THE

PLANTERS' MONTHLY.

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PLANTERS' LABOR AND SUPPLY COMPANY,

INCORPORATED MARCH, 1882.

OFFICE—HONOLULU, HAWAIIAN ISLANDS.

ANNUAL MEETING IN OCTOBER OF EACH YEAR.

OFFICERS ELECTED OCTOBER 20, 1886.

H. P. BALDWIN.....President | H. F. GLADE.....Secretary
H. F. GLADE.....Vice President | J. B. ATHERTON.....Auditor
P. C. JONES.....Treasurer

TRUSTEES ELECTED OCTOBER 19, 1886.

H. P. BALDWIN, H. F. GLADE, J. LIDGATE, GEO. C. WILLIAMS,
R. HALSTEAD, P. C. JONES, GEO. N. WILCOX, JAMES B. CASTLE,
Z. S. SPALDING.

COMMITTEES OF THE PLANTERS' LABOR AND SUPPLY CO.,

APPOINTED OCTOBER 20, 1886.

LABOR.—Z. S. Spalding, W. F. Allen, J. K. Smith, R. R. Hind, S. L. Austin.

CULTIVATION.—G. C. Williams, C Koelling, W. S. Rickard, G. N. Wilcox.

MACHINERY.—J. M. Lidgate, R. Halstead, T H. Davies, E. Lycan, J. Ross.

LEGISLATION.—S. B. Dole, J. B. Atherton, T. R. Walker, W. R. Castle, D. H. Hitchcock.

RECIPROCITY.—F. A. Schaefer, W. W. Hall, C. R. Bishop, R. Halstead.

TRANSPORTATION.—J. M. Horner, W. Y. Horner, J. N. Wright, Chas. Notley, G. H. Dole.

MANUFACTURE OF SUGAR.—E. M. Walsh, Jos. Marsden, C. C. Kennedy, A. Haneberg, A Dreier.

LIVE STOCK.—B. F. Dillingham, W. H. Bailey, G. N. Wilcox, A. Dreier, A. H. Smith.

FORESTRY.—T. R. Walker, E. Lycan, E. G. Hitchcock, C. R. Bishop, W. H. Purvis.

FERTILIZERS AND SEED CANE.—R. A. Macfie, A. H. Smith, E. H. Bailey, R. Halstead, A. Faye.

VARIETIES OF CANE.—H. M. Whitney, G. C. Williams, W. H. Purvis, G. F. Holmes, J. Ross.

STATISTICS.—W. W. Hall, W. F. Allen, C.S. Kinnersley, H. W. Mist, C. M. Cooke.

FRUIT CULTURE.—L. A. Thurston, Jonathan Austin, C. Koelling, G. N. Wilcox, E. H. Bailey.

EDITORIAL AND GENERAL.

Mr. E. A. Burchardt, of Kohala, has returned from a holiday trip in Europe.

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All corporations must make full and accurate exhibits of their affairs on or before the 31st instant. This is the burden of a by-authority notice.

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A boiler and engine have been set up on the Ramie Plantation near Hilo. The manager will shortly be able to give very practical proof of his venture.

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On Maui rains are reported, and the crops are said to be in fine condition. Hana plantation is reported to be flourishing, the rains there having been copious.

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Mr. W. J. Lowrie takes charge of the management of Grove Ranch Plantation, August 1st. Mr. Lowrie has been Superintendent of the Kahului Railroad for some time.

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The notice of Young's Automatic Cleaner, which was published in the April number of the PLANTERS' MONTHLY has been largely copied into the sugar papers of the world.

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Professor E. D. Preston, of the U. S. Geological Survey, is now engaged on Maui in ascertaining correct latitude observations. The Professor has made similar observations on Hawaii and Kauai.

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The present period of dry weather along the windward coast of Hawaii is the longest and most severe that has been known for some years, and it is feared will have a disastrous effect on the coming crops.

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The series of papers on the "Chemistry of Plants," by Professor Van Slyke, of Oahu College, will be resumed on the return of the Professor, who is now enjoying a vacation toru in the United States.

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The plant of this year for the Districts of Hilo and Hamakua bids fair to be a larger one than ever before, and with fair conditions of weather and labor, will turn out a larger amount of sugar than any crop heretofore.

The plantations along the windward coast of Hawaii are, as a rule, nearly through with the season's crop, which, in most cases, has proved a very satisfactory one. The recent prevailing dry weather has in some cases been a serious hindrance both to grinding and planting.

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The weather has been extremely dry in Hamakua and Kohala during the last month. The cane in Kohala is very dry, and planting for the new crop has been seriously retarded. A slight shower, which occurred in Hamakua during the second week of this month, did very little good.

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The survey for the Hilo Railroad is progressing. The latest accounts from Mr. Wilder state that as soon as political security is assured the money will be forthcoming for the enterprise. It behooves all those who are interested in the prosperity of the Islands to see that the present *status quo* be preserved.

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Hamakuapoko Plantation has finished grinding for the season, and records an output of 4,000 tons of sugar, being an average of 6½ tons per acre. Paia Plantation reports 2,600 tons—also an average of 6½ tons per acre. The Grove Ranch Plantation will have over 2,000 tons, which will give an average of 7 tons per acre. This speaks highly for the excellence of the cultivation and perfection of the machinery used on these plantations. Pretty nearly all the sugar that can be got out of the cane is obtained.

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The *New Orleans Picayune* gives a carefully prepared statement showing the result of the last crop in detail. The total proves to have been 151,427 hhds., against 220,882 hhds. for the previous crop, as made up by the *Picayune*. The total crop in pounds is given as 196,088,321 lbs., say 87,535 tons of 2,240 lbs., against 122,274 tons last year. The past season has been one of the most unfavorable experienced in a number of years. The prospects for the coming season are as bright as the retrospect of the past season is gloomy. The planting period just over has been unprecedented, and a splendid stand of both plant and stubble is reported from all sections of the State. The acreage has in most cases been increased.

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Most of the Hilo mills are closing, or just about to close, their present crop. In many cases the crop has overrun the estimates, and the output from the district this year is in excess of any previous year. Owing to the many changes made in the management throughout the district, and the consolidation of small places into large concerns run at small expense, the large plants of cane now being put in yearly, the

centralizing system in mills, with all the latest and most improved machinery, the plantations are getting on a basis that, if there is any money to be squeezed out of the cane, they are going to get it. As has been proved the world over, that large concerns will live where it would be utterly impossible for small concerns to eke out an existence, and so it is here and must be, that only by running the sugar business on a large scale can it be made to pay.

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THE FUTURE OF CANE PLANTING.

HOW CAN THE SUGAR INDUSTRY BE CARRIED ON PROFITABLY ?

Low prices of sugar still prevail, and remain low with discouraging persistency; so that the hopes we once entertained of seeing again the days of flourishing prosperity fade out utterly into the dark, and many a man who once thought himself assured of reasonable wealth through sugar, now finds that it will not even yield him a competence. Under existing conditions in Hawaii, as a whole, sugar is not remunerative.

In addition to the low price of sugar, we must not forget another—the undoubted decrease of yield consequent on the gradually impaired fertility of the soil. In certain localities the land will not yield more than half what it once did, and it is already a serious question whether it can be made to return the cost of cultivation. As the years go on this difficulty must increase, and will be met, if met at all, only at considerable expense for artificial fertilizers, which will thus increase the cost of the resulting sugar. Thus far, however, in many districts, no practical fertilizer has been found which will produce the desired results, and the question now stands: Will it pay to cultivate our fields for the two tons or so that we may get off of them?

The situation stated above, makes it fairly evident that the planter *must* make some very considerable reduction in expense, if he would hope to make any money out of sugar.

By all means the largest item of plantation expense is that of unskilled labor. Not only is it the largest, but it exceeds all others put together, and thus forces itself on our attention as the most important direction in which economy should be instituted. From figures made up from monthly reports, we find that, in the case of one plantation under good management, the cost of unskilled labor is 63 per cent. of the total yearly expenditure; while in the fields alone, which is the case of the planter who is concerned only with the raising of the

cane, the proportion of unskilled labor to the whole expense is 75 per cent. In this particular case, a reduction of $2 in the monthly wages would have decreased the expense, and consequently increased the profits, by $10,000.

It is very well to economize in the hundred and one other things that, with labor, constitute plantation expense; to struggle for an eighth of a cent in rice or bags, or ten cents a ton on freights, or a few dollars in rents, insurance or salaries; but all these things, even in the aggregate, do not very materially influence the result, and are utterly overbalanced and swamped by the tremendous single item of unskilled labor. So long as that remains out of all proportion, both to the rates prevailing in other sugar-growing countries and the ordinary profits of sugar in this, it will be comparatively futile to seek to squeeze large profits out of small economies, however wise and worthy these may be in themselves. The times, the circumstances, and conditions of sugar in Hawaii, *demand* lower prices for labor.

Very worthy of attention, as looking this way, is the attempt now being made by the Planters' Labor and Supply Company to arrange such unity of action among planters as shall lead to a considerable reduction in the cost of Chinese unshipped labor, and put such labor on something like a uniform basis throughout the country.

The weakness of Hawaiian planters heretofore has always been in that disunion and individuality of purpose and action, which are always fatal to any concerted action, and in the end fatal to the interests of the individuals themselves. With all his misfortunes and difficulties, the Hawaiian planter has always held himself as a very independent man individually, consulting almost solely for what he considered his own special interests, regardless of general interests. For this reason he has continually failed to exercise that influence which both wealth and intelligence fairly entitled him to, and has found himself continually outwitted and outbalanced by almost every interest in the Kingdom, from the Crown to the Chinese laborer. And thus things must remain until the extreme pressure of circumstances or increased common sense of planters shall lead them to adopt a policy of union in place of one of faction. We trust they may arrive at the condition of unanimity in action before they are placed by disunion in the condition of unanimity in misery.

