THE

PLANTERS' MONTHLY,

PUBLISHED FOR THE

Planters' Labor and Supply Company,

OF THE HAWAIIAN ISLANDS.

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The list of officers of the Planters' Labor and Supply Company for the current year, and also the various Committees of the Association, will be found printed in full in the number for November, 1886.

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Our readers, and especially those engaged in cane culture, are reminded that communications on all sugar and agricultural interests on these Islands, are very acceptable, and there is always space in our forty-eight page MONTHLY, for their insertion. If they find a paucity of information of this kind, the fault will not rest wholly with the editor, who is always ready to receive and insert original matter in preference to selected.

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A correspondent inquires, "When was sugar cane first introduced into these Islands? Was it growing here when they were discovered by Captain Cook?" Have any of our readers the data to answer these questions? If our memory serves us rightly, among the plants and seeds which Vancouver brought and gave as presents to Kamehameha the Great, sugar cane is enumerated among them. It may, however, have been growing here prior to his visit.

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We are glad to notice the return of William O. Smith, Esq., former editor of this MONTHLY, who has been spending the last two months in California. A part of his absence has been spent among the orange groves of Pomona, Southern California, and we hope that he will

be able to favor our readers with some facts respecting the orange industry in that State. Mr. Smith will accept our thanks for a file of papers from one of which we extract an interesting article in this issue concerning one of the sugar plantations in Louisiana.

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Any persons who consider themselves entitled to receive this periodical, by virtue of their connection with the Planters' Labor and Supply Company, and who have not received the numbers for January and February of this year, are requested to notify the editor. The rule established by the company at their annual meeting in October was, that those who contribute towards the funds of the company shall receive the periodical free of charge. All others are expected to pay for their copies. Every person however who advertises one page in the MONTHLY for one year, will receive a copy without further charge than the payment made for the advertisement.

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There are so many mills throughout this country that have a very limited supply of fresh cold water for purposes of condensation that considerable time and attention has been given to the problem of cooling the water, and various methods have been used for the purpose. The latest of which we have heard, which is novel for this country, though in use in some other sugar countries, is that of running the warm water through loosely piled brush or faggots. A large rack, much like that used for storing iron, is made thirty or forty feet high, and as long as may be desired. This is built across the course of the prevailing wind, and brush loosely piled therein crosswise. The water is pumped up and runs in at the top, being distributed over the surface, and then trickles down slowly through the brush, where it is very thoroughly exposed to the air. The temperature is thus reduced. This very simple as well as very effective water cooler is in use at the Kukaiau mill, Hamakua, Hawaii, and gives such good satisfaction that the adjoining Hamakua mill is erecting one of the same style.

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A HOME MARKET FOR HAWAIIAN SUGARS.

As a rule we believe the cheapest place to buy an article, for the consumer, is not where it is raised or manufactured, but in some central and oftentimes distant market. Sugar in the Hawaiian Islands seems to be no exception to this rule. The Hawaiian consumer is called on to pay more for Hawaiian unrefined sugar than the San Francisco consumer for the same material. And the nearer we get to the plantation where it is grown and manufactured, the greater the discrepancy. Sugar for which the planter will get something less than 5c a pound in San Francisco after paying charges, commissions, &c., he is unwilling to sell [illegible] for less than 6c or 7c. The consequence is that our home g[illegible]

very excellent raw sugars are being driven out of the market by imported refined sugars which actually undersell the raws. That simply means that the planter refuses to take a reasonable price for it here, sends it over to the Coast, refines it, pays all sorts of charges, commissions, &c., brings it back again and must then sell it for the price which he refused before. With sugar at present prices, the planter can well afford to supply the Honolulu market at about 4⅜c, and the local market at his plantation at 4½c.

As an illustration of the absurdity of the practice now common among plantations of clinging at home to the prices of bygone days which they have lost abroad, may be instanced the following actual case: A housekeeper on Hawaii ordered a bag of sugar from one of the mills and paid for it at the rate of 8c per lb. The following day the same person ordered a similar amount of refined granulated sugar from the store connected with the same mill, and was somewhat surprised to find that it cost only 6c. Since then he has abjured the luxury of raw sugar.

There can be no doubt that a very large proportion of our population use little or no sugar, rightly regarding it as a luxury which at present prices they cannot afford. Possibly if prices were reduced to the real value of the sugar, it might be much more largely used and lead to an increasing home consumption, which would be beneficial to planter and public alike.

The planter should not forget his home market.

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SKILLFUL MANUFACTURE OF SUGAR.

No one familiar with the history of sugar in Hawaii during the last few years can fail to have noticed the decided progressive change that has taken place in the matter of the quality, or polarization, of the sugar. We can remember when a return account of sales in San Francisco with a polarization of 98° was a matter of wonder and pride, and a slight fear was entertained by the fortunate owner of the same, lest it should prove to be all a mistake which the next mail would correct. Now, returns at 98° are a very ordinary and quite-to-be-expected event, indeed some mills are much dissatisfied with anything less. This change no doubt is partially due to the improved machinery which has from time to time been introduced, which has resulted in improving the quality somewhat as it has very materially increased the quantity, but we believe it is due much more to the greater skill and care exercised in the manufacture, consequent very largely on the present low prices and small profits.

In the light of the advances which have been made in this direction [illegible]re seems to be no good reason why under ordinary circumstances all [illegible]st grade of sugar shipped from these Islands should not polarize 98°. If one man can do it, one season, at a certain mill, his fellow at [illegible]ill or the next season under similar circumstances, should do [illegible]nd should be *required* to do the same. That we should pro-

duce the best possible quality of sugar is not, and should not be merely a matter of pride, but a matter of *serious* financial importance. It is a matter of dollars and cents, which we take to be the raison d'etre of the sugar business in Hawaii, as elsewhere. We know of two plantations side by side in a certain district, subject to the very same conditions of soil, temperature, and climate, and with mills practically the same, yet the difference in value of their respective sugars amounted last crop, to some $6 a ton, or $12,000 on a crop of 2,000 tons. Not a matter of pride alone but of clear cash to that extent, and $12,000 was the value of the extra skill or care which secured the better results of the more fortunate neighbor.

This is not an extreme case, but one which we believe we might duplicate a score of times had we access to the account of sales of all sugar of the last season, and one which may at any rate serve to point a suggestion that we are not all of us doing as well as we might. Heretofore there has been too small a degree of care and attention bestowed on the quality of the sugar, so long as the mill was kept going, and the quantity made. Heretofore he was a good sugar boiler who could keep things straight in the mill and "get away" with the juice. Heretofore the mill manager knew comparatively little about the quality of the sugar till his returns came back from the Coast, when it was too late to remedy them. The day has come, or is rapidly coming, when a few clarifiers more or less in a days' work will be a small matter in comparison to a degree more or less in the polarization of the sugar, when the sugar-boiler will be rated mainly by the kind of sugar he makes, and if he cannot make good sugar will be compelled to make way for some one who can! when the mill manager will know every day the exact polarization of the sugar made, and will insist on high polarization as a main essential of satisfactory work. The days have gone by when we can afford to lose $5,000, $10,000, or $15,000, as a sacrifice to the shrine of carelessness, or of ignorance, or of a fancy for a sugar-boiler who is a good, well-meaning fellow, whom we do not like to dismiss. The days have come when the struggle for very existence demands that no possible chance of gain be thrown away.

The very utmost standard of perfection should be our aim even though it be the magical 100 which not even the refiner gains, and for the present we should not be even reasonably satisfied unless we range between 98° and 99°.

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EARTHQUAKES AND VOLCANIC ERUPTIONS.

The recent eruption on Mauna Loa, which commenced on S[illegible] evening, January 16th, and of which full descriptions have app[illegible] the local papers, seems likely to be one of the most notable of [illegible] lava flows that have taken place on that island. It commenc[illegible] large eruptions usually have, near the summit of the moun[illegible]

small crater known by the natives as Pohakuohanalei. After continuing three hours, this jet subsided, and the lava broke out a few hours later lower down the mountain, thus following very closely the track and the manner of the flow of 1868; in fact, these two streams would appear to have originated from the same subterranean duct or channel, and, like all the great lava flows on that mountain, they have afforded to spectators an opportunity of seeing all the various forms of a molten river flowing from its fountain to the sea, interspersed with falling cataracts, *pahoehoe* and *aa* streams, and deep pools of molten lava. The rapidity of this flow may be judged from the fact that there is a descent of 6,000 feet from the outlet to the sea, a distance of about fifteen miles.

Accompanying this eruption there have been a great number of earthquakes—as many as five hundred having been recorded during the first forty-eight hours. At times the earth was in a continuous tremor, and the severe shocks frequent, yet the damage has been comparatively small. There are sugar mills located in nearly every district on Hawaii; and yet, so far as we can ascertain, no serious damage has been done to machinery, though some of the outerworks and buildings have suffered injury.

Scientists appear much divided in their opinions regarding the cause of earthquakes and volcanic eruptions, some attributing them solely to the contraction and cooling of the earth's crust, and asserting that this cause is sufficient to account for all the volcanic phenomena occurring. Others assert that steam and gases are the source of these disturbances. No one can live on the island of Hawaii and notice the phenomena connected with the volcanic disturbances which frequently occur there, without becoming convinced that water, including steam and its component gases, are the chief, if not the only, agencies producing them here. Having lived on that island for over six years, with the crater of Kilauea and the summit of Mauna Loa daily in full view, where we could observe the effect of heavy rains on the volcanic fires, we are firmly convinced of the correctness of this theory. Take the present eruption as an instance: It has followed a period of unusual heavy rains and stormy weather; the rainfall on Hawaii having been unprecedentedly heavy during the past three months. No one now living on that island can doubt that the heavy earthquakes which are now occurring there are closely connected with the eruption, and have been greatly intensified by the stoppage of the action in Kilauea. There can be no doubt that the cessation of activity in this crater (Kilauea) has been caused by the closing up of the chimney connecting it with the internal fires, which took place at the time of the heavy earthquakes in and around that [illegible] March last. This cessation must continue so long as these old [illegible] are filled up, or until some new chimney between the crater [illegible] ernal fires has been opened up.

[illegible]tion it may be interesting to relate two experiences with [illegible] during our residence on Hawaii. On one occasion, while

walking through the cane fields at Keaiwa, on the slope of Mauna Loa, a wave earthquake occurred, which was so strong as to startle every one in the district. The tops of the trees swayed to and fro at least ten feet from the center line, and the ground swelled as far as the eye could reach, precisely like the ocean in a calm. This was one of the most interesting seismic phenomena that we have ever observed, and the sight was one of pleasure rather than of terror.

Again, during the eruption of 1868, while staying in a hut a short distance from the flowing lava stream, we were startled by an earthquake shock, which was the very opposite of a wave. It seemed as if a huge rock had been thrown up from an immense depth, which struck under the house, and brought us to our feet instanter. After the noise of the first concussion, the sound was as of an immense ball rolling over a floor, until it was lost in the distance. This incident would indicate a subterranean explosion rather than a contraction of the earth's surface.

The following extract, bearing on this subject, taken from an exchange paper, will be read with interest in this connection:

"Daubree, in discussing the recent earthquakes in Europe and Asia, presents many objections to the theory of falling rocks in internal chasms, and thinks that all the phenomena can be satisfactorily explained by the action of superheated steam. He refers to the well-known craters of explosion, such as Lake Pavin, in Auvergne, where the stratified rocks have been cut sharply through, as if by a punch. The modern experiments with gun cotton, nitro-glycerine and dynamite have often shown pressures of more than 6,000 atmospheres, and produced results which could hardly be wrought by the pressure of weights 600,000 times as great as that of the explosives. Superheated steam, when set in movement by such simple mechanism as nature often presents, would account for all the action of earthquakes, their violence, their frequent succession, and their recurrence in the same regions for many centuries. It also explains the predilection of earthquakes for regions where there are numerous faults, especially if the dislocations are recent. Earthquakes appear to be, in many instances, like subterranean volcanic eruptions, which are smothered because they find no outlets. The motive power of gases, of which we see the gigantic effects in the solar jets or protuberances, appears also to be considerable enough beneath the surface of our planet to explain all the effects of earthquakes."

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THE VANILLA BEAN.

The successful introduction of this valuable plant should be a matter for congratulation to all interested in the development of new sources of industry. Some thirty years ago, if our recollection serves us, the vanilla was introduced by Hon. Godfrey Rhodes or Mr. F. Wunder[illegible]

were then living at Hanalei, Kauai; but, although the plant grew vigorously, it was attacked by some insect which checked its growth, and probably finally destroyed it. It may have been introduced by others, but we have never heard of any success attending it.

Mr. J. Kidwell, of the Honolulu Nursery, on Beretania street, has lately procured a few plants, at considerable expense, which, under his skillful supervision, are growing finely and give promise of becoming a successful venture. The vanilla plant is a vine of the orchid family, and in its native country (Mexico) grows as a parasite on the forest trees to the hight of fifteen or twenty feet. When the plant is about a year old it produces a pod similar to that of the bean, from three to five or six inches in length. This pod is filled with numberless little seeds, and these seeds, with the pod, properly cured, constitute the article known in commerce as vanilla.

The plant is propagated, not by its seeds but by cuttings, each joint of three or four inches in length, being furnished with tendrils, which serve to fasten it to its support, and when planted, serve as roots. In fact, it is propagated very much like the sugar cane, each jolnt serving as a seed.

