880. Water valued at $30 per miners' inch in 1880 had a value of $300 January, 1883, and $720 in 1888. This naturally meant better use of water and higher duty of water. The duty of water increased to one miners' inch for four or five acres, and has still increased until at present this duty for some of the best citrus lands is one miners' inch for ten acres.

Most of the improvements for economy of water and for the decreased loss in transportation were started after 1880.

Canals were first paved to prevent seepage and erosion; and to permit the use of an economical section. This paving was then improved upon by paving and cementing. Plastering with cement mortar and the use of concrete for lining came into use soon after.

At about the same time the use of steel or cement pipes was introduced. They have since become much in favor in southern California, when the volume of water to distribute is not large, and have to a great extent replaced the smaller open ditch.

While for these parts of southern California there is no doubt but what the use of cement in some form will always be the most generally used material for canal lining, it is expensive and its use is only justifiable where the value of water is very high, or where excessive seepage must be stopped.

For districts where water is plentiful the seepage loss may not be of so much consideration, or at least not so great but that a concrete lining would be prohibitive. The canals or even the laterals of these districts carry several times more water than the largest canals of southern California. The lining, if concrete were used, would have to be stronger and the cost large.

Other considerations besides seepage must, however, be studied before one can decide whether it will be beneficial to line the water channels, and other linings should also be investigated.

A good lining should fulfill the following requirements: (1) It should stop seepage; (2) it should prevent gophers and squirrels from burrowing through the banks; (3) it should prevent vegetation; (4) it should prevent scouring; (5) it should not be easily damaged by the tramping of cattle and by the action of the weather.

No doubt concrete will answer for all these requirements, but cheaper linings in many cases will be more economical. It was mainly to inquire into this that these investigations were undertaken. * * * * * *

RESULTS OF OBSERVATIONS AND EXPERIMENTS.

A study of the table shows that cement concrete 3 inches thick stopped 86.4 per cent. of the seepage which occurred in an earth ditch excavated in the same material. This percentage would

probably have been larger had the earth been more porous; for this would make the loss in earth ditches greater, while the loss from the cement concrete ditch would probably not have been increased. This is true also, but probably not to the same extent, for the other lined ditches. However, it is quite safe to believe that in more porous or open soil the percentage saved by lining would be greater than shown in the table.

2. *Table showing Results of Experiments.*

Description of lining.	Average mean sinkage per hr. in feet excluding evaporation.....	Efficiency ratios.	Per cent. saving	Experimental cost of lining per sq. ft.....	Actual cost of lining per sq. ft.*
				Cents	*Cents*
Cement concrete, 3 inches thick.....	.0046	7.17	86.6	8.3	7.5
Cement lime concrete, 3 inches thick.....	.0114	2.90	65.5	8.3	7.5
Cement mortar.....	.0121	2.73	63.3	3.88	3.25 3.50
Heavy oil, 3⅔ gallons per square yard...	.0176	2.02	50.4	1.20	1.20
Clay puddle, 3½ inches thick.....	.0185	1.78	47.8	3.90	1.20
Heavy oil, 3 gallons per square yard.....	.0220	1.50	38.0	1.00	1.00
Heavy oil, 2⅓ gallons per square yard...	.0239	1.37	27.3	.77	.77
Thin oil, 2½ gallons per square yard.....	.0329	1.08	7.3	1.00	.80
Earth (no lining).....	.0329 .0355 .0330	1.00	0.00	.....	.....

* Excluding the preparation of the ditch. (Last two columns.)

While there is no doubt but that cement concrete is the most efficient as regards seepage, it is also the most expensive, being more than six times the cost of the heavy oil lining (3⅔ gallons per square yard), which saves 50.4 per cent. of the water which would seep were the ditch not lined. This saving with the concrete ditch is 86.6 per cent., or 1¾ times as large. Where water is very valuable there is no doubt but that the concrete ditch is more permanent and economical. But where the water is not so scarce and a little waste will do no damage, the expense of lining the ditch with oil may be justified, while a more expensive lining would be impracticable.

The question will come up: "Is it economical to use oil on a ditch to save 50 per cent. or less of the water which is being lost in ditches not lined?" Perhaps there is a great deal of water, and in many irrigated districts the waste of water seeping from the

canals and laterals while large is small compared with the larger waste due to over-irrigating the fields and to poor methods of irrigation. These conditions will no doubt better themselves as California becomes more settled and the water is more economically used and more valuable. But even under the present conditions the advantage of lining a canal is not alone the decrease in seepage; other factors should be considered, as mentioned in the first part of this paper. (1) The prevention of growth of vegetation is an important item and is quite an expense, when in most cases the ditch or lateral must be cleaned out several times during an irrigation season. (2d) The resistance to scouring, on which depends the velocity which the water can be given. (3d) The prevention of squirrels and gophers from burrowing into the banks and bottom of ditches.