If we would meet with any better success in this present attempt to control the price of labor than we have in several similar attempts before, we *must* adopt concerted action. It is useless for us to cry out about the high prices of labor, and

then resist by narrow individuality, not to say selfishness, any concerted action to reduce those prices. There can be little doubt that there is sufficient labor in the country to satisfactorily till the fields and run the mills, and that a reasonable reduction of wages will not materially lessen the labor supply, because labor cannot do better elsewhere. Both Chinese and Portuguese, as a rule, are here to stay for some time, whether the wages be $20 or $16 a month. They will naturally strive for the higher figure; but we believe if they cannot get it, they will take and be content with the lower. But they must be convinced that they cannot get $20 a month, and only $16; and concerted, firm and persistent action is required on the part of planters to convince them of this. So long as one planter pays $20, his neighbor must do the same or lose his labor. When it is a settled fact that $16 is all that any planter will give, everyone can safely reduce to $16 without fear, and no one probably will lose a man.

In order that the scheme should be a success, every planter should go into it with perfect honesty, loyalty and persistence of purpose, realizing that it is a matter of vital and paramount importance—sufficiently vital to warrant risking the well-being and success of a year's crop if necessary; sufficiently vital to warrant the most stubborn and persistent tenacity in carrying the point. We trust all who go into the scheme will have their minds made up to stand the siege for six months, if necessary; will have courage enough to see unmoved their fields grown up to grass and weeds, if necessary, and will lose part of a year's crop, if need be, rather than depart from their promised adherence or flinch in their determination. Entering the scheme thus, we shall win.

The date chosen for the inauguration of the scheme, September 1st, is wisely chosen, as at that season of the year most planters are the most independent of labor and best fitted to reduce wages and abide by the result. It will doubtless be in the interest of all places contemplating such reduction to specially prepare for the event, by putting things in order and getting their fields into the most perfect state of cleanliness and cultivation, so that they may be enabled to lie over during such time as the labor supply may be idly contemplating the situation or seeking to starve out the planter.

If planters will undertake the scheme unanimously and whole-heartedly, and carry it out faithfully, it will assuredly succeed, provided only that there is sufficient labor in the country. If on trial we find there is not sufficient labor in the country, then we shall at least know what the remedy is and how to apply it.

THE NEW CONSTITUTION.

This is a most important change and affects planters more, perhaps, than any other class in the community. For years the planter along with other property holders has not been properly represented in the Legislature. The new Constitution gives a vote to every foreign male resident on the Islands, without the necessity of becoming naturalized. Many planters and employees on the plantations have for the past twenty years been debarred from voting, who will now have an opportunity of exercising the franchise and making their views felt in the government of the country instead of standing passively by and seeing their hard earned wages or profits voted away, by designing men, for every conceivable and inconceivable folly.

Besides providing for the franchise the new Constitution provides safe guards of liberty in a number of directions. The dismissal of cabinets by back stair influence at midnight can no longer take place. It guarantees to the people, "Life, liberty and the right of acquiring, possessing and protecting property, and of procuring and obtaining safety and happiness," and what more can men desire ?

The new Constitution is a good one, the result of careful thought on the part of some of the most conservative men in the Kingdom. It will, we feel sure, command the support not only of the planting interest, but of every right thinking man in the community. The opponents to it are men who have been battening upon the public funds and who know that the change in Constitution means change in the rotten methods of government or rather misgovernment, which have obtained for so long.

This magazine is devoted to the furtherance of agricultural interests but it comes quite within its province to support what is good in government. Bad government meant serious loss to the planter. The people of Honolulu having got rid of the bad government, it becomes incumbent on the entire planting interest to support the present men in office, as long as they do their duty. In the coming election the present party of reform should be supported in every part of the Islands, and the Constitution of July 6th thoroughly endorsed by every out-district.

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The Dutch Government Bills affording temporary assistance to the sugar industry in Java, are meeting with serious opposition in the Bureau of the Second Chamber. The proposed measure are considered inadequate for the purpose, and the majority of the deputies are opposed to an artificial protection, demanding instead a reduction of taxes and the removal of the restrictions, which at present weight upon the industry.—*Sugar Cane.*

DRIED FRUITS.

There are certainly many ways in which some of our small holders might add to their incomes. Our soil is fertile enough, our climate unexceptionable, and can be depended upon almost to a certainty.

Take the fig for instance. The culture is easy, and the tree occasions very little labor or trouble of any kind; it is not subject to disease, and requires little pruning—at the same time it needs some slight care. The soil must be loose, and there must be sufficient space for the roots to run and for the branches to develop. Fig trees can be planted in almost every garden plot in the country. There is hardly a manager's house or that of a luna on our plantations that does not give opportunity for planting this useful tree. On plantations such as Lihue, where the German laborers have garden plots. there could no more easy and profitable tree be planted. It gives ample shade, and under it other crops can be raised.

The following advice as to drying the fruit appears in the *Planter and Farmer*, and may prove of advantage to some of our readers. We can remember one place on Maui where the fruit was so abundant that it was rotting on the ground. Why not dry it there?

The drying of figs is a work that could be well and profitably done by the members of the household. The white Marseilles, also known as white Genoa and white Naples, is the best and, indeed, the only sort that should be used for drying.

The first matter of importance is to know when the figs are thoroughly ripe, which is when they begin to show signs of wilting and small white seams or cracks appear, they will then separate easily from the shoot; but, lest they should be injured by pressure, it is safest to cut them off with a knife or scissors, and carefully place them singly on trays. When laid down flat a portion of the juice is liable to be lost by running out at the eye; it is, therefore, advisable to have light frames covered with wire netting of one inch mesh. As the figs are gathered they are placed upright in the tray, with the stalks in the meshes and the eyes upwards. They should be carefully handled, lest the bloom be removed. The trays are placed in the sun, and either removed indoors or carefully covered at night or during rain. As soon as there is no longer any danger of the juice escaping, the fruit may be placed on canvas sheets, though small trays, such as those used for grapes, are generally more convenient. The time required for drying is a fortnight or three weeks, according to the weather. a hot wind drying them very quickly. It is found that the figs shrink more and more every day, but puff up again at night, and they are not sufficiently dried until that ceases, but when they arrive at

that stage they must be no longer exposed, be ready for packing; leaving them longer would be injurious, over-dried figs acquiring a cooked earthy flavor, which lowers their value.

Different modes of packing figs are practised, being quite elaborate in some of the fig-growing countries, especially Smyrna and some other places on the coast of the Mediterranean, where the figs after being dried, and immediately before being packed, are dipped in sea water, while some dip them for two seconds in boiling brine, the object being to soften the fruit. Then the stalk of the fig is pressed upward and the eye downward to flatten them the reverse way, giving the appearance the Smyrna figs are known to present. It is said that the process is necessary—first, because it distributes the thicker skin around the eye evenly, so that in eating one gets equal parts of the thicker skin—certainly a peurile consideration, and one which could only be carried out where labor is cheap, and seems quite unnecessary, though the figs, it appears, bring a higher price in consequence of the appearance of the box being improved; but that may be effected without the dipping if the figs are not over-dried and sufficiently pliable. After having been dipped in the brine, the fig tastes at first exceedingly salt, but after a few days the salt works into the fig and gives it a peculiar appetising taste, counteracting the excessive sweetness which would otherwise be too predominant. When the figs are placed in the boxes they are strongly compressed, the reasons given that the figs beings being compressed into a compact body injurious insects are debarred from entering between them; the air is also excluded, which would cause the figs to become dry. In order to obtain sufficient force, the figs in the boxes are in some places subjected to the action of a screw press, previous to which they are dipped in the salt water after being placed in the boxes. The main objects in taking so much pains is that the figs may retain their moisture and present a good appearance when the boxes are opened. After all, proper drying and immediately packing them closely into their boxes seems to be all that is necessary.

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A WORD IN SEASON.

A writer in the *Barbados Agricultural Gazette* makes some remarks which seem quite applicable to our people here. The complaint in Barbados is of hard times, that the horizon ahead is very gloomy and the question is asked, what is to be done?

To this the writer makes reply, "we must put away, root and branch, the artificial style of living that has been, and, to a great extent, still is so much the fashion among us. Then as a corollary to this we shall be less dependent on the services of

others. Next we must banish from our hearts the smallest semblance of despair, and replace it with a true and manly courage. Following this, we shall necessarily have clearer heads for thinking, and thus equipped with independence, manly courage, and a clear, calm mind, our chances of success will be a thousand fold increased."

After advocating improved methods of cultivation and the use of the best machinery, all of which we have already attended to here; the writer proceeds to say a word for the so-called minor industries. He gives his attention to two, viz: tobacco and tea. He says: "The soil which is well adapted for cane-growing is not so for tobacco, and *vice versa*. There is abundance of land in this island on which the sugar cane can be grown only under great disadvantages, and where tobacco would flourish luxuriantly. Tobacco is a plant of rapid growth, and its mode of manufacture exceedingly simple; moreover, it is an article of commerce which finds a ready sale and is somewhat expensive in countries where it is not grown, so that that presumably it yields a fair profit."

As regards tea, there are some districts on the Island of Hawaii where tea could be cultivated to some profit, and the preparation of it for market through tedious, is not very expensive while as an article of commerce it pays handsomely.

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CROSS BREEDING IN POULTRY.