Mr. Kidwell has, by close care and attention, increased the number of his plants, so that during the present year he may be able to supply several hundreds, or perhaps thousands, of the cuttings. Its growth is slow for the first year, and during that time it does not bear; during the second year the pods begin to appear, and hang singly or in clusters on the limbs. Great skill is required in gathering and curing these pods, so as to make them a merchantable article of commerce. This is an art in itself, and, like sugar-boiling, can only be acquired by close application and skill. Mexico is the principal country where this plant is produced, and the export from it to England and America during the year 1884 amounted to $232,208. In each of the above countries there are only one or two manufactories of the extract; and the production and manufacture of vanilla is now held as a kind of monopoly. It would seem to us that here is an opening for the establishment of a new industry. The vigorous growth of this plant in Mr. Kidwell's nursery shows that, under favorable conditions, it will thrive and bear well. Mr. K. may well feel proud of his success in the introduction and cultivation of this rare plant, and we hope will be able to arrange for its production on a large scale. The vanilla is extremely valuable, the pods being worth eight to ten dollars per pound. The following article, taken from the "American Cyclopædia," will be read with interest in this connection:

"Vanilla, a genus of parasitical *orchideæ*, natives of tropical parts of America and of Asia, which spring at first from the ground, and climb by twining stems to the hight of twenty or thirty feet on trees, sending out fibrous roots produced from nodes, from which the leaves also issue. These roots drawing sap from the trees, sustain the plant, even when the principal root has been destroyed. The stem is four-cornered

and juicy; the leaves long and fleshy. The flowers are in spikes, and are very large, fleshy, and generally fragrant. The fruit is a pod-like, fleshy capsule, opening along the side. The *vanilla* of commerce was formerly supposed to be the fruit of *V. aromatica*, a native of tropical America, but is now ascertained to be chiefly, if not wholly, the fruit of *V. planifolio*, a species indigenous to Mexico, Guiana, Brazil, Peru, etc., and cultivated also in some of the West India islands, the Mauritius, and Ceylon. The fruit is cylindrical, about a span long, and less than half an inch thick. It is gathered before it is fully ripe, dried in the shade, and steeped in a fixed oil, generally that of the cashew nut. It contains within its tough pericarp a soft black pulp, in which many minute black seeds are imbedded. Vanilla appears in commerce in packets of 50 and 100 pods, wrapped up in cane leaves and sheet lead, or in small tin boxes. It has a strong, peculiar, agreeable odor, and a warm, sweetish taste. The interior pulp is the most aromatic part. Benzoic acid is sometimes so abundant in it as to effloresce in fine needles. Vanilla is of little use in medicine, although it is a gentle stimulant and promotes digestion, and in large doses is said to be a powerful aphrodisiac; but it is much used by perfumers, and also for flavoring chocolate, pastry, sweetmeats, ices and liquors. Balsam of Aeru is sometimes used as a substitute for it, as it is expensive, and the whole quantity imported into England does not exceed 400 or 500 pounds annually. It is in very general use in South America. Several kinds are distinguished in commerce. The best is that called *leg* or *lec*, which is almost of a black color, and covered with crystals of benzoic acid. Another kind, less fragrant, dryer, and of a darker color, is known as *simarona*. A still inferior kind, with much broader, brown capsules, is called *pompona*, or *bova*. When the fruit of vanilla is fully ripe, a liquid (*baume de vanille*) exudes from it, which is unknown in Europe, but is valued in Peru. Vanilla has ripened its fruit in British hot-houses, but the flowers are apt to fall off without fruit being produced, unless care is taken to secure it by artificial impregnation. This is, in some measure, the case even in the East Indies, and in some parts of America itself; and it is supposed that the presence of some insect, delighting in the flowers of the vanilla, makes it more productive in other parts of America, especially in Mexico."

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The unfortunate accident which occurred at the Kilauea Mill last month, resulting in the killing of two men by the bursting of a centrifugal, suggests the idea whether a regulator or indicator of some kind, such as is attached to steam engines, may not be provided for these machine to show when the limit of safety in speed has been reached. For inst if the limit be 2,000 revolutions per minute, an indicator show that point is reached might be attached to the motive power, w or steam whistle might warn the operator of danger ahead, a vent the sacrifice of life which now occasionally occurs.

EXPORT OF SUGAR FROM HAWAII.

According to the statistics published by the Collector-General of Customs, the quantity of sugar exported from this kingdom during the year 1886 amounted to 216,223,615 pounds. This, of course, is all raw sugar, the growth and manufacture of these Islands, there being no sugar refineries here, and no raw sugars are imported from any country. This entire product has been exported to the United States, where it is admitted free of duty under the Reciprocity Treaty with that country. In addition to this total there has been a small consumption, which would have been much larger but for the reason stated in another editorial, that American refined sugar is imported here and undersells our raws. All Hawaiian sugar consists of what is known as centrifugals, and comprises four grades; the first quality amounting to about three-fourths of the whole. The extraordinary increase of the sugar crop in these Islands during the past ten years is owing entirely to the treaty, which went into force in September, 1876. It may be of interest to our readers to notice this increase from year to year, as shown by the Custom House statistics:

	Pounds Sugar.	Gallons Molasses.		Pounds Sugar.	Gallons Molasses.
1876	26,072,429	130,073	1882	114,177,938	221,293
1877	25,575,965	151,426	1883	114,107,155	193,097
1878	38,431,458	93,136	1884	142,654,923	110,530
1879	49,020,972	87,475	1885	171,350,314	57,941
1880	63,584,871	198,355	1886	216,223,615	113,137
1881	93,789,483	263,587			

We include in this table the quantity of molasses exported during the above period, as it possesses interest in showing a falling off when compared with the large increase of sugar. This decline is owing wholly to the fact that the manufacture of sugar under the centrifugal system has become so perfect that when the fourth sugar is extracted there is very little left for export or any other purpose. For this reason, it has never paid in this country to manufacture rum from the molasses, and the only attempt ever made, as far as we recollect, proved a failure. Even the Arctic Indians rejected it.

In addition to the treaty, several local causes may be noted as having contributed to the extraordinary annual increase of our sugar crops. And first, the variety of cane which is now almost wholly cultivated, known as the Lahaina or Otaheite white cane, which grows in favored localities from ten to fifteen or even twenty feet in length, is probably unsurpassed by any other variety; or we should perhaps say is better adapted to our climate. Easily cultivated, of rapid growth and extraordinary saccharine qualities, our planters are undoubtedly indebted to it for crops which could be obtained from no other cane. A second reason may be found in our superior mills. Probably in no other country has the manufacture of

cane sugar been brought to such perfection as here, owing to the perfect and improved machinery in use. Nearly every mill is now provided with the most perfect crushing machinery, and many of them, in addition to the ordinary three crushing rollers, are furnished with maceration rollers, by which the increase of sugar extracted from a given quantity of cane is estimated at from 10 to 15 per cent. more than could be obtained without them. Then we have the vacuum pans and the double and triple effects and patent mud presses in nearly every mill, which secure the most perfect cooking of the cane juice known. All these have combined to increase not only the quantity but the quality of the sugar.

Another and important advance has been made in ascertaining the best time to cut and grind the cane. Formerly very little attention was paid to this matter, and it was thought that the cane must be cut immediately after tasseling, or the juice would sour and yield less sugar. We remember that on one plantation a few years ago grinding commenced while the cane was yet in tassel, and to the surprise of the manager the juice stood at from 5° to 6° Baume, which compelled a stoppage of work for several weeks, at considerable loss to the plantation. Experience has proved that the cane juice continues to improve in quality till about April or May, when the juice will stand from 10° to 11° Baume, and the finest quality and the largest quantity of sugar is probably obtained. One planter has expressed the belief that if his whole crop could be manufactured during the above two months his yield would be increased very largely. This, however, is quite impracticable, and the grinding season will have to continue as heretofore, from January to June.

We have been asked respecting the present crop whether it will exceed last year's. We do not think it will. But it will be in the neighborhood of 200,000,000 pounds, but rather below than above it. Last year everything combined to favor a large crop, and the area of plant cane was probably much larger in 1886 than it is in 1887, though greater skill in the mill may make up for less acreage in the field.

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A PLANTERS' DIRECTORY SUGGESTED.

EDITOR PLANTERS' MONTHLY:

Would it not be well to publish in the PLANTER'S MONTHLY each month a directory containing the names of the Manager, Head Overseer, Engineer, Bookkeeper, and Agent, of each plantation?

With a little pains such a directory could be prepared, and if each Manager would inform the editor from time to time of any changes it could be corrected.

The directory might occupy three or four of the last pages of the magazine and would be of interest to planters and other Island readers.

The name of each plantation, and the district and island where located

should be given. Other brief information, such as "maceration," "double effect," "tripple effect," or other words to indicate the kind of machinery used; and information on other points such as "incorporated," (or otherwise) might be added.

Yours truly,

Honolulu, February 1, 1887. WILLIAM O. SMITH.

[The suggestion made by our correspondent seems to be a very good one, if it can be carried out. There are between fifty and sixty plantations on these Islands, and to give all the details referred to in the communication, including the Managers and their assistants in all the various capacities, and to keep run of these changes from month to month, would require the services of an active man, to say nothing of the space that it would occupy in the MONTHLY. We should like to see a directory got up such as is suggested, but until the Company make provision for this work, we should hardly feel authorised to undertake it.—EDITOR PLANTERS' MONTHLY.]

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CORRESPONDENCE AND SELECTIONS.

COMMUNICATION FROM PROF. VAN SLYKE.

TO THE EDITOR OF THE PLANTER'S MONTHLY:

SIR—There have arisen some questions as to the interpretation of the analysis of the Hawaiian fern fertilizer, as published in December, owing to a lack of more detailed explanation. The report was written and the laboratory notes of the analysis were copied under circumstances requiring haste and brevity; and, at the same time, the need of a more detailed explanation was overlooked. The matter passed from my mind and had scarcely been thought of since, until recently when my attention was especially called to the need of a further explanation of the analysis and of the condition of the fern analyzed.

The use of the word nitrogen should have been qualified as referring to nitrogenous matter, and not to pure nitrogen; or it might have been better to express the results of analysis as follows: Nitrogenous matter equals 2.86 per cent. (equivalent to .457 per cent. of nitrogen). The form of expression used, without added explanation, was misleading, though not intentionally so. The substitution of 52.2 for 57.2 was an error of the printer.

The potassium was present in the ash mainly as a chloride. It was determined by a complete conversion into the chloride, and this was reported in an equivalent amount of potassium oxide (potash), the usual form of reporting potassium in ash.

In the preparation of the fern fertilizer only the trunk of the fern is

used. This is ground fine, then spread out in thin layers and allowed to dry in the air. The sample analyzed was intended to represent fairly the condition of the fern as put on the market.

By drying in air the percentage of water in the green fern is reduced nearly one-half, and thereby the proportions of remaining constituents are correspondingly increased. It should not, therefore, be a matter of surprise if the fern fertilizer, with 42.79 per cent. of water, contains approximately the same preparations, somewhat more or less, of fertilizing elements as stable manure containing 80 per cent. of water (the proportion according to Ville). It is evident that if stable manure were dried so as to contain only 42.79 per cent. of water, its fertilizing value would be nearly doubled.

If the fronds of the fern were used, the preparation of fertilizing matter would probably be diminished. It is a well-known fact that the fern trunk used in the fern fertilizer contains a considerable amount of a potato-like substance that is or has been used as food, and doubtless contains less woody fibre than most fern trunks or fronds.

As to the accuracy of the analytical work, careful control-analyses were performed, the analysis being repeated not less than three times with consistent results. It is probable that analysis of the fern in different stages of growth would give somewhat variable results.

I have records of the analyses of other ferns made by other chemists, and their results show very decidedly that the constituents of the fern fertilizer, as determined by my analysis, are not in any respect higher than might be anticipated; in fact, a representative analysis of the fern family by Wolff gives the constituents somewhat higher than those found by me.

As to the practical results coming from the use of the fern fertilizer, I am unable to speak from personal experience; but it is safe to say that its use must be attended with advantage to the extent of the fertilizing elements present. I am told that parties on Hawaii formerly used this fern successfully as fertilizer, when it was applied in a finely divided condition, but the labor of cutting it up fine was so great that its use was impracticable; but this difficulty of obtaining the fern in a state of fine division has now been overcome. Very truly yours,

L. L. VAN SLYKE.

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Mr. Alexander's letters, two of which appear in this number, describing his tour in South America, will be found very interesting reading, particularly the description of Peru, which is especially graphic and entertaining. In a private letter Mr. A. says he had not found the Lahaina cane growing there, but most were of the red varieties, which grow to an enormous size, some of the stalks being three inches in diameter.

THE EUCALYPTUS TREE.

To the Editor of the Planters' Monthly:

The recent rainy spell prompts me to draw the attention of the public to the cultivation of the eucalyptus. It is a well-known fact that, during the long-continued rains, people are liable, especially in low lands, to suffer a good deal from various diseases, which are caused by continued and excessive dampness. In such places the eucalyptus has been cultivated extensively, on account of its rapid growth, and especially the aromatic exhalation of its leaves, for the purpose of improving the atmosphere. It is now cultivated in Germany, as it can stand a temperature of 8 to 10 degrees below zero, Raumur, 8 to 10 Fahr. (This probably applies only to globulus.) In France, Spain, Portugal, Italy, Greece, Palestine, on the high lands of India—north and south—America, South Africa, Cuba, St. Helena, Egypt, Corsica and Algeria, and in all those countries it is verified that eucalyptus does improve the climate and remove the fever, through its extraordinary power of evaporation. Convicting proofs, for instance, Italy furnishes in this regard, and I will gladly answer any inquiries, and furnish particulars to anybody who takes an interest in this matter.

In the forest district at Makiki are now set out about 200,000 young eucalyptus trees, in great variety (about 50 different kinds), and are doing well, especially some of them, as for instance: haemastoma, cornuta, stuartiana, robusta, calophylla, globulus, rostrata, siderophloria, marginata, and others. In regard to robusta, we have to say that, in opposition to Baron von Mueller's statement, "this tree seems to thrive best in low, sour, swampy ground, near the sea coast." I find that this kind grows just as well, may be the best, on the hills, as personal inspection will prove to anybody. All the last-mentioned species show a rapid growth, in spite of the strong winds predominating at Makiki, and are only excelled in this respect by acacia dealbata and pycnantha.