That oil will prevent vegetation and the burrowing of animals on the banks and bottom of the ditch is clearly shown by the example near Lemoore, previously mentioned.

That oil will prevent scouring to a great extent and will allow a much higher velocity of flow of water than the earth ditch may be expected, when we consider its resistance to wave action at the Ivanhoe Reservoir, and the resistance of oiled roads to cutting under the action of running water. This toughness of oil lining was also noticed in filling the experimental ditch each morning. When the water carried by the wooden flume discharged into each ditch through the gate it had a fall of at least one foot. It was difficult to prevent the sloping ends of the earth and puddle ditches from being badly cut up by the erosive force of the falling water. These ends had to be well protected with heavy canvas, and even the erosion could not be altogether prevented. The ditches lined with oil resisted the erosion and showed no cutting, although they were not protected with canvas.

A letter from the Superintendent of the Modesto Irrigation District, dated January 21, 1907, states that the ditches were examined by him after the recent heavy rainfalls. The banks of the earth ditches were badly washed where the water ran in; the clay puddle was slightly so, but the oiled ditches showed absolutely no sign of wash. The oil linings are all hard and firm and scratch almost like concrete.

This resistance to erosion will permit in a saving of cross-sectional area due to the possibility of giving the water an increased velocity. The higher velocity will prevent the deposition of silt to a great extent and there will be a consequent decrease in the cost of operation and maintenance.

The puddle lining in the experiment showed a saving in seepage nearly equal to the heavy oil lining when 3⅔ gallons of oil per square yard was used, and a greater saving than the other oil linings. This puddle lining, whose thickness was 3½ inches, would, no doubt, if made thicker, be more efficient than any of the oil linings as regards seepage; but clay puddle when wet becomes

very soft and will not resist the erosive force of the flowing water unless the velocity is very small. It will not prevent the growth of weeds. For these reasons it is probably not as efficient for canal linings as oil. But where clay is plentiful it would be preferable for reservoir lining. But slopes should, however, be protected against the erosive action of the waves by the use of cobblestones or other protection.

The use of oil in lighter quantities, while not very efficient in preventing seepage, will no doubt prevent the growth of vegetation, as illustrated by the example of the ditch near Lemoore. In this case only 1½ gallons per square yard was used and this quantity has been sufficient to prevent vegetation.

Cement mortar plaster, so extensively used in southern California, showed a saving in seepage water of 63 per cent. Better results were expected, and it is probably safe to expect a greater saving where good work is done, especially where the work is constructed in cold weather. This lining had to be applied when the temperature in the field was probably 110° or over. The cement mortar was mixed in small quantity and quickly applied. As soon as the setting had started the lining was sprinkled and covered with wet canvas, but even with these precautions better work could be done in cooler weather.

This plaster, while very efficient and economical on small ditches, would not be of sufficient thickness and strength to be used on the larger canals and laterals of larger irrigation systems, where a thickness of from 2 to 4 inches would no doubt be successful.

NOTE ON THE EFFECT OF LIME UPON THE AVAILABILITY OF THE SOIL CONSTITUENTS.

F. B. Guthrie and L. Cohen.

(Read before the Royal Society of New South Wales.)

The experiment here described was undertaken with the object of determining to what extent the availability of the soil-constituents is affected by the addition of lime.

Three kinds of soil were used in the experiment—a light sandy soil, a garden loam fairly rich in humus, and a very stiff clay soil.

The soils were well mixed, passed through a sieve with a 1 millimetre mesh, and about 10 lb. of each placed in an ordinary 11-inch terra-cotta unglazed pot, closed at the bottom with a cork. Duplicate portions, sifted as above, were thoroughly mixed with 1 per cent. freshly-slacked lime, and potted in duplicate.

The pots were placed for a month in a position exposed to sun, rain, and wind, and kept moist the whole of the time. On three occasions they were saturated with heavy showers, but did not overflow.

The clay soil which had been treated with lime had undergone considerable physical change, having become quite friable and easily broken up by the fingers at the end of a fortnight.

At the time of filling the pots, samples of the original soils in an air-dried condition were taken for the determination of the plant-food soluble in hydrochloric acid, citric acid, and water. The analyses are as follows:

ANALYSES OF ORIGINAL SOILS.

		Clay.	Loam.	Sand.
Soluble in HCl. Sp. gr. 1.1.....	CaO	.742	.827	.109
	K_2O	.241	.103	.031
	P_2O_5	.184	.348	.074
Soluble in 10 per cent. citric acid	K_2O	.0115	.0254	.0055
	P_2O_5	.0405	.1674	.0317
Soluble in distilled water.....	K_2O	.0057	.0061	.0027
	P_2O_5	.0027	.0026	.0019

After the pots had stood a month, the soil in each pot was well mixed and all lumps broken up, after which a fair sample was taken, without sifting, and dried at air temperature.