It is a somewhat remarkable circumstance that nine persons out of ten outside of those who are termed "poultry fanciers," if asked for an opinion as to the best variety of poultry to keep for ordinary use, will almost invariably recommend some cross-breed. The ruling fancy appears to be for a cross of Spanish with almost any other breed; the cause of this being the increase in the size of the eggs obtained by the introduction of Spanish blood. A more short-sighted policy can scarcely be imagined. When it is taken into consideration that poultry breeders have for years been carefully developing certain qualifications in various breeds of poultry, it is only reasonable to suppose that their labors, guided by experience and the teaching of the very best authorities, must necessarily have tended greatly towards success, even if the most perfect results may not have been accomplished. For instance if we select the favorite breed, Spanish, it must be apparent to most observers that the object aimed at by their cultivation, the production of large white eggs, cannot be excelled by any other breed, and can only be equalled by Minorcas or Andalusians, themselves sub-varieties of the Spanish family. Where, then, is the utility of crossing these birds to produce mongrels which cannot equal

the parent stock? Strength of constitution is the reason generally assigned for this erratic procedure, but strength and vigor may be retained in poultry of the purest blood by attending to the proper ethics of breeding. and taking care that the stock is not closely related. Herein lies the difficulty over which most poultry breeders stumble. A few birds, probably from good stock, are obtained as the foundation of a poultry yard, and these, bred together year after year, without the thought of infusing new blood ever entering into the calculations of the breeder. The fowls become degenerated and puny, the constitution which is wanted to preserve them when attacked by disease has gone, and a slight epidemic will frequently end in the devastation of a collection which the owner has looked upon with pride as probably the best of their kind to be obtained. The blame is then attributed to the want of stamina of the variety, and not as is really the case, to the want of judgment on the part of the breeder. Disgusted by his bad fortune, he usually rushes to the other extreme, and fills his yard with cross-bred fowls. Another argument for crossing is to produce size for table fowls, and in this direction the experiments are almost innumerable. Dorking and Game, Brahma and Dorking, Houdan and Cochin, and other crossings are recommended with an earnestness which does credit to the ingenuity of experimenters, while it does not say much for their perspicacity. It should be well known that there are certain pure breeds which have been carefully developed with this very object in view, and to cross them with inferior kinds can only be a retrograde movement. It has been incontestably proved that Houdans carry more flesh on less bone than any other variety of fowls; the quality of the flesh at the same time being of the greatest excellence. How, then, can it be possible to "improve" them for table by the introduction of blood from a variety which is inferior in this respect? Next to Houdans come Dorkings, consequently nothing but the introduction of Houdan blood could improve them. But where is the utility of rendering two breeds, excellent in themselves, to the level of mongrels, which all crossbred fowls must necessarily be? Another consideration which should have great influence in preventing indiscriminate crossing is the admitted fact that, while fowls produced from a "first cross" of two pure breeds may be to a certain extent satisfactory, any further admixture of blood, even if pure, renders them comparatively useless. There is only one way, in our opinion, in which cross-breeding can be beneficial, and that is by the introduction of males of pure breeds into yards where only common hens are kept, such a proceeding having a tendency to raise the quality of their progeny; but even then good can only result by the periodical introduction of fresh male birds of different strains

to keep up the stamina. To those who have pure-bred fowls of any variety we would say improve your birds by selection, and the introduction of fresh blood, and leave crossing to those who do not desire to excel in the science of poultry breeding, and in a very short time you will have occasion to be gratified that you have not been led away by the theories of persons who cannot have had any experience in the pleasure to be derived from watching the gradual development of birds bred to a recognized standard. One season of such experience will do more to educate the poultry breeder than a lifetime spent in useless experiments in "crossing."

CORRESPONDENCE AND SELECTIONS.

HAWAIIAN MILLS AND THEIR WORK.

LAUPAHOEHOE, HAWAII, July 1, 1887.

TO THE EDITOR OF THE PLANTERS' MONTHLY:

DEAR SIR:—The grinding season in the Hilo and Hamakua districts is now drawing to a close, and as far as can be learned the yield of sugar will equal, if not surpass the estimates made at the commencement of the crop. This is as it always should be, because it is encouraging and satisfactory to all parties.

The most favored district for fluming, this season, has been from Hilo to Hakalau. The mills in this part of the district have been kept running continuously since they first started, and some of them have improved their opportunity, and have made some excellent runs; as the amount of work done has surpassed anything done hitherto. From Hakalau to Laupahoehoe there has been almost a continual drought for the last three months, and this has greatly retarded the work in these mills. The old mill at Laupahoehoe has been the most delayed by this scarcity of water, nothing having been done there to speak of, for this length of time, as the water in the ditches and gulches has been quite dried up. The new mill at Kaiwilahilahi, although somewhat retarded, has been running almost constantly up to the 15th of June, but it has done nothing to speak of since.

As the water for the Kaiwilahilahi mill is got from another source, it usually lasts longer than at Laupahoehoe. Notwithstanding the scarcity, however, Mr. R. McKenzie, the manager of the A. L. Co.'s plantation succeeded in fluming enough cane during the month of May, to make a daily average of nearly 20 tons of sugar for every working day of the mill.

This dry weather, which has retarded the work in Laupahoehoe, has been of great benefit to such places as Ookala, Kukaiau

and Hamakua, where the cane is hauled to the mill in wagons. But this long drought is now proving to be a great injury, as it retards the growth of the young cane, besides delaying the planting.

There is a great improvement seen in the plantation management all through these districts. The cane, in the first place, is kept in better condition, the soil is better cultivated, and a system of manuring is being introduced, which is likely to be of great service. Mr. H. Morrison, the former manager of the Hakalau plantation, was the first man to thoroughly experiment with fertilizers in this district, and the unprecedented success which he met with, encouraged others to follow his example; so that at this time almost all of the plantation managers are using some kind of fertilizer.

It was at Hakalau also, that the new method of plowing in the trash, cane-tops, etc., was first introduced. and then add fertilizers after the young cane had started to grow; and this I find agrees with the best practice in other countries. The advantage of plowing in the cane leaves is very great, as it supplies nature with one of the most important, and also one of the most needed elements.

It is found by the chemist, as well as by the planter, that one of the elements most lacking in cane soil is nitrogen and although there is abundance of it in the air, so far as known, it cannot be utilized by the plant in this form. (See Proffessor Van Slyke on the Chemistry of Plants, June number.)

As the free nitrogen of the air is not available, it is important that this substance should be applied in some other way, either as decomposed organic matter, ammonia, salt, or nitrates.

The great advantage of using stable manure for this purpose, can be seen at Laupahoehoe, in a piece of cane belonging to the Laupahoehoe Sugar Co. In this instance the ground was plowed, harrowed and then furrowed out, the manure laid in the bottom of the furrow, the seed cane was then laid on top of this, and then lightly covered with earth. The cane now looks beautiful, being of a very dark green, and looks both rich and strong.

There is another field at Kaiwilahilahi belonging to A. Lydgate & Co., which very forcibly illustrates the advantage of using the mud from the mud-presses, ashes from the fires, etc. In this instance, only half of the field was fertilized, and at this place there is a line of demarcation, as plain as it is instructive. These ashes contain a great deal of potash, and this is another thing which is needed in almost all cane fields. Most astonishing results have been realized by using but a small quantity of this substance for fertilizing the soil. Nitrogen and potash seem to be what is most wanted for plant-food; neither is very hard to get but it is more difficult to know just how to apply them. Especially is this true, in regard to foreign fertilizers,

as some believe in giving only one dressing while the best practice seems to call for two. Again, some put the manure with, or under the seed-cane; others think it better some distance away, because the roots spread outward, others again, fertilize before planting, others afterwards, and there are some "doubting Thomases," that don't believe in fertilizers at all. But they are in the minority. This subject is coming to the front with great force, and it is bound to carry every opposition before it.

On most plantations there are quite a number of bones lying around the slaughter-house, which could be easily turned to account. The following I found in an old paper, and seems to be practical, and is easily done: "Take 4,000 pounds of bone, take 4,000 pounds of unleached wood ashes, 600 pounds of fresh burnt lime and 4,500 pounds of water. First slack the lime to a powder, mix it with ashes, and place a layer of bones in a suitable receptacle—a pit in the ground lined with boards, stone slabs, or bricks—cover them with the mixture; lay down more bones and cover, and repeat this until half the bones, or 2,000 pounds are interstratified with the ashes and lime; then pour on 3,000 pounds of water, distributing it well, and let it stand. From time to time, add water to keep the mass moist. As soon as the bones have softened so that they can be crushed between the fingers, to a soft-soap like mass, take the other 2,000 pounds of bones and stratify them in another pit, with the contents of the first. When the whole is soft shovel it out to dry, and finally, mix with dry loam, (4,000 pounds) or enough to make it handle well; if 4,000 pounds cannot be had, take 400 pounds and drop off a cypher from each of the quantities given."

Great improvement is now seen in mill work, particularly is this true in regard to the grinding or crushing of the cane, good grinding is now the rule, poor grinding the exception. In almost every mill one sees double grinding, and this partly accounts for for the better work; although the three-roll mills are doing much better work than formerly, and to get a very high extraction, it is imperative that the three-roll mill does the best possible work. It was thought otherwise at one time, but that was a delusion; the drier the trash is at the first mill the drier it will be at the second; there can be no doubt in regard to that. Some will do better work than others, because they have a better, larger and stronger three-roll mill, others because they have a faster speed for the two-roll mill. A slow speed for a two-roll mill is decidedly objectionable, as one must always run with a thick feed, which is something to be avoided.

High extraction, high polarization and low expenses, and no waste, is now the order and aim of the managers.

The highest polarization, so far, has been made in the Kukaiau and Hamakua mills. The highest extraction will always be got (other things being equal) from the best cane.

Last year the Kaiwilahilahi mill, at Laupahoehoe, got the highest extraction in these districts, sometimes getting as much as 72 per cent for the first mill and 9 per cent for the second, making a total extraction of 81 per cent. The extraction for the month of June, 1886, was 69.8 for first mill and 8.2 per cent for second mill, making a total average of 78 per cent.

This is as good work as it is possible to do when extracting the juice by crushing, and nothing has been done to equal it in these districts this year, either at Kaiwilahilahi or at any other mill. Indeed, it must be extraordinary good cane to get this amount, and there must be extraordinary care taken in the work besides. Yours respectfully, O HAWAII.