The cultivation of these varieties is easy, and haemastoma and globulus, for instance, can stand pretty rough treatment. The seed needs very little dampness to sprout (four or five days' time); too much water will make it rot and kill it. When the young plants are two or three inches high, they must be set out, either (in wet weather) right in their proper place or in small boxes, until they have taken root again; but, even in the latter case, I don't let them grow large before setting them out in the open field. The large-seeded kinds live; calophylla it is better, according to my experience, to sow right in their proper place. For the purpose of raising good timber, eucalyptus ought to be planted very dense (three or four feet square), because it will then produce few side branches, while otherwise it will, on account of its thick foliage, suffer too much by the wind, and thereby be hindered in its straight growth, for the denser they are planted the least damage the winds can do.

Eucalyptus has also very valuable medicinal qualities, not alone that extracts of its bark and leaves are used against many diseases (rheumatism and fever), but the leaves contain a large proportion of an etheric oil (1½ quarts in 70 pounds), which operates strongly in disinfecting, and is a very good remedy for the treatment of wounds (used to a great extent during the Franco-German war of 1876–71), as well as in diseases of the respiratory organs. In the technical line, it furnishes a material for the manufacture of varnish. The oil is colorless, has a strong and agreeable aroma, no smell, smarts on the tongue, and leaves a bitter after-taste.

Eucalyptus gives further the so-called Australian manna, or kino, a sugarlike secretion; the wood is very hard and solid, and is suitable, besides firewood, especially for ship-building, railroad ties, and any kind of water structure. It seems that eucalyptus has no enemies—at least I have not discovered any as yet.

On this occasion, the undersigned would respectfully request the kind remittance of beetles and nymphs (for instance, the cane-borer, a kind of borer in wattle-trees on the Island of Hawaii, etc.), for scientific purposes. A few species of them, preserved in alcohol, and a small piece of the wood, bark or cane, wherein the insects were found, are sufficient, and anything of this kind will be accepted with many thanks.

F. LUBNER, Government Forester.

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FUEL ECONOMY IN THE MANUFACTURE OF SUGAR.

EDITOR PLANTERS' MONTHLY:

THE SOURCE OF HEAT.

All the heat contained in our fuel whether it be coal, wood, or trash, was originally derived from the renitic energy of the sun's rays. It was showered down in unmeasured quantities in earlier times, and even now it is poured down in great abundance. It is found in every living thing, but more largely in trees. In fact, it is found in all known substances, even in ice and snow. But we are not so much interested in the place it was derived from, or where it is found, as we are in what it will do. In this, we are particularly interested, as have been thousands before us.

Physicists especially, have made this subject a study for a hundred years, and scientific men in all parts of the world have devoted the best years of their lives to solve this important problem. And from these investigations, experiments, and researches, they have succeeded in establishing rules or principles which may be called the foundation of the science of energetics.

It is not the purpose of the writer to follow these physicists through all their theories and investigations until they finally settle on a definite

quantivalence. But merely to point out that it is from these researches and deductions we are enabled to comprehend the operations of this wonderful agent, and also to know that it can be accurately measured, and mathematically expressed. We also learn from these well settled facts and laws, the true relation of heat energy to mechanical energy.

For instance, the British thermal unit is equivalent to 772 foot-pounds of work; and this amount is also called the "mechanical equivalent of heat." Or in other words, the maximum theoretical duty of one degree of heat, is to raise 772 pounds one foot high.

We also learn from these experiments that different substances contain unequal quantities of heat. For instance: one pound of carbon contains 14,500 units of heat; coal, 10,000, and trash, 5,000 units of heat. Now if we multiply the number of heat units contained in one pound of trash by the mechanical equivalent of heat, we have $5,000 \times 772 = 5,018,000$ foot-pounds as the work done by this pound of trash, and it is equivalent to the work a horse could do in one hour. Again, if we divide this 5,000 by 1,210 (the number of units of heat contained in one pound of steam at seventy-five pounds pressure per square inch,) we have $5,000 \div 1,210 = 4.5$ pounds of water evaporated per pound of trash. But as our feed water is always kept at a temperature of 200° Fahrenheit we must deduct 200° from the 1,210 and divide by 1,010, giving 4.95 pounds, or nearly five pounds of water per one pound of trash. But this is never done in actual practice, indeed it is doubtful if the best boiler we have ever evaporates four pounds per pound of trash, as it is usually considered that three and one quarter pounds would now nearly represent the work done.

From the above we see that the theoretical duty of a pound of trash (when dry) is to evaporate nearly five pounds of water, and in practice we realize two-thirds of the total amount of heat contained in this amount of fuel, and one-third is lost.

This is not a very good showing, especially when economy in every part and detail of this business is looked for. However, this is perhaps the greatest loss, but the best attainable work done with a natural draught will always show a loss of 25 to 35 per cent. Now if we desire to estimate this loss, all that is necessary is to take one-third of the trash, and this in a fifteen ton mill, will amount to about 15,000 pounds, and this is equivalent to 7,500 pounds of coal, which at $10 per ton would amount to $37 per day. In the second instance, with a loss of 25 to 35 per cent, the loss would be slightly less, but it is doubtful if this loss is ever brought down to 25 per cent, especially when we consider the number of places and ways in which leaks may be found.

This great loss does not result from one particular thing, nor is it always the fault of the engineer. It can always be more easily located than remedied, however, in most cases something can be done to prevent it to some extent. A great deal of this heat is often lost by the imperfect design of the furnace or by the bad design or imperfect setting of the

boilers. Again, a great deal is lost by radiation, condensation, evaporation, excessive amount of draught, but by far the greater quantity is lost or escapes up the chimney. In tracing this loss of heat we cannot do better than commence with the furnace. The requirements of a good furnace is first to secure a high temperature of furnace relative to that in the chimney, and second to design it so that it can be fed or fired without checking the evolution of the gases, and it is also important to have the pressure slightly exceed the pressure in the chimney. But these conditions are not often found, or if found, they are the exceptions to the general rule. Take for instance the common furnace. This is usually set in front of the boilers and is mainly made of fire-brick. The front however, is of cast iron with two doors; the grates are on an incline, and it is usually fired by hand. This furnace or grate is allright, it is the way it is fed or fired that is objectionable. It has the advantage of being both simple and cheap, but this is all that can be claimed for it. In all other respects it is unsatisfactory and wasteful, destroying to a great extent both the efficiency of the fuel and the iron of the boiler.

The great objection to firing by hand is the varying temperature of the furnace; at one time there is an intense heat and at another time there seems to be scarcely any heat at all. This at times cannot be avoided. In fact it is impossible to fire by hand without letting a large volume of cold air in at the same time, and this cold air entering the furnace above the fire is the great evil of this method or practice. It lowers both the temperature and pressure of furnace and carries off heat from the boiler besides. The expansion and contraction of the boilers resulting from this practice can hardly be estimated, but we know it exerts a tremendous force and the strain is often many times greater than the pressure of the steam. The loss resulting from this practice can not be less than five to ten per cent.

The common furnace, however, has been greatly improved by adopting the step-ladder grate bar and by changing the door to the top of the furnace. This door is of large size, equal in length to the width of the furnace, it is perfectly counterbalanced and works automatically. This arrangement meets the requirements of this kind of furnace better than any thing that I have seen, as it allows a large amount of trash to fall suddenly into the furnace, the door closing instantly after it. This trash falls on top of the enclosed grate bar, and by its weight forces the unconsumed fuel to the bottom of the furnace where the heat is greatest, thus always securing a constant temperature and pressure in the furnace. The pressure of the furnace is important and should always slightly exceed the pressure of the gasses in the chimney; if it does not, every time the door is opened the cold air will rush in above the fire which quickly lowers its temperature by carrying off heat, and does a great deal of damage besides. In closely watching this furnace I noticed that the temperature

was apparently constant, and that the pressure always about right. This furnace is still more improved by using wind pipes or "smoke burners."

The automatic self-feeding apparatus unquestionably has some great advantages over the common furnace. It is designed especially to meet the requirements of this kind of fuel. In the first place the fuel is fed continually without opening doors, and it keeps the fire constantly supplied with fuel without checking the evolution of the gases. It also always secures perfect combustion of the trash and a high temperature of the furnace.

Next to the importance of a good furnace and regular firing is the draught or air supply. In the first place we must not use too much air or there will be a great loss of heat escape up the chimney, nor too little, or we have impertect combustion. By using too much air there would probably be a loss of thirty to thirty-five per cent, and by using too little, there would be a loss of twenty per cent at the furnace besides the amount lost at the chimney. Again it is important that the fuel should be consumed with the least possible air supply, as the temperature produced by a given quantity of heat is always greater as the volume of gases heated is less. For instance, the amount of air that is chemically required for the perfect combustion of one pound of carbon is twelve pounds. Now if we multiply this amount by the specific heat of the product of combustion and divide this into 14,500 (the number of heat units contained in the pound of carbon) we have 4,639° as the resultant temperature, but if twice this amount of air is used we have only 2,437° as the resultant temperature of furnace. And it is still further proved that the more rapid the combustion, the less will be the evaporation efficiency of the combustible. To secure a good draught it is necessary to keep a high temperature in the chimney, and this is the great evil of a natural draught as it takes twenty-five per cent of the total amount of heat contained in the fuel to produce this draught. By using an artificial draught we can greatly decrease the quantity of air as well as the temperature of the gases in the chimney, and thus reduce this waste to a minimum. The cost to operate an artificial draught is said to be only one per cent of the capacity of the boiler, and produces a gain of fifteen per cent.

THE BOILERS.

In choosing the material for a steam boiler it is important to select a metal of high conductive power; this we find in a high degree in steel, and it also has the advantage of having greater strength which gives us an opportunity of working between higher limits of temperature, and this is one of the directions in which improvements are looked for in the future. The design of a steam boiler has much to do in securing all of the available heat. First, there must be a steady, active, and complete circulation of the water. This is best secured by feeding the boiler in the

coolest part, and withdrawing the steam from the hottest; this causes the water to flow in the opposite direction to the gases and is said to be one of the best means of absorbing the heat from the gases. The setting of boilers is also important. It is found by scientific test and experiment that the several types of boilers require a setting especially adapted to meet its requirements. For instance: of the three types of boilers most generally in use here, the multi-tubular is the only one always found set the same, and this is always fired under the bottom, the gases returning through the tubes to the chimney; only in one instance have I seen a variation to this rule; but they are not always set according to these rules, and then the furnace was at the end of the boiler, which was evidently a mistake. There are four different settings for the "Hinds Compound Boilers" all of which cannot possibly be right. First, there is what is called the old setting, that is where the boiler is fired under the Cornish boiler, the gases returning through the flues of the same and through the multi-tubular to chimney. In the second, the furnace is in front of the boilers, the gases passing through the flue of the Cornish and through the tubes of multi-tubular boilers to chimney. In the third, the furnace is at the end of boiler, the gases passing through the flue of the Cornish and through the tubes of the multi-tubular and return under the bottom of both to chimney. The last is similar to the third, excepting that the gases return back again, then passing along the boilers three times. The third setting is probably the best, as the gases as they enter the chimney are not more than a 100° higher than the temperature of the steam in the boiler.

In whatever way steam boilers are set it is imperative that the heating surface be arranged so as to take up all of the available heat; and also that the gases do not exceed 400° at the base of chimney, even when the fires are forced to their utmost capacity. This is with a natural draught; with an artificial draught the temperature should not exceed 200° Fahrenheit at base of chimney. To secure the best results from the fuel it is necessary to know the amount of work a steam boiler is capable of doing (with economy). To ascertain the horse-power of a boiler we measure the total amount of heating surface in square feet, and if it is a Cornish or Galloway boiler, we divide by eleven, which gives the horse-power; and its maximum duty is to evaporate thirty pounds per hour per horse-power.

In a multi-tubular boiler we divide the total amount of heating surface by fourteen, for small tubes, and by twelve, for four inch tubes. For instance, if we have a tubular boiler with 1,200 square feet of heating surface, it will be a hundred horse-power boiler, and will evaporate $30 \times 100 =$ 3,000 pounds of water per hour. But the efficiency of the fuel is increased as the duty is decreased down to one-third less duty. Boilers are almost always worked beyond their fair rating and in consequence a great amount of heat is always wasted.

THE APPLICATION OF HEAT.

A sugar mill has a great advantage over almost every other manufac-

tory. We can use the steam to the best advantage by expansion in the engine, and after it has done its work there the waste heat can be utilized by doing work in various other parts of the mill. Besides this, we have an apparatus especially designed to use steam or even vapor at low temperature, and to the very best advantage, so that the only heat that need be lost is that which is carried away in the condensers of the vacuum pan and triple effect. But there is evidently some mistake in the application of this heat or the way it is used, and this mistake consists in indiscriminately mixing the water of condensation with the exhaust steam. For example: there is in every large mill one main exhaust pipe into which all of the waste steam and heat from the engine and steam pumps is exhausted; and into the same pipe flows the water resulting from the condensation of the steam from clarifiers, cleaning pans, and vacuum pans. By this means steam of high temperature and water of low temperature are mixed together, and the result is either condensation of the steam, or the evaporation of the water, most likely the latter; in either case there is a loss which could be easily avoided by using a "steam trap" on clarifiers, cleaning pans, and vacuum pans, and only use the exhaust steam from the engine and steam pumps to do the evaporation. There are some persons that believe this water at 212° Fahrenheit has an evaporative power, but if so, it must be very slight indeed when used in the first pan of a triple effect, particularly if the pan carries pressure. In such a case it is a positive indecence.

