THE

# PLANTERS' MONTHLY,

PUBLISHED FOR THE

## Planters' Labor and Supply Company,

OF THE HAWAIIAN ISLANDS.

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Louisiana is in a bad state, a New Orleans paper says: "Thousands of acres of sugar and cotton in Louisiana will go to waste for lack of laborers."

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The weather in the Hamakua district has been very suitable for cane-growing and manufacture, and all the mills have been working during the past month.

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A table of the prices of sugar, in various weights, will be found of advantage when making calculations as to the value of the product as the market rises and falls.

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Russia is sick of the sugar bounty system. An imperial ukase has been promulgated stating that the payment of bounties is closed, except for sugars exported to Central Asia.

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Grinding re-commenced at the Pahala Mill, March 6th. Every preparation has been made in the mill for the coming season; the machinery has been thoroughly overhauled and new boilers put in.

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Direct communication by steamer with Victoria ought to be of great advantage to our small producers. There is no reason why a considerable trade should not be carried on during the winter months in garden produce and fruit. We shall have a profitable market opened up for us, The steamers which propose to run through between Victoria and Australia will be some of the largest Cunarders.

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The fourth installment of Mr. Alexander's tour in South America is given in this issue. His interesting letters will come to an end for some short time, as he has been quarantined for a month at Rio Janeiro.

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The sugar market, according to latest advices, was not in a very bright condition. Cuban was falling, while there was a slight advance in Manila. The unfortunate word "dull" tells a dismal tale for us.

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A second large sugar refinery is to be established at Chorrera, in Cuba, and the plant for the purpose is to be transferred from a factory in the United States. The new refinery is to have a capacity of 67 tons per day.

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Considerable cargoes of sugar are going forward direct from Kahului to the Coast. The bark W. Case, which sailed from that port March 1st, carried 1,869,465 pounds, the largest shippers being, of course, the H. L. and S. Company.

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The scheme for obtaining laborers from Java for the Queensland plantations has come to a summary end, the Netherland's Government having decreed that the "engagement of native laborers for service out of the country a criminal offense."

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Dr. Martin's new test paper for cane juice will excite considerable interest among sugar boilers. A few specimens of the paper have been forwarded to the editor of this magazine, and are at the disposal of any one who wishes to experiment with them.

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We regret to hear of the serious accident which has occurred to Mr. W. M. Giffard, of the firm of Irwin & Co., sugar factors, Honolulu. An explosion of gasoline occurred at his residence, and Mr. Giffard has been seriously burned about the hands and head.

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The beet sugar business is not likely to have much of a boom in the United States. At the present prices of sugar it is more profitable to turn the beets into fat cattle than to sell them to the beet sugar manufacturers. The American farmer has tumbled to this idea, which is good news for us.

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Professor Van Slyke's article, which appears in this number, is the first of a series that will undoubtedly prove of great value to all engaged in the various agricultural industries of the Islands. During the series, the various soils of the sugar estates will be treated of, and some interesting correspondence will doubtless be drawn forth by his remarks.

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A new way of washing butter has been patented in Germany. As soon as the butter has formed into small globules in the churn, it is taken out and put into a cylinder lined with cheese-cloth. The cylinder is perforated, and revolved at a greater speed whilst water is sprayed in from the top. The buttermilk, and afterwards the water, is thrown out by centrifugal force, whilst the butter is completely washed and dried. The bag with its contained butter is then taken out, the butter is salted, moulded and made ready for market with the smallest amount of handling. We recommend this idea to the butter makers on the other islands. Those engaged in the business will always find that by keeping abreast of the times they will satisfy the public and increase their own gains. With a few honorable exceptions, dairy work is in the dark ages in the Hawaiian Islands.

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## *HOW TO WIN, OR MINOR INDUSTRIES.*

The future of sugar is not bright, and unless a European war takes place there seems every prospect of a further fall in prices. Hawaii, which has to depend entirely upon the products of the soil, has need to look for something to supplement her great staple, and fortunately there are many things which she can fall back upon. What is needed, however, is continual experiment in the so-called "Minor Industries," so that, when the time comes, our agriculturists may not be found like the foolish virgins, with lamps untrimmed and the oil shops closed for the night, but like the wise ones, with lamps ready trimmed and a plentiful supply of liquid fuel on hand.

A few of our planters have experimented, and among these may be mentioned Mr. Herbert Purvis, of Hawaii, who has demonstrated, at considerable expense to himself, the feasibility of cultivating the cinchona on lands which are useless for cane. So, also, we have one or two orange plantations, and a little coffee is cultivated, though hardly sufficient to supply the home market. A good deal more, however, might be done. The cultivation of arrow-root might be profitably carried on, and there is always a ready market for the product. Hemp is a plant to which no attention has been paid, and yet it could be grown on lands which are of no use as cane lands. The Philippine Islands, celebrated for their sugars, are almost equally celebrated for their hemp. The value of the hemp sent to England *alone* in one year amounted to £670,000, or about $3,350,-000. And this is a source of agricultural revenue which we have never tried, and one that if we did try we would regard as one of our *minor* industries. One great advantage of hemp is that it is a plant yielding a full and quick return within a season. Not only does hemp yield the fibre, but in a tropical climate it exudes the churras, a resinous substance of intoxicating property, for which there is a market in China, and the seeds yield a well-known oil. Moreover, the plant, sown along the boundaries of fields, serves, from its narcotic properties, as a protection against insects.

Of the vanilla bean we spoke in our last issue, and we trust that the subject will not sink to sleep in the pages of the magazine, but will take practical shape in the shady corners of plantations and kuleanas. The castor-oil bean is also worth producing. This is a hardy plant, and can be raised even in arid places. We have the wild castor-oil plant here, growing abundantly, and if it will grow, so will the true castor-oil of commerce, *ricinus communis.* The gutta-percha tree, *isonandra gutta,* could be successfully grown in regions far above the cane limit, and the demand for this product is yearly increasing, for it is used in so many manufactures.

Mr. Jaeger has demonstrated that on our waste hill slopes, the Australian wattle can be successfully planted, and it will not be long before the trees on the Government reservation above the Lunalilo Home will produce a regular income by their bark. Plantation owners will do well to plant this tree, and we believe that a step has been made in this direction by one or two of the Hawaii planters.

With all these strings to our bow, we ought not to become too depressed by the steady downfall in the price of our staple. But viewing that downfall with far-seeing eyes, we should prepare ourselves to turn our land to good account in some other way when our present staple will no longer support us. A few hundred or even a few thousand dollars spent now in experimenting may prove of incalculable benefit a few years hence. It is no use waiting till we are fairly shoved against the wall. We should have a hole cut through the wall in readiness to creep through when the need comes. The more we broaden our base, the more likely are we to prosper, and when we find ourselves attacked and defeated in one direction, we ought to be prepared to strike out and succeed in another.

We have said nothing in this article upon the subject of tobacco. Experiments were made here many years ago, and proved abortive, but we are by no means satisfied that the experiments should be regarded as final. The experiments were made when there was nothing like the push and energy, nothing like the means of rapidly testing whether the plant, as grown here, might or might not be a success. We believe that it would be money and time well spent, if some of our planters would choose suitable spots of land and plant with tobacco, obtaining their seed from Cuba, Manila and Fiji, in which latter colony considerable pains have been taken with the plant, and the opinion of experts taken on the result. Nothing venture, nothing win, is a good old proverb, and a very true one. A venture or two on every plantation will enable our agriculturists to decide what card to play in order to win the game of fortune and success.

## *THE COMING AGRICULTURAL SHOW.*

There can be little doubt that the annual meeting and exhibition of the Hawaiian Agricultural Society should provoke more interest than it does at present. In one line the show may be regarded as a success, viz., in stock. But such shows should not be confined to one line, and the promoters of the Society should seek to give greater popularity to this show. What they want to get at are not the wealthy and those who can afford to spend considerable sums in raising fancy products, but the cultivator who has small means, or whose means consist in only the time he can snatch from his regular labor and the work of his own hands. We have both Chinese and Portuguese around the city who should be urged to compete for various prizes offered. And these prizes should be of a character which would be acceptable to the competitors. No Chinaman and no Portuguese will tramp down to Kapiolani Park and pack his produce there with the prospect of an engraved card, in not too high a style of art, as his reward. The prize should be something practical, either garden tools or money. Not only should the small cultivators and gardeners be urged to compete, but the occasion might be seized of getting exhibitions of many other industries. Carpentry and joiners' work is of importance to our great industry, so are the products of the machinist's lathe. Agricultural implements have always found a place in our show, because the large importing houses find it an excellent advertisement, but are there no mechanics who have some improvement either in tools or implements to offer ? There must be, or the American mechanic has deteriorated by changing his skies, and that we cannot believe.

Our housewives should come forward with their pickles and preserves. There are many delightful compounds made especially on the other islands which are practically unknown to many of the residents in Honolulu. Were they once known, quite a little trade might spring up which would be of mutual advantage both to consumer and producer. We know of one family of young ladies here who get all their pin money from the manufacture of jam, and so great is the demand among their friends that they always have orders ahead. What they do others might do, and an exhibition of these product would create the demand.

Then again there is wood-carving. There are a number of wood-carvers here, and some wood-cutters. Their productions are seen by a few. Were they exhibited at the yearly show they would be seen by crowds and their work appreciated. Among the Portuguese are stone-cutters, and specimens of their work should find a place in the show. Some months ago we saw some excellent stone-cutting done by a Portuguese at Waialua, and the man was teaching his son the art.

The exhibition might also afford an opportunity for showing paintings and sketches by professional and amateur artists; fancy work and plain sewing might find a place ; in fact, the agricultural show might be made the means of bringing together specimens not only of our blooded stock and the main staple of our country, but of every industry, useful and ornamental, practiced in the Islands. An exhibition on the lines we have suggested would be most interesting and highly popular, and would create an interest not only among the small circle who can afford to keep blooded stock and grow fancy plants, but among the artisan and laboring classes.

To get such an exhibition together, however, would require considerable work and personal solicitation. To get the class we would desire interested, something more than merely advertising a list of prizes is required. Once, however, get the people interested, and the need for solicitation would be over, once and for all; the ball properly set rolling would grow as it advanced, like a snow-ball sent spinning down hill.

Another thing to be thought of is the time at which such an exhibition should be held. It ought to have its principal day on a public holiday. Mechanics and workingmen on wages cannot afford to lose a day's work, but they will only be too glad to take advantage of an off day to give their families and themselves an outing.

That an exhibition of this kind can be got together in a tropical country is evidenced by the success of the Annual Industrial Exhibition in Barbadoes. The prizes at that exhibition are not of any great value, but they are eagerly competed for, and every class in the community is represented among the prize winners. Thus, like interest excited here, like results might be obtained, but it will require work on the part of the Society to get the exhibition together.

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## *ANALYSES OF SOILS.*

We give in our issue of this month the analyses of the Lihue, Kauai, soils, and also one of the Honouliuli soils, Oahu, the latter in 1886. The former analysis was made many years ago. It would be interesting to have a fresh analysis of the Lihue soils made, so that a comparison could be made with the land then and now. The importance of these analyses cannot be over-estimated. As the competition grows keener, the necessity of scientific cultivation increases, and there can be no scientific cultivation without a thorough knowledge of the material one is working with. Hitherto there has been a great deal of rule-of-thumb work, and by constant experiment and frequent loss, a planter arrives at a fairly good result. But if he has his soil analyzed, he knows just what ingredient his soil requires to make it good cane-growing land. It may be wise to let it alone altogether, or it may be wise to add the ingredient, which may be obtainable at a small cost. A good analysis will also enable the planter to decide whether, when he buys a manufactured manure, he is getting what he really needs. For there are fertilizers and fertilizers, and some will give a fine-looking cane which will produce but little sugar.

The following remarks, which we take from the *Louisiana Sugar Planter*, show how highly this subject is appreciated there:

During the season just ended, the Station has several times analysed specimens of cane from the 300 experiments grown on the grounds. It has also analysed several hundred for the farmers of the State, grown upon every variety of soil, and with perhaps every kind of manure used, in varying quantities. In all, over 2,000 distinct analyses have been made. A peculiarity of these results has been noticed by many observing planters, and has been commented upon in correspondence with the Station. The peculiarity is this: On the Station the unfertilized plats have frequently given the highest per centage of sugar. This is easily explained when a close examination of the soil of the Station is made. It is a very black soil, which has long been badly cultivated, with very little or no drainage, and although its chemical composition is very fair, its execrable physical condition checks the plant in its root development, and prevents the collection and assimilation of that food necessary to a arge, continuous growth, and the plant, so checked prematurely, ripens even in our short seasons. The amount of sugar in a cane is just in proportion to maturity. Therefore, a plant checked in its growth from any cause, poverty of soil, drouth, etc., at once does the only thing left for it, matures, *i. e.*, stores up sugar. Hence, upon poor soils, unfertilized plats, in favorable seasons, will perhaps always be the richest in sugar. Why then use manures? The reply is, to increase tonnage. The period of growth in this country is very short, and therefore to get the highest results, we must fertilize with quickly available manures, so as to force the cane into a good growth, by the time the cool nights of September and October check vegetation and induce maturity. The manures give increased tonnage, but rarely increased per centage of sugar. It is hoped that at an early day a fertilizer may be found which will accomplish both. But in the use of manures, great care should be exercised in selecting those which, while causing a rapid growth, will at the same time induce a moderate elaboration of sugar. Nitrogenous manures alone produce a sappy, succulent, one-sided growth, make a cane rich in ferment and albumoids but low in saccharine matter, except upon soils rich in available mineral matter. Therefore, nitrogenous manures should rarely be used alone, and never in excessive quantities. The exact quantity to be used per acre cannot be accurately foretold. Sometimes favorable seasons will permit of the appropriation of very large quantities to great advantage, while unfavorable seasons fail to utilize even small quantities. Again, if an excessive quantity used this year is not appropriated by the plant, the greater part of it is lost from the soil or rendered unavailable for the next season. Hence, prudence, would suggest the application of enough of this kind of manure to make, under a medium season, a fair crop. The maximum amount of nitrogen, according to this, would be from 40 to 60 pounds per acre—an amount usually contained in 600 or 800 pounds cotton-seed meal. But phosphoric acid and potash must be present, either in the manure or in the soil, in readily available forms, in order to combine with the nitrogen to make a perfect plant. The former, when present in the right proportions with nitrogen, causes a quicker and more vigorous growth than the latter alone, since the presence of this ingredient [phosphoric acid] causes a more rapid translocation of the albumoids [whose formation seems to be the chief function of nitrogen], through the sap or juice of the cane, and at the same time conduces to the formation and deposition of sugar.