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COUNTERVAILING SUGAR DUTIES.

It is always as well that we should hear both sides of the question, and as we recently published an account of a meeting of gentlemen interested in the industry and desirous of checking the bounty system, we now reprint from one of the London papers a well-written article, in which the arguments used are against the imposition of countervailing duties. We have at all times recognized the difficulties in connection with this subject, and we consider that the strong arguments contained in the article referred to are well worthy the consideration of those connected with the sugar industry

Whatever else may be the shortcomings of the advocates of countervailing duties on sugar imported from countries in which bounties are paid, lack of pertinacity cannot be laid to their charge. For something like five-and-twenty years, efforts have been made to persuade the people of this country that they ought to levy a duty on sugar imported from certain countries, in order that they might have the pleasure of paying a higher price for a similar article produced elsewhere. It is not surprising that the public are as yet unconvinced, and that, consequently, no Government has been disposed to give colonial sugar planters and home sugar refiners any reason to hope that their wishes would be acceded to. It is not that the difficulties of the position in which these gentlemen are placed and not fully realized, are sympathized with. It does not require any business insight or technical knowledge to understand clearly enough that, if the Governments of continental nations so arrange their duties on sugar and the drawbacks allowed on what is exported, that a very considerable bounty is paid to the exporter, any sugar grower or refiner who has not the benefit of such bounty must in an open market like our own be placed at a great disadvantage. There is all the difference in the world, however, between fully recognizing that

under such conditions the competition is not equal, and being disposed to decline to take advantage of the willingness of other countries to pay part of our sugar bill.

The sugar trade is exceedingly depressed. It was, probably, never more so. Prices are unprecedentedly low. Sugar is sold by grocers at about the same price as oatmeal and flour. It is not, therefore, perhaps to be wondered at that the agitation against sugar bounties should flicker into life again. The West India Committee have labored long and energetically, but hitherto without any appreciable result. Judging from a meeting which was held in London recently, it seems that they are now to be reinforced by gentlemen connected with every sugar-growing colony in the Empire, and with such other allied interests as refining, engineering and ship-owning. A determined attempt is to be made to induce the Government to take action, and by action is meant imposing a countervailing duty. The effort will fail, as have and will all efforts to induce the people of the United Kingdom to turn their backs upon their free-trade policy. Of course many of the advocates of a countervailing duty tell us that they are free-traders. That has always been a very common statement for advocates of a protectionist policy to introduce their arguments with. They tell us that, in this particular instance, the essence of free trade will not be ignored, but will rather be recognized by putting all sugar growers and refiners on precisely the same footing, so far as financial aid for the State is concerned. The essence of free trade, however, is that every man should be at liberty to buy freely in the cheapest market, and everything which, under any pretense whatever, imposes duties on goods coming from one country which it does not impose on the same class of goods either imported from other countries or made at home, is distinctly a protective policy for those who are engaged in the trade in the countries upon the goods of which no duty is levied. The Lords of the Treasury in 1879, during the Ministry of Mr. Disraeli, put this matter very clearly in reply to representations which were then made to them in support of a countervailing duty. They said that the proposal "rests upon a principle which the Government of this country could not admit without reversing its whole system of commercial policy. If the doctrine was still maintained that the Government should adopt fiscal measures for other than fiscal objects, and should attempt to make such measures an engine for assisting British manufacturers to compete on what may be considered equal terms with their foreign rivals, the present case might undoubtedly be considered a very proper one for the application of such a principle. But it cannot be doubted that if the Government were to act on this doctrine in the present case, it would soon be called upon

to do so in other cases also. Their Lordships are of opinion that the Government ought not to countenance such a step, unless it is prepared to review the whole code of commercial legislation in this country." That extract precisely represents the position, and the country is not prepared to review its "whole code of commercial legislation." Even the recent Dull Trade Commission, from which the fair-traders, as they call themselves, expected much, and which was certainly far more favorably disposed in the direction of the economic fallacies of protection than any similar body is ever likely to be again, did not dare to suggest any departure from the broad lines of free trade on which our international commerce is based. The case of the sugar trade in its various bearings was put before the Commission with great clearness and ability by gentlemen eminently qualified to state it, but it entirely failed to carry conviction to the minds of those to whom it was addressed. The minority of four, who signed the report of the fair-trade dissentients, adopted the proposal as part of their general suggestion in favor of levying duties on many imported articles. But the other nineteen members of the Commission declined to give their sanction to any such folly.

It is all very well to tell us, as the witnesses before the Commission did, and as the supporters of this movement continually do, that by levying a duty on sugar to counterbalance bounties paid by those countries which do pay them, we should enable our colonial planters and home refiners to compete on equal terms, and that then they could hold the market, and we should thus give employment to colonial and home industries, employ the capital and labor of British subjects, and spend our money with people who would purchase far more largely of us than do those of whom we now purchase our sugar in considerable quantities. The people are now accustomed to look a little more closely into matters of this kind than was formerly the case, and they are not likely to be misled by such a plausible but very misleading way of putting the matter. The first thing that they see is £8.000.000 a year more for their sugar, in the way of duty and profit on it. That amount is now spent in some other way, and if it had to be spent on sugar, other trades which now receive it would suffer to that extent. Thus far, therefore, the operation would be no more profitable than was that of the historic Irishman who lengthened his blanket at the top by attaching to it a piece which he cut off the bottom for the purpose. Next, they see that if they ceased to buy the sugar where they do now, they would render it more difficult for the people to buy goods of them, so that what they might gain in the way of customers in the colonies, they would almost certainly counterbalance by the loss of orders from the Continent. Further, there are certain trades carried on in the

United Kingdom—such as jam, biscuit and confectionery making—which are largely benefitted by the low price of sugar. Immense businesses have been built up, the sales both at home and abroad are very large, and a considerable amount of labor is employed. The success of these trades is owing to the cheapness of sugar here, as compared with other countries. Anything that would raise the cost of sugar here, as compared with its cost elsewhere, would seriously diminish the advantage which these trades now possess, and might easily lose to our country more business in these directions than any increased prosperity of colonial sugar growers would give us. Thus it will be seen that the roseate views of prospective commercial advantages which the advocates of countervailing duties hold out to us, are merely phantom visions, which entirely disappear on being closely scrutinized.

Beyond all this there is, as has been already intimated, the broad basis of our commercial policy. We could not, were we so disposed, touch any portion without going much further. If anyone can urge a claim for a protective duty, it is the agricultural classes in our own country. Every practical argument of real weight that can be urged in favor of countervailing sugar duties applies with tenfold force in favor of a duty on corn. But the people will not listen to such a suggestion, and very wisely so, too. Thoroughly sound commercial policy is to buy everything that you require in the market where you can get it best and cheapest. The commercial man who trades with a friend simply because he is a friend, and pays him more than he could get a similar article for elsewhere, may be doing a generous thing, but he is not acting on sound business principles, and if he conducted the whole of his transactions on that footing, he would soon find that the balances were accumulating on the wrong side of his ledger. Of course Englishmen would prefer to consume colonial sugar, but they will no more pay more for that sugar when there is no corresponding advantage in quality than colonists will pay more for English goods when similar ones are offered at a lower price from other lands.

The sugar bounty system of America and the continent is a most irritating and trying one for sugar growers and refiners elsewhere.

But it does not appear to be all advantage to the people for whose benefit it has been established. The depression has been great amongst sugar planters in the colonies and refiners at home, but beet growers and sugar refiners in Europe have not been rolling in prosperity. France, Austria, Russia and Holland have given unmistakable indications that the system has by no means been a success with them; while in Germany the present condition of trade is worse than it has ever been

before. So long as people elsewhere are willing to pay part of the cost of the sugar we consume, we cannot, as common-sense people, refuse to let them. More or less they have been doing it somewhere or other for twenty-five years, but the proceeding has not been sufficiently satisfactory to induce any one of them to keep at it with the same energy and generosity all the time, and we venture to predict that, if the present keen competition which is so seriously affecting our colonial planters and our home refiners continue much longer, the natural course of events will work a cure that will be far more satisfactory and permanent than any which could be brought about by such a war of sugar tariffs as we are invited by the trade to embark in.—*London paper.*

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DIFFUSION TESTS.

The Yield of Louisiana Cane at Fort Scott.

An Analytical Review of Prof. Wiley's Figures—Why they are among the impossibilities, by Mr. W. P. Kirchoff.

Whatever be the advantages of diffusion over milling, one thing is patent, that the diffusion experiments at Fort Scott on the Louisiana cane brought about some wonderful results. Early in November last the phenomenal yield of 144 pounds of sugar per ton was the result of working 8325 tons of cane. At that time nothing further of the experiments could be learned. Since then, however, Dr. H. W. Wiley's report on said experiments made its appearance. With it some interesting figures reveal themselves. In order to find out something more about that phenomenal yield, let us turn to page 53 of said report and ascertain how this yield was brought about. As the yield of sugar is the last step in the process, it will be best to commence at the beginning, and ascertain from how much juice this phenomenal yield was extracted.

On page 53, at the bottom of the page, the report mentions that the 8325 tons of cane filled 86 cells or diffusers, and that 2,066 pounds of chips were in each cell; by referring to my copy of the work done at the diffusers on this lot of cane, I find that the figure 86 is not correct, but should be $78\frac{3}{4}$ cells, and that therefore 2114 pounds of chips were in each cell. On page 54 it is stated that the weight of juice drawn from each cell of chips was 1100 litres. Specific gravity 104=2516·8 pounds; this figure, 25168 pounds, is also wrong; it should be 2475 pounds.

It is further stated, on page 53, that 96 per cent. of the total increase in the cane was extracted by diffusion in working up the 8325 tons of Louisiana cane. Let us see if this is correct.