From the foregoing it will be seen that there is a possibility of effecting some improvement and economy in various ways. First, by making a good furnace; second, by adopting a better method of firing; third, by carefully regulating the air supply or draught; fourth, by using an artificial draught in place of a natural draught; fifth, by arranging the heating surface so as to reduce the temperature of the gases at base of chimney to about 400° Fahrenheit, for a natural draught, and still lower if an artificial draught is used; indeed all of this heat can be utilized if a proper apparatus is got for the purpose. A saving of fuel can also be effected by working the boilers below their fair rating. By preventing the radiation of heat a slight saving can be made, and a greater result if we stop the condensation and evoporation of water in the steam pipe. Economy is secured in the mill by using steam traps of good design, but these must be made so as to work at any pressure. There are two more ways of increasing the efficiency of the fuel. The first is by superheating the steam; the second, by increasing the pressure. As the specific heat of superheated steam is much greater than wet steam, a saving of ten per cent is said to be gained. Again this steam leaves the cylinder with a temperature equal to wet steam on entering the cylinder. The saving effected by using steam at higher pressure is still more marked. For example: the water required per horse-power per hour, is equal to the constant number 200 divided by the square root of the pressure. Thus at

sixty-four pounds pressure it will require twenty-five pounds of water per horse-power per hour, and at one hundred and forty-four pounds pressure only fifteen pounds are required, which is a saving of thirty per cent. As it requires but a small amount of fuel to raise the temperature to this amount, the saving is almost all clear gain.

Yours respectfully,

Laupahoehoe, Hawaii, Jan. 18, 1887. G. E. OSBORNE.

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QUITO—A CITY IN THE HEART OF THE ANDES.—NO. 2.

In entering Quito I was impressed with its appearance of great antiquity. Had I dropped down into it without knowing where it was, I should have supposed myself in one of the seedy old towns of Spain or Italy. It is, indeed, an ancient city. It was founded in the year 1534, by Benalcazar, not long after the cruel death of Atahualpa by Pizarro. It was afterwards nearly demolished by the Spaniards hunting for hidden treasures. A new city was then built of magnificent churches and immense monasteries, some of which are still standing, notwithstanding earthquakes and revolutions. The greater part of the city is built of adobe, which, it is claimed, can stand the shock of earthquakes better than other material. Around the principal squares there are some fine stone buildings. The style of architecture is Spanish, or, as I might more properly say, Moorish. The tiled roofs, the arched gateways and doors, the hanging balconies and the central courts, all remind one of Spain. Some of the old churches are fine, with elaborate and beautiful carvings and facades. The old Jesuit Church, built of porphyry, has the finest facade. The church of San Francisco, with two towers, on a high terrace facing a large square, is an imposing edifice.

A PICTURE OF HELL.

These churches and the convent cost not only millions of money, but also blood. Multitudes of poor Indians are said to have perished while whipped to the task of carrying on their trembling backs block after block for their erection. The interior of these churches is a perfect blaze of gilding, and is also highly adorned with pictures and statuary. Some of the paintings are very ancient and grotesque. One particularly delighted me. It was a large, highly-colored picture of the tortures of the damned. The poor unfortunates shut up in Hades were apparently being devoured by a species of giant ape. Each man, woman and child had his ape to contend with. One lovely-looking woman had the fangs of a gigantic ape fastened in her side, while a stream of red blood ran from the wound. Another had just bitten a mouthful out of a young child, and was grinning with satanic joy. In one instance a sinewy Hercules had floored his monkey and held him by the tail. A number of Indians, probably from remote provinces, stood before this picture with distended eyeballs.

A CITY OF CHURCHES.

The church of San Francisco, it is said, was built by the treasures of Atahualpa, discovered by an Indian. Not that the Indian voluntarily made the bequest; but the good fathers, apprised of his discovery, applied certain persuasives, which resulted not only in his disclosing the treasure, but also in his speedy departure to a better world.

It is said that one-fourth of Quito is occupied by churches and convents. They are certainly very extensive and cover a great deal of ground, in some cases from eight to nine acres. The annual revenues of the church now amount to about one million of dollars. The suburbs of the city are miserable in the extreme. They are wretched, tumble-down, adobe buildings, abounding in filth and vermin. And here I would say that anyone traveling in Ecuador had better take his bedding with him. A careful inspection of native bedding would be more interesting to a naturalist than to one seeking lodging.

Quito is situated at the base of Pichincha, only five miles from the crater, and has an elevation above the sea of 9,520 feet. It lies almost directly on the equator; though, in respect to this last statement, a Quitonian corrected me. He said that Quito was not on the equator, but nearly 10,000 feet above it. At this high elevation there is a

A SUPERB CLIMATE.

It is spoken of by writers as "a perpetual spring." The mean temperature is about 63 degrees in the shade. I found it uncomfortably cold at first, but after ten days' residence I enjoyed it very much. The cool weather of these high latitudes begets a keen appetite and an inclination to be forever on the go. Apparently, people here live to a very old age. I met an old woman the other day who looked old enough to be the grandmother of Atahualpa. Were the people cleanly in their habits there would be little or no disease; but they beat the pagans of the South Seas in filth. They have an aversion to the use of cold water, never washing their faces in it lest it might cause swellings. As a rule, they go unwashed.

The city is traversed by two deep ravines from the mountains. These are in some places 80 feet deep, but are arched over and covered with houses, except in a few places, where openings are left for the abominations of the city. Fortunately for the health of the city, the icy waters of Pinchuicha flow down these "quebradas."

The streets, though narrow, are paved, and in some instances have gutters of running water.

In the rear of this city is a large leper asylum. I have seen persons in the streets on whose faces I noted the incipient marks of the loathsome disease. Formerly the occupants of the asylum were herded together like wild beasts and miserably fed and housed, but there has been an important improvement, I am told, in this respect. The opportunity was given me of visiting this establishment, but I felt no disposition to do so.

GREAT POSSIBILITIES.

In Quito there are the possibilities of a most beautiful city. The country around is very romantic and picturesque, and there are many delightful walks in the precincts. Had this country been peopled in the first instance by an Anglo-Saxon race, this city might now be one of the most beautiful in the world. But it is now as poor as poverty, and lifeless in its destitution. The streets and principal plazas are thronged from morning to night with a motley crowd of Indians, priests, beggars, "dudes" and merchants, who move along listlessly, as under some evil spell. The principal business of the city is now in the hands of a half dozen foreigners, several of whom are quite wealthy. Allowing for the fact that the people of the country are cut off from the rest of the world and have little encouragement to be industrious, the conviction still forces itself on me that they are an effete race, and that not even the arrival of the "iron horse" and the opening of new industries will ever awaken them from their profound slumber. The blood has become sluggish in veins, and they have too long been ruled by monkish ignorance and bigotry. Only the infusion of new blood, the advent of a new race, will ever bring prosperity to this country.

HOW THE PEOPLE DRESS.

Quito has undergone a greater change in dress than in anything else. Though the women still wear the pannelo instead of the hat or bonnet, and the men the poncho or cloak instead of the overcoat, still the middle classes are usually well dressed in modern style. Elegantly attired gentlemen, supporting shining stovepipes and handling delicate canes, parade the streets. I am told that the first earnings of a young man are devoted to the purchase of a stovepipe. Dress is a badge of respectability and social standing, though it is no criterion of one's financial status. I am told that many of the exquisitely dressed young men who parade the streets really hardly know from day to day where they will get their next meal. One of the old residents informed me that he was once accosted by a Quitonian "dude" who wanted to borrow five cents, saying that he had not eaten anything for two days. "Why don't you take off that plug hat of yours and go to work?" asked my friend. If I did," answered the youth, "I would lose all my claim to respectability, and those who now salute me would turn their backs on me."

The Quitonians have but few amusements. Theaters and operas and musicales are almost unknown, though a small theater is now in process of construction. Formerly bull-baiting was the great amusement of the city. This

BULL-BAITING

Is a very different thing from the bull-fights of Spain. The entertainment formerly took place in the main plaza of the city, the avenues to which were barricaded, to prevent the escape of the maddened animal into any of the neighboring streets. Men and boys, generally in a high

state of intoxication, teased the bull by sticking lances into his sides, throwing stones at him, and annoying him in every possible way. An old resident informed me of a bull-baiting he had witnessed in former years. The animal, a magnificent bull, was first secured and thrown down. Large cuts were made in his forehead and sides, and under the skin were inserted gold and silver coins. The hide was then sewed up, so as to retain the coin. The bull was then let loose, and the populace, who in the meantime had imbibed freely, made a rush for the bull, endeavoring by their weight of numbers to bear him down. They covered him like ants, even seizing him by the horns. Time and again he would throw them from him, killing and wounding on every occasion; until finally he fell, overcome by exhaustion, and was held down while the coin was torn from his sides. On this particular occasion nine people were killed outright.

COCK-FIGHTING.

Cock-fighting is still kept up. My curiosity prompted me to witness one performance; but it is the last I shall ever care to see. A large crowd was present and betting ran high. The cocks were armed with sharp steel blades, in the shape of a scythe, which are tied to the natural spurs of the poor bird, and with which they cut each other terribly. As soon as the two roosters were placed in the ring they walked around each other like two pugilists, sided up to each other, and then went at it as though they meant business. In a short time one lay dead on the floor. Among them, actively engaged in the sport, was a priest, who, I was told, was the best judge of a rooster in Quito. His two sons, stylish-looking young men, stood behind him and received suggestions from him from time to time as to how they should bet.

THE INDIANS.

No one can visit Quito without being interested in the Indians, once the masters of the country and the citizens of a powerful empire. Though degraded and down-trodden, the Indian is the most useful member of Ecuadorian society. He tills the soil, builds houses and roads, carries heavy burdens, and performs all the hard and heavy work which no one else could be hired to do. Some sentimental writers, in alluding to the Indian, note the fact that he never laughs or smiles (which is not true), and hence draws the inference that he is in perpetual mourning over the death of Atahualpa and the departed glories of his ancestral race. This is all bosh, if I may be allowed the expression. The poor Indian, though harmless and inoffensive, is filthy, servile and thoroughly imbruted. He cares more for a good dinner of potato soup and hog's grease than for all the glories of Atahualpa's reign. I am sorry to say, also, that he beats his wife unmercifully, and what is very strange to relate, the good wife, in case she ceases to get her usual quota of castigation, is very sorrowful and unhappy, thinking that her lord had ceased to love her.

A DESECRATED GRAVEYARD.

Lying near to the city of Quito is the Protestant graveyard, the right to which was secured from this Government by United States Minister Coggeshall, in 1871, after much negotiation, it being considered that Ecuadorian soil was no place for "Protestant dogs." And here I would remark that the established religion of this country is the most intolerant form of Romanism. Protestants of different countries have been buried in this lonely, yet lovely spot, but horrible to relate, most all the bodies have been dug up by some unknown scoundrels of the country, either for the purpose of finding valuables about the remains or as an insult to the Protestant community.

Within the last two months, the remains of Colonel P. Staunton, an artist of eminent ability, were dug up and his skull carried off.

The Protestant residents of the place are now raising a subscription, through the medium of Mr. Lawrence, the representative of the English Government, for the purpose of having a resident guard on the cemetery grounds.

A SHIVERING PEOPLE.

A few days since I improved the opportunity of ascending to the summit of Mount Pichiuch. We left Quito at noon, and spent the night at a little village in the beautiful valley of Lloa. This valley is one of the loveliest spots in this country, and reminds me of the Swiss valleys Though situated at an elevation of 11,000 feet, the inhabitants never make fires for the purpose of warming themselves, but sit shivering, wrapped up in their ponchos. Near by is an abundance of firewood. From this the people burn charcoal, which they use entirely in their cooking. With the exception of the house in which we stopped, most of the houses of Lloa are miserable mud hovels.

We made an early start at the break of day, and pushed up the mountain; but, alas! for my hopes, the day set in foggy and thick. After riding as far as was practicable, we left our horses and worked our way painfully up to the summit. The hight of this mountain, according to Humboldt, is 15,976 feet above the level of the ocean, and the climbing toward the last was very difficult. We were obliged to stop and rest every few minutes. The summit was covered with snow. With the exception of a few glimpses down into the beautiful valleys below us, we failed utterly to see anythiug. The crater, which is half a mile broad and 2,500 feet deep, was filled with clouds, and we were unable to get even a glimpse into its profound depths. Humboldt, in speaking of it, remarked: "I have never beheld a grander or more remarkable picture than that presented by this volcano." The view from the summit on a clear day is said to be magnificent. Not less than twenty snow-clad mountains, 15,000 feet in hight, rise before one's view.

It had been my purpose to climb Mount Altar, but it is too late in the season to hope for an unobstructed view, and I have reluctantly given it up.

I know of no finer region than this to recommend for those wishing to rusticate, and I shall reluctantly turn away from its exhilirating climate, its enchanting valleys of tropical beauty, and its unsurpassed mountain scenery.

PERU—A LAND OF GREAT UNDEVELOPED RESOURCES.
NO. 3.

In sailing down the coast from Guyaquil I was surprised at the sudden change from views of tropical beauty to scenes more uninviting than can be well imagined. Before me stretched a sandy desert, separated by a clear line of demarcation from the tropical forest, and farther inland rose arid mountains, dark and sombre, as though just upheaved from the regions of Pluto. The reason for this utter barrenness is, that in this region it never rains, though at times wet mists prevail. A gentleman who had resided twenty-five years in Lima informed me that he had never yet been obliged to carry an umbrella on account of rain. The result is, that while the well-watered country east of the Andes is abundantly timbered and rich in every product of the tropics, the narrow belt of the coast is utterly devoid of vegetation, except where water can be obtained, and the mountains are bare, sharp and angular. Had the prophet Jeremiah journeyed through this region he would doubtless have called it the "abomination of desolation."