For the citric-soluble determinations, 100 grammes of air-dried soil were placed in a Winchester with a litre of 1 per cent. solution of pure citric acid, the bottle being then fixed in a mechanical-shaking apparatus (end-over-end motion), making approximately fifty revolutions per minute, and shaken continuously for twenty hours.

With this solvent, it has been shown by A. D. Hall that no further quantity of phosphoric acid or potash goes into solution after that time. The shaking being completed, the Winchester was allowed to stand in an upright position for some hours, after which the clear supernatant liquid was syphoned off and filtered through a dry paper.

Of the clear filtrate, 500 c. c. were taken and evaporated to dryness with about 50 c. c. of nitric acid. The residue was then ignited gently at a low heat, and, on cooling, taken up with hydrochloric acid, using the molybdate method for P_2O_5 and the platinic chloride method for K_2O.

To obtain the water-soluble extract, 200 grammes air-dried soil were shaken in a Winchester, with a litre of distilled water, for twenty hours in the above-described apparatus. After standing for about six hours the clayey liquid was syphoned off and filtered under pressure through a Pasteur filter-candle by means of a force-pump.

500 c. c. of the clear filtrate were evaporated to dryness with a few drops of HNO_3, proceeding in the same manner as for citric-soluble.

The results of the analyses are given hereunder.

WATER SOLUBLE.

(*a*) Phosphoric acid, P_2O_5.

	Original	Standing 1 month	Standing Mean	Limed 1 month	Limed Mean	Increase	Decrease
Sand	.0019	.0006	.0007	.0029	.0033	.0026	....
		.0007		.0027			
Loam	.0026	.0004	.0005	.0022	.0024	.0019	....
		.0006		.0025			
Clay	.0027	.0008	.0008	.0019	.0019	.0011	....
		.0007		.0018			

(*b*) Potash, K_2O.

Sand	.0027	.0018	.0019	.0038	.0039	.0020	....
		.0019		.0039			
Loam	.0061	.0045	.0044	.0048	.0047	.0003	....
		.0043		.0046			
Clay	.0057	.0007	.0008	.0038	.0034	.0026	....
		.0009		.0030			

CITRIC SOLUBLE.

(*a*) Phosphoric acid, P_2O_5.

	Original	Standing 1 month	Standing Mean	Limed 1 month	Limed Mean	Increase	Decrease
Sand	.0317	.0315	.0309	.0315	.0312	.0003	....
		.0302		.0308			
Loam	.1674	.1860	.1815	.1802	.1792	....	.0023
		.1770		.1782			
Clay	.0405	.0423	.0426	.0210	.0241	....	.0185
		.0429		.0272			

(*b*) Potash, K_2O.

Sand	.0055	.0074	.0071	.0087	.0081	.0010	....
		.0067		.0074			
Loam	.0254	.0196	.0193	.0221	.0221	.0028	....
		.0190		.0221			
Clay	.0115	.0113	.0113	.0118	.0114	.0001	....
		.0113		.0110			

The analyses were made in all cases on the air-dried soils. The moisture was determined in each case, in order to apply corrections if necessary.

No corrections were made, as the water-contents were fairly constant, but the figures are given below.

MOISTURE-CONTENT OF SOILS.

	Original.	Standing— 1 month.	Limed— 1 month.
Clay	6.36	8.07	8.94
Loam	3.99	2.02	2.89
Sand	1.69	.19	.26

There are one or two points to be noted in these tables. In the first place, the amount of mineral plant-food (phosphoric acid and potash) soluble in water has suffered a very considerable decrease during the period of the experiment, notably the water-soluble phosphoric acid in all soils and the potash in the clay soils.

The action of liming has been in all cases to produce an increase in the quantities of water-soluble plant-food over the unlimed; but it is only in the sandy soil where liming has had the effect of increasing the proportion of water-soluble phosphoric acid and potash above those originally present in the soil.

There was no vegetation in the pots, and no drainage except through the walls of the pots, and the samples for analysis were taken by mixing the whole of the contents, and not from the surface layer only.

It would therefore appear that there is a steady loss of water-soluble plant-food during the period, either by percolation through the sides of the pot or by conversion into insoluble plant-food.

Whether the lime present prevents this reversion of the water-soluble plant-food, or whether it renders fresh plant-food soluble in water, is not shown by this experiment.

In the case of the citric acid soluble ingredients, there has been very little appreciable alteration in the quantities after standing—in some cases there has been an actual increase.

The effect of liming is much less marked than with the water-soluble plant-food. In the case of the phosphoric acid there is an actual decrease in this constituent, especially in the clay soil.