To make this determination, the following data are at our disposal:—

	Per cent.
The total solids in diffusion jnice	9·86
The total solids in mill juice	14.38

As in each cell there is, according to the report, 2,066 pounds of chips x 90=1859.4 pounds juice: 1859.4 x 14.38=267.38 pounds total solids.

As 1100 litres of diffusion juice were drawn from each cell of specific gravity 1.04, therefore they weigh 2516.8 pounds. 2516.8 x 9.86=248.15 pounds total solids. Therefore 267.38 : 248.15 : : 100 : 6=92.88 per cent., that is to say, 92.88 per cent. of the total increase in the cane, or 83.59 per cent. of juice on the weight of cane was extracted by diffusion.

Hence, from Dr. Wiley's own figures, we find that 92.88 per cent., instead of 96 per cent. of the total increase in the cane was extracted. As, however, I have shown that Dr. Wiley's figures are not correct, the extraction should be as follows:—

In each cell was 2114 pounds of chips. 2114x90=1902.6x14.38=273.59 pounds of total solids, as 1100 litres of diffusion juice of specific gravity 1.04 were drawn from each cell, as 1 litre of diffusion juice of 1.04 specific gravity weighs 2.25 pounds, therefore, 1100x2.25=2475 pounds; 2475x9.86=244,035 pounds total solids; therefore, 273.59 : 244,035 : : 100 : x=89.19 per cent., that is to say, 89.19 per cent. of the total increase in the cane was extracted by diffusion, or 80.271 per cent. of juice on the weight of cane was extracted.

Since there was 9.56 per cent. of sucrose in the canes worked up, therefore, 89.19x9.56=8.52. That is to say, of the 9.56 per cent. sucrose in the cane, 8.52 parts were extracted by diffusion; leaving a loss of 1.04 parts or 10.9 per cent. by diffusion, of the total sucrose in the cane.

Dr. Wiley says, on page 53, that "the mean loss of sugar in the chips at Fort Scott was 0.38 per cent. (I presume by the word 'chips' he refers to the exhausted chips), and the quantity of sugar present was 9.56. The percentage of extraction was therefore 96 per cent."

Let us see how he gets the 96 per cent. of extraction.

	Per Cent.
The total sucrose in cane is	9.56
Mean loss of sugar in chips	0.38
Sucrose extracted	9.18

Therefore $\frac{9.18}{9.56} = 96$ per cent. extraction; it appears, therefore, that he subtracts the mean loss of sugar in the chips from the total sucrose in the cane, and thereby secures a remainder, 9.18, corresponding to an extraction of 96 per cent. of the total sucrose in the canes. This method is certainly incorrect, as it assumes that 0.38 per cent. of sucrose in the exhausted chips is 0.38 of one part of the total sucrose in the cane. Moreover,

the report has not taken into consideration the percentage of sucrose lost in the waste waters. However, it would be a difficult matter to get at that percentage, as no analysis of the waste waters were made while running on the second lot of Louisiana cane. The analysis of the waste waters of lot one shows that they contained 1.24 per cent. of sucrose.

Above, I obtained 89.19 per cent. extraction of the total sucrose in the cane worked from the weight of cane of one diffuser, and 1,100 litres the amount of diffusion juice drawn from one cell. To verify the figure 89.19, I will take the total number of pounds of cane worked up during the second trial; also the number of diffusers of juice drawn off, and make the calculation of extraction thereon. As 83.25 tons of cane, or 166,500 pounds of chips, filled 78¾ diffusers; as, however, 85 diffusers were drawn off, being six more than there were diffusers of cane, those six should not have been drawn at all. Taking, therefore, 79 as the proper number (I use the word proper because there should never be more diffusers of juice drawn than there are diffusers filled with chips), and bearing in mind that in the mill juice there are 14.38 per cent. of total solids, and in the diffusion juice 9.86 per cent. of total solids, and that 1,100 litres of juice were drawn from each diffuser, we have, assuming that the cane contains 90 per cent. of juice, 166,500x90=149,850 total pounds of normal juice; 149,850 x14.38=21,548.43 pounds total solids in normal juice; 1,100 x2.25x79=195,525 total pounds of diffusion juice; 195,525 x9.86=19,278.765 pounds total solids in diffusion juice; therefore 19,278.765-:-21,548.43=89.4 per cent., that is to say, 89.4 per cent. of the total sucrose in the cane, or 80.46 per cent. of juice in the weight of cane, was extracted by diffusion. It will be seen, therefore, that by either method the above figures are correct.

A few words now about the phenomenal yield of 144 pounds sugar secured by diffusion from 83.25 tons Louisiana cane. The report says that "It is thus evident that the large gain in the yield, as established at Fort Scott, cannot be due wholly to the increased extraction of the sugar. It must, therefore, be largely due to the processes of depuration employed.

"The process of carbonatation tends to increase the yield of sugar in three ways:

"1. It diminishes the content of glucose. This diminution is small when the cold carbonatation, as practised at Fort Scott, is used; yet, to at least one and a half its extent, it increases the yield of crystallized sugar.

"2. By the careful use of the process of carbonatation, there is scarcely any loss of sugar. The only place, etc.

"In addition to the two causes of increase already quoted, and which are not sufficient to produce the large renderment

obtained, must be mentioned a third, the action of the excess of lime and its precipitation by carbonic acid on the substances in the juice, which are truly molassigenic. Fully half of the total increase which the experiments have demonstrated is due to this cause. It is true the coefficient of purity of the juice does not seem to be much affected by the process, but it is evident that the treatment to which the cane is subjected increases, in a marked degree, the ability of the sugar to crystallize. This fact is most abundantly illustrated by the results obtained.

"Not only this, but it is also evident that the proportion of first sugars to all others is largely increased by this method. This is a fact which may prove of considerable economic importance."

Let us see from the analysis what the process of carbonatation has done to the juice that produced this wonderful yield. The following analyses are at our disposal:

	Sucrose. per cent.	Glucose. per cent.	Total Solids. per cent.
Mill juice	10.62	1.77	14.38
Diffusion juice	7.16	1.22	9.86
Carbonate juice	7.17	1.15	9.91
Sulphate juice	7.17	1.19	10.12

	Coefficient Purity. per cent.	Glucose per 100 of Sucrose—per cent.	Baume degrees.
Mill juice	73.90	16.66	8
Diffusion juice	72.60	17.03	5.5
Carbonate juice	72.31	16.04	5.5
Sulphate juice	70.84	16.59	5.6

As the above analyses are on juices of different densities, for the sake of an actual comparison of the different juices with one another, it is best to bring the above analyses to some basis that will reduce them to terms of the dry substances. The above analyses, so reduced, are as follows:

	Coefficient Purity. Per cent.	Glucose. Per cent.
Mill juice	73.85	12.31
Diffusion juice	72.62	12.37
Carbonate juice	72.34	11.60
Sulphate juice	70.84	11.76

	Impurities. Per cent.	Glucose—per 100 of Sucrose.
Mill juice	13.84	16.66
Diffusion juice	15.01	17.03
Carbonate juice	16.04	16.04
Sulphate juice	17.39	16.59

From a study of the above reduced analysis of the respective juices we see—

I.—THAT BY PROF. WILEY'S METHOD OF DIFFUSION:

1. The coefficient of purity of the mill juice was lowered to the extent of 1.66 per cent. instead of raised.

2. That there was an increase of glucose of 4.87 per cent. of the glucose in the reduced mill juice.

3. That the impurities were increased by 8.4 per cent. of those in the mill juice.

4. That the proportion of glucose per 100 of sucrose was increased by 2.22 per cent. of that in the mill juice.

We also see that—

II.—BY THE PROCESS OF CARBONATATION:

1. The coefficient of purity of other diffusion juice is lowered to the extent of 3.85 per cent. of itself.

2. The glucose in the diffusion juice is diminished by 6.22 per cent. of itself.

3. The impurities in the diffusion juice were increased by 6.86 per cent. of themselves.

4. The proportion of glucose per 100 of sucrose in the diffusion juice was diminished by 5.81 per cent. of itself.

Likewise that—

III.—BY THE PROCESS OF SULPHURIZATION.

1. The coefficient of purity of the carbonated juice is lowered, instead of raised, by 2.07 per cent. of itself.

2. The glucose in the carbonated juice was increased by 1.38 per cent. of itself.

3. The impurities were increased by 8.4 per cent. of those in the carbonated juice.

4. The proportion of glucose per 100 of sucrose was increased by 3.43 per cent. of that in the carbonated juice.

To sum up the above, it should be stated that, although the process of carbonatation did diminish the percentage of glucose, yet this diminution was more than an offset by an increased percentage of impurities throughout the whole process; the fact that the coefficient of purity of the diffusion juice (72.62 per cent.) was lowered by 3.85 per cent. of itself by the process of carbonatation, points clearly to the injurious effect it had on the diffusion process. Moreover, since, experience has clearly demonstrated that every one part of the impurities in a juice or syrup prevents the crystallization of every one part of sucrose therein, and as it has been shown that carbonatation does increase the impurities, it is evident that the treatment of the juice by carbonatation decreases in a marked degree the ability of the sugar to crystallize. The great length of time (eleven hours) required to boil one strike of sugar in the vacuum pan confirms that fact.

Relative to the yield of sugar from lot No. 2, Louisiana canes, from the report we find that the analyses of the mill juices average as follows:

	Per cent.
Sucrose	10.62
Glucose	1.77
Water	85.62
Impurities	1.99
	100.00

Total solids, 14.38 per cent.; coefficient of purity, 73.90 per cent.; specific gravity, 1.0579; Baume, 8 degrees.