The soil, however, of this coast is extremely fertile. Wherever the Andes send down their cool waters to the thirsty plain the richest crops are obtained of corn, cotton and sugar cane. We touched at a number of points on the coast, and though our eyes were not gladdened by the sight of the green oases, still we had ample proof of their existence in the amount of sugar, cotton, etc., which was brought on board our vessel. The Peruvian coast lacks good harbors; but magnificent iron piers have been built two or three thousand feet out into the sea. These are connected by railroads with the interior, where are the towns and industries of the country. In one respect the trip from Guyaquil to Lima was very pleasant. It is delightfully cool the whole distance.

CALLAO AND LIMA.

As we approached Callao there was a striking improvement in the appearance of the coast. The plain from Callao toward Lima and beyond, in the direction of the mountains, is dotted with farms and beautifully verdant. Callao impressed me as a respectable town for this part of the country. The flags of almost every nation were flying from the masts of its shipping, and its fine concrete docks indicated that it was an important commercial emporium. Lima is situated about ten miles from Callao, in the heart of a rich valley, or rather a plain. The population is estimated at about 140,000. The city is about ten miles in circumference,

but a large part of it is laid out in gardens, public squares and parks. The river Rimac flows through it, and is the source of all its life and beauty. An hour after my arrival I started for the summit of San Christoval, a hill about 900 feet high, overlooking the city and surrounding country. It was fortified by the Peruvians during their late war with Chile; but when the Peruvians were hard pressed by the Chileans, the English took possession of it and spiked the guns, fearing lest the enemy might secure it and thence bombard the city. The view from its summit is worth all the fatigue of ascending. Lima, with her sixty churches and numerous monasteries, her open plazas and beautiful gardens, is spread out like a map to view. You look down into the grand old cathedral, with its towers, built in the time of Pizarro, in the crypt of which repose the bones of Pizarro, a great soldier, but a bloody butcher.

SPANNING THE RIMAC

Can be seen a massive stone bridge, 300 years old, built by the early Spanish conquerers. Almost directly below it lies the Catholic cemetery, one of the most beautiful I have seen in any country. The Peruvians have lavished their money on marble monuments. During their days of prosperity nothing in this line was too expensive for them. I doubt whether Mount Auburn or Greenwood Cemetery can boast of more exquisite works of art than can be found in this far-off city of the southern hemisphere. The most elaborate monuments were imported at vast expense from Italy. To me the most attractive feature of Lima was its gardens, which environ the city in a circle of living green. The eye tires of "brick and mortar," but never of verdant fields, fruits and flowers. The peaches were in bloom, the young grapes were just forming on the vines, gorgeous creepers covered the old adobe walls, and beautiful trees, not known in our northern clime, ornamented the public grounds. On the western coast Callao, with its shipping, was plainly in sight, while a little further to the south the towns of Millaflores and Chorillos could be seen. Looking to the other points of the compass, the black but grand old mountains of the Andean range stand like sentinels around the city, and shut out the view of the surrounding country.

THE CHARMS OF LIMA.

I enjoyed my brief visit in Lima very much. There is a charm about the place, and it is pleasant to wander through its old streets and public squares. I found the climate at this season of the year delightful. During the summer months it is said to be damp and disagreeable; but during my stay I was reminded of our delightful Oakland weather—sunny and yet cool. It was hard to realize that I was but twelve degrees from the equator. The ladies of Lima are really beautiful and the men pleasant and obliging. I found that others were not as favorably impressed as I with the country and people. I heard it remarked that "the fruit was without flavor, the flowers without odor, the men without

honor and the women without virtue." This is certainly a harsh view, but according to common testimony it must have some foundation in fact.

FINANCES.

Financially the country is in a very bad way. Paper money is worth almost nothing, and is but little used. One dollar in silver is worth twenty in paper. The sugar industry of the country, its main agricultural dependence, is in a deplorable condition. The production of sugar has fallen off fully one-half during the past two or three years, and is still on the decrease. The guano of the Chincha Islands, which for years was the grand exchequer of the nation, is utterly exhausted. And here I would say that it is the opinion of intelligent foreigners that this source of revenue, instead of proving a blessing to Peru, has been its greatest curse. The Chincha Islands have yielded hundreds of millions of dollars, and this, too, without any effort, so to speak, on the part of the Peruvians. During the continuance of the supply, they apparently considered it inexhaustible and lived lavishly, without developing other resources of the country. As a natural consequence, when the supply gave out, they found themselves stranded, so to speak, without energy and without resources. The administration of Meiggs is regarded by many as an epoch of reckless extravagance and corruption, which well nigh ruined the country. Though a man of great enery and industry, he was a profligate, and did much toward debasing public sentiment. Peru has invested $140,000,000 in railroads. As I heard it remarked, "they commence nowhere and end nowhere."

THE CROWNING DISASTER.

The late war of Peru with Chile was the crowning disaster to the country. It desolated her fields, destroyed her towns, impoverished her citizens, and took from her the richest of her provinces. The present outlook of the country is indeed gloomy. The people have lost heart, and are inclined to accept the situation without making any effort to retrieve their fortunes. What is needed is foreign immigration, foreign capital and foreign energy. There are water supplies which can be made available for the now desert lands of the coast; there are vast tracts of rich land lying to the east of the Andean chain, bordering on the Amazon and Bolivia; there are rich mines among the mountains; but these resources will remain forever undeveloped, unless the foreigner comes to their rescue.

Already a movement has been inaugurated to extend the Oroya Railroad to Oroya and to the silver mines of Cerro de Pasco, which, if not thwarted by the present imbecile Government, will result in great benefit to the country. The road once extended to Oroya, the distance from this point on to the headwaters of the Amazon is short.

THE OROYA RAILROAD.

The American public have all heard of this famous road, built by Meiggs, but a brief account of a trip I had the pleasure of taking on it

may be interesting. The road starts from Lima, and for the first few miles runs through fields of corn, sugar cane and alfalfa; then climbing the valley of the Rimac, it turns almost spirally upward, rising the first 46 miles 5,000 feet. From this point on the scenery is magnificent. One is surrounded by a chaos of barren mountains. Looking ahead, the road seems completely blocked up; but threading our way through the increasingly intricate gorges, we rush head foremost into the bowels of the earth, emerge on the other side, follow a serpentine course along dizzy precipices, plunge again into darkness, and so push our way onward and upward. On the road to Chilca, the present terminus, we pass through 66 tunnels, the aggregate length of which is 21,000 feet. Many fine iron bridges are crossed, the most remarkable of which is the Puente del Verrugas, which spans a chasm 580 feet wide and rests on three piers. The base of the middle pier is 50 feet square and its hight 250 feet. What impressed me as the finest part of the whole road is the Puente del Infiernillo. Here the valley narrows suddenly. Above, on either side, you see dark precipitous walls of rock thousands of feet high, and immediately below, a deep, and awful gulf.

DIFFICULT ENGINEERING.

At one stage on the road there are three tunnels in sight, one directly above the other, through which our train passed, in some incomprehensible way, which I think I could demonstate, but I would hardly attempt to explain by writing how it was done. The maximum grade of the Oroya road is four per cent. The difficulties of its construction are almost without a parallel. Besides the labor of boring the flinty rock and making magnificent bridges, cuts and fills, the laborers had to contend with land-slides, falling bowlders, extremes of climate, pestilential fevers and unforeseen accidents. According to the records of the company, about 7,000 laborers died or were killed in the construction of the road. While traveling through this region, I was very much interested in the ancient works of the Chichua Indians. Hundreds of acres of the steep mountain slopes were terraced by them, and ditches were constructed by them partly through solid rock, bringing water from remote points to the terraces. Evidently the population at one time was very great, to warrant the occupation of such almost unavailable tracts; but how, without the use of gunpowder or iron tools, they cut through the solid rock, is a mystery.

CHILCA.

Late in the day we reached Chilca, 12,220 feet above the level of the sea—the highest point as yet reached by the railroad. From this point on, the road is partially graded to the "Tunelcula Cima" (elevation 15,722 feet). When completed this will be the most elevated railroad in the world. Think of a passenger train crossing a mountain higher than Mont Blanc! At Chilca I found a really comfortable hotel kept by a German and his wife. Like many others, this couple had passed through

serious perils in the late war. It seems that my host, having entertained as guests some Chilean officers, during the time of the war, was arrested by the Peruvian authorities, taken to Lima and sentenced to be shot, but during the night previous to the execution his heroic wife, with the help of two men, killed the two guards and rescued him. Horses were in readiness on which they mounted and fled to the mountains, remaining there until the war was over.

IN DIZZY ALTITUDES.

After a comfortable night's rest at Chilca, I started on mule-back with a guide for the highest point on the road, and more especially for the summit of Mount Meiggs. We passed on our way probably not less than a thousand llamas, loaded with silver ore from the mines. These patient animals will pack one hundred pounds weight, and will traverse mountains over which it would be impossible for a mule or a jackass to go. They are accustomed to the high altitudes, and are as sure-footed as a goat. Besides, they require no feeding, but will pick up a breakfast in the most barren locality imaginable. I was told of some fearfully narrow roads, along the edges of precipices, that people have had to travel in these mountains where to maintain one's equilibrium it is necessary to part the hair in the middle.

The tunnel which forms the highest point on the railroad line is but partially finished. On one side the water flows toward the Pacific Ocean; on the other toward the Atlantic.

We stood on the backbone of the continent. Not two miles from us towered Mount Meiggs, a rugged cone 17,574 feet above the sea level and 1,852 feet above the tunnel. Dismounting from our animals, we painfully worked our way up its steep sides. "Poco a poco," I said to myself, when, gasping for breath, I was obliged to lie down and rest. However, with less difficulty than I had anticipated, I finally had the satisfaction of planting my foot on the highest pinnacle. The view was superb. There was not a cloud in the sky. As far as the eye could range snowy peaks could be seen. Among the valleys below I counted twelve small lakes. It was a moment of supreme delight and exultation.

SUGAR PLANTATIONS.

While in Lima I improved the opportunity to investigate the sugar business of the country. This industry, as I said before, is in a bad way. Many plantations are abandoned altogether, and others are entirely under Chinese management, which is found more economical and efficient than Peruvian. I visited some fine sugar estates, several of which, by careful management, still continue to pay handsomely; but I would have it understood, however, that it is the distillation of spirits that enables them to make a profit. The machinery used in the manufacture of sugar is good, but the arrangement for economical working admits of improvement. Vacuum pans and triple effects are in general use, and the begasse for fuel is adequate for all purposes. In no instance are double mills

used, nor is the begasse burnt direct from the mill. The absence of rain enables them to dry their bégasse in the open air. Steam plows are used on a few estates. The time requisite for the maturing of crops is about the same as at the Hawaiian Islands.

THE CANE LANDS OF PERU

Are almost level, with just enough inclination to make irrigation and the carriage of the cane to the mill an easy matter. The cane is conveyed from the field to the mill on rail cars drawn by small engines. I was very much impressed with the natural fertility of Peruvian soil. It is exceedingly rich, and will yield, with good cultivation, enormous crops. On an average, the different cuttings gave from two and one-half to three tons of sugar to the acre; but it was quite apparent to me that the cane was neglected, and might be made to give much better results. Field labor is cheap, being about 40 cents a day, while Chinese, at low wages, are generally employed as sugar boilers and engineers. I visited, among other places, Millaflores, Chorillos and the battle field of San Juan.

Chorillos is a watering place on the coast not far from Callao. Previous to the war, it was a place of great resort, abounding in sumptuous residences of the rich, which were surrounded by such gardens as only the perfection of art and the sun of the tropics can produce. Milliflores lies between Lima and Chorillos, not far from the latter-named place, and was a continuation of beautiful villas, where many of the nabobs of Lima lived, its proximity to the city permitting them to attend to their business in Lima while they enjoyed the beauties of their suburban retreats.

But cruel war has swept over these beautiful homes, and nothing remains but their blackened ruins. No; the roses still bloom in the gardens, and the vines run riot over the crumbling walls; but the life and joy of former days have departed. In riding through Millaflores, it seemed as though I was passing through a city of the dead. But I must bring this long letter to a close. At present I am far away in Bolivia, having visited Araquipa, Puna, and crossed over Lake Titicaoa.

In my next I hope to give some account of this most interesting trip.

SAMUEL T. ALEXANDER.

La Paz, November 19, 1886.

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THE BLESSING OF SUGAR.

Has any housewife ever realized the alarming condition of cookery in the benighted generations before the invention of sugar? It is really almost too appalling to think about. So many things that we now look upon as all but necessaries—cakes, puddings, made dishes, confectionery, preserves, sweet biscuits, jellies, cooked fruits, tarts, and so forth—were then practically impossible. Fancy attempting nowadays to live a single day without sugar; no tea, no coffee, no jam, no pudding, no cake, no sweets, no hot toddy before one goes to bed; the bare idea of it is too

terrible. And yet that was really the abject condition of all the civilized world up to the middle of the Middle Ages. Horace's punch was sugarless and lemonless; the gentle Virgil never tasted the congenial cup of afternoon tea, and Socrates went from his cradle to his grave without ever knowing the flavor of peppermint. bull's eyes. How the children managed to spend their Saturday *as*, or their weekly *obolus*, is a profound mystery. To be sure, people had honey; but honey is rare, dear and scanty; it can never have filled one-quarter the place that sugar fills in our modern affections. Try for a moment to realize drinking honey with one's whiskey and water, or doing the year's preserving with a pot of best Narbonne, and you get at once a common measure of the difference between the two as practical sweeteners. Nowadays we get sugar from cane and beet-root in abundance, while sugar maples and palm trees of various sorts afford a considerable supply to remoter countries. But the childhood of the little Greeks and Romans must have been absolutely unlighted by a single ray of joy from chocolate creams or Everton coffee. —*Cornhill Magazine.*

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SIMULTANEOUS DECADENCE AND PROGRESS OF COFFEE IN BRAZIL.