The potash, on the other hand, conspires with the chlorophyl grains of the leaf to form carbo-hydrates, which are all ultimately in the cane resolved into sugar.

Therefore, when soils are deficient in these ingredients, they must be supplied in the manures. Excessive quantities of these ingredients can be used without fear or subsequent loss from the soil, if not utilized the first season. Numerous experiments have abundantly proven this.

But whether excessive quantities of these ingredients in the manure, especially potash, cause excessive quantities in the juice of the cane, to the prevention of the crystalization of sugar, are questions now being investigated by the Station.

It is believed that potash exists in available form and quantity in most of the sugar soils of the State. At all events, very small quantities of this ingredient in manures suffice to make large crops, and increased quantities do not enhance either the tonnage or sugar content. On the other hand, the application of phosphoric manures seems to be beneficial to all soils.

From the results of the field experiments of the past year, the Station would say that nitrogen and phosphoric acid are the ingredients absolutely needed for cane on the sugar soils and lands of this State, and that cotton-seed meal and soluble phosphates furnish these ingredients in as cheap and as efficient forms as can be obtained by the planters, and that small quantities of potash may be beneficial, and can be easily and cheaply supplied in the form of kainite.

When the soil contains a moderate amount of vegetable matter, cotton-seed meal and acid phosphate should be used in equal proportions; if deficient, the cotton-seed meal can be increased. On pea fallows it can be decreased. Upon stubble cane, cotton-seed meal can be advantageously increased.

Nitrate of soda has been very effectively used as a top-dressing during the past season upon small and late stubble.

The first essential to the successful production of sugar is a large crop. To attain this, the following conditions are demanded: Thorough drainage, excellent preparation of soil, good seed properly planted, judicious manuring, both in quantity and quality and mode of application, early culture, deep and thorough—after culture as shallow as possible for good work, and a laying by as early as is consistent with cleanliness and good condition. These being accomplished, nature will do the rest, and a reasonably large crop may be confidently expected.

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## *THE NEW RAMIE MACHINE.*

A letter from Mr. Lycan, which we publish in this issue of the MONTHLY, affords some valuable information relative to ramie cultivation and manufacture. The importance of this communication is very great, and we shall be happy to have any further information which Mr. Lycan may feel disposed to send. Many inquiries reach us relative to ramie, and we notice that similar questions constantly appear in the various magazines devoted to tropical agriculture. The great difficulty before the ramie grower has always been a practical machine for putting the fiber into a marketable condition. This, apparently, Mr. Lycan has been able to cope with, and has thus cut the gordian knot. It is greatly to the credit of Hawaii that this invention should have been in the Islands. We have given the world the centrifugal, for the first of these machines ever used for sugar purposes was set up in Honolulu—the parent of the centrifugals in every sugar manufactory in the world. And now, though we cannot claim absolute invention for a ramie machine, we can yet claim such a modification and improvement upon the machines of other countries as bids fair to put the ramie industry into the range of practical agriculture and manufacture. It is evident that residence in the tropics does not cause the vigor or the mental power of those engaged in the great struggle for existence to deteriorate or become slack.

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Oscar A. Droege has entered into a contract with the Mexican Government to plant 2,000,000 trees in the Valley of Mexico within four years. He pledges himself to plant 80,000 ash, 36,000 willows, 120,000 poplars, 60,000 eucalyptus trees, 66,000 trœnosjapones, 60,000 mountain cypress cedars, 60,000 acacias and 120,000 of miscellaneous varieties. The trees must be in plantations of from 50,000 to 100,000 each.

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A new remedy for the destruction of the scale-bug is given by George Partee, of Santa Clara county. Having a number of fruit trees badly affected with the scale, he tried the experiment of driving nails into the trunk of the tree near the ground. The nails were driven from half an inch to an inch apart, and all around the trunk. The result is a total destructlon of the scale, and a perfect reinvigoratton of the trees. The experiment is easily tried.

# CORRESPONDENCE AND SELECTIONS.

## *THE CHEMISTRY OF PLANTS AND SOME OF ITS APPLICATIONS.*

BY PROFESSOR VAN SLYKE OF OAHU COLLEGE.

### 1.—THE ELEMENTARY COMPOSITION OF PLANTS.

The series of articles, of which this is the first, is designed to give an outline of what is ordinarily called agricultural chemistry. The plan, in brief, is to study in a general way the essential elements that enter into the composition of plants; then to consider what are the exact position, relations, and functions of each in the vegetable economy. The subject cannot be treated at all exhaustively in the limits proposed, but it is hoped that the more essential facts may be given.

To present such a subject briefly in a way that is clear and always simple, is no easy task, for it is impossible to dispense entirely with scientific phraseology. While technical expressions will be avoided as much as possible, a certain amount of general and special knowledge of the meaning of many terms must be presupposed.

While these articles may not prove of any practical value, and, indeed, may not present much that is new to many, it is hoped that they may serve to convey a more systematic and comprehensive knowledge of the subjects considered than is ordinarily obtained by reading miscellaneous and disconnected articles in the same line. In so far as possible, special application of the facts considered will be made to questions of agricultural interest in these islands.

Most of the readers of the PLANTERS' MONTHLY are men of high intelligence and extended experience in agricultural matters, and to such there is no need of speaking about the importance of the scientific side of agriculture. By the aid of modern science, agriculture has been more fully developed, in its chemical and physiological aspects, during the last fifty years, than in all the previous ages. Less than eighty years ago, not a single vegetable substance had been accurately analyzed; and, although much was learned about the elementary composition of plants in the thirty years following, it was not until 1840 any comprehensive theory of plant-nutrition was propounded. Since that time our knowledge of the chemistry of plants and of its practical application has been developed with wonderful rapidity. Much remains to be learned, but investigations are constantly being carried on in various parts of the world, and new facts of importance are being ascertained.

All matter is composed of about seventy different elements, or simple substances. Just as the letters of our alphabet are combined in various ways to form the words of a whole language, so these seventy elements, constituting nature's alphabet of matter, are capable of being united to produce all the different chemical compounds that go to make up the countless forms of matter. The number of different combinations possible between these elements is simply infinite.

The exact number of different species of plants growing on the earth has never been definitely ascertained; but not less than 125,000 are now known, and, when all have been discovered, the number may reach or even exceed 200,000. Of this large number only a few hundred have been subjected to careful chemical analysis, and yet, so uniform in all its wonderful variety are nature's methods of working and building, that we can quite safely say that, so far as the ultimate or elementary composition of plants is concerned, little remains to be learned. Chemical analysis shows that, of the seventy elements known to exist, only fourteen are essential to produce all the different forms of vegetable life.

While all plants possess certain chemical compounds in common, it is probable that each plant possesses in some or all of its parts one or more chemical compounds peculiar to itself, so that there probably are at least as many distinct chemical compounds in the vegetable kingdom as there are different species of plants. This, of course, cannot be known absolutely until all plants in existence have been analyzed; but, whether the number of different chemical compounds in the vegetable kingdom be a few thousand or a few hundred thousand, we know that they are almost entirely made up of fourteen elements, and these, therefore, form the alphabet of the vegetable kingdom, all the different vegetable compounds, like words, being formed by the union of two or more of the elements.

The fourteen elements which are essential to the perfect growth and development of every plant are the following: Carbon, hydrogen, nitrogen, oxygen, phosphorus, sulphur, calcium (lime), chlorine, iron, magnesium, manganese, potassium, sodium and silicon. The element fluorine is of frequent occurrence in exceedingly minute quantities; and the following elements are of very rare or doubtful occurrence: Aluminum, barium, bromine, copper, cobalt, iodine, lead, lithium, nickel, rubidium, tin, titanium and zinc; but their occurrence is a matter of curiosity rather than practical importance, for, unlike the fourteen named above, they seem to be in no way essential to plant life.

The essential elements composing plants naturally resolve themselves into two quite distinct classes, with important and marked differences. The first class, to which I shall give the name of air-derived elements, consists of carbon, hydrogen, nitrogen and oxygen. The second class, to which may be given the name of soil-derived elements, consists of the remaining ten elements in the list above given. The reason of such a division is quite evident; for the elements of the first class are derived, for the most part, if not entirely, from the air, while those of the second class come exclusively from the soil. It has been usual among writers on agricultural chemistry to designate these classes by the terms organic and inorganic, but this use of these words is extremely inaccurate; for any element may be either organic or inorganic, according as it is or is not a part or product of an organized body. Oxygen, as it exists in the air, is inorganic matter; but when, through vital processes, it becomes part of an animal or plant, it is organic.

When a plant is burned, the air-derived elements, for the most part, disappear in a volatile form; while the soil-derived elements, usually the smaller part, are left in the form of an incombustible residue or ash. Some carbon and oxygen are always found in the ash, and often also nitrogen, while slight quantities of sulphur and phosphorus are apt to be vaporized. The two classes are thus not so sharply defined in this regard as they are in respect to the sources from which they come.

A third point of difference between these two classes of elements is that the air-derived elements constitute, at least, ninety-five per cent. of the whole vegetable kingdom, while the soil-derived elements occur in small quantities, varying from a fraction of one per cent. up to ten per cent., or even more in rare cases. Because the soil-derived elements occur in so much smaller quantity, it does not follow that their function is of less importance. In their absence vegetation would disappear.

The distribution of the elements throughout the various organs of plants is noticeably unequal. There may be a popular impression that the stem, the bark, the leaves and the fruit are alike in composition, being only different phases of development of the same substance; but this is not so, for each organ has, in a marked degree, a composition peculiar to itself. Moreover, the same organ varies in composition at different stages of growth.

As a general rule, the fleshy parts of plants contain a larger proportion os soil-derived elements than do the woody portions. The cause of this is that the fleshy parts have more direct and extended communication with the air, and the water contained in the sap evaporates more rapidly in the former parts than in the latter.

Again, herbaceous plants contain a larger proportion of soil-derived elements than do trees; the leaves of a tree, more than the bark; and the bark, more than the sap-wood and heart-wood. The pods of leguminous plants, being in more immediate and larger contact with the air, lose their water more rapidly, and, therefore, contain more soil-derived elements than do the seeds within the pod. Similarly, in the temperate climates, the leaves of evergreens contain less soil-derived ingredients in winter than in summer, since evaporation does not take place so rapidly in winter as in the hot summer.

The following table will serve to illustrate the general truth of the preceding statements:

SOIL-DERIVED ELEMENTS IN 100 PARTS OF VEGETABLE SUBSTANCE IN DRY STATE.

| | | | |
|---|---|---|---|
| Herbaceous plants | 7.84 | Sap-wood | 2.65 |
| Trees | 0.99 | Pea Pods | 5.50 |
| Leaves | 14.20 | Peas | 3.10 |
| Bark | 7.47 | | |

In respect to their distribution throughout plants, the air-derived and soil-derived elements differ quite strikingly, as may be illustrated by the subjoined analysis of the grain of wheat and wheat straw:

AIR-DERIVED ELEMENTS IN 100 PARTS.

| | *Carbon.* | *Hydrogen.* | *Oxygen.* | *Nytrogen.* |
|---|---|---|---|---|
| Wheat (grain) | 46.1 | 5.8 | 43.4 | 2.3 |
| Wheat (straw) | 48.4 | 5.3 | 38.9 | 0.4 |

SOIL-DERIVED ELEMENTS IN 100 PARTS OF ASH.

| | *Phosphoric Acid.* | *Potash.* | *Magnesia.* | *Lime.* | *Silica.* | *Chlorine.* |
|---|---|---|---|---|---|---|
| Wheat (grain) | 46.2 | 31.1 | 12.2 | 3.1 | 1.7 | 0.7 |
| Wheat (straw) | 5.4 | 11.5 | 2.6 | 6.2 | 66.3 | 2.8 |

By inspecting the first of the two preceding tables, it will be seen that three of the air derived elements, carbon, hydrogen and oxygen, are found present in nearly equal proportions in both the grain and straw. If we were to examine the different parts of any number of plants, we should find these three elements distributed in all plants and in all the different organs, in nearly equal proportions.

On the other hand, the second table illustrates the fact that the soil-derived elements have a kind of elective affinity for certain parts of plants. Silica, lime, chlorine, as well as iron and sulphur, are found in the stalks and leaves more abundantly than in the fruit and seeds, while phosphoric acid, potash and magnesia prevail to a very marked degree in the fruit and seeds.

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## *A NEW TEST PAPER.*

To the Editor of the Planters' Monthly:

I take the liberty to recommend to planters and sugar boilers a new test paper invented by me, which enables sugar makers to detect the smallest percentage of alkaline lime in sugar-cane juice, and permits the control of the sugar manufacturing process in a closer way than it did before.

The sensibility of this test paper exceeds the sensibility of lilmus paper by a long way, and the paper indicates in the same time whether cane juice from the roller is pure or mixed with other substances not desirable in the juice.

The test itself is very simple. A drop of the cane juice on a square piece of the paper of about half an inch will produce in the center a dark spot with a light blue ring in case the sugar cane drop is alkaline. When the juice is very clean the central spot will be transparent after drying, and when impure the whole will, after drying, become of an opaque dark-reddish or brown color. To detect the alkality of juices it will be necessary, at least in beginning, always to compare the drop of original juice with limed juice.

The test paper will be a great help to a sugar boiler, and will enable him to work more regularly than he could before, being in position to give his juice any alkality he likes, and which suits best for his cane juice.

Yours faithfully, DR. MARTIN.

Waianae, February 28, 1887.

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Dr. Martin encloses the following certificate:

WAIANAE, March 2, 1887.

I herewith certify that I have tried Dr. Martin's test paper, and that I use it now continually for the determination of alkality in the juices of the sugar cane, and that this paper has given me every satisfaction, and that I prefer it to any other test I have tried before.

CARL ARNEMANN, Sugar Boiler.