As from practical experience in making syrups and sugars I find that every one part of impurities prevents the crystallization of an equal part of sugar, the actual yield of sugar from the above mill juice, after deducting the impurities, will be as follows: 10.62—1.99=8.63 per cent. on the weight of juice extracted; as at Fort Scott I find the juice extraction to be 80.46 per cent., that is, from 2,000 pounds of cane, 1,609.2 pounds of juice was secured, therefore 1,609.2x8.63 per cent.=138.8 pounds of sugar per ton of cane. As, however, no mill juice, but only diffusion, carbonated and sulphured juices were worked at Fort Scott, and as it has been shown that diffusion, carbonatation and sulphurization inverted a considerable portion of the sucrose, and injured the juice generally, the actual yield of sugar was diminished in consequence. In order to show the falling off of the actual yield of sugar of the mill juice by the process of diffusion, carbonatation and sulphurization, it is best to reproduce the analysis of the sulphured juice:

	Per cent.
Sucrose	7.17
Glucose	1.19
Water	89.88
Impurities	1.76
	100.00

Coefficient of purity, 70.84 per cent.; total solids, 10.12; specific gravity, 1.0405; Baume, 5.6 degrees.

In order to get the actual yield of sugar the sulphured juice yielded, the juice must be first reduced to the same degree Baume as the mill juice, that is to 8 degrees B.; the analysis of the sulphured juice will be then:

Sucrose	10.24 per cent.	at 8 degrees Baume.
Impurities	2.51 " "	

As the glucose and water do not figure here, I have omitted them. Deducting now the impurities from the sucrose, we have 10.24—2.51=7.73 per cent. Then at 80.46 per cent. juice extraction, we have 1,609.2x7.73 per cent.=124.39 pounds of sugar, the actual yield per ton of cane.

By comparison now of the actual yields from the mill juice and the sulphured juice, it becomes evident that 10.44 per cent. of the actual yield of sugar per ton from the mill juice was lost by the process of diffusion, contraction and sulphurization, as practised at Fort Scott.

Having obtained the actual yield of 124.39 pounds of sugar per ton of cane from the analysis of the sulphured juice, let us see what the actual yield will be if calculated from the total gallonage of semi-syrup made and its analysis. As the reports mention that the semi-syrup was put in two tanks, but omits to state how many gallons it made, and as I measured, at the

time of the experiments, the actual amount of semi-syrup in each of the tanks, I can say that the total number of gallons of semi-syrup in both tanks was 3,939 gallons at 23 degrees Baume. The average analysis of this syrup is given on page 49 of the report, and is:

	Per cent.
Sucrose	31.4
Glucose	6.2
Water	57.6
Impurities	4.8
	100.0

Total solids, 42.4 per cent.; coefficient of purity, 74.05 per cent.; specific gravity, 1.1918; Baume, 23 degrees cold.

From the specific gravity 1.1918 of the syrup, the weight of one gallon of syrup at 23 degrees Baume is 9.93 pounds, therefore 3,939x9.93=39,114.27 pounds, the weight of 3,939 gallons. As now, as before stated, every one part of impurities in a juice or syrup prevents the crystallization of an equal part of the sucrose in the solution, we find from the above analysis the actual yield of sugar on the weight of syrup to be 26.6 per cent. (31.4 per cent.—4.8 per cent.—=26.6 per cent.), therefore 39,114.27 pounds x26.6 per cent.=10,404.39 pounds sugar; this divided by 83.25, the number of tons of cane worked, gives us again the same actual yield of 124.9 pounds of sugar per ton of cane.

To verify the fact that every one part of impurities in a juice or syrup does prevent an equal part of the sucrose therein from crystallizing, let us take the analysis of the mill juice of Gov. Warmoth's plantation of the season of 1884–85, which is:

	Per cent.
Sucrose	13.05
Glucose	.67
Water	83.46
Impurities	2.82
	100.00

Deducting now the impurities from the sucrose, we have 13.05—2.82=10.23 per cent., that is 10.23 per cent. of the weight of mill juice will give the actual yield of sugar per ton of cane; as the juice extraction of that season was 74.58 per cent., we have 2,000x74.58=1,491.6 pounds juice, 1,491.6x10.23 per cent.=151.49 pounds sugar per ton; as his actual yield was 158.42 pounds of sugar per ton, this proves the correctness of my method of determining the actual yield of sugar.

Applying this method to the season of 1885 and 1886, of the same plantation, with the mill juice of the following composition:

	Per cent.
Sucrose	12.11
Glucose	1.02
Water	84.20
Impurities	2.67
	100.00

Proceeding in the same way as before, we have 12.11 per cent.—2.67 per cent.=9.44 per cent., the juice extraction being 78.07 per cent.; this gives 1,561.4 pounds juice x9.44 per cent. =147.39 pounds as the calculated actual yield, against 148.75 pounds sugar actually secured.

Since I have shown that the phenomenal yield of 144 pounds of sugar, claimed at Fort Scott, cannot be attributed to the juice extraction nor to the process of carbonatation, to what then must it be attributed? In view of the fact that it cannot be traced to either of the above, it seems more like an impossible than a possible yield.

The Fort Scott diffusion process applied to Magnolia plantation during the season of 1885–86.

As I have demonstrated, that owing to the method of diffusion, as practised at Fort Scott, a great deal of the sucrose in the Louisiana cane suffered inversion, and that additional impurities went into the diffusion juice that were not in the mill juice, the yield of 124.39 pounds of sugar per ton of cane appears to be a more possible one than 144 pounds per ton. As the yield of 124.39 pounds of sugar represents 6.2 per cent. on the weight of cane, as 9.56 per cent. was the total sucrose in the cane, then the difference, 3.36 per cent., represents a loss by diffusion of 35.1 per cent. of the total sucrose in the cane.

Taking now Magnolia's season of 1885–86 into consideration, we find that during that season the total increase in the cane was 10.90 per cent., therefore 10.90x35.1 per cent.=3.82; 10.90 —3.82=7.08 per cent. on the weight of cane as the actual yield of sugar; 2,000x7.08 per cent.=141.6 pounds of sugar as the actual yield that Magnolia would have made by diffusion.

There is another method of arriving at the same figure (141.6 pounds), namely, by taking the polarization of the respective mill juices. At Magnolia, that season the mill juice showed an average of 12.11 per cent. of sucrose; at Fort Scott, the mill juice showed an average of 10.62 per cent. of sucrose; now, as 10.62 : 12.11 : : 124.3 :x=141.7 pounds, that is to say, with a yield of 124.3 pounds sugar per ton of cane at Fort Scott, Magnolia would have made by diffusion a yield of 141.7 pounds per ton.

The Magnolia process, applied at Fort Scott, to the second run on Louisiana cane:

First Method.—During the season of 1885–86, at Magnolia plantation, 86.6 per cent. of the total sucrose in the cane was extracted; also 78.7 per cent. of the sucrose extracted was the actual yield of sugar made per ton of cane. As the total sucrose in the second lot of Louisiana cane, worked at Fort Scott, was 9.56 per cent., we have 9.56x86.6 per cent.=8.278, 2,000 pounds x8.278 per cent.=165.56 pounds of sugar that were extracted or went into the juice by milling; now, 165.56x78.7

per cent.=130.3 pounds of sugar per ton of cane—the yield that the Magnolia process would have given had it been applied to the Louisiana cane at Fort Scott.

Second Method.—There is another method of arriving at the above figure (130.3 pounds), by taking into consideration the polarizations of the respective mill juices. The juice tested at Magnolia (1885-86), 12.11 per cent. of sucrose; the yield of sugar that season was 148.75 pounds per ton; the mill juice at Fort Scott showed 10.62 per cent. of sucrose; by proportion we have: 12.11 : 10.62 : : 148.75 :x=130.4 pounds; therefore the yield, had the Magnolia process been applied at Fort Scott to the second lot of Louisiana cane, would have been 130.4 pounds of sugar per ton of cane.

On page 52 of Bulletin No. 14, Dr. H. W. Wiley says:

"What would have been the yield had the Magnolia process been applied at Fort Scott?"

After multiplying and dividing certain figures, he says: "The product 5.58 will be the yield of sugar which the Magnolia process would have given at Fort Scott, 111.6 pounds per ton. Deduct this from the quantity obtained and the remainder will represent the increased yield, viz.: 32.4 pounds. Thus, in whatever way the calculation is made, it is seen that the process of diffusion and carbonatation give a largely increased yield."

As Dr. Wiley makes the yield per ton 111.6 pounds, and I make it 130.4 pounds, one of us must be wrong. Granting that 111.6 pounds is the correct figure, let us now see to what juice extraction the yield of 144 pounds per ton corresponds, if at 78.07 per cent. juice extraction the Magnolia process would have made 111.6 pounds per ton. By simple proportion we have 111.6 : 144 : : 78.07 : x=100.73, that is, say, if from 100 pounds of cane 78.07 pounds of juice were obtained, the Magnolia process would have secured a yield of 111.6 pounds of sugar per ton, then, in order to secure a yield of 144 pounds per ton, from 100 pounds of cane 100.73 pounds of juice must be obtained. As, however, it is a well-known fact that in 100 pounds of cane there are only 90 possible pounds of juice, it is impossible to secure more juice than the cane contains, or more juice than there is cane.

Since such a thing as securing 100.73 pounds of juice from 100 pounds of cane belongs to the impossibilities, it is rational to suppose that either the yield of 111.6 pounds or 144 pounds of sugar per ton of cane is incorrect. Which one is incorrect, I will leave to the hand of time to figure.

W. P. KIRCHHOFF.

April 12, 1887.

AVERAGE EXPENSES AND PRODUCTION CF CUBAN CENTRAL SUGAR FACTORY.

With Some Account of the Habits and Condition of Laborers on Cuban Sugar Estates.

(*Continued.*)

We have now reached the period when grinding operations commence, or in other words when the work of the factory begins. We have mentioned already that grinding operations commence in Cuba about the 15th December, and extend up to April or May, according to the season, the size of the crop, and the effective power of the plantation.

As before stated, 36 carts deliver daily at the mill 680 arrobas, or about 152 cwts. sound cane; each cart making four trips each day. This makes a total per day of 24,480 arrobas, or 5,464 cwts. cane.