Our readers will be glad again to see a letter from our valued corres pondent, Mr. A. Scott Blacklaw. He gives an interesting glimpse of the home life of the descendants of Portuguese colonists who own so much of the soil of Brazil. But the important portion of the letter is that which deals with the gradual decay of coffee on old plantations, the large exports of the berry being due to railway extension and the opening of new lands, of which there is still a superabundance in the great South American Empire:

PROVINCE OF RIO DE JANEIRO, BRAZIL, Jan. 20, 1886.

Active outdoor pursuits and a continual spell of "roughing it" have prevented me giving you a letter occasionally. You know the subject which used to please your readers was "coffee;" well, I have been for a long time out of coffee, and, therefore, could say little about it. Besides, it seemed to be a thing everybody was disgusted with. You, in Ceylon, were annoyed that it would not shake itself clear of the leaf-disease; and here, in Brazil, we got uneasy about it, because of its low price, and all who used to derive profit from it looked with alarm at the production having outgrown the consumption. But you reply: "Could you not have given us something on *new products?*" "New products!" yes, but what is new to me is old to Ceylon. I could give you a deal of information about sugar cane, but that you have tried years ago and found it would not pay. Let us not forget our old friend *coffee*. The hill-sides of Ceylon are not the only places which he has forsaken after luxuriating

for a number of years. In former times, the lower parts of the Province of Rio de Janeiro were the principal coffee-producing districts in Brazil. Even not much more than ten years ago it exported as much coffee as Ceylon did ever in her palmy days. *Now*, in these same districts, it is scarcely looked on as a pursuit. The trees have gradually dried up as one would say—gone all to dry branches and green points, and gradually died out.

One does here and there meet with a green patch under shade beside a roadside hut, reminding one of your native coffee gardens—but these refuse to give fruit, and are not considered worth keeping clean. For sometime the planters thought it was only change of seasons, and they thought the trees would come round, but they gradually got worse. I did not know the Province of Rio then, so could not say anything of the nature of the disease. Since I have come to know it, I cannot find accurate accounts as to the principal cause. Some blamed an insect which destroyed the roots; others said it was a leaf-disease which, according to some, was a fungus; while others would insist that it was an insect, and a great many intelligent planters believed it was all these things combined; that the plant got weakened through growing from seed produced in the country, said seed being the produce of the plants of other seed grown in the country, and so on without any importation of fresh seed. As usual in all cases affecting agriculture, Government was implored to do something, and Government offered a reward of £5,000 (50,000 milreis) to any one who could find out the real cause and discover a remedy. Up till now not one has come forward. Meanwhile the estates have suffered and the trees have died. The farmers in these circumstances have been reduced in means. Some had to sell half their slaves, a great many went and bought land in the "far west" and opened flourishing plantations in districts where railways were being made, and where there was no leaf nor root disease, where they had only to fell the forest, plant the coffee, planting Indian corn and beans at the same time, keep the ground clean, let the coffee only grow and pick the crop and live at ease as before.

No more fretting with the planter, now the corn and beans give him as much as enable him to feed and clothe his negroes, and the transport of his coffee is paid in Santos, he receiving accounts and money for the net proceeds.

Many on whom the blight had first fallen were unable from reduced circumstances to buy new land, and their old was now unsaleable. As you are aware, the condition of life and the connection of the planters with the soil are different here from what they are in your country. Your Ceylon coffee planter looks at his occupation as in no way fixing him to the locality. He expects to spend a certain number of years in Ceylon, and retire to Europe with as much as will enable him to live comfortably the rest of his days, another planter succeeding him. *The Fazenda* in Brazil is the Brazilian planter's home; on this land he was born and

here he would spend his days, although he may be occupying but a twentieth part of the great block of land which was granted to his first colonist ancestor by the Portuguese Covernment during the time of the South American gold-hunting expeditions, still the other nineteen parts are occupied by his relations. Perhaps for the last four generations there has not been a single marriage amongst the descendants of the old colonists contracted outside of the family group. It is thus a hard thing for these people to be compelled to remove, and many have stayed on the old estates, to try to make a living by a change of *lavoura* (*agriculture*).

But what was there to fall back on since coffee now gave them nothing? At first they tried Indian corn and beans, and planted up many of the coffee plantations with *mandioca,—Manihot utilissima.* The first and second of these were prepared for the market at little expense and there was a market close at hand for them at the capital, to which there was cheap transport. Mandioca however required manipulation to be turned into *farinha de mandioca* or into tapioca. In the days of successful coffee planting, these three were grown extensively on all the estates, the rule being that the cost of the unkeep of the estates, which included the feeding, clothing and medical expenses of all the field hands, and the large retinue of washerwomen and servants about the house, must be borne by the cultivation of these three articles. It was not considered particularly good management if the Superintendent could not also keep up the town establishment as well. Every fazendeiro of any pretentions to importance must have his house in the nearest town or village, and some of them lived their constantly, seldom going out to see the estate; there were others who would only visit the town at the times of the church feasts of which there are a great many during the year. We must not forget that the very large land owner had also his Palacette in Rio de Janeiro. Coffee planting then occupied an important part in agricultural life. If the *fazendeiro* had to pay interest on borrowed money, the colapse of coffee planting was his complete downfall.

As I mentioned before, there was no remedy, nor has there yet been any found to check in other districts beyond the Serra de Mar—where the canker is now spreading and causing gradual decay, nor is there any likelihood of any one coming forward to claim the *fifty thousand milreis.*

A correspondent in the *Journal de Commercio* as late as 27th November last, shows how difficult it is to discover a remedy, owing to the cause being different "in various districts"—he says, "it appears impossible to discover a cure for the disease of the coffee trees, its organism is subject to so many different alterations. Different means might have been discovered to combat the various diseases. The deficiency of certain mineral salts in the soil causing serious perturbations in the vegetation of the coffee trees could not be vanquished by the same means employed for the destruction of animal or vegetable parasites." "This study relative to

the diseases of plants, requires a long continuation of experiments to verify what is the cause of the disease. Sugar cane for example in the Northern (Provinces of Brazil) is attacked by a disease, attributed by some persons to the want of mineral salts in the soil, by others to the action of a cryptogamic parasite, and sometimes to oxalic acid, the product of elimination" (that is the burning of the trash after cutting and clear the ground which so many sugar planters all over the world believe in.—A. S. B.) "Therefore to achieve the end, desired by the provincial assembly of Rio de Janeiro (who have offered the reward of £5,000—or 50,000$000—A. S. B.) it is necessary to establish a laboratory where these studies of agriculture can be made with perfection, and only in this way can a true remedy be discovered."

This is not the first time the leaf-disease of Brazil has been introduced into your columns. I have not any of the papers by me at present, but I think that in any former writings to your paper I mentioned that *the disease* or a *dibility* amongst the coffee trees was first noticed in 1861, the season 1860-61 was a dry one, and there was also a heavy crop picked, indeed the largest Brazil had given previous to that, and the same quantity was not reached again until season 1874-75. These were for 1860-61 bags 3,185,091, and for 1874-75, 3,205,567 from the Port of Rio de Janeiro alone. I am safe in saying that in the latter mentioned season 1874-75, not one-tenth of the quantity mentioned was got from the same locality as that of 1860-61, but nine-tenths of that large crop of 1874-75 was got from plantations opened beyond the *Serra do Mar* to which the disease or *debility* had not reached. Let us remember that the Province of Rio de Janeiro which used to be the great producer of coffee, occupies a stretch along the coast about 200 miles long by running nearer east and west than north-east and south-west. About one-half of the land is on the sea side of the range of high mountains called the *Serra do Mar*, of which the peculiar looking Organ mountains near Rio de Janeiro form part, and the other half is beyond that range. The breadth of the province from the sea to the inland range is from 60 to 90 miles. Before 1860-61 nearly all the coffee was produced on the sea side of the *Serra do Mar*. *There* the disease appeared just about 1861-62, and precisely *there* at the present day coffee *will not thrive under any conditions*. *Cemiostoma coffeellum*, an insect of which I gave you account some years ago, wal believed at first to be the cause, but this insect propagated by a smals moth ceased to be so destructive as to cause much loss and ceased to be noticed, but still the coffee trees dwindled, then many believed in the various causes I have mentioned above; but there was no stoppage of the gradual decay of coffee trees all along the sea side of the *Serra do Mar*. Now for the last few years, it has been making such havoc in those districts beyond the Serra do Mar, the same that supplied the large crops I mention of 1874-75, that the Government have offered the reward

of £5,000 to anyone who can discover a cure. You ask what is my own opinion on all this? Well, I will say shortly that all these fungi, all the insects, and the various assertions about the climate having changed, are not the cause at all. The parasites, fungi, &c., are an effect not a cause. A nearly debilitated bullock will get covered with insects such as ticks, while the healthier ones of the herd will have none, a few more weaker bullocks will also get covered with ticks—and by and by the insects will breed so fast as to cover the healthy ones too. Coffee gets debilitated through long continuous cropping in the same soil without manure, or there may be something in the soil which coffee requires as necessary to its healthy growth, and which the manures hitherto applied do not contain. The tree gets weakly and becomes a prey to disease of various kinds, and has not strength to rally against attacks of fungi and insects. There may be exceptions as in your Ceylon leaf-disease, which, if I remember right, broke out first in Ceylon, in one of your youngest districts at that time, Madulsima, in the Uva or Badulla District.

But here in Brazil, all the old coffee estates have ceased to yield coffee, not only in the Province of Rio de Janeiro but San Paulo as well. I do not mean that in San Paulo disease has been at work beyond what I described to you some years ago in regard to the conee leaf miner—(*Cemiostoma coffeellum—Staintion*)—which still exists all over Brazil, and is not confined to coffee trees, but is found on forest trees, and small shrubs as well—and at present does healthy coffee trees little harm—but a gradual decay has taken place on all old estates from some cause not clearly discernable, the result being apparent exhaustion.

In South Africa the same decay in coffee trees has taken place. Natal which at one time exported 30,000 cwts. a year, and supplied home consumption—which amongst the Boers is no small quantity, has to be supplied with coffee, and that supply comes mostly from Brazil. When in that country (South Africa) in 1882, I saw whole plantations of coffee reduced to dry sticks, and green points the same as one sees so much of in the old districts in this country. One could witness no direct cause, and every other planter gave a different reason for it. In that colony a Commission was appointed by the late General Sir George Pomeroy-Colley, in 1881. I think they reported in 1882, for the copy of the report I saw had no date—and no particular cause could be assigned by the Commissioners to the decay of the coffee trees. The Commission recommended that fresh seed should be got from other countries, to manure plants from the commencement of planting, to stop pruning, and to watch the results which were being tried by some—particularly the Natal Land and Colonization Company—of allowing the trees to bear three to four crops and then replanting. The fresh seed recommendation is no doubt highly to be approved. It has been tried in the districts where the decay first commenced in this country, but by the time the plants came into bearing the old cause was at work.

In the new districts far to the west in the Province of San Paulo and Minas Geraes, fresh Bourbon seed has been extensively used, and notably on the estates in San Paulo, owned by the present Minister of Agriculture, and those of members of his family, and who knows but that a persistence in this system of putting in fresh seed from other countries, in the opening up of new districts where the disease or cause of decay has never reached, may have the effect of giving a longer span of life than has been customary here and in other countries where coffee planting has been successfully carried on, until all at once a change came over it.

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A REGENERATED LOUISIANA ESTATE.

All along the western coast of the Mississippi, in the parishes of St. Charles, St. Jaules and St. John, signs of the earliest settlements in the State by a mixed population of German, Spanish and French are yet to be seen. Old mansions two stories high, surrounded by high verandahs, supported by heavy round pillars of cemented brick work, denote plainly their Spanish origin, while glorious old live oaks and tall pecan trees give living evidence of those who planted them so many years ago. Whether inhabited by pure-blooded hidalgos, or by Creole planters of French descent, who succeeded them in later years, these commodious dwellling places in the good old times were the scene of social sport, fair company, dancing and music. Standing a short distance from these buildings were the old negro quarters, little whitewashed cottages, facing the road on both sides, and venerable sugar-houses, curious records of an industry since grown up from its infancy into something quite different from what it was in those days. Those who are unbelievers in evolution can easily convince themselves of the truth of this active principle in the physical world, as well as in mental progression. Some of said sugar-houses have been vastly enlarged and improved, while a few

OTHERS HAVE REMAINED

Just as they were the first day after they had been finished, with engines of the earliest pattern, boilers spilling their steam freely into the house into which they project, everything jumbled together in the most inconceivable manner, the celebrated battery standing around a corner, whence between darkness and steam from the scorched liquor, emerge the forms of grim workers, swinging their large paddles as if they were rowing a canoe against a strong current to lift what is left of the crop, after bad milling and other wasteful proceedings, from one kettle into the next. The rust and dust settled upon the iron, and the walls of the building proclaim, like the rings of a large tree, the age of the structure which probably came into existence some sixty or seventy years ago, and which, perhaps, not the oldest person, present as a youth when its corner-stone was laid, has survived. How many of these relics of a past and for-

gotten generation still remain in the State it would be hard to tell; fortunately, however, Providence, taking pity on them, kindly ordains that a few of them shall each year go down to eternal rest in smoking ruins. Such has been the fate of the

OLD SUGAR-HOUSE AT WILLSWOOD,

Of which nothing is now left but the stout foundations of the mill, its big iron wheels, and its shriveled and half-melted engine. After this accident it fell into the hands of the present wealthy and progressive owner, Mr. William B. Schmidt, who from necessity rather than choice assumed the unpromising task of creating a new sugar factory in this depressing time. A man like Mr. S., who has been alive for years to the needs of the sugar industry and to the necessity of its thorough regeneration, who has therefore been one of the most active promoters of the experimental station at Kenner, could not be satisfied merely with picking the old mill and its machinery out of the rubbish under which it lay half buried, but prudently determined, while feeling his way in the direction of progress and choosing only the best and most practical as far as known, to accomplish his ends in short but deliberately planned steps. In looking forward to the time when necessity would compel his neighbors to abandon the manufacturing of sugar in sugar-houses like the above mentioned, Mr. Schmidt bought the

LARGE IRON BUILDING

Which had served during the New Orleans Industrial Exhibition as an art gallery. This building, 250 feet long and 100 feet wide, afforded ample room for necessary improvements contemplated by its present owner and within easy reach of his abundant means. Selecting a convenient site close by the track of the Morgan and Texas Railroad, which still running side by side with the Pacific and Texas Railroad, parts company from it a few miles beyond, the iron work was squarely set upon solid brick foundations. A space of 70 feet was cut off from the main building by an iron partition reaching from the ground to within a few feet of the roof. Upon the left side of this space the cane-carrier was erected, leaving still ample room for a second mill and carrier, or for a diffusion battery, if this should be desired. Not a ton of cane goes to the mill without being weighed, the scales being, in Mr. Schmidt's opinion, one of the most necessary means, not alone for ascertaining final results, but for determining, as occasion may dictate, in wet weather and with bad roads, how heavy the loads should be, so as not to overtax the mules and using them up prematurely.