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## *ORANGE AND LEMON CULTURE.*

A lady horticulturist, Mrs. S. S. Spence, of Butte county, writing to the Oroville *Register*, says: "It may not be generally known that the orange and lemon can be grown from cuttings with very little trouble, yet such is the case. In my orchard are eleven-year-old trees from cuttings that have borne fruit for two seasons. They are very thrifty, and bid fair to become as large as seedling trees from which they were taken. I prefer grafted to seedling trees. The former attain larger size, and the fruit is of better flavor, while the latter remain small, and the fruit coarse and insipid, and more susceptible to frost. After waiting thirteen or fourteen years, the fruit on trees grown from the seed is often found worthless, but trees grown from cuttings are true and constant, and will bear about four years sooner than a seedling. Cuttings should be taken from good seedling trees, the wood to be of about two years' growth. Place them in a nursery by themselves, where water is plentiful, and in two years they can be set out where they are to remain."

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Great success has been made at Kukuihaele plantation with the maceration machinery. A plot of forty acres which with ordinary machinery would have, it is estimated, yielded five tons to the acre, has given the unprecedented yield of eight and a half tons per acre. The total advantage to the plantation from using the new machinery will be about 600 or 700 tons on the whole crop. Good for maceration.

## *AN IMPORTANT INDUSTRY—RAMIE GROWING IN THE HAWAIIAN ISLANDS.*

TO THE EDITOR OF THE PLANTERS' MONTHLY:

About twenty years ago Dr. Hillebrand sent to California and China after ramie roots and seed, and after the roots arrived here he sent about a pound to Kona, Hawaii, and half a pound to Wailuku, Maui. The roots sent to Kona were planted by an old native, long since dead, and those sent to Maui were planted in Iao Valley by Capt. Wilfong. The roots planted in both places were almost entirely neglected, and in Wailuku the cattle have nearly destroyed it, but in Kona no cattle ranged on the ground where the ramie was planted, and so it has continued to grow and spread ever since, notwithstanding the dense growth of Lantana and Hilo grass surrounding it on every side, and the ramie now covers about thirteen acres, from the original planting of one pound of seed, besides the native first planting sold some roots to a Chinaman, who planted them about three miles from the first planting by the native, and this patch, which is about twelve years' growth, covers seven or eight acres, and from these two patches of ramie the natives and Chinamen in Kona have for years made their fishing lines and some nets.

Something like nine years ago a small machine was imported by the Hitchcock Brothers, in Hilo at that time. Messrs. Hitchcock planted some ramie, but as the machine was a failure they gave up the ramie business, so they were the first men in this country to invest and lose money in the ramie industry.

After that Mr. C. C. Coleman thought that he could improve on the machine imported by Messrs. Hitchcock, and Messrs. S. N. Castle and B. F. Dillingham furnished the money needed for his experiments to the sum of $7,000. After his machine was finished Mr. Coleman secured patents in several countries, but as Messrs. Castle and Dillingham stopped the supply of money, Mr. Coleman allowed the whole affair to drop into the background, and nothing was done to revive the ramie industry until three or four years ago, when the textile people all over the world became interested in ramie through the untiring zeal of such men as Professors F. Fremery, La Franc and Berthet. Rewards were offered by several governments for a machine that would prepare the fibre of ramie for market so that it would be profitable at from 5 to 15 cents per pound. These offers have so stimulated inventors that no less than eighteen machines of more or less merit have been patented for cleaning ramie, but very few of the patents are of value.

The H. C. Smith (Death & Ellwood) machine took the reward offered in British India, $14,000, but as it only cleans from 60 to 100 pounds per day, and requires three men, two-horse-power engine and 400 gallons of water per hour, the machine is only good for small growers, and will not prove of much value even to them. A machine invented by George Gibson, from the reports of the New Orleans Exposition, seems to have a goodly amount of merit, but is of small capacity, 400 pounds per day. Two men, two boys and a three-horse power engine are required to run it, so report says. A machine that is said to do a large amount of work has been invented by a gentleman Guatemala, but as he has no patents yet, and one gentleman who went to see it operate for me says it can only handle a small amount of ramie stalks per day (it requires four minutes for a lot of stalks to pass through the machine), and as it cannot properly treat over twenty-five stalks at a time, and it only produces 3½ per cent. of fibre, it is easy enough to see that the claim of 4,000 pounds per day is very far from being correct. One hundred stalks per minute is for ten hours 60,000 ; twenty green stalks weigh about one pound ; 3,000 pounds of green stalks at 3½ per cent., 105 pounds of clean fibre. But I hope that the machine will prove better than the above showing. I show the above figures because several have become much interested in this new machine, but without the least knowledge of facts in regard to working ramie.

About three years ago, after endeavoring to get Mr. Coleman to set up his machine without success, Messrs. Dillingham, Castle and myself bought out his patents and machines, and immediately had the machine set up and tried, but it was so complicated that it was practically useless, so I began modifying it, and at last so perfected it that we could only secure a patent as a new invention, and not as an improvement. This machine was decided by the Commissioner, Mr. Jonathan Austin, appointed by the Government, to be entitled to the bonus ($10,000) voted by the Legislature, but as the reason given for not paying it by the then Minister of the Interior (no money in the Treasury) has not to my knowledge been removed, we have not received the money up to the present time. As the fibre cleaned by that machine (for which we were offered five cents per pound for all that we could make in five years) was often cut by the fluted rollers, and was delivered from the mill somewhat tangled, I have since perfected a machine that never cuts the fibre, nor can the fibre by any possibility be tangled while being cleaned. The proved capacity of the machine is at least one ton (2,000 pounds) per day. It needs two men, two boys and one-horse power engine to operate. The product is a clean ramie bark, and at present is worth from 10 to 15 cents per pound.

The Hawaiian Ramie Company (Limited) owns the two Colman machines and the two invented by me, has thirty-six acres of ramie growing on the plantation in Puna (400 acres), where over $12,000 has been spent in improvements, and we can now confidently say that at last the ramie industry here is an assured fact, and that the business will prove at least as profitable as sugar.

I will give you a few figures. For perfection in growing ramie we want rice soil, little wind, warm climate and plenty of rain, but as the ramie plant does fairly well, or as well as sugar cane does, wherever the cane grows ramie will grow. So there is no lack of plenty of room for ramie, and as ramie needs no cultivation except to keep the grass and weeds out the first year, there are hundreds of places where ramie can be successfully grown, where it would not pay to plant sugar cane.

The cost to us for the first year is about $100 per acre. This includes cost of seed, and as one planting is all that is needed, the expense after the first year is only for cutting and stripping off the leaves. After the first year we can cut three or four crops every year, depending on conditions of soil, etc., and will get from a ton and a half to two tons and a half of fibre to the acre for each crop, and at five cents per pound, taking three crops and a ton and a half to the acre, we have as a result, gross receipts, $450 per acre per annum, and say that cleaning and marketing, etc. (a very high estimate), costs three-quarters, we have as net result $112 50 for every acre planted in ramie.

I will gladly answer any questions within my knowledge concerning ramie. Respectfully, E. LYCAN,

Manager Hawaiian Ramie Company, Hilo, Hawaii.

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## *PERU—THE WONDERS OF THE CHINCHA ISLANDS—NO.* 4.

Embarking again on a steamer at Callao, I voyaged further south three days to Mollendo, along a coast even more barren than the northern part of Peru. The wretched ports at which we touched looked really more inviting in contrast with the surrounding desert. On our second day we passed the Chincha Islands. It was hard to realize that these small barren islands had ever yielded the enormous wealth reputed to have been taken from them. There are three of these islands. The most northerly, called Chincha, is not more than a quarter of a mile broad by half a mile long, and the others smaller; yet it is computed that from 1851 to 1872 11,000,000 tons of guano were shipped from them. In the palmy days of this business, it was no uncommon sight to see 200 ships receiving cargoes or awaiting their turn to be laden. The business was conducted with the greatest dispatch. The sides of the islands are quite bold and even precipitous, so that ships can lie close to the shore and receive their cargoes through long shutes. A 2,000-ton ship receiving guano at her two hatches could be laden in a day.

Various theories are advanced in regard to the origin of these islands. It is believed by some that they were formed by an upheaval of phosphates, or, as I heard an old sea captain express it, "they are the graveyards of the fishes, hove up from the bottom of the ocean." But it is now generally conceded that the guano was deposited by sea birds. Mixed with the deposits of the birds were their own decomposed bodies and eggs, and the bodies of seals. When about to die, seals climb to the highest place on the rocks. As these islands swarm with these animals, it is safe to assume that millions have died upon them. No rain ever falls here, hence these accumulations have not been washed away.

MOLLENDO.

Mollendo, where I landed, is a small seaport town, and only important as the terminus of the railroad to Arequipa and Puno. It may be well described as bounded on the north by a desert, on the east by a desert, on the south by a desert, and on the west by the ocean. It receives its water supply from Arequipa. The water is brought in an eight-inch iron pipe a distance of ninety miles, the outlay for which was over $1,000,000. Along the line of this pipe reservoirs have been constructed to secure a supply of water in case of accident to the pipe; and here and there, at the way stations, where water has been applied, a marvelous vegetation has appeared. It is not at all improbable that throughout this country artesian wells could be bored with good results, and this "howling wilderness" made "to bud and blossom as the rose." A climb of 7,650 feet in a distance of ninety miles brought us to one of the most picturesque and interesting spots in South America, Arequipa. Like the city of Damascus, it is bounded on the four points of the compass by a desert. Like that city, too, it is watered by a river running through it, and is environed with beautiful gardens. There is, moreover,

AN ORIENTAL LOOK

About this city which I have not noticed in other South American cities. The buildings are generally of substantial masonry, with arching roofs of stone, and the whole whitewashed. It is the second city of Peru, having a population of about 60,000. But what attracted me most of all was the magnificent mountain of Misti, rising immediately in the background to a height of 18,500 feet. This gigantic cone of ashes and stone looks down on Arequipa as Vesuvius on Pompeii. The ascent is said to be very difficult. Its sides are steep, and the road passes over cinders and sand. Almost a year since two young Englishmen made the ascent, and on their return they were belated, lost their way, slid down into a deep ravine, and being unable to extricate themselves, perished from cold. One was afterward found in a sitting position, with his watch open in his hand, as though having timed the last moments of his life. To me there was a fascination in that distant summit. I could not keep my eyes or my thoughts away from it. The sirens from their icy retreat seemed to beckon upward. It was with reluctance that I turned my back on Arequipa. I was much interested in the accounts of

THE TERRIBLE EARTHQUAKE OF 1868,

Which shook this city to its very center. The first shock of this earthquake was followed by an unearthly rumbling sound as of subterranean thunder, after which the shocks succeeded each other quick and fast, until almost every building in the city was toppled over. The loss of life was great, and the destruction of property immense. Even now, after the lapse of eighteen years, there is scarcely a block in the city which has not its pile of debris and shattered walls.

The people of Arequipa seem to have imbibed from the country something of the volcanic into their temperament. In matters of religion they are fanatical, and they have also been the instigators of every revolution which has disturbed unhappy Peru. On the cars, coming up with us from Mollendo, were three members of the Peruvian Congress, who had voted for the expulsion of the Jesuits from Peru. When near Arequipa they were informed by friends that they would receive rather a warm reception on their arrival at the Arequipa station, and they were advised not to continue their journey, which advice they wisely followed. Sure enough, on our arrival we found a mob gathered at the station,

ARMED WITH CLUBS AND GUNS,

Wreaths of cactus and various unsavory missiles. A man present who ventured to say something in favor of the expected guests, was set upon by the crowd, thrown down and kicked, his jaws were forced open and his mouth filled with filth. A companion of mine suggested that the peace of the country would be conserved by an eruption of Misti which might swallow up the "infernal crowd," in which opinion I concurred. The railroad from Arequipa to Puno deserves more than a passing notice. It is 218 miles in length, and, like the Oroya railroad, its construction is a marvel of engineering skill. Soon after leaving the city our train began to ascend among the desert hills and through a mass of volcanic rock and cinders. The excavations and cuttings on this part of the road were enormous, amounting, it is said, to 10,000,000 cubic feet. The deepest cut is 127 feet, and the deepest "fill" is 141 feet. At the high altitude of a great portion of this road, where exertion is very fatiguing, and where water boils before it is fairly hot, its construction must have been difficult.

ON AND UP

We went among the mountains and in the dreary pampas stretching between them, crossing deep ravines, winding around precipices, threading valleys, now on a level with a bank of snow on the sides of the giant mountain, and again looking down on the clouds almost under your feet. Finally we reached Vincamago, a railroad station, 14,443 feet above the level of the sea. Here we found a small hotel, and improved the opportunity of replenishing the "inner man" and warming up with a cup of hot tea. While thus employed, it was snowing furiously outside. Moving on, the train soon reached Alto del Cruco, the highest point of the line, and 13,660 feet above the sea level. Here we were surrounded by a dreary, boggy waste, covered with stunted coarse grass. Along the upper line of this route we saw large flocks of llamas and alpacas, and occasionally caught sight of the wild vacunias, the animal so much prized for its velvety fleece.

FROM THE SUMMIT DOWN

The descent was gradual. Our engine, on the down grade, rushed furiously along, passing quickly over the long stretches of barren paramos, past several small lakes, until finally, just as the sun was setting, we saw in front the blue waters of Lake Titicaca. I must confess to a thrill of delight as, for the first time, I looked upon this mystic lake. There, upon the islands, the Incas built their palaces and had their shrines, and here still, upon its blue waters, the Indian sails his rush volsa as of old. With such reflections we rode a few miles along the margin of the lake; then the whistle sounded and we were at Puno. The rain had commenced to fall, and as we passed out into the chill air and muddy streets of Puno, all my sentiment effervesced, and I breathed execrations upon the place.

Puno is essentially an Indian town, with a population of about 8,000. There is quite a sprinkling of Spaniards and half-breeds, a number of Italians, one German and two American attaches of the railroad. The elevation of Puno above the sea is 12,547 feet. In the summer the days are warm and comfortable, but the nights are always cold. In midwinter the thermometer often goes down to zero, and even in summer it is no uncommon thing for water to freeze. Universally throughout this treeless land fires are never used except for the specific purpose of cooking. As a natural consequence the evenings are rather uncomfortable, end one is disposed to retire early and rise late.