Our crushing is of double pressure with five rollers, and extracts upon an average 70 per cent. of juice, the remaining 30 per cent. being damp bagasse. This is equivalent to 17,136 arrobas, or 3,825 cwts. juice, and 7,344 arrobas, or 1,640 cwts. begasse; so that one arroba of cane (25 lbs.) produces 17½ lbs. or 1¾ gallons, making 42,840 gallons per working day, and in the same way 1 gallon juice being equal to 1 lb. sugar, we have 42,840 lbs., or about 382 cwts. of sugar.

The reader will at the same time notice that at this plantation or factory, that 25 lbs. sugar is obtained from a little more than 3 cwt. of cane, and that consequently 1½ cwt. clarified sugar is equivalent to 22 cwts. cane. Ten lbs. of juice being the weight of each gallon producing 1 lb. of sugar.

It will be seen from the figures given that for every five bags or 62 arrobas (14 cwt.) of sugar, about 900 arrobas (200 cwt.) of cane has been crushed at the mill, which averages 25 hhds. of sugar per working day. The damp bagasse delivered from the mill, as already stated, is equivalent to 30 per cent. of the gross weight of the cane. When dried for fuel at the sugar kettle furnaces it loses 50 per cent. of its weight, that is 3,672 arrobas, or 15 per cent. of the gross weight of the cane. The ashes from this begasse weigh on an average 120 arrobas, or 3,000 lbs., which is heaped to be used for fertilizing. After being mixed and prepared with 60 per cent. of manure and other substances, it is distributed over six acres of cane field. Three tons of dried bagasse used as fuel is equal to a ton of coal on an average.

Though we have said that the grinding season in Cuba extends over four or five months, we generally find that the weather, and other circumstances, only allow about 100 days

for good work. Consequently we take this figure as the basis of our operations at our Central Sugar Factory.

Cane purchased and delivered at the crushing mill conductor* —14,400 loads sound cane in 100 days' work, weighing net: 2,448,000 arrobas, or 546,428 cwts., at $2 50 per 100 arrobas, or 2,500 lbs=10s. per 23 21-100 cwt.=$61,200†=£13,784.

GRINDING AND FACTORY EXPENSES.

General:		
1 Manager	$2,500	£563
1 Bookkeeper	340	77
1 Accountant	200	45
1 Cane-weigher	425	96
1 Carpenter	180	40
1 Mason	140	32
2 Cooks	250	56
1 Blacksmith	160	36
2 Watchmen	250	56
1 Messenger	75	17
80 Messes at $4 each per month	1,600	358
Government and city taxes	1,000	224
	$7,120	£1,600
Crushing mill:		
1 Chief engineer	$ 500	£112
1 Assistant engineer	400	90
12 Hands at the crushing mill departments	1,350	304
8 Hands carting bagasse	800	180
Oils, paints, oakum, etc.	200	45
Brushwood for boilers, etc.	1,000	224
	$4,250	£955
Sugar house:		
1 Sugar-maker	$1,200	£270
1 Assistant sugar-maker	400	90
40 Hands at sugar-house departments	4,500	1,020
Lime, twine, marking ink, etc.	150	34
12,500 empty bags at 25 cents each	3,125	704
Filling, weighing, sewing and marking the sugar-bags	400	90
	$9,775	£2,208
Seaboard or Market:		
Railroad freight to seaboard	$7,464	£1,680
Storage at seaboard	3,110	700
Brokerage on amount of sales	484	110
	$11,058	£2,490
Grinding, manufacturing, and marketing expenses	$32,203	£ 7,253
Cane ground	61,200	13,784
Total gross expenses	$93,403	£21,037

PRODUCTION.

42,840,000 lbs.=1,713,600 arrobas=382,500 cwts. juice=70 per cent.
18,360,000 lbs.= 734,400 " =163,928 " bagasse=30 per cent.

61,200,000 lbs.=2,448,000 " =546,428 " cane, gross weight.

* On this sugar plantation the colonists have no carts or oxen of their own. The owner of the lands provided them with the 36 carts and the 72 yoke of oxen, charging them in account current at the rate of 70 cents per trip.

† In converting the Spanish dollars or pesos into English sterling, the Cuban market par value has been taken. Consequently £1=$4.44.

The above given amount of juice has rendered the following quantities of sugars :

2,998,800 lbs.=119,952 arrobas=26,775 cwts.=70 per cent. centrifugal sugar.
856,800 lbs.= 34,272 " = 7,720 " =20 ditto ditto molasses ditto.
428,400 lbs.= 17,136 " = 3,835 " =10 ditto ditto molasses.

4,284,000 lbs.=171,360 " =38,320 " sugars packed and sold, as follows:

9,673 bags‡ centrifugal or clarified sugar, No. 11 D.S., pol. 96 deg., weighing net:

119,952 arrobas or 2,998,800 lbs. at 5 rs. per arroba of 25 lbs., or 2½ cents per lb.	$74,970	£16,885
2,767 bags centrifugal molasses sugar, No. 9. D. S., pol. 87 deg., weighing net:		
34,272 arrobas or 856,800 lbs., at 3½ rs. per arroba, or at 1¾ cents per lb.	14,994	3,377
12,440 bags§ at 40 cents each	4,976	1,120
252 hhds. centrifugal molasses gauge net, 42,840 gallons, pol. 42 deg., at $8 per hhd. of 170 gallons‖ delivered at R. R. Depot..	2,016	454
Total gross production	$96,956	£21,837

The above production shows that each caballeria de tierra of 33 acres from the 40 devoted to cane have rendered a little over 62 hogsheads or 310 bags of sugar; but if we take into account that the colonists at the plantation control 50 caballerias, or 1,666 acres, then the average production to each caballeria of 33 acres hardly reaches to be 50 hogsheads, or a little over 24⅘ bags sugar.

LIQUIDATION.

Total gross production of the estate	$96,956	£21,836
Total gross amount of expenses	93,403	21,037
Net profits	$3,553	£799

From said figures we come to the conclusion that the estate has rendered for a year's work an apparent net profit amounting to $3,553, or £800; but if we examine the matter in a close business-like way we will find out the results to be of a most disastrous character. Let us only figure out the interest to which the large amount of money invested in the estate is entitled to.

INTEREST ACCOUNT.

Value of 60 caballerias de tierra, or 2,000 acres of lands, embraced by the estates, at $1,500 caballeria, or $45 each acre	$90,000	£20,270		
Rate of interest: 6 per cent. per year¶			$5,400	£1,216
Value of buildings, machinery and implements	150,000	33,784		
Rate of interest: 6 per cent. per year			9,000	2,042
	$240,000	£54,054	$14,400	£3,258
Apparent net profits reported			3,558	799
Actual loss			$10,842	£2,459

‡ There is a difference of ⅜ cent per lb. in the market price in favor of sugars packed in bags as compared with those packed in hogsheads or boxes on account of the cost of the package.

§ Equivalent to 2,487 hhds. sugars of 62 arrobas each.

‖ The Cuban domestic hogshead holds 175 to 200 gallons molasses; but as molasses ferment easily, they never fill them up to the full capacity.

¶ In Cuba the current rate of interest is generally 12 per cent. per year, and the legal rate is 8 per cent. per year. In exceptional cases 6 per cent. is accepted, and we have here taken this rate as the most moderate one ruling.

Such a statement plainly shows that the owner of this central plantation sugar factory has paid to his colonists an extravagant price for their cane. If he had bought the cane at $2 50 per 100 arrobas in place of $2.50, he would have realized a handsome profit from his investment. To this, he may answer that competition compelled him to allow such price, as his colonists bound him by written contract to pay the same price ruling in the neighbourhood, and which was considered to be in accordance with the sugar market prices. Consequently, in this case, the colonists have had the full benefit afforded by the sugar market, having the use of the lands, machinery etc., for nothing, or, in exact words, for only $3,558, or £799.

At any rate, the history of the crop realized by this central plantation sugar factory plainly shows that the system can be established and give splendid profitable returns by practical experience, aided with judicial management. But, at the same time, this shows the planter or company, wishing to establish the central plantation factory system, that it is not in every and all cases where the plan gives profitable results. It is necessary to own good lands and advantageously situated; secure smart and hard-working colonists, and command plenty of money, so as not to be compelled to borrow the same in the market. Just for curiosity sake, we will here give out a liquidation of a sugar and molasses seaboard merchant contract in Cuba, with a planter of good financial standing, that borrowed $30,000, or £6,756, in advance of the crop, and payable with the very first sugars and molasses to arrive in the market:

Dr.

Cash advanced	$30,000	£6,756
Four months—interest at 1 per cent. per month	1,200	270
¼c. per lb. from amount of sales—sugar	3,100	698
$1 per hhd. from amount of sales—molasses	160	36
2½ per cent. commission on $30,000	750	168
	$35,210	£7,928

Cr.

4,000 bags centrifugal sugar weighing net:		
49,600 arrobas, or 1,240,000 lbs., at 5 rupees per arroba, or 2½c. per lb	$31,000	£6,980
160 hhds. molasses, at $8 each	1,280	288
	$32,280	£7,268
Less ½ per cent. brokerage	161	36
	$32,119	£7,232

Balance in favor of seaboard merchant, $3.091, £696. To balance this amount the planter must continue delivering sugar to the seaboard merchant under the same conditions stipulated above. The reader will plainly notice that our planter, for the benefit of using $30,000 for four months, has been compelled to return $35,210, or, in other words, paid a premium of $5,210,

And it should be understood that in Cuba, that is considered to be a contract under very favorable terms for the planter. A planter, of a poor financial standing, would have to pay 1¼ per cent. monthly interest and ½c. per ℔. from the value of the sugars, besides mortgaging the plantation in a legal way. Unfortunately, in our days, this is the position of the majority of the Cuban planters, as well as at many other sugar-producing countries.—*Sugar Cane.*

———o———

BEE REARING.