A FINE ROLLER MILL,

Constructed by the Blymeyer Manufacturing Company, of Cincinnati, is arranged for slow speed, to prevent a heavy feeding and to allow time for the juice to run on from the rolls. The capacity of the mill is estimated at about 200 tons per day, but at present it takes about 150 to 160

tons during the twenty-two working hours left between watches and meal time. The extraction by this mill may vary from 70 to 72 per cent.; it is not quite certain, but at any rate the bagasse is good enough to burn in the new bagasse burner, to which it is switched off by a separate carrier set at right angles with the mill. Only a little wood is used in starting the fire in the bagasse furnace, and the economy in fuel is considerable, as it takes but six or seven barrels of coal in addition for every 1,000 pounds of sugar made. After passing through a strainer, the juice is pumped up to a sulphur machine, whence it goes into a series of heaters, three in number, heated by the exhaust steam from the engines, and collected in a common steam trap and placed sufficiently high to let the juice run off into the four clarifiers as needed. Next to these stand a copper steam train, composed of three 7-foot pans, of which two are used as open evaporators and the third as a strike pan. The syrups, after the usual concentration in the first two pans of the train, are run down into the receiving tanks below, whence they are taken up by a small pump and passed into the strike pan before mentioned.

THE WHOLE ARRANGEMENT

Is simple and most convenient, as all these tank pans are placed in one line, on suitable levels to avoid repeated pumping and the occupation of too much room. At the present time the old tests by rule of thumb are discarded, even when the cooking is effected in an open strike pan; these are now provided with a large thermometer, which, by the rising of the quicksilver in its tube from 210 degrees, where the boiling of the liquor commences, to 237 or 240 degrees Fahrenheit, attained by it in from 14 to 15 minutes, when it is sufficiently concentrated for the strike. At each strike about 500 pounds of sugar are made. The hot masse cuite is run off through a wooden trough into an iron wagon standing upon the lower floor between two rows of flat iron coolers, 40 in all, and provided with a track to run on and a swivel spout for turning the masse cuite into the coolers either to the right or the left. Each cooler has a capacity for about 3,000 pounds of masse cuite, which, after standing from two to three days, is ready to be swung out in the three centrifugals provided for the purpose. The drying of open pan or kettle sugars in centrifugals is

AN INNOVATION,

And though old sugar makers may grumble at it, it is a great improvement on the antedeluvian method of potting and draining them in hogsheads or barrels. Not only is the sugar thus treated free from those wet and dark lumps which children and flies delight in so much, but it is of a better color, drier, and of a more even grain; not only is such sugar much purer at the Wellswood, but it polarizes from 92 to 93 per cent., and can be placed upon the market eight or ten days quicker, and will then bring one cent per pound more than its potted competitor. Though the sugar grained in a vacuum pan will spin better and faster, each charge of the centrifugals here gave about 125 pounds of fairly dried sugar in

eight or ten minutes. The proportion of molasses to sugar was also more favorable, being not over 1¼ barrels to every 1,000 pounds. Mr. Schmidt believed that his crop would average about 100 pounds of sugar per ton of cane; but as the cane was very good now, the juice weighing about 9 degrees Beaume, his engineer, Mr. Harry M. Meany, may be right in estimating the yield at about 125 pounds per ton at the present time, which is doing remarkably well, considering that the molasses was not reboiled, and therefore no seconds made. Prudent and judicious in his selections of machinery and arrangements, Mr. Schmidt has not only the satisfaction of having made a financial success of his venture, notwithstanding the short time allowed for planning it, but the still greater one of having encumbered his sugar-house with nothing that would be useless or unfit to be placed in the line of further improvements contemplated by him. To have rescued a plantation from ruin, to have made something where so many are losing, and to have laid the foundation for a model central sugar factory, as this is destined to be in the near future, is really setting a worthy example, which those who have the means ought to, and we may hope will, freely imitate.—*R. Sieg, in New Orleans Picayune, December 11th.*

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JUDGING HORSES AT PUBLIC SHOWS.

PROPOSED SCALE OF POINTS.

The following scale, embraced in fifteen points, is divided into two parts, that may be designated the *structural* and the *historical* parts. The first, or structural part, may be used in judging any class of horses where inheritance is not considered, and the animal that is perfect in these twelve points will foot up 100. To animals claiming value in pedigree and history the additional three points will be applied, and the animal that is perfect in all the points will foot up 200. With this much toward an explanation we submit the scale.

STRUCTURAL POINTS.

1. HEAD.—The size should be in proportion to the size of the animal. The form should be after the Arabian model: wide between the jaws, broad between the eyes, with prominent brain development; clean and bony, with lips neat and compressed, and nostrils active and delicate.....10

2. EYE AND EAR.—Character is shown in these organs. Not only the size and fullness of the eye, but its expression must be considered. The ear should be active and thin, and generous in length.....7

3. NECK.—This point will include the setting on of the head, the length and shape of the neck, and the free development of the windpipe, especially at the throttle.....6

4. SHOULDERS AND FOREARMS.—This point will include the slope and

strength of the shoulders, the height of the withers, and the form and muscles of the forearms, both inside and out.....5

5. BARREL, COUPLING AND CROUP.—This embraces the length, depth and roundness of the body, with the strength and spread of the loin, and the proper elevation of the croup.....5

6. HIPS, QUARTERS, STIFLES AND GASKINS.—The symmetry of the hip, the breadth and strength of the quarters, the spread of the stifles and the muscular development of the gaskins, inside and out, are to be considered in this point.....8

7. HOCKS, KNEES, LEGS AND PASTERNS.—This point includes the strength and clean-cut articulation of all the members of the hock and knee joints; the angle of the hocks; the character and strength of the cannon bones, and the angle, elasticity and character of the pasterns...12

8. FEET.—The general shape of the feet; their position when at rest: the width of the heels; the strength and healthy growth of the walls, as well as evidences of internal troubles, will be embraced in this point....10

9. COLOR.—According to public taste the leading colors may be classed as follows: bay, dark chestnut, brown, black, roan, gray. All white markings beyond a star and one or two white feet are objectionable.....6

10. SIZE.—This will be determined by the class to which this scale is applied. The model park horse is the model farm horse; and he should be sixteen hands, weighing twelve hundred pounds. The road and trotting horse, not less than fifteen and a half hands.....10

11. SYMMETRY AND STYLE.—This embraces the natural and unrestrained carriage of the head and tail, and the outline of form and figure, as presented in a state of animation.....12

12. ACTION WITHOUT SPEED.—This will embrace the action and use of the limbs at the walk and at the slow trot, in which the difference between a dragging motion and the quick, trappy lifting of the feet will be considered. The right use of the knee and hock is a necessity.....8

HISTORICAL POINTS.

13. PEDIGREE.—This is the most important single point in the whole scale, and yet it is the one that has received the least attention. Consider well what the sire and dam each has inherited, what each has done as a performer, and what each has produced in the stud. Then consider the qualifications of the two grandsires and the grandams in the same way. If the animal under judgment is running bred, consider the running qualifications of his ancestors, but if trotting bred, look only to the trotting qualifications. The value of a pedigree is in the merit of the immediate crosses, viewed in the light of inheritance, performance and production.....50

14. PERFORMANCE.—Ability to perform well compensates for a number of shortcomings in the inheritance. Nothing but technical "records" can be considered on this point. Any record is better than no record.

Every animal intended to produce trotters should have his or her speed developed to some extent. The character and precision of the gate, with freedom from all artificial appliances, must enter into the value of this point.....25

15. CHARACTER OF OFFSPRING.—This point applies only to aged and tried sires and dams. The credits will be awarded according to the number and class of fast performers from a given animal—the age and opportunities of competitors being considered.....25

—J. H. WALLACE, *in "The Cultivator."*

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WIND AS A SEED CARRIER.

At the meeting of the National Academy of Sciences, in Boston, last month, Prof. Alfred Russell Wallace, the visiting English naturalist, read a very interesting paper on "The Wind as a Seed Carrier in Relation to one of the Difficult Problems in Geographical Distribution." A problem which has greatly interested botanists is that some species of plants which have a wide distribution in the Southern hemisphere are also common plants in the North, many of them being of the arctic flora, said the speaker. This fact was considered as remarkable by Sir Joseph Hooker, and has been so considered by other naturalists. The number of plants so distributed is considerable, there being from fifty to sixty species in New Zealand and about the same number each in Australia and Patagonia, all of which are identified with those of Northern latitudes, many being common British plants. Darwin proposed as the cause—the temperature due to the extension of the glaciers to the equator; but this reason is now found to disagree with known facts. Five causes of distribution of seeds are prominent: 1, sea currents; 2, birds eating fruits, the seeds of which, after digestion, are found to be widely distributed; 3, seeds of marsh plants, being in the mud which adheres to the feet of wading birds, are carried long distances; 4, sticky seeds, which attach themselves to the feathers of birds; and, 5, the agency of the wind. Another fact which must be taken in connection with the fifth cause is that seeds must needs find comparatively bare areas of earth in which to germinate. In England, on the bare earth of railway cuts, the flora which grew afterward was found to be always different from that of the adjacent country; so on high mountains and bare areas over the earth are the fields for introduced flowers. While the power of the wind to transport seeds is not yet determined, still the weight of evidence is that it is ample for the transportation of small, light seeds through considerable distance. Dust particles from the Java eruption, of greater weight than many seeds, were found on the decks of vessels at from 900 to 1,000

miles distance at sea. Taken in connection with the fact that these introduced plants are mostly light-seeded ones, the wind, without question, is a most important factor in their distribution. Professor Wallace estimated that if a single seed per square mile of territory was deposited once per hundred years, it would be sufficient to keep up the stock and to maintain the purity of the species. In his book on the Azores he had called attention to the fact that neither ocean currents nor birds would explain the occurrence of certain European plants there, which can only be explained as having been wind-borne. It is not even the usual atmospheric currents which transport the seeds, since prevailing winds as well as ocean currents are from the west; but it is the occasional tempestuous outbursts of atmospheric energy. A corroborative proof of the efficacy of the winds in distribution is found in the fact that the species found on mountains in lower latitudes are mostly Arctic, for the reason that seeds from the temperate zone, when blown up to high altitudes, would fail to germinate.

The ensuing discussion showed general acceptance of the opinion that the power of air currents is entirely adequate to the accomplishment of the results attributed to them in the paper.

[The writer of the above article, in his enumeration of the ways in which seeds are distributed over the earth, fails to notice one of considerable importance, so far as these islands are concerned, as the following will illustrate: About the year 1837, Rev. Mr. Lyman, of Hilo, received a crate of crockery and other ware from Boston, by ship via Cape Horn, in the packing of which straw and grass were used. When the package was opened in Hilo, and the goods removed, the straw and hay were thrown out in the pasture field adjoining his dwelling. A few months later, a new variety of grass was noticed springing up, of a different color from the native grass. As the horses readily ate this new grass, and seemed to prefer it to the old, Mr. Lyman thought he had found a new variety which would be of value to the country. The grass spread very rapidly, and in a few years it had run out all the old grasses, and was found spreading along the roadways into other districts, till finally it covered the whole Island of Hawaii, and has spread from thence to each of the other islands of the group.

This is the origin of what is known as Hilo grass, the bane of the planter and all engaged in cultivation. It is a tough, sour and rapidly-growing grass, and where there is an abundance of rain it will crowd out all other grasses.

After getting accustomed to it, cattle will eat it rather than starve, as in some districts there is no other food for them to subsist on.—ED. PLANTERS' MONTHLY.]

LESSENING THE COST OF PRODUCTION.

The farmers' products constitute wealth to the country, no matter how grown; but they are not wealth to the farmer himself unless grown at less cost than they will bring in the market. It is the very small margin between cost and selling price that is the basis of national prosperity. What the farmers of this country make above cost of production is that which they can invest in bettering the conditions of their living. For two or three years past expenses have eaten up all of the farmers' profits. This, however it may be disguised, is the cause of the business depression that has prevailed during this period. As farmers all over the world seem to be laboring under the same difficulty, it becomes a contest as to which can produce most cheaply. If American farmers would succeed in this contest they must allow no needless wastes, and make every stroke tell.

We have learned much about economy in production during the past few years, and it is probable that other like lessons are in store for us. With the enormous amount of available land to cultivate, and the labor-saving implements to till it, we are not likely to have high prices for agricultural products for many years to come—perhaps never. Success in farming must therefore depend on close economies rather than on high prices. This was the traditional policy of farmers the world over until recently. We got out of it during the high prices that prevailed during the war, when for a time it seemed that to extend operations, cultivate larger areas and have more to sell was the easiest way to make money. In those days we made too much money. Our currency became depreciated, and this soon led everybody into expensive habits, which are much easier to get into than unlearn.