In the case of potash, the increase is also much less than with the water-soluble potash, except in the case of the garden loam.

Portions of the unlimed and limed soils were also examined, in order to ascertain the effect of lime on the soluble nitrogen.

The pots had by this time been standing eight months in a dry state. The soil was well mixed, and a weighed portion shaken for a few minutes with nitrogen-free water, in the proportion of 1 gramme of soil in 2 c. c. water.

The extract having been filtered through porcelain under pressure, 2 grammes of purified "vegetable black" were added to about 250 c. c. and stirred for twenty minutes. The whole was filtered again through a Pasteur candle, the filtrate being then, as a rule,

completely decolourised. In two cases, however, the treatment with "black" had to be repeated before a perfectly colorless solution was obtainable.

The carbon used for this purpose was the ordinary "vegetable black" of commerce, containing large quantities of paraffin oils.

It was purified by heating to redness in a covered crucible, and when cool lixiviating three times with hot nitrogen-free water.

For the determination of ammonium salts, portion of the filtrate from the soil, after decolourisation, was nesslerised direct.

The nitric nitrogen was determined by the phenolsulphonic-acid method, and the nitrous by the starch method.

The results are given below.

NITRITE NITROGEN.

	Unlimed.	Limed.	Increase or Decrease.
Clay	.4	3.6	+3.2
Loam	.1	2.0	+1.9
Sand	Nil.	.7	+ .7

NITRATE NITROGEN.

	Unlimed.	Limed.	Increase or Decrease.
Clay	8.0	5.0	—3.0
Loam	4.5	4.5	....
Sand	.2	.4	+ .2

The interesting point about the above figures is the large increase in the proportion of nitrite nitrogen in the limed soils. The total nitrogen as nitrite and nitrate has increased in all cases, and the nitrate-nitrogen has remained almost stationary, except in the clay soil. It would not, therefore, appear that the production of nitrites is due to any process of denitrification, but rather that, under the conditions of the experiment (vegetation being absent and the soil undisturbed), the action of lime is to promote the development of the organisms which convert the ammoniacal soil nitrogen into nitrous acid.

The figures for ammoniacal nitrogen do not throw any light on this point, for the decrease in ammoniacal nitrogen after liming is undoubtedly largely due to loss of ammonia, the limed soils all giving off a distinct odor of this gas. The figures obtained are, however, given.

AMMONIACAL NITROGEN IN PARTS PER MILLION OF FUEL.

	Unlimed.	Limed.	Increase or Decrease.
Clay	8.2	1.0	—7.2
Loam	5.3	1.6	—3.7
Sand	5.3	.8	—4.5

The fact that there has been no loss of the very soluble nitrites and nitrates would indicate that the diminution of water-soluble potash and phosphoric acid previously noted is not due to percolation through the walls of the pots so much as to conversion into the less soluble forms.

It is our intention to continue these experiments under conditions which will afford more precise information concerning the various questions involved.

Sugar Plantations, Cane Growers and Sugar Mills.

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Hilo Sugar Co	**	J. A. Scott	Hilo
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Waiakea Mill Co	*x	C. C. Kennedy	Hilo
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Hutchinson Sugar Plantation Co	**	Carl Wolters	Naalehu
Union Mill Co	*x	H. H. Renton	Kohala
Kohala Sugar Co	*	Geo. C. Watt	Kohala
Pacific Sugar Mill	x**	A. Ahrens	Kukuihaele
Honokaa Sugar Co	x**	K. S. Gjerdrum	Honokaa
Olaa Sugar Co	xx	J. Watt	Olaa
Puna Sugar Co	...		Kapoho
Halawa Plantation	x*x	R. H. Atkins	Kohala
Hawi Mill & Plantation	††	John Hind	Kohala
Puako Plantation	††	Jno. C. Searle	S. Kohala
Niuli Sugar Mill and Plantation	*x	Robt. Hall	Kohala
Puakea Plantation	*x	H. R. Bryant	Kohala
KAUAI.			
Kilauea Sugar Plantation Co	**	F. Scott	Kilauea
Gay & Robinson	x*x	Gay & Robinson	Makaweli
Makee Sugar Co	...	G. H. Fairchild	Kealia
Grove Farm Plantation	x	Ed. Broadbent	Lihue
Lihue Plantation Co	x	F. Weber	Lihue
Koloa Sugar Co	x	L. Weinzheimer	Koloa
McBryde Sugar Co	*x	W. Stodart	Eleele
Hawaiian Sugar Co	x*	B. D. Baldwin	Makaweli
Waimea Sugar Mill Co	*	J. Fassoth	Waimea
Kekaha Sugar Co	x	H. P. Faye	Kekaha

KEY.

	HONOLULU AGENTS	
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x	H. Hackfeld & Co	(9)
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x*x	H. Waterhouse Trust Co	(2)
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