THE INDIANS

Of this part of the country are of a different type from those I have seen further north. They seem to be a mixture of the Mongolian and the Polynesian. There are, however, two different races in these parts, namely, the Aymaras and the Quichnays, These two races, though they live side by side, and are never at war with each other, rarely associate and never intermarry. They generally adhere to their old habits and customs. They wear the same kind of garments, made out of the same kind of woolen goods, that their forefathers used 300 years ago. They manufacture their own goods, and rarely buy anything from the foreigner. These two races occupy different parts of the town, have their respective markets, and, I am told, never quarrel. I could more than fill up this letter with interesting facts respecting this strange people. They have one custom or habit which should be described. This is universal with men and women. The distended cheek everywhere tells of the use of "the weed," as with tobacco chewers. Though I myself perceived no particular taste in the coca, and perceived no effect from a single trial of it, still I infer its power from the fact that the use of it becomes a habit which the Indian finds impossible to abandon. As a general rule, the juice is swallowed, but on one occasion I happened suddenly into the plaza (used as a market) and saw a row of apparently

RESUSCITATED FEMALE MUMMIES

Seated on the stones, chewing vigorously and expectorating with a vengeance and precision that was surprising. Whether this gathering was what we in Oakland would call a "social," or had any deep significance, I was unable to learn. Remarkable stories are told of the effect of coca upon the natives. It is said that they will travel for days without food and show no signs of weariness, if they only have a supply of dried coca leaves to chew. In some instances they have been known to travel seventy miles a day for three consecutive days, with no other sustenance than this article. The natural inference would be that the use of it would prove deleterious, and that reaction would follow, but this is denied. It is argued that instead of producing a reaction, like that consequent upon the use of ardent spirits, it has the effect to

ARREST THE WASTE OF TISSUES.

This view of the case does not, however, seem physiological. As sure might fire burn without the consumption of fuel as muscular effort continue without a corresponding waste of tissue; and unless this waste is made good by the use of food, exhaustion and debility must ensue. The mistake is sometimes made confounding the coca used by the Indians with the leaf of the cocoa or chocolate of commerce. Coca is the dried leaf of the plant called by the natives *cuca.* It grows on the high table lands of Peru and Bolivia, at an elevation varying from 5,000 to 8,000 feet, and is a shrub about six feet high. The leaves are dried in the sun, during which process a little quicklime is applied. They are then cured and ready for market. When chewing the coca the Indians use wood ashes prepared with paste (not quicklime, as is generally supposed), which, it is claimed, produces a chemical action, bringing out the latent properties of the coca. Some such chemical process, I am informed, is used in evolving the extract or alkaloid of coca, called cocaine. It seems strange that the Indians, in their crude way, should have discovered a method of producing a like chemical result.

LAKE TITICACA

Is over 100 miles long, by about sixty miles in width. It has not a regular, contour, as the maps indicate, but is very irregular in shape, and is also dotted with numerous islands. Two small steamers make trips to different points on the margin of the lake. There are also numerous bolsas of the Indians navigating the lake in all directions. These bolsas are made of rushes tied tightly together in the form of a canoe. They are often quite large, carrying from one to two tons weight. We passed one which was crossing the lake with a cargo of twenty-four horses. The sail used is also made of rushes, as during the centuries long gone by. One would naturally suppose that a craft built of rushes would soon become water-logged and would decay, but I am told that these bolsas last for four or five years. Being exceedingly buoyant and elastic, they are certainly seaworthy, and are used in crossing the lake when the steamers dare not make the attempt. The distance by water from Puno to Chililaya, the southern extremity of the lake, is 115 miles. This is the route taken by those who go to

LA PAZ, IN BOLIVIA.

As our steamer was leaving the wharf I asked our Captain, an American and an old resident, what he knew about the circumstances of Professor James Orton's death. Pointing to a miserable little schooner of about twenty-five tons burden lying at anchor, the Captain said: "That is the vessel in which Professor Orton died." Professor Orton had been quite unwell for some time, and while crossing over from the further side of the lake in this vessel, died. His remains were put on shore, but as he was a Protestant, the authorities refused him interment, and his body lay exposed to the sun and rain for three days, until decomposition had set in. The privilege was finally granted of burying him on a little island a few hundred feet from shore. Here, on this bleak island, within sight of Puno, is the lonely grave of this eminent naturalist. No stone or monument of any kind marks its site. Our steamer passed within a hundred yards of the island, and it was with a melancholy interest that I gazed upon it. For the first few miles of our voyage the water was smooth, but as we gained the mouth of the lake it became very rough, reminding me of the channels between the Hawaiian Islands.

About 8 o'clock in the evening, while rounding a point of land, the steamer came to a dead stand, and commenced thumping furiously on the bottom.

WE HAD RUN AGROUND.

The night was dark and stormy, our steamer was heavily laden, and the outlook seemed rather bad, to say the least. With the waves breaking on the sides of the vessel, it was hard to realize that I was in a fresh-water lake, nearly 13,000 feet above the level of the sea. The thought of having perhaps to swim for the shore in these icy waters sent a chill through me. To add to the disagreeableness of the situation a thunder storm set in. The bursts of thunder overhead were almost simultaneous with the flashes of lightning, which played incessantly. Our captain and crew seemed to realize that they had got themselves into a bad fix, and they worked desperately to extricate themselves. The engines were backed, kedge-anchors were dropped to the windward, and every expedient resorted to to extricate ourselves, but still our steamer stuck fast, and the bumping of her stern continued. It was not until four hours had passed, and the wind had veered to another quarter, that our vessel slid off into deep water again. Our rudder-gear was broken, and we made but little progress that night. When morning broke, however, I did not regret the detention. Our location on the lake commanded the finest view possible of the Bolivian Cordilleras. On the east side of the lake, in full view, this chain of magnificent mountains extended north and south as far as the eye could reach, not the barren rocks of western Peru, but snowy mountains of truly

ALPINE GRANDEUR.

Two peaks, in particular, among this snowy range, arrest the attention. I refer to Sorata and Ilimani. There is no mistaking the place they occupy as mountains of the first order. Their sunny heads tower far above their fellows, and their gigantic flanks lie buried under cold glaciers. I would here mention that on my return trip I had the pleasure of meeting Professor Bernado Weis, a German metallurgist, who has resided for many years in South America, and who has devoted himself in particular to mountain climbing. On the present occasion he had just returned from a trip to Mount Sorata. He claimed that he had ascended this mountain to the enormous altitude of 22,250 feet, and that he had made careful measurements establishing the fact that Mount Sorata was 28,240 feet above the sea level. If these figures prove correct, the fact will be very interesting to scientists, and will place Sorata as second only to the loftiest mountain in the world—Mount Ernest, in Asia. Professor Weis said he would never have been able to have accomplished this ascent of Sorata had he not, like the Indians, used coca. This drug seemed to render him oblivious to all fatigue or hunger, and he even outdid his hardy Indian guides in climbing.

ILIMANI,

Too, according to the late measurements, occupies no mean place among the grand mountains of the world. It has been measured twice lately, and in neither instance has its height been found to be less than 25,000 feet. In future Aconcauga will have to take a back seat among the family of mountains. I sat for hours on the hurricane-deck of our steamer gazing with increasing delight upon this long line of sunny peaks. It was a season of pure unalloyed enjoyment.

A little later and our steamer was running close to the island of Titicaca. This island was once covered with the palaces and temples of the Incas, but now little remains except a few crumbling old walls. The island is, however, inhabited by the Indians, and cultivated from its summit to its base. To see the remains of the Incas in their most perfect state of preservation, one must visit Cuzco, which unfortunately I was unable to do.

CHILILOYA.

Where we landed, is a cold, bleak spot, swept by the rivers from the icy mountains. From this place to La Paz the distance is about forty miles, and the journey is made by stage. Our road led us in a comparatively level country some 1,300 feet above the level of the sea. The soil is poor, and the climate severe even in summer. Notwithstanding these unfavorable circumstances, the Indian has made his home here, and has put all the available land under cultivation. These Indians are a hardy, industrious race. We met them all along the line of the road, working in the fields and turning the soil with their wood plows. They are essentially a pastoral and agricultural people, and instead of dying off, like the Indians of North America, they are now increasing in numbers. Their present condition is much better than it was a few years ago. The Indian government now appoints from among their own number an Alcalde, who dispenses justice and looks after their internal affairs. The Alcalde, in virtue of his office, carries a silver-headed cane, and occupies a very exalted position in the estimation of his fellows.

AN AMUSING STORY

Is told of an Alcalde's first judicial experience: An energetic but uncouth looking Indian had been appointed by the Government to the position of Alcade, but before his installment into office he was told that he must be washed and have his hair combed. The ordeal of being combed was exceedingly repugnant to his nature, and he writhed under it as though it caused him the most acute bodily suffering.

Some days after this ordeal he was called upon to act as judge for the first time in a most important case. An Indian had committed a most atrocious murder. The evidence against the prisoner was clear and conclusive, and nothing remained but to pronounce the sentence. Turning to the trembling prisoner the judge cried, "Take this man hence and *comb his hair*."

After riding for hours over the level "paromo," we came suddenly to the edge of a huge "baranca" or valley, in the bottom of which nestled the city of La Paz. We could look directly down upon its red tiled roofs. Through the city runs the La Paz river, which flows into the tributaries of the Amazon. A ride of only one day from La Paz to Mungas will bring one to a land of tropical vegetation.

I have now crossed over the crest of the Andes at three different points. In my next I hope to give an account of Chile, and of my proposed trip across the Andes from Valparaiso to Buenos Ayres.

SAMUEL T. ALEXANDER.

Mollendo, November 23, 1886.

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## *BEST FEED FOR HENS.*

Considerable difference should be made in the feed of poultry, according to their breed. The Brahmas, Cochins and their crosses are quiet, lazy sorts, and, consequently, fatten more easily than such as are fond of roving around at considerable distance from the house—as Leghorns, Hamburgs, game, etc. Little corn or Indian meal should be fed to the former, except in the coolest weather; and then we only make it about half their rations. In Spring and Autumn we give them all they are inclined to eat during the day, a pudding made of one-third Indian meal and two-thirds wheat bran, with a sprinkling of whole oats, late in the afternoon, on the ground in the yard, or near the house, for them to scratch and pick up just before going to roost. In summer we make the pudding only one-fourth Indian meal and three-fourths wheat bran. In this about half a gill of pure, strong brine is mixed to each gallon. A little brine is very healthy in the food of poultry, but it must not be taken from the meat barrel. A tablespoonful of sulphur is excellent te mix, once a week, in the pudding, as this keeps lice out of the hens, and in addition is healthy for them. So is the same quantity of wood ashes or a gill of fine charcoal dust. The hens ought to have a grass plot to run on. If this cannot be had, give them some boiled vegetables or raw cabbage leaves. In summer grass can be cut for them and put in their yard. Lettuce and spinach are excellent when no other green feed is to be had, and we cultivate these in our garden especially for them. For the most active breed of fowls we give a greater proportion of Indian meal in their pudding. If this can be mixed with skim milk it will be all the better for the production of eggs. Whole wheat is an excellent egg producer.—*Bee and Poultry Magazine.*

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## *ANALYSES OF HAWAIIAN SOILS AND SUBSOILS.*

### ANALYSIS OF SOILS FROM LIHUE, ISLAND OF KAUAI.

The following analysis of soils from Lihue, Kauai, has been handed to us by H. F. Glade, Esq. We subjoin an analysis of Honouliuli soil, and also some tables from analyses taken in Louisiana.

The samples submitted are thus described by Mr. Rice :

Nos. 1 are from the kukui groves; one of them surface soil and the other subsoil from the same place. Nos. 2 are from the border of the old cane fields near the Hanamaula road, surface and subsoil. Nos. 3 are from the field makai of the Hanamaula road, not far from the point where the water lead crosses the line of the old board fence; surface and subsoil as the others. The surface soil was taken to the depth of about three inches. I then scraped off about an inch more, and took the subsoil immediately underneath. The surface and subsoil of each sample will be easily distinguished, by the former being considerably darker than the latter."

The soils have a common character as thoroughly disintegrated volcanic lavas. They are pulverulent, eminently ferruginous, and possess clay and organic matter enough to enable them to retain, in good measure, carbonic acid and ammonia at ordinary temperatures.

Qualitative analysis showed them to contain alumina, magnesia, ammonia, water, peroxide of iron, potassa, silica, sand and lime, soda, (trace), organic matter, undecomposed rock.

The most careful examination of even large quantities of the soils did not yield phosphoric acid enough to weigh. Sulphuric acid was also wanting. Of hydrochloric acid there was a trace. Quantitative analysis was made with the hydrochloric acid solution.

Nos. 1.

| | *Surface Soil.* | *Subsoil.* |
|---|---|---|
| Water | 5.790 | 9.181 |
| Organic matter | 17.558 | 15.140 |
| Nitrogen | .389 | .019 |
| Potassa, with trace of soda | .592 | .778 |

| | | |
|---|---|---|
| Magnesia | .549 | .116 |
| Lime | .661 | .068 |
| Oxide of iron and alumina | 30.328 | 20.044 |
| Soluble silica | .062 | .119 |
| Insoluble residue and loss | 44.051 | 54.535 |

Nos. 2.

| | *Surface Soil.* | *Subsoil.* |
|---|---|---|
| Water | 12.016 | 12.366 |
| Organic matter | 19.707 | 13.671 |
| Nitrogen | .349 | .297 |
| Potassa, with trace of soda | .513 | .347 |
| Magnesia | 1.120 | .494 |
| Lime | .246 | .090 |
| Oxide of iron and alumina | 24.731 | 28.015 |
| Soluble silica | .144 | .044 |
| Insoluble residue and loss | 42.807 | 44.676 |

Nos. 3.

| | *Surface Soil.* | *Subsoil.* |
|---|---|---|
| Water | 11.615 | 12.857 |
| Organic matter | 18.726 | 13.381 |
| Nitrogen | .127 | .055 |
| Potassa, with trace of soda | .606 | .487 |
| Magnesia | .350 | .273 |
| Lime | .117 | .203 |
| Oxide of iron and alumina | 27.780 | 34.070 |
| Soluble silica | .168 | .369 |
| Insoluble residue and loss | 40.685 | 38.389 |

The significance of these qualities will appear on a glance as the properties of a good soil. It must supply the inorganic constituents of plants, and must possess the physical properties that enable it to retain water from extreme evaporation or drainage, and furnish it, as well as carbonic acid and ammonia, to the roots of vegetation.