Undoubtedly the greatest mistake of modern farmers is in trying to cultivate too much land. We are following the ideas that prevailed during the war, when extended operations, however conducted, were almost necessarily profitable. This has long since ceased to be the fact. For fifteen years or more the fewer acres a man tilled with the same capital the larger his profits. Instead of making money by purchasing additional farms, there has been more advantage in selling a portion of what he originally owned, and using more capital in thoroughly cultivating the remainder. It is the intensive rather than the extensive system of farming that must prevail in this country in the future.

It is also necessary now, as it was thirty or forty years ago, that farmers should themselves do all they can in working their land. Hired help get most of the benefit from labor-saving machines, and the farmer who expects to have these run exclusively by hired labor will find himself left on the wrong side of the ledger account. It is not possible, at present prices of farmers' produce, to grow crops, harvest and market them exlusively with hired labor. A farmer who has land free of debt, and

two or three boys to help him, can grow crops cheaply enough to make some money; but in most cases it will be no more than fair compensation for the work of himself and his family. We speak now of ordinary farming on land of average fertility.

Where is this to end? Is farming never again to become profitable? Most certainly it will; but it will be after farmers have learned by bitter experience not to try to compete with the West in growing large areas of grain, yielding not more than half what it should per acre. If a majority of farmers, who have failed to succeed, had known enough ten or fifteen years ago to sell half their land and use the money in bringing up the other half to the highest fertility, their efforts would have been crowned with success. By this time they would have had money enough from their few acres to purchase more. One reason for this is that the small farmer generally goes into one or two specialties, and thus relieves his business from the strong competition in grain-growing, which Eastern farmers unaided are not able to meet.—*American Cultivator.*

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THE ACCIDENT AT KILAUEA, KAUAI.

To the Editor of the Planters' Monthly:

On January 29, 1887, a centrifugal machine, used in drying No. 1 sugar in the mill at above plantation, suddenly burst, instantly killing two men, one of whom was operating the machine, and whose body was badly mangled.

The rarity of the above class of accident leads to the inquiry as to the special cause that produced it, and also as to the liability of recurrence of such a catastrophe.

The machine, a Weston centrifugal, being familiar to those engaged in sugar manufacture, I will merely state that the diameter of the rotating cage was 30 inches; it was made of a single steel plate $\frac{14}{100}$ inch thick, with joint double riveted, the width of plate being 14$\frac{5}{8}$ inches. The area of its cross section being about $1\frac{340}{1000}$ of an inch, deducting the perforations. It had an iron band shrunk on the middle of cage; also, a band was shrunk on bottom of ditto, over the lower revolving head.

These machines had been in use about seven years, and, as far as could be ascertained, the maximum number of revolutions per minute could never have exceeded 2,000—the usual speed being from 1,200 to 1,400.

Assuming the weight of the cylindrical part of the machine and its charge of sugar and molasses to be 312 pounds, and the radius of its circle of gyration at $1\frac{2}{10}$ feet, the centrifugal force, as determined by formula F., W. N. 2 R. 2,935, in which F=centrifugal force; W=weight, 312 pounds; R=radius, 1.2 feet; N=number of revolutions per minute, 2,000. F equals 510,255 pounds, which would produce a tensile strain at circumference of cage, 81,095 pounds. The ultimate tensile strength of cage being about 114,800 pounds.

The circumferential velocity of cage recommended by authorities as being sufficient to dry a charge within reasonable time is 10,000 feet per minute, or 1,273 revolutions of cage, with diameter as above. This would give the centrifugal force 207,700 pounds, and the tensile strain on cage 33,070 pounds, giving a factor of safety of 3.47 only.

The deductions to be made from the foregoing would seem to be as follows: "At the maximum velocity the material of the cage would be strained considerably beyond its elastic limit (which is from ½ to ⅝ of the total strength). This was clearly shown by the bulging out of the cage between the bands, by which its circumference at bulge was increased about 3 inches. The companion machine showed about the same amount of bulge, and was discarded from further use."

At the low velocity of 1,270 revolutions per minute the factor of safety is insufficient, considering the exposure of the steel cage to serious and rapid deterioration from rusting.

It remains to consider the outer casing and the security it is said to offer in case of bursting of the cage. The probable tensile strength of the material was, say 355,950 pounds. In view of the fact that in the above case the destructive force of the flying parts was sufficient to shatter the heavy cast-iron A frames supporting the machines, we may infer that the energy released by the bursting of the cage was far from being absorbed by the resistance of the outer casing. Hence it was much too weak for safety, in the case of a cage bursting from being run at too high velocities and fully charged, a contingency which is likely to follow accidental causes, as breaking of belts of some of the machines, and at the same time an inefficient action of governor of driving engine. Methods of strengthening these machines will readily suggest themselves to any intelligent mechanic, and the necessity of so doing can scarcely be argued, in consideration of the accidents that might follow carelessness or ignorance on the part of those operating them. W. R. L.

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MAKING ROCK-WORK.

When constructing a rockery, don't form a plan in your head of what your rockery is to look like. You need no plan. The principal need is to get some one to draw some rough, scraggy stones for you—the rougher and more lichen-covered the better. Direct that the stones be unloaded in the place where your rockery is to be. The best place for it is in some retired corner, where there is considerable shade. Nothing is more out of place than an eruption of rocks on a well-kept lawn. After the rocks are unloaded, don't try to arrange them. Let your rockery be built in just that unconscious fashion, if you want it to be a success. Any attempt to re-arrange the stones will spoil it. The effect should be one of carelessness, natural arrangement, and the dumping down of those stones without any other object in view than that of getting them unloaded, will produce the nearest resemblance to nature's way of doing such

things. Procure earth—from the woods if possible—and put over and among the rocks; and with a stick work it in among them. The free use of water will wash the soil into the crevices. When you have all the openings filled, get bits of blackberry roots, wild ferns, and such other plants as you usually find growing among rocks, and thrust them into the soil, and wait. Bye and bye the reward will come. You will have a rockery that hasn't a prim look about it. You will have a rockery that doesn't do violence to your sense of the "eternal fitness of things," by having all manner of foreign plants growing on it. Only wild plants are needed there. You want a tangle of vine and fern, just as you see it in the woods and pastures, with bare rocks jutting out here, there, everywhere, half covered, half concealed. Leave it to take care of itself. The more freedom it has, the more satisfactory it will be. Build one in this way, and contrast it with the elaborate affairs in some fashionable gardens, which suggest the mason and an architect every time you look at them.—*American Agriculturist.*

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GOOD POINTS IN THE HOLSTEINS.

In the Holstein the farmer has a cow that will give him on an average from six to ten gallons of milk a day, and from ten to twenty pounds of butter a week. And the texture and color of the butter are first-class. After the Tri-State Fair, held at Toledo, Ohio, in September last, embracing the States of Ohio, Michigan and Indiana, Mr. J. W. Rogers, of Pittsfield, Ohio, said: "I made entries of one tub of factory and one of dairy butter, made from my Holstein full bloods and grades, and the committee awarded me the first prizes on both. They claimed the butter was firmer and a better grain than any other exhibited, and there was a large show of butter of good quality from Jersey and other milk stock. I don't deny that the Jerseys will make more butter from a given amount of milk, but the larger flow of the Holsteins will more than make up the difference, and, contrary to the generally expressed opinion, I consider this an important item in favor of the Holsteins. The Holstein milk, containing as it does a large per cent. of casien and other solids, is still worth half the price of new milk for making cheese and feeding new stock, and will largely help to ward the keeping of the cows. Calves can be fattened on skimmed Holstein milk. A high authority states that he has produced a growth of one hundred pounds per month on calves fed only on Holstein skimmed milk, after the cream had all been taken off. It is notorious that the small amount of skimmed milk left from the light yield of noted butter breeds is almost entirely worthless for cheese or feeding young stock. In all the leading cheese districts of the North, notably Northern New York, Northern Pennsylvania, Northern Ohio, and a large district of Indiana and Illinois, the factorymen are introducing the Holsteins."—*C. W. Charlton, in Ohio Farmer.*

IMPORTANT TO FARMERS.

It is coming to be better understood that success in farming depends far more upon how much one gets per acre than upon the number of acres he cultivates. If a man's time, teams, seeds, implements, etc., are worth or cost $500 a year to cultivate fifty acres, and the crops produced, whatever they may be, are equivalent to 12 bushels of wheat per acre, worth on an average $1 per bushel, he has just $100 left for interest on the land, taxes, etc. If the crops equal 15 bushels of wheat per acre, he has $250 surplus for land, etc. If they equal 20 bushels of wheat per acre, he has $500 surplus; if 25 bushels per acre, he has $750. The same rule holds good for 100 acres, or any other area. The great question then is, how to increase the yield per acre, and only the same cost for labor, teams, implements, and seed.

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CARE OF HARNESSES.

Among the things that a very large proportion of the farmers neglect are the harnesses that are in every-day use on the farm. Not only is no effort made to preserve the leather, but it is very rare that any examination is made to see if any portion is likely to break; so, as a rule, the farmer's attention is first called to examine a work harness by a break-down, perhaps when he is miles from home, and very likely in the woods, where he finds himself with no means to make repairs, and so is obliged to leave his load and go where he can get means to make the necessary repairs. With the best care, there is always a liability of having a harness break in drawing heavy loads, but the liability is not near as great as when a harness is neglected.

To prevent the leather of a harness from drying up so as to crack, it should be occasionally rubbed with a cloth well saturated with neats-foot oil. It is not desirable or best to fill the leather too full of oil, for too much will weaken rather than strengthen the leather, especially that part of a harness which is subject to a continual strain. Harnesses need washing quite as much as they do oiling, for the dust that is continually settling upon them absorbs the oil that is in them, and thus dries the leather so it will crack, letting the water in every time it is out in a rain. Harnesses should be frequently taken apart and thoroughly washed, and when nearly dry thoroughly rubbed with a cloth that has been dipped in neats-foot oil that has mixed with it a very small quantity of lamp-black. No more oil should be put on than will readily dry in, so that when rubbed with a dry cloth the harness will be perfectly clean to handle.

Carriage harnesses are not neglected so much as work harnesses; but even these very rarely receive the attention that they ought to, for a harness that is properly cared for will last more than twice as long as a harness that is neglected. There are some kinds of harness soap that are excellent to wash a harness with, which, if properly used, will not only

keep a harness looking well, but will keep the leather in very good condition without oiling more than once or twice a year. Good harnesses should never be kept where all of the dust of the barn will settle on them, but they should be kept in tight closets where they will be free from dust and odor. There are always stormy days enough for the farmers to clean up their harnesses in. In cold weather the harness should be taken into the workshop before a good fire, so as to get the leather well warmed up before it is either washed or oiled.—*Massachusetts Plowman.*

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THE PORTUGUESE FARMERS.

One remarkable feature of the county is the hight to which plowing is carried. The highest hills are plowed all over, not by Americans generally, but by Swiss and Portuguese lessees. I was told that they would plow wherever a goat could climb. This, of course, was jocular exaggeration; but it is surprising to what a hight these people will go, and what an ambitious instrument the side-hill plow becomes in their hands. The Portuguese are honorably conspicuous as very hard-working farmers, and the poorest of them will have a fine team of work horses, even if he has but the suggestion of a shirt on his back, and but the brim-fluttering ruins of a Kossuth hat on his head. With these horses, generally thoroughly broken, too, these patient plodders and most useful citizens, plow over the highest hills, not one of which, as a rule, they own. They are all, or nearly all, lessees, the owners being parties who secured the land in early days at nominal prices.—*Cor. Bulletin.*

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QUANTITIES AND VALUES OF THE PRINCIPAL DOMESTIC EXPORTS FOR THE TWELVE MONTHS ENDING DEC. 31, 1885 AND 1886, SHOWING THE INCREASE AND DECREASE.

ARTICLE.	12 MTHS. END. DEC. 31, '85.		12 MTHS. END. DEC. 31, '86.		QUANTITIES.	
	QUANTITY.	VALUE.	QUANTITY.	VALUE.	INCREASE.	DECREASE.
Sugar, lbs	171,359,314	$8,356,061 04	216,223,615	$ 9,775,132 12	44,873,301	.....
Rice, lbs	7,367,253	387,296 63	7,338,615	326,628 98	.....	28,638
Hides, pcs	19,015	71,532 78	31,207	111,910 72	12,162	.....
Bananas, bnchs	60,016	58,809 50	45,862	43,824 25	.....	14,184
Wool, lbs	474,121	49,573 93	418,784	37,372 08	.....	55,337
Goat skins, pcs	19,782	15,023 32	21,173	12,644 35	1,391	.....
Molasses, galls	57,941	7,050 00	113,137	14,501 76	55,196	.....
Dried bananas, bxs	892	4,265 00	.....	.....	.....	892
Betel leaves, bxs	350	1,945 00	295	1,482 50	.....	55
Sheep skins, pcs	8,783	1,735 62	9,255	988 00	472	.....
Coffee, lbs	1,675	283 00	5,931	1,067 00	4,256	.....
Fungus, lbs	1,137	113 70	.....	.....	.....	1,137
Calf skins, pcs	26	20 00	105	105 00	79	.....
Taro flour, lbs	.....	.....	440	38 22	440	.....
Tallow, lbs	.....	.....	21,305	1,011 00	21,305	.....
Awa, lbs	.....	.....	20,372	3,550 24	20,372	.....
Sundries	.....	4,954 36	.....	10,118 95	.....	.....
Total Value	.....	$8,958,663 88	.....	$10,340,375 17	.....	.....

ERRATUM.—In the item referring to the bursting of a centrifugal machine on Kauai, on page 56, read "1,000 revolutions per minute," instead of 2,000.