The essential constituents of the ashes of cultivated plants include potassa, lime, oxide of iron, phosphoric acid, silica, soda, magnesia, sulphuric acid, hydrochloric acid, and manganese, though frequently present, is in small quantity comparatively.

As important, in this particular case, here follow the results of an analysis of sugar cane stalk made by Payen. He found in ripe sugar from Tahiti:

| | |
|---|---|
| 71.04 water. | 0.35 waxlike and coloring matter. |
| 18.02 sugar. | 0.12 insoluble salts. |
| 9.56 cellulose and woody fibre. | 0.16 soluble salts. |
| .55 albuminous substances. | 0.20 silica. |

The soluble salts consisted of:

| | |
|---|---|
| Phosphate of magnesia. | Soda, Potassa, Lime, } Combined with organic acids. |
| Phosphate of lime. | |
| Alumina. | |
| Sulphate of lime. | Silica. |
| Oxolate of lime. | |

Casaseca found in the ash of the stripped sugar cane stalk (amounting to 0.160 per cent. of the whole), 68.6 per cent. silica and 31.4 per cent. lime, with traces of oxides of iron and manganese.

In the leaves, or portion stripped off, he found ash (amounting to 0.228 per cent. of the whole), consisting of 68.9 per cent. silica and silicate of iron, with little silicate of manganese, 31.1 per cent. lime, with oxide of iron and manganese.

These results show that soluble silica, lime and oxide of iron are needed for the sugar cane stalk, while the elaboration of the juices—the sugar—requires phosphoric acid, sulphuric acid, potassa, soda, lime and magnesia. Alumina is uniformly sufficiently abundant to meet the wants of soils; so far as any demand for the juices of plants may require it, and oxide of manganese, whether essential or not, generally accompanies iron.

The Lihue soils contain, when thoroughly air-dried at 75° Fah., a notable quantity of water, not completely expelled below 212 Fah., illustrating their power to retain moisture.

Taking the average of the surface and subsoils, there are for

Nos. 1— 7 per cent. water.
Nos. 2—12 per cent. water.
Nos. 3—12 per cent. water.

This absorbent power is due in part to organic matter, of which, taking the average of surface and subsoil, there are for

Nos. 1—16 per cent. organic matter.
Nos. 2—16 per cent. organic matter.
Nos. 3—16 per cent. organic matter.

The power of retaining carbonic acid and ammonia is due to the organic matter acting somewhat as charcoal, or muck or peat, and also to the alumina and oxide of iron. There are present as follows in

Nos. 1—25 per cent.
Nos. 2—26 per cent.
Nos. 3—31 per cent.

Magnesia and lime are invariably present in the seeds of plants. Of magnesia there is in

Nos. 1—0.332 per cent.
Nos. 2—0.807 per cent.
Nos. 3—0.312 per cent.

Of lime there is in

Nos. 1—0.364 per cent.
Nos. 2—0.168 per cent.
Nos. 3—0.155 per cent.

The alkali was nearly all potassa, though there was uniformly a trace of soda. Without one or both of these the production of sugar, or the elaboration of any complex organic tissues or juices, would be quite impossible. There was in

Nos. 1—0.685 per cent.
Nos. 2—0.480 per cent.
Nos. 3—0.546 per cent.

Soluble silica, important not only for the stalk of the sugar cane, but for all cereals, is present in moderate quantity, and it is probable that the insoluble residue of the soil may, by proper treatment, furnish it in quantity for an indefinite time to come. It is in

Nos. 1—0.090 per cent.
Nos. 2—0.094 per cent.
Nos. 3—0.268 per cent.

Nitrogen, chiefly in the form of ammonia, was present in larger measure in the surface soil, as it should be. It is in

Nos. 1—0.204 per cent.
Nos. 2—0.313 per cent.
Nos. 3—0.092 per cent.

The two ingredients in Payen's analysis not found in the Lihue soils in appreciable quantity, are sulphuric and phosphoric acids. Of the former, and also of hydrochloric acid, in the form of chlorides of potassium and sodium, it is probable that sufficient for all the wants of vegetation will be brought on by the winds from the sea. This will depend somewhat on its proximity, but saline matters are carried to great distances inland. The east winds sweeping across New England carry salt to Albany, and chlorides are found in rain east from the Bay of Biscay at all points as far as Munich. For the phosphoric acid, however, especial provision must be made.

If it be proposed to grow other crops, as cereals, the demand will be more imperative.

As an example, here follows a recent analysis of a variety of wheat by Way & Ogston:

| | *Grain.* | *Straw.* |
|---|---|---|
| Potassa | 23.18 | .68 |
| Soda | 3.09 | |
| Lime | 3.33 | 6.93 |
| Magnesia | 11.75 | 1.69 |
| Oxide of iron | 1.11 | 0.99 |
| Sulphuric acid | | 0.74 |
| Silica | 1.18 | 67.90 |
| Phosphoric acid | 46.36 | 5.05 |
| Chloride of potassium | | 15.13 |
| Chloride of sodium | 10.00 | 0.89 |

The great excess of magnesia and phosphoric acid in the seed over the same ingredients in the stray, and the excess of silica in the straw, are strikingly apparent. To supply this deficiency of phosphoric acid and to meet all the wants of any crops, there could be no doubt of the value of Peruvian guano. But this is distant and expensive. Mexican guano is cheaper, and, if facilities for transportation should offer themselves, it would furnish phosphoric acid. An analysis of it, just completed in the laboratory of the scientific school, gives:

Soda (no potassa), 1.47
Lime (as carbonate), 56.29 useless.
Phosphate of lime, 33.17.
Organic matter 5.12.
Sulphuric acid 1.83.

The guano of Jarvis Island, suggested as the nearest source, I have analyzed from a sample sent me by mail by Captain Davis. It contains:

| | |
|---|---|
| Water expelled at 212 deg. Fah. | 3.00 |
| Organic matter | 14.10 |
| Phosphate of lime | 65.30 |
| Silica and sand | .60 |
| Nitrogen | .06 |
| Soluble salts (sea water evaporated to dryness) | 16.94 |

An analysis made by Boussingault of guano from the Islands of Jarvis, Howland and New Nantucket gives:

| | |
|---|---|
| Phosphate of lime | 16.50 |
| Nitrogen | .25 |

If such guano as Captain Davis sent me can be procured in quantity, it would certainly prove valuable. But I somewhat fear its extent, from the contrast between my results and those of the eminent French chemist.*

A better and an obviously cheaper source, and fortunately an adequate source for an indefinite time to come, is at hand in the numerous fish which I learn from Professor Agassiz swarm about the Sandwich Islands.

I have examined the specimens sent here, and learn that the numbers of some species, somewhat resembling the menhaden of Long Island Sound, already so long and successfully used for manuring lands on both shores, are immense.

Such fish are taken along the shore with long nets in localities where the schools pass frequently. They are also taken by another kind of dip net, taken by two sail boats into the open sound. The Sandwich Island labor for such purpose cannot be expensive.

The course of best treatment is this: Muck from the shore or head of some creek, or seaweed, either or both, should be mixed with the fish in beds or trenches, and covered to such depth with sea weed and earth, as to prevent the escape of any of the offensive gases, of which the most abundant and valuable are ammoniacal compounds.

After remaining in this condition for three or more months, according to the time required for the decomposition of the fish, they should be dug over, more intimately mixed, suffered to remain a while longer for more perfect disintegration, and then carried upon the land and plowed in. The results of this mode of treatment are well known. They are eminently profitable. The French employ them largely in the neighborhood of fishing stations; and fish guano is an article of commerce, under the direction of a French company on the coast of Nova Scotia, and under English direction on the coast of Norway.

If the fishing season is short on the one hand, or continuous throughout the year on the other, the practical course will suggest itself. The fish bones and scales will furnish all the constituents needed by the Lihue soils. It may, however, in time, be desirable to add lime for the purpose of gaining more soluble silica by decomposition of the silicates. It should be composted as quicklime with the soil, and spread on the soil. As shippers would probably be unwilling to carry it, it might be practicable to send coarse magnesian limestone as ballast, and burn it there. There is now produced a soluble silicate of soda, employed in calico

* [Until the eminent French chemist accounts for 83.25 parts in 100 of the guano analyzed by him, his analysis must go for nothing.—G. P. JUDD.]

printing. It is a form of silicate suited to transportation as ballast, and costs about five cents a pound. It would carry both alkali and soluble silica in most desirable form to the soil. It was at one time produced at the Roxbury Chemical Works.

Neither of the latter nor the Jarvis Island guano will be wanted if fish can, as seems eminently probable, be procured in unlimited quantities.

Respectfully submitted,

(Signed,) E. N. HORSFORD, Chemist.

Cambridge, July 20, 1858.

SAMPLES SENT BY MR. A. J. CAMPBELL, HONOLULU.

| | Soil, No. 1. Depth, 13 inches; color, dark. | Subsoil, No. 1 Depth, 13.26 inches; color, dark. | Soil, No. 2. Depth, 12 inches; color, red. | Subsoil, No. 2 Depth, 12.25 inches; color, red. |
|---|---|---|---|---|
| Insoluble matter | 13.050 | 12.956 | 15.913 | 13.905 |
| Soluble silica | 26.755 | 25.129 | 23.072 | 26.027 |
| Potash ($K_2O$) | .243 | .221 | .222 | .400 |
| Soda ($Na_2O$) | .123 | .154 | .062 | .108 |
| Lime ($CaO$) | .221 | .187 | .442 | .241 |
| Magnesia ($MgO$) | .517 | .432 | .685 | .641 |
| Br. ox. of Manganese ($Mn_3O_4$) | .189 | .126 | .637 | .680 |
| Peroxide of Iron ($Fe_2O_3$) | 21.170 | 22.244 | 17.525 | 20.153 |
| Alumina ($Al_2O_3$) | 24.149 | 25.246 | 26.835 | 26.061 |
| Phosphor. acid ($P_2O_5$) | .121 | .205 | .197 | .129 |
| Sulphuric acid ($SO_3$) | .005 | .005 | .004 | .005 |
| Carbonic acid ($CO_2$) | ........ | ........ | ........ | ........ |
| Water and organic matter | 13.722 | 13,416 | 14.362 | 12.061 |
| Total | 100.265 | 100.321 | 99.956 | 100.411 |
| Humus | 1.097 | ........ | 1.455 | ........ |
| Available Inorganic | .714 | ........ | 1.226 | ........ |
| Available Phos. Acid | .047 | ........ | .085 | ........ |
| Hygroscopic moisture absorbed at 13°C | 13.70 | 14.40 | 12.200 | 13.050 |

GEO. E. COLBY, Berkeley, Cal.

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## *ANOTHER RAMIE MACHINE.*

Mr. George Gibson, of Pittsburg, Pa., recently visited New Orleans, to introduce his patent fibre-decorticator, which is especially designed to work the dry stalks. He had the machine built, after his own plans, at Lille, France, under his personal supervision, and tried it there; next took it over to Belgum, where it was again worked successfully; then to Italy, where he worked it on ramie to the satisfaction of all who saw it, and now he proposes to give the same machine a trial in Louisiana, as soon as material can be had to work it.

## *ANALYSES OF SOILS OF SUGAR EXPERIMENT STATION IN LOUISIANA.*

| | Plat No. 16—Next to river—Mixed Soil. | Plat No. 2, Group 1—200 yards from river—black soil. | Plat No. 2—Group 7—400 yards from river—black soil. |
|---|---|---|---|
| Insoluble matter. | 79.37 | 77.52 | 74.21 |
| Soluble Silica...... | .01 | .01 | .01 |
| Potash.................. | .31 | .20 | .13 |
| Soda...................... | .48 | .19 | .23 |
| Lime...................... | .46 | .57 | .52 |
| Magnesia............ | .04 | .03 | .03 |
| Peroxide of Iron } Alumina......... } | 6.37 | 6.74 | 6.63 |
| Phosphoric Acid.. | .12 | .11 | .10 |
| Sulphuric Acid... | .04 | .04 | .03 |
| Organic Matter... | 10.50 | 14.50 | 16.24 |
| Carbonic Acid.. } Chlorine & loss.. } | 2.30 | .09 | 1.87 |
| | 100.00 | 100.00 | 100 |

An examination of above shows that, so far as the mineral ingredients are concerned, that these soils are almost identical. The organic matter increases as we go from the river. These soils are deficient in physical qualities rather than chemical ingredients; the former limiting the available supply of the latter, and requiring the application of manures for large crops. To test the kinds and qualities required, has been the object of the series of experiments which follow. It should be remembered that any physical amendment to a soil, such as underdraining, deep plowing, subsoiling, etc., is in itself a manure, since it enables the roots of a plant to forage over an increased area, and thus obtain larger supplies of available food. Unfortunately for the station, the seed used in its experiments were seriously injured by being badly put away. Accordingly no stands were obtained anywhere on the station. Through hot-beds prepared on the station and the liberality of our neighbors, Messrs. Soniat Bros., this defect was partially repaired. In May all the gaps were filled up with transplanted cane, placed six inches apart, or two plants to the running foot. Thus a uniform but by no means a large stand was obtained late in May, and in reading the results given, due allowances must be made for these deficiencies. Had twice the stand been obtained early in the season, the results would probably have been very much larger.

Of the plats given in Bulletin No. 3, Nos. 1 and 9, on account of very defective stands, were abandoned, and the cane transplanted to fill up vacancies in other plats. Nos. 2, 7, 8, and parts of 4 and 5, were successfully carried through the sugar-house. Nos. 14 and 16 were used for seed in fall planting, while No. 6, and parts of 4 and 5, have been windrowed for seed and for the mill, to be worked up at various times during the winter. Samples of cane from all these plats have, however, been several times analyzed, and results, with dates of analyses, will be given under proper heads.

PLAT NO. 2.—CANE.

Ground prepared with four-horse plow. Harrowed and manures put out and cane planted October 19, 1885. Nos. 3, 8, 13, 18, 23, 28, 33 and 38 were not manured at time of planting. They were manured May 24th. Ground was hard and cloddy when planted. Hence much of the seed dry-rotted during the drouth which prevailed immediately after. Having failed to secure a stand from the seed, this plat, together with all the others, was transplanted with cane from prepared hot-beds and from our neighbors' field. The stalks of cane of all sizes, from a few inches to a foot or more in hight, with the mother stalk attached, were very successfully transplanted, six inches apart. Thus a stand of one running stalk every six inches was obtained, which, though uniform, was far from being enough.

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## *SUGAR CANE.*

[From Bulletin No. 7 of the Louisiana Experiment Station.]

HISTORY.

From ancient historical writings it is learned that sugar cane came originally from India. Pliny, the older, Varro, and Seneca, well-known Latin authors, speak of it. India may then, with certainty, be called the birth-place of sugar cane. Thence it passed into China, where its cultivation has been carried on for immemorial time. It can then be traced into Arabia, Nubia, Ethiopia and Egypt. About the year 1500 A. D., after the crusades, the Venetians introduced it into Syria, Cyprus and Sicily. Later, Dom Henry, King of Portugal, introduced it into the Madeira and Canary Isles, where was manufactured for 300 years all the sugar used in Europe. Since that time it has been slowly supplanted by the vine. Portugal, at the end of this epoch, sent it to St. Thomas. After the discovery of America, Peter Etienza introduced it on the Island of St. Domingo, and from this island it has spread over the tropical and semi-tropical portions of North and South America.

BOTANICAL RELATIONS.

Sugar cane belongs to the large family of grasses (graminaciæ); to the tribe andropogon, and its botanical name is *saccharum officinarum*, or *arunda saccharifera*. Sugar cane is a gigantic stalk, six to twelve feet in hight, erect during growth, but bent or reclined at maturity. Its roots are fibrous and lateral, stretching several feet in every direction, and usually not penetrating the soil to any great depth. Hence its instability in loose or soft soils, and its liability to be blown down by wind.

Its cylindrical stalk is composed of nodes and internodes, sometimes reaching as high as eighty in number. These joints are long or short, according to variety grown, or to favorable or unfavorable conditions of growth. The upper part of each joint divides into two parts, the inner one forming the rind of the next joint above, and the outer one uniting with cells from within, forms the leaf. On the stalk, near the nodes, occur a white, pulverulent, waxy substance, called *cerosin*. Its chemical composition is $C_{24} H_{48} O$, and would be called in chemistry an alcohol of the fatty series. The color of the stalk depends upon the variety cultivated. The leaves of the cane are alternate, clasping. pale to dark green in color, receding from the stalk during growth, and falling off at maturity. At the base of each leaf is an eye or bud, which contains the germ of a cane, and is the true seed of the sugar cane. Around the stalk at the eye are several rows of semi-transparent points, which produce roots when the cane is placed in contact with moist earth. Just above these rows is a light-colored semi-transparent narrow band, which clearly divides the lower from the upper joint. In tropical countries the cane flowers, first sending forth a long shoot (arrow), upon which is borne a panicle of sterile flowers. The flowers never produce seeds. In this respect it resembles the banana and agave.

The inference that sugar cane, coming originally from India, would require a warm, moderately damp climate, with intervals of dry weather, is fully sustained by experience in its culture. It appears also to thrive better near the sea; whether this is due to the extensive moisture existing in the prevailing sea breezes, or whether the latter bear inward certain saline salts which increase the fertility of the soils, is yet an uncertain question.

Though cane is cultivated in countries varying greatly in climate and temperature, yet it has been found to succeed best when the main average temperature is between 60° and 90° F., and with an annual rainfall of from 60 to 80 inches. These are natural conditions best adapted to its growth, but there are countries where the deficiency of rainfall can easily be remedied by irrigation, a practice which might sometimes be successfully and cheaply applied in Lousiana. But while this amount of rain and this mean temperature is necessary to its most successful growth, another condition is essential to the accomplishment of the latter, viz.: Proper distribution of both. Two distinct seasons usually exist in countries of highest production—the one warm and rainy, lasting from four to six months, with a mean temperature of 80° to 90° F.; the other dry, or very moderately rainy, and a mean temperature of about 70° F. The first is a season of rapid growth and development; the second is a period of the arrest of growth, the elaboration of sugar and the slow evolution of perfect maturity. Again, a large amount of humidity in the air (70 per cent. at least) is conducive to best results. Bright, sunshiny days, with dry winds, are therefore prejudicial.

SOILS ADAPTED TO CANE

Are those naturally rich and filled with vegetable matter. However, when cane is planted upon soils of medium fertility and irrigated properly, it will, with the aid of judicious manures, yield well and give highly remunerative results. Climate, rainfall and manures are far more essential factors in cane culture than soils.

In fertile, fresh, friable and deep soils, with proper rainfall, the cane is well formed, large, and full of sugar.

In sandy and light soils, the canes, without manure, are small, but very sugary. Calcareous soils develop a superior cane, rich in sugar and easily worked. In rich alluvial soils, not properly drained, or too rich in certain salts, the canes, though fine in appearance, are poor in juice, work difficultly, and produce a great deal of molasses.

A complete study of the sugar soils of Louisiana was begun last summer, and samples were analyzed from Jefferson, St. Bernard, St. Mary, Terrebonne, St. Charles, Ascension, Assumption and Rapides. This work will be continued by the station during the summer months until finished, when a special Bulletin on the sugar soils of Louisiana will be issued.

The culture of cane depends entirely upon the character of the soil. That culture which will keep the soil porous, pulverable, free from weeds, and which will disturb the roots of the cane the least, is the best. Every planter should aim in cultivation to accomplish all these as nearly as possible.

Field experiments in cane at the station during the past year were of four kinds, as given in Bulletin No. 3, issued in April, 1886:

1—Germination questions.
2—Physiological questions.
3—Varieties best adapted to Louisiana.
3—Manurial requirements.

GERMINATION QUESTIONS.

It has long been a question among planters whether to plant the tops, the entire stalk, or only the matured part. The practice of planting the green unmatured tops is the one suggested by economy, since these contain little or no sugar, and are frequently thrown away. This practice is, however, severely criticised by some, upon reasons drawn from known principles of vegetable physiology. The cane, say they, has only sterile flowers, and consequently give no seeds or grains. Therefore, the eyes of the cane are intended to replace the true seed or grain. In all seed bearing plants, those seed germinate and fruitify best which are permitted to reach perfect maturity. Therefore, in imitation of this natural law, we must seek that part of the stalk which contains the largest and best developed eyes, in order to secure seed which will produce the most vigorous plants. It is further claimed that where tops are universally used as seed, that a degeneracy of the cane will follow, since the latter is always reproduced with those parts of the cane where the juices are the poorest in nourishment [sugar] and the eyes the most imperfectly developed. Hence it is a practice with some of our planters never to plant fall cane until the polariscope shows at least 10 per cent. sugar in the cane. *Per contra*, there are others who claim that the planting of the tops is justifiable from purely scientific reasons, besides the economy involved. They regard the cane planted as "cuttings" rather than true seed, and the eyes as buds to be developed under proper conditions. They say that the florist when he wants to root new plants, never uses the old or mature wood, but rather the young and succulent portion. Therefore, in planting cane the youngest and most succulent portions will secure the best results. Which is right has not yet been decided by science. Experiments in the field have demonstrated that eyes from both the mature and immature parts of the stalk will germinate. But which are the best, i. e., which will insure the best and surest results under the varying conditions of our seasons, soils and rainfall? To determine the question, the following experiments were instituted with a view of continuing them through a series of years, in order to eliminate, as far as possible, all the modifying factors, incident to one year's experiment. Great pains were taken to select healthy stalks of uniform length. These were cut up into short pieces, beginning with the green immature top.

PLAT O—GERMINATION QUESTIONS.

Experiment No. 1—Planted with green tops usually thrown away.
Experiment No. 2—Two joints next to top [green].
Experiment No. 3—Next two joints [partially green].
Experiment No. 4—Next two joints.
Experiment No. 5—Next two joints.
Experiment No. 6—Next two joints.
Experiment No. 7—Next two joints.
Experiment No. 8—Next two joints.
Experiment No. 9—Two butt joints.
Experiment No. 10—Upper thirds of the cane.
Experiment No. 11—Middle of the cane.
Experiment No. 12—Butt of the cane.

This plat was planted in the fall, and the subsequent severe winter, with a late unfavorable spring, so prevented germination as to vitiate results. All germinated badly, but No. 3 gave the largest number of sprouts; No. 2 next, with No. 7 third. These experiments have been repeated, with better promises of success.

PHYSIOLOGICAL QUESTIONS.

*Influence of Suckers.*—A very great diversity of opinion prevails as to influence of suckers, "side shoots," which spring up around the base of the original sprout. This opinion has been based partly upon poorly conducted experiments, and partly upon the erroneous impression which this wrongly used term "sucker" has produced upon the mind. Some think it is an abnormal growth, a live parasite preying upon the nutriment of the main stalk, and thus depriving the latter temporarily of its vigor, at a time when rapid growth is so desirable, and therefore they should be removed. It has been found, on the other hand, however, that these suckers, if permitted to grow, reach maturity almost as soon as the parent stalk, is equally as large, and quite as rich in sugar. They also add largely to the crop, and when a thin stand is obtained, the multiplication of suckers rapidly closes the gaps, and gives in the end fair yields. Some planters thus ascribe to suckers the greater part of their crop, and encourage their growth by awaiting for their full development in the spring, before proceeding to a vigorous cultivation of their crop. They further claim that the suckers give stubble the next year, while the original or central stalks do not ratoon well, if at all.

All these discrepencies of opinion arise from a misunderstanding and misuse of the term "sucker." The habit usually denominated suckering in cane, is not suckering at all, but a process common to all graminaceous plants, and known usually as "tillering." It is a natural means of increase and of preserving its own existence in the battle of life. By this means, grasses and small grains are enabled to occupy the entire ground to the exclusion of other plants, and thus secure increased harvests. This "tillering" is an underground development characteristic of cane and wheat, and springs from underground buds specially prepared for this process. Simultaneous with the development of the sucker is a set of roots of its own, springing directly from it and in no way interfering with the roots of the original plant. The extent of tillering or suckering depends therefore upon the healthy growth of the plant, the fertility of the soil, the weather during early growth, the thickness of the stand, and the time it has to sucker in. Abundant tillering is an evidence of thriftiness and an index to increased root development. The cane however truly "suckers," but fortunately such occurrences are rare. By true suckers is meant the develpment of eyes above ground, which produce stalks living at the expense of the parent stalk. This occurs whenever the upward growth of the plant is checked, or the stalk is bent down from any cause, followed by very damp weather, etc. This process is very common to some varieties of sorghum, after its main stalk has reached maturity. It is also found in oats, which frequently send forth branches from the axils of leaves which bear grain. In both instances the seed unequally ripens. True suckers in cane are therefore very ob-objectionable, and should be prevented if possible.

Duplicate experiments were made to test the question of removing the so-called suckers, both at the Sugar Experiment Station and at the State Experiment Station, Louisiana State University, and A. & M. College at Baton Rouge, La., and with almost identical results. The following is an account of these experiments:

Three plats were manured and planted and cultivated alike.

On No. 1 the "suckers" were removed daily until June 22d.

On No. 2 the "suckers" were removed daily until September 22d.

On No. 3 they were not disturbed. Before giving the results, which are decidedly positive, a description of the difficulties encountered, and the effects produced by suckering, will be given.

The original cane grew very slowly, and seemed to have expended all of its energy in trying to make "suckers." When one sucker was carefully removed, several would appear in a day or two afterwards. Neither time, removal of suckers, cultivation, nor any practice tried, could dissuade the plant from its disposition to sucker. On June 22d it was determined to let plat No. 1, which up to that time had been carefully desuckered, proceed with its suckering at will. In two weeks time, the cane had a thick stand and a wonderful stand; several of these suckers, by actual measurement, growing over two feet in vertical hight in two weeks.

Plat No. 2 was restrained from suckering till September 22d, at which time it was abandoned, and when the frost struck it there was a vigorous growth of densely crowded young cane about two feet high. This prohibition of "tillering," however, produced true suckers. Early in July it was found that the eyes of the cane were developing under the leaf, soon made apparent by a vigorous shoot from the center of the leaf. These developments took place as fast as the eyes were matured. They were removed as fast as discovered. This process of true suckers continued up to the top of the cane, so that at the end of the season there was scarcely an eye to be found on any stalk in the plat.

This ceaseless attempt at tillering and suckering was also destructive of the sugar in the stalk, as repeated analysis showed never more than 4 per cent. sugar in the cane. The results at Baton Rouge, on a different soil, were the same.

RESULTS OF SUCKERING CANE, NOVEMBER 6, 1886.

| | YIELD PER ACRE. | ANALYSES OF JUICE. | |
|---|---|---|---|
| | *Tons.* | *Total Solids.* | *Sugar* |
| No. 1—Desuckered till June 22 | 19.32 | 13.4 per cent. | 10 per cent. |
| No. 2—Desuckered till Sept. 22 | Not worth harvesting. | | Still standing. |
| No. 3—All suckers allowed to grow | 22.62 | 14.27 | 10.6 per cent. |

From the above it is perfectly plain that the "tillering" [suckering] of cane is a natural process of great benefit, and should be restricted with great care. To what extent and when a too great a tendency to this process should be corrected, is a question for the individual planter to decide. Cane planted too thick, in thin soils, in badly broken or poorly tilled land, and very late in season, tiller but little. The tendency nevertheless exists, but root growth is checked, and with it the prospects of a crop. Hence the aim should be to attain the healthiest and richest type of the plant, and such is to be found only when the conditions exist for its freest and fullest development of all its parts in a manner devised by nature. This suggests, then, care in planting, not to secure too heavy a stand in the beginning for the fertility of the soil; proper manuring, in quantity, quality, and mode of application; deep plowing in preparation of land; and early cultivation of crop, and shallow culture thereafter to prevent disturbance of increased root growth, early planting with well selected seed, and upon mellow, well-drained soil. A close attention to the above, and a process of suckering, can be encouraged with hope of highest results.

Whether the stubble comes only from the suckers, can be positively determined next year, since these plats will be reserved for that purpose.

## *SCALE OF SUGAR PRICES.*

Cuban given sugar prices in dollars and cents, with corresponding English given weights, are as follows:

| Cents per lb. | Sack, Bag or Bbl. =300 lbs. | Per Box 400 lbs. net. | Per Hhd= 1,500 lbs. net. | Per Ton= 2,099 2,000 lbs. net. | Per Ton= 20 cwt. 2,240 lbs. net. | Per Ton= 1,000 kilog. 2,176 lbs. net. |
|---|---|---|---|---|---|---|
| 1-16 | $0 18¾ | $0 25 | $0 93¾ | $1 25 | $1 40 | $1 36 |
| 0⅛ | 37½ | 50 | 1 87½ | 2 50 | 2 80 | 2 72 |
| 0¼ | 75 | 1 00 | 3 75 | 5 00 | 5 60 | 5 44 |
| 0⅜ | 1 12½ | 1 50 | 5 62½ | 7 50 | 8 40 | 8 16 |
| 0½ | 1 50 | 2 00 | 7 50 | 10 00 | 11 20 | 10 88 |
| 0⅝ | 1 87½ | 2 50 | 9 37½ | 12 50 | 14 00 | 13 60 |
| 0¾ | 2 25 | 3 00 | 11 25 | 15 00 | 16 80 | 16 32 |
| 0⅞ | 2 62½ | 3 50 | 13 12½ | 17 50 | 19 60 | 19 04 |
| 1 | 3 00 | 4 00 | 15 00 | 20 00 | 22 40 | 21 76 |
| 1⅛ | 3 37½ | 4 50 | 16 87½ | 22 50 | 25 20 | 24 48 |
| 1¼ | 3 75 | 5 00 | 18 75 | 25 00 | 28 00 | 27 20 |
| 1⅜ | 4 12½ | 5 50 | 20 62½ | 27 50 | 30 80 | 29 92 |
| 1½ | 4 50 | 6 00 | 22 50 | 30 00 | 33 60 | 32 64 |
| 1⅝ | 4 87½ | 6 50 | 24 37½ | 32 50 | 36 40 | 35 36 |
| 1¾ | 5 25 | 7 00 | 26 25 | 35 00 | 39 20 | 38 08 |
| 1⅞ | 5 62½ | 7 50 | 28 12½ | 37 50 | 42 00 | 40 80 |
| 2 | 6 00 | 8 00 | 30 00 | 40 00 | 44 80 | 43 52 |
| 2⅛ | 6 37½ | 8 50 | 31 87½ | 42 50 | 47 60 | 46 24 |
| 2¼ | 6 75 | 9 00 | 33 75 | 45 00 | 50 40 | 48 96 |
| 2⅜ | 7 12½ | 9 50 | 35 62½ | 47 50 | 53 20 | 51 68 |
| 2½ | 7 50 | 10 00 | 37 50 | 50 00 | 56 00 | 54 40 |
| 2⅝ | 7 87½ | 10 50 | 39 37½ | 52 50 | 58 80 | 57 12 |
| 2¾ | 8 25 | 11 00 | 41 25 | 55 00 | 61 60 | 59 84 |
| 2⅞ | 8 62½ | 11 50 | 43 12½ | 57 50 | 64 40 | 62 56 |
| 3 | 9 00 | 12 00 | 45 00 | 60 00 | 67 20 | 65 28 |
| 3⅛ | 9 37½ | 12 50 | 46 87½ | 62 50 | 70 00 | 68 00 |
| 3¼ | 9 75 | 13 00 | 48 75 | 65 00 | 72 80 | 70 72 |
| 3⅜ | 10 12½ | 13 50 | 50 62½ | 67 50 | 75 60 | 73 44 |
| 3½ | 10 50 | 14 00 | 52 50 | 70 00 | 78 40 | 76 16 |
| 3⅝ | 10 87½ | 14 50 | 54 37½ | 72 50 | 81 20 | 78 88 |
| 3¾ | 11 25 | 15 00 | 56 25 | 75 00 | 84 00 | 81 60 |
| 3⅞ | 11 62½ | 15 50 | 58 12½ | 77 50 | 86 80 | 84 32 |
| 4 | 12 00 | 16 00 | 60 00 | 80 00 | 89 60 | 87 04 |
| 4⅛ | 12 37½ | 16 50 | 61 87½ | 82 50 | 92 40 | 89 76 |
| 4¼ | 12 75 | 17 00 | 63 75 | 85 00 | 95 20 | 92 48 |
| 4⅜ | 13 12½ | 17 50 | 65 62½ | 87 50 | 98 00 | 95 20 |
| 4½ | 13 50 | 18 00 | 67 50 | 90 00 | 100 80 | 97 92 |
| 4⅝ | 13 87½ | 18 50 | 69 37½ | 92 50 | 103 60 | 100 64 |
| 4¾ | 14 25 | 19 00 | 71 25 | 95 00 | 106 40 | 103 36 |
| 4⅞ | 14 62½ | 19 50 | 73 12½ | 97 50 | 109 20 | 106 08 |
| 5 | 15 00 | 20 00 | 75 00 | 100 00 | 112 00 | 108 80 |
| 5⅛ | 15 37½ | 20 50 | 76 87½ | 102 50 | 114 80 | 111 52 |
| 5¼ | 15 75 | 21 00 | 78 75 | 105 00 | 117 60 | 114 24 |
| 5⅜ | 16 12½ | 21 50 | 80 62½ | 107 50 | 120 40 | 116 96 |
| 5½ | 16 50 | 22 00 | 82 50 | 110 00 | 123 20 | 119 68 |
| 5⅝ | 16 87½ | 22 50 | 84 37½ | 112 50 | 126 00 | 122 40 |
| 5¾ | 17 25 | 23 00 | 86 25 | 115 00 | 128 80 | 125 12 |
| 5⅞ | 17 62½ | 23 50 | 88 12½ | 117 50 | 131 60 | 127 84 |
| 6 | 18 00 | 24 00 | 90 00 | 120 00 | 134 40 | 130 56 |

## *MEETING OF SUGAR PLANTERS AT FRANKLIN, LOUISIANA.*

### PRESENT CONDITION OF THE SUGAR MARKET.

In the daily New Orleans *Picayune* of December 12th, for which we are indebted to W. O. Smith, Esq., we find the report of a convention of sugar planters, called to discuss the present condition of the sugar market.

Before the convention met, the *Picayune* correspondent conversed with a number of planters and business men in regard to the future of the sugar industry. Said one well-known business man, who is a close observer of all newspapers in connection with the agricultural interests of Louisiana: The trouble about these conventions is that the planters meet and talk, and that is about all they do perform; they do not act. Our sugar planters, it is true, seem anxious to find some way of solving the problem of how sugar is to be made to pay in spite of the many difficulties presented year after year; but there are so many different ways in which the planters conduct their business, that it will be difficult for any convention to hit upon a plan that will be satisfactory to all.

Some planters operate on their own capital, some on borrowed capital, and some on very little capital from any source. Take for another instance the question of the price of labor. A firm contract will be entered into to pay only so much per diem. One planter will get behind and offer 25 cents more a day for hands than his neighbor is paying, and thus the compact is broken. Why is it that one particular planter will produce say 150 to 190 pounds of sugar to a ton of cane, while his neighbor produces from the same land 90 to 100 pounds? It must be in the difference of cultivation, machinery, etc. It is useless to lay all the blame on the New Orleans market—the handling when made. No doubt there are grave faults in that direction, but the planters themselves are at fault in many instances. Does the planter producing ninety pounds of sugar to the ton of cane fertilize his soil as the planter does who produces 170 pounds on probably an adjoining plantation? Does the successful planter cultivate differently? Does he extract more juice from his mill? Does he use all useful appliances and improved machinery to obtain this extraction? How does he boil his juice into syrup? How does he granulate his sugar? These are questions the unsuccessful planter should ponder; and if he intends continuing in the business he should adopt the means his successful neighbor has pursued, and there are a number of successful planters who will continue in the business, resolutions to the contrary notwithstanding, tariff or no tariff, high price or low price, and any planter who has succeeded in making money raising sugar the past two or three years, need not fear for the future. Mark my words, sir, the remedy lies in skillful cultivation, improved machinery to save what they produce, and some radical changes in the manner of handling the crop in New Orleans."

Another prominent planter said:

"The purpose of the meeting called for to-day is, I think, to take into serious consideration the causes of the present depressed condition of the sugar industry, and to endeavor to formulate some plan by which it may be placed upon a firmer, more substantial and remunerative basis."

"What causes have produced the present condition of this industry?"

"The causes of the present condition of the industry are many and varied. While unfavorable seasons, overflows, storms, drouths and freezes produce occasional depressing effects, there are others which are unceasing and unrelenting in their exhaustive drain upon the planter, and these are, first, the exactions for transportation of the produce to market; and, second, the charges and taxes to which it is subjected after reaching market.

"What are these exactions and charges?"

"It is ascertained from actual accounts rendered that the two combined tax the planter from 7½ to 10 per cent. of the gross value of his crop, not including in this the tax for freight on supplies, machinery, mules and implements, etc., which the needs of the plantation require, nor the usurious interest exacted if he should be so unfortunate as to be forced to borrow money for the cultivation of his fields. The tax to which supplies, machinery, etc., are subjected is roughly estimated at from 6 to 7½ per cent. of the gross value, and this is paid from the proceeds of his crops; and thus the railroad or other means employed for transportation gets not only the freight for carrying the produce to market, but likewise another freight on the proceeds of the crop which return to the planter in supplies, machinery, etc., and the railroad, having no competition, establishes its own schedule of rates, regardless of the interest of the planter."

"What do you think of the charges the crop is subjected to in this market?"

"The charges to which the crop is subjected after it reaches New Orleans is another heavy tax, as every account rendered of sale will abundantly show. You must know that the sugar and molasses is securely packed in new barrels, weighed, gauged, and weights and quantities plainly marked thereon, carefully coopered and shipped in the best of condition on the cars, but when it reaches New Orleans, although in the same condition as when it left the point of shipment, and carefully guarded on the route, it is again weighed and coopered, or said to be, for it is charged in the bill of expenses; then appear charges for drayage, tarpaulins or sugar shed, the merchant's commission of 2½ per cent. for selling it, and in no infrequent instances ¼ to ½ per cent. brokerage as an additional charge. All these exactions consume from 12½ to 17½ per cent, of the value of the produce. It has been estimated by persons who have carefully inquired into the matter, that an average of one sugar crop out of every ten in St. Mary is exacted for the payment of transportation—that a like proportion is exacted for market charges in New Orleans."

"Are there any other charges against the crop of which you planters complain?"

"Yes. If the planter finds himself in need of money to cultivate his crop, pay his laborers and purchase supplies, etc., he borrows say $1,000 in April or June of his commission merchant in this way: He furnishes to the merchant his promissory note due the following January, secured by a pledge of his crop and bearing 8 per cent. interest from date. This note is indorsed by the merchant, for which a charge of 2½ per cent. is made, and then is discounted at bank, or shaved on the street or by the merchant himself, and this discount or shave, which is always deep enough, is also charged to the planter, so that in borrowing $10,000 he will realize say about $9,000, against which he draws for supplies, agricultural implements, etc., and money to pay his laborers, as his needs require. Should he require his merchant to make purchases to supply his needs he is charged 2½ per cent. commission for it; so that at the end of the season, when the crop is sold and a settlement made, a careful scrutiny will show that whilst the planter is ostensibly paying 8 per cent. interest on the money loaned, he is in reality paying from 15 to 20 per cent."

Another planter, asked for his views on the subject, replied that he indorsed the above in the main, having heard the questions and answers. "But," said he, "I am opposed to antagonizing the New Orleans commission merchants, and do not fully agree with many of my brother planters that rates for handling our products are exorbitant. The commission merchants are about the only friends we have left, and I think we ought to continne on amicable terms with them. A great many New Orleans commission merchants have gone down in advancing to planters, and those who are now doing business with us are, in my opinion, taking as great if not greater risks than any other class connected with the sugar industry. It is worth all the percentage they charge us. I can say in defense of the position of the commission merchant, that if I were a capitalist I think I would prefer smaller per cent. and less risk than carrying sugar planters, with the possibility of freezes, strikes, low prices and other attendant drawbacks as a foundation for the business."

The above interviews were elicited previous to the meeting of the convention, which was called to order in the Court House at noon by Mr. Caffery, who placed in nomination for Chairman Dr. H. J. Sanders, of St. Mary, who was unanimously elected. Mr. J. Y. Gilmore was elected Secretary.

Mr. Caffery being called upon by the Chairman to explain the objects of the meeting, said in substance what had been uttered in the published call.

Mr. L. S. Clark asked if Mr. Caffery would suggest some definite ideas for the accomplishment of the ob!ects of the meeting, in response to which he read the following paper, which he had prepared:

The area embracing the sugar parishes constitutes the fairest and most fertile portion of our State. St. Mary sits in this favored region like a rare gem surrounded by a cluster of precious stones. Taking into consideration the cost of rehabilitating the sugar belt, destroyed in a great measure by war and reconstruction, no portion of the South has advanced more rapidly in material progress.

From a number of causes, chief among which is the enormous quantity of sugar produced in the world, the cost of producing the cane and manufacturing sugar is in excess of the price of the latter.

To see whether or not the situation admits of relief is the occasion of our meeting. It is one of great gravity, on the solution of which depends the continuance of our staple.

By scientific appliance and improved agriculture the best growers of Europe have rivaled and excelled the cane produces of the tropics. They in turn are fast imitating the enterprise and adapting, so far as the surroundings permit, the methods of the scientific European.

With rare exceptions, the planters of Louisiana pursue the old methods of a century ago. In the sharp competition induced by large production under economical methods, the sugar planters of Louisiana find themselves in front of the problem of raising cane and manufacturing the same into sugar below cost. The only solution is to raise cane and manufacture sugar cheaper or abandon the business.

The causes which operate a reduction in the price of sugar are apt to continue, and no relief can be rationally looked for from enhanced prices. On the contrary, the beet will make extraordinary efforts to maintain its ascendancy, the islands will put forth every energy to compete with the beet, and the planters of Louisiana must engage in the struggte with better equipments, or surrender to superior skill and more favorable conditions. It appears from statements from the planters of the West Indies that the pressure of low prices is affecting them with the same disastrous effects as in Louisiana. The British Colonies in the tropics and in Australia have petitioned Parliament against the injurious competition of the bounty fed and highly protected beet, but without effect.

If tropical countries, heretofore considered invincible in their sugar product and beyond the reach of any competition, suffer as much as Louisiana, it would seem that, notwithstanding their superior yield, they have drawbacks which bring them to our level of production. These drawbacks are said to be longer periods for the ripening of the cane, inferior labor and the want of a home market, without considering a malarial climate, with its attendant ills, cyclones, and a government which seems to be constituted principally for the purpose of taxation.

We must therefore see what is wrong in our system, and if a remedy can be applied that will afford us a living profit from the culture of the cane, it is our obvious interest and duty to immediately apply it.

The error appears to be in merging the two characters of planter and manufacturer. In the division of labor is the perfection of labor. Heretofore the planter was compelled to combine the two characters. Begun under the system of slavery, when co-operation was neither needed nor desired, and when profits were so considerable as to justify its continuance, the system of planting and manufacturing was continued after slavery ceased and after the profits dropped off.

Agriculturists are noted for conservatism. Improved methods are of slow adoption among them. Nothing but necessity forces them out of beaten paths; the "bookish theoric" of the more advanced among them is more frequently the subject of derision than of imitation, and though disaster often overtakes the wanderer from old ruts, making the prophets of failure wise in their own conceit, yet to the invention of the five-roller mills, the double effect, the bagasse burner and the filter press are the longing eyes of the planter turned in this emergency.

It is manifest that, with the methods and appliances of the ordinary sugar planter, the business, under present prices, cannot be carried on. The ordinary extraction per ton is 100 pounds. The ordinary price for open kettle sugar is 3½ cents per pound. The expense of cultivating, cutting, grinding and boiling a ton of cane is at least $3. No profit can be drawn from this statement. The molasses will be consumed in packages, freight, insurance and commissions.

The situation is not improved by boiling the juice into syrup and having the same refined at 1 cent per pound.

The difference between open kettle and centrifugal sugar is too small (a little over a cent a pound) to pay toll of a cent per pound and make any profit.

But we are told by men who have the five-roller mill, double effect and bagasse burner, that they can make a profit raising sugar at the present prices. If that be so, it would seem that the planters who have not these appliances ought to adopt them. To adopt them is a question of great difficulty. Individually they have not the means. Can they do so collectively? To do this, the planter must suffer a divorce *a vinculo* from his first love, his sugar house. He must raise cane to sell, and a central mill must buy. Each department must be distinct, and yet the planter must be so connected with the central plant as to secure patronage and afford a guarantee of honest dealing. The planter must sell his cane at a fair price. To guarantee a fair price, it must be seen what the central mill can grind the cane and boil the juice for.

Let us see whether, by taking figures that appear to be correct, the planter on the one hand and the mill on the other could both make a fair living.

It costs to raise a ton of cane at ordinary wages, $1 50.

It costs to cut and haul the average distance from the field to the sugar house about 75 cents per ton.

The ordinary tonnage per acre is twenty. So if the planter had to haul to his own sugar house his cane would stand him $2 25 per ton delivered there.

Now, when it goes to the mill, I am informed by Mr. Daniel Thompson, that $1 25 per ton will grind and boil the average, with five-roller, double effect and bagasse burner.

The average extraction per ton this season for five-roller mill is 150 pounds; the average price is five cents per pound. If a ton of cane gives 150 pounds sugar at five cents per pound, we have a result of $7 50 per ton.

It costs the planter $2 25 to raise and haul to his own sugar house. To deliver to a central mill by narrow gauge rail, or by rail barge on the bayou, would cost say 25 cents per ton more, making a total of $2 50 per ton. If the mill turns out $7 50 per ton at a cost of $1 25 per ton, the mill has $6 25 to base a purchase price on. Deduct the cost per ton to the planter of $2 50 per ton, and we still have $3 75. Now, if the mill paid the planter $3 50 per ton delivered, the mill will make on each ton a profit of $2 75 per ton.

A mill of 400 tons capacity per day can, in the course of eight weeks grinding, which is the ordinary time, work up 17,000 tons of cane. A profit of $2 65 per ton gives the figure of $46,750.

The above figures are derived from the best information I can obtain. They are not put down as absolutely correct. A few considerations will show they are approximately so.

A begasse burner saves three-fifths of the fuel. A five-roller mill gets 30 per cent. more juice. A double effect saves 75 per cent of labor of boiling. A central mill saves the hands of a number of smaller mills—nearly 50 per cent. of the labor. Their hands would be employed in the field, thereby insuring a more rapid harvesting of the crop.

It would appear, therefore, that if the planter can raise twenty tons per acre and make $1 per ton clear, he can, averaging cane and corn at half the acreage each, and cultivating twenty acres per hand, make $10 per acre. This is certainly a fair yield for land. All cultivable land that yields $10 per acre surely, is as surely worth $100 per acre. But the planter, in order to get the factory started, must himself be a partner. He must be a stockholder. If a number of planters form a joint stock company in a neighborhood where the transportation will not be far, it is evident that they get all the benefits of the enterprise. If the central mill turns out a dividend of a large per centum, and they are stockholders, they get profits in proportion to their stock.

The remedy I suggest is that the planters in a certain neighborhood unite together and form a joint stock company, with sufficient capital stock to represent the cost of the plant, and 100 per cent. additional; that they subscribe to half the stock; that they invite the plant furnishers to put up the necessary machinery and appliances, and take paid up stock to its value; that the profits of the concern go first to paying the plant furnished, and that when they are paid the subscribers holding stock to represent par value, carry on the concern, for their own benefit.

Whether this plan is feasible depends greatly on the faith of the founders in the central system. Where practicable the planters could furnish what they had on hand in the shape of material as paid up stock, according to fair appraisement. If fortunate enough, by combination and use of material of their own, to supply partially or entirely the necessary plant, but little aid from the outside would be required. It is also feasible, by short and small sums to be paid on the stock, to raise all necessary sums to pay for erection and construction of machinery, and possibly part of the purchase price.

The question of transportation is to be met by narrow-gauge roads along the bayou forming the group of plantations tributary to the central mill, or to utilize the bayou by means of rail barges. Rail tracks on barges of sufficient dimensions, connected by a short track with the carrier of the mill, and connecting the barge at the landing, are esteemed a practicable method of transporting the cane at a low cost.

It is thus seen that in union lies our hope for continuance in the sugar industry. The gloom of the situation is relieved by a fact that stands out conspicuously in the light of experience. It is that Louisiana can hold her own with the tropics.

The same causes which operate to compass our ruin bear on them with equal weight. Our soil is too fertile, our climate too salubrious, our transportation facilitates over a level plain, through which our bayou, with a uniform stage of sufficient water, meanders like a silver thread, too great; our labor too efficient; our energy and skill too large to allow us to invite loss by inaction or by separate action. We have looked too much for extraneous aid, and watched too intently the action of political parties on the tariff. Let us see what we can do for ourselves; whether we can find sufficient food for our material health and comfort, without waiting for the Government spoon to feed us.

One of the direct results of the divorce between the planter and his sugar house will be more attention to the field, and that will eventually entail a diversity of crops. It may be that this semi-tropical climate and soil of extraordinary fertility may develop some other product of greater profit than sugar cane. At all events the opportunity will be given for experiment.

At the conclusion of the reading of Mr. Caffery's address he followed it up by remarks pertinent to the subject by others.

Mr. L. S. Clark, in an appropriate address, strongly favored the establishment of central sugar factories. He said that he considered twenty tons of cane per acre was a fair average yield throughout a term of years; that central factories should be capable of making at least 5,000,000 pounds of sugar, and that such a plant could afford to pay $4 a ton for cane; at the present prices of sugar no ordinary sugar house can afford to do that. Not less than a 5,000,000-pound plant should be erected, which should be guaranteed a supply of cane, while by the present system it was unsafe to give over $3 per ton, as the yield on the Teche at present with the best plants was not over 135 pounds per ton. He had no doubt that a central factory would average 160 pounds per ton, even taking into account the loss by cold.

The central factory, he said, should have a triple effect. Five million pounds of sugar could be made with the same number of laborers as 2,000,000, only requiring more centrifugal men.

Dumping cane on the carrier direct would save the use of many laborers. Such a plant could be erected at a cost of $125,000, entirely new. He preferred the transportation of cane by tramways and portable railways.

Mr. J. Y. Gilmore gave an account of a recent visit he made to Gov. Warmoth's Magnolia plantation, and showed by figures that Gov. Warmoth, by the use of portable railways, was saving 75 per cent. in transporting cane, 12 to 15 per cent. in shredding it, and 75 per cent. in fuel by the use of his improved bagasse burner. His three filter presses save him from 6 to 10 per cent. by filtering skimmings alone. His average sugar extraction by his five-roller mill was 78 per cent. By the use of his double effect or Rillieux apparatus he saves a large percentage in evaporation. Gov. Warmoth had stated his willingness to contract for 5,000 tons of cane annually at $4 per ton at present prices of sugar. He used no juice tanks nor sulphur. At present his cane polarized at nearly 15 degrees. Mr. Gilmore closed his remarks by calling attention to the fact that in Cuba the central sugar refinery system was fast being applied, and that fully 30 per cent. of the crop of about 700,000 tons was being manufactured in central plants.

Captain J. N. Pharr arose and said that the great want of the country was the proper organization of the labor system. He was satisfied the central sugar factory system was the correct one. You should interest the laborers with you, he said, so as to insure no interruption of the manufactory process, and closed by saying that he would put his entire property into the stock of a central factory.

Several other gentlemen made remarks favorable to the erection of central factories.

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## *THE "SUGAR" FROM COAL TAR.*

Sir Henry E. Roscoe, M. P., lately delivered a lecture on the recent progress of the coal tar industry, in which he spoke of the so-called coal tar sugar as follows: Of all the marvelous products of the coal tar industry, the most remarkable is perhaps the production of a sweet principle surpassing sugar in its sweetness two hundred and twenty times.

This substance is not a sugar—it contains carbon, hydrogen, sulphur, oxygen and nitrogen. It formula is :

$$C_6H_4\left\{\begin{matrix}CO\\SO_2\end{matrix}\right\}NH,$$

and its chemical name is benzoyl sulphonic imide, or for common use saccharine. Saccharine possesses a far sweeter taste than cane sugar, and has a faint and delicate flavor of bitter almonds. It is said to be 220 times sweeter than cane sugar, and to possess considerable antiseptic properties. On this account, and because of its great sweetness, it is possible that it may be useful in producing fruit preserves or jams, consisting almost of pure fruit alone; the small percentage of saccharine neccesary for sweetening these preserves being probably sufficient to prevent mouldiness. Saccharine has been proved by Stutzer, of Bonn, to be quite uninjurious when administered in considerable doses to dogs, the equivalent as regards sweetness in sugar administered being comparable to over a pound of sugar each day. Stutzer found, moreover, that saccharine does not nourish as sugar does, but that it passes off in the urine unchanged. It is proposed thus to use it for many medical purposes, where cane sugar is excluded from the diet of certain patients, as in cases of *diabetes mellitus;* and in this respect it may prove a great boon to suffering humanity, although we must remember that, as certain of the aromatic compounds if administered for a length of time are known to exert a physiological effect, especially on the liver, it will be desirous to use caution in the regular use of saccharine until its harmless action on the human body has been ascertained beyond doubt. Saccharine is with difficulty soluble in cold water; from hot aqueous solutions it is easily crystallized. Alcohol and ether easily dissolve it. Hence, from a mixture of sugar and saccharine, ether would easily separate the saccharine by solution, leaving the sugar. It melts at about 200° C. with partial decomposition. The taste is a very sweet one, and in comparison with cane sugar it may be said that the sensation of sweetness is much more rapidly communicated to the palate on contact with saccharine than on contact with sugar.

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## *HOW DOCTORS DIFFER.*

In the vegetable kingdom there are several substances that possess the double quality of food and medicine, and as such might be usefully employed in therapeutics. Among the vegetables that possess the valuable property referred to water cress may be mentioned. According to an analysis by M. Chatin, Director of the School of Pharmacy of Paris, and present President of the Academy of Medicine, water cress contains—1, a sulpho-nitrogenous essential oil ; 2, a bitter extract ; 3, iodine ; 4, iron ; 5, phosphates, water and some salts. As medicine the water cress has been vaunted for its efficacy in all cases in which the digestive organs are weak, in cachexia, in scurvy, in scrofula and lymphatism ; it has even been prescribed as a cure for phthisis. The medicinal principles which it contains are more or less abundant according to the culture or maturity of the plant. Thus, when the plant is in flower they are in greater quantity than before that condition; the essential oil increases according to the quantity of the sun's rays to which the plant is subjected. The proper culture of water cress develops in it the bitter and tonic principles, and the phosphates will be fonnd in proportion to the manure employed. Finally, the quantity of iron will depend upon the richness of the water in which the cress is planted. As food water cress ought to be used in its green or uncooked state, in the form of salad or without any seasoning. Water cress enters largely into the composition of "sirop antiscorbutique" of the French Pharmacopœia.—*British Medical Journal.*

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## *MISS SMITHARD'S REMARKS.*

This lady was chief dairymaid in the working dairy at the last Royal Agricultural Show in England, and the dairy was intended to give practical demonstration in making the best butter and cheese. One reason for bad butter in England was the cows were not kept clean. The smell of silage near the dairy taints the milk. Milkers should thoroughly cleanse their hands before milking. The cream should be taken off the milk before it turns the last sour; otherwise the cheesy flavor is acquired. The cream should be left to ripen before churning; but if cream is taken off with the centrifuge it should first be cooled, and then warmed to the proper temperature for churning—58° to 60° Fah. From 24 to 30 hours is enough to ripen cream. When at the proper warmth the cream will churn in 30 minutes—certainly in 40 minutes. If it is not warm enough, it is best to put the cream in a cylinder and dip in warm water till it is right. Coloring is objectionable, but carrot juice is the least so. At first churn slowly; take out the plug every few minutes to ventilate the churn. Stop directly the butter comes; take away all the buttermilk, and wash the butter three or four times. Never touch the butter with the hands. For salting, mix one to one and a half pounds salt in a gallon of water; do not use dry salt. Wash the butter for the last time in the brine. Do not squeeze or spread the butter, as it spoils the grain of it.

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Things not Generally Known.—A pace is three feet. A hand in horse measure is four inches. A palm is three inches. A span is ten and seven-eights inches. A fathom is six feet. A square of land, each side measuring two hundred and nine feet is one acre within an inch. There are 2,750 languages. Sound moves 1,118 feet per second. Light travels 186,00 miles per second. The average of life is thirty-one years.