A colony consists of three different kinds of bees—workers, drones, and the queen or mother bee—and the whole of the bees in the hive are her progeny; mention must be made of the tremendous mortality during the summer months, which is so great as to entirely re-people the hive about every sixth or seventh week, rendering the importance of the mother bee at once recognizable. Should any accident happen which deprives a swarm of its queen, it will very soon die a natural death. The term mother-bee is, strictly speaking, the more correct, for her sole province seems to be that of depositing eggs. She first examines the cell, and then passing over it curves her long body into it, and upon its withdrawing the egg may be seen, a small speck, attached to the center of the cell. Some writers (principally of the old school) say that she is the ruler of the hive, in the sense of directing all its labors, but I have not been able to ascertain that such is the case, and I am quite satisfied that all the labors of the hive, except brood rearing, proceed just as well in her absence as in her presence; her whole duty seems to me to be to lay eggs, the task of nursing or rearing the brood and all the other labors of the hive devolving upon the worker bees, which are said to be undeveloped queens—that is, they possess in embryo all the organs of the queen. This opens up quite a field for research, and it seems truly wonderful to find that the fully developed insect emerges from the cell in five days' less time than the undeveloped one does. Any egg which will produce a worker will produce a queen.

The importance of having in every hive a good and prolific queen at once presents itself, and the careful apiarian will always have a few spare queens on hand for emergencies; for queens often turn into drone layers, when they are useless and must be replaced; some are born with imperfect wings or other deformity, and quite a number are lost during their "wedding flight," either by being snapped up by birds, by mistaking their hive, or other accidents to which they are particularly liable. Others again may have their wings injured in the hive, and when they attempt to come forth with a swarm

are lost in the grass, if such is permitted to grow about the hives. In the latter case the swarm will return to the hive, and probably come forth with the first queen hatched, which will be on the seventh or eighth day after the swarm had previously issued, The important work of egg laying should not be interrupted if it is avoidable. When a swarm issues from a hive or the queen is removed or injured, a period of from six to seven weeks will elapse before the progeny of her successor will hatch out. Under the most favorable circumstances five days will elapse after the swarm has issued before the young queen will leave the cell, on the third day she will be fertilized, ten days after that she will commence depositing eggs, which in twenty days will hatch; and, when we bear in mind the tremendous mortality in the hive during certain periods of the year, the importance of having a fertile queen introduced and accepted cannot be over-estimated.

Whenever we open a hive, and all hives are opened and examined in our apiary every week, we ascertain if the queen is all right. It is not always necessary to see her majesty, indeed she is seldom looked for. A frame from the brood chamber is examined, and if eggs are observed in the cells she was all right three days previous at the furthest; but if no eggs are found in the hive, a frame containing eggs or very young larvæ is inserted and examined next day. If it is observed that queen cells are being built upon it a laying queen is caged upon the comb, whom the bees will very soon release. The mere presence of eggs, however, is not always to be accepted as an indication that the queen is all right. As before stated, the worker is an undeveloped queen, but she can be so far developed to enable her to deposit eggs to all appearance similar to those laid by the queen; these will produce drones only. Fertile workers, as these laying bees are called, appear in a hive from which the queen has been lost at a time when there is no unsealed brood or eggs present, and they are consequently unable to replace her. It may be several of the workers will usurp her place and functions, whether it is from ambition or not I am not in a position to determine; but they will seldom accept a laying queen or even a queen cell which may be inserted will be almost immediately torn down and destroyed. During my first year of bee keeping a swarm got into this state, and after losing two queens and two cells, I united them with another colony and they did famously. When they are in this state it is useless according to Root, giving them a small piece of brood comb to raise queens from. To make a sure thing, he says, "Give them at least three good frames of young brood and bees. This," he adds, "is like starting a new colony—but it is the cheapest way." When one sees a number of eggs in a single cell and others again with none, or those laid in worker

cells are being capped over with the raised convex capping, showing they will produce drones, he may suspect the presence of a fertile worker, and as she is exactly similar to other workers, it is useless searching for her, when I should advise him to do as Root recommends.

Sometimes it is found that certain queens are not nearly so prolific as others in the same apiary; others again may not produce such good workers, the temper of some swarms may be quite vindictive and spiteful, or it may be desired to improve the breed. Any of these deficiencies may be remedied by removing the queen and replacing her by a selected one. Professor Cowan says: "Success in honey-getting will be in a direct ratio to the vigor and capacity of our queen, and the hardiness and number of her offspring. In order, therefore, that we may attain the desired result, queens should be reared only from specially selected colonies possessing in a marked degree the quality we desire to perpetuate."

Whilst we are careful to select the queen whose progeny is to become the mothers it is just as requisite that the drones who are to meet these queens should be just as carefully chosen. Of course it is impossible to make an absolute certainty that the young queen shall meet any particular drone, as the act of impregnation takes place upon the wing. This seems to be one of those wonderful provisions of nature to prevent in-breeding, and consequent deterioration of the stock. Many have been the attempts to procure fertilization in confinement; wire cloth houses of considerable dimensions have been constructed, in which queens and drones could take wing together, and partial success has been claimed. But it seems to me that if the success had been even partial, the advantages to be obtained are so manifest and important that it would have been sounded forth with trumpet tongue, and would have been followed up instead of allowing the results obtained to become simply a recorded fact or simple assertion. Doolittle says, "that although he has succeeded in getting queens and drones to embrace and fall together, yet in not a single instance did fertilization result." Nature has provided that they shall rise upon the wing and soar away together for some considerable distance; were it otherwise it seems difficult to imagine how a queen could avoid the inmates of her own hive. The time she is away from the hive is variously stated to be from ten to forty minutes, if she is upon the wing the whole time she might travel miles away. When leaving the hive she attracts no attention, but comes forth upon the alighting board and tries her wings for the first time by taking short flights and hovering about the entrance, minutely and carefully examining the hive just as any other young bee does when taking its first flight, in order that she may be able to return to the

exact spot from which she set out. She, however, shows more care and thoroughness in her examination of the vicinity, and will fly round and round for a considerable time, taking its bearings and closely examining every landmark in the vicinity. She seems to be aware that her life depends upon her returning to her own hive, and if she mistakes the hive she will receive different treatment than any other young bee, for when very young they may enter almost any hive in the apiary without interference; not so with her, however—she would be met at the entrance and stung to death without ceremony. It is, therefore, not until she is perfectly satisfied of her ability to return to her starting point that she allows herself to lose sight of her hive. Now all this time she is perfectly unnoticed by the drones which may be flying about, indeed were it otherwise it will easily be seen it would be impossible for her to take her bearing with sufficient accuracy to enable her to return. I imagine that when she has satisfied herself regarding her ability to return, she gives forth some peculiar note which at once attracts the attention of the drones flying in the vicinity until one succeeds in effecting its purpose; they fall together to the ground, when she tears herself away, leaving her helpless mate to almost immediately expire; she has been observed upon her return to have attached to her body the generative organs of the drone, which is shortly afterwards absorbed and becomes a minute sac inside her body, and impregnates each egg as it passes from the ovaries. Impregnation only effects the worker progeny. A black or common queen impregnated by an Italian drone will produce hybrid workers and pure Italian drones. An unimpregnated queen will produce drones only of her own variety. This interesting fact explains how it is that some queens suddenly turn drone layers and how it is that an ordinary queen can cause her eggs to produce either workers or drones at will. It also shows why but one act of impregnation suffices for her lifetime; although it has been known to take place a second time, but that only after an extraordinary and compulsory cessation from her maternal duties, when, I presume, the sac of seminal fluid had become exhausted or dried up, whilst the queen was in full vigor, and she was thus compelled to come forth a second time for fertilization. But such cases are extremely rare, and she will generally become a drone layer and consequently useless, and should be at once replaced. In September last I procured two selected Italian queens for the purpose of Italianising my apiary, and introduced them to two strong colonies of blacks, when they at once commenced laying. In one hive I always kept two frames of drone comb in the center of the breed nest which, as soon as they were filled with eggs, I removed, and placed in one of the black colonies, and inserted another sheet

of drone comb in its place carefully, keeping down the production of drones in the black swarm by cutting the heads off the drone brood, or cutting out the drone comb altogether, so that I had the majority of my thirty colonies rearing the Italian drones. Any to which I could not give Italian drone brood I took good care had no means of raising black ones. I thus secured a fair measure of success, and will have the whole of them Italianised within a month or two. I might have done this sooner, but thought it better to wait till the main honey crop was over.

The method we adopt of raising queens either for ourselves or for sale is to place a frame containing a strip of foundation comb about two inches wide in the center of the brood nest of our choice Italian queen, and we watch it until it is drawn out and the queen has commenced to deposit eggs in it. We then make an artificial swarm or remove a queen from one of the hives and give it this frame with the strip of comb containing the eggs; but before giving it to them we enlarge a number of cells in the position we desire the young queens to be placed; they will rapidly take the hint and draw out the cells as desired. Now there are three courses open to us, each of which we have practised, and each giving the same amount of success; the first we did was to cut each cell off as soon as it was sealed over, and place them on each frame. The bees soon make the fastening secure. Our first batch of cells was six, and we were thus able to make six nuclei, but we found some of the nuclei tore down the cells, so that I would advise others who might be disposed to follow this practice not to make out as many nuclei, as they have cells to insert, so that if the first one is torn down another will still be available for insertion. Our nuclei is formed in full sized hives with a division board, and consist of a good quart of bees, to which are given two frames of hatching brood besides the one with the queen cell attached, and one frame with a starter of comb foundation one or two inches wide. This gives them something to do until the queen is fertilized. As soon as the last frame is drawn out the division board is set back and another is inserted, and so on till the hive is full. If it is desired to push the hives forward frames of hatching brood are given instead of empty frames, and starters, if the season is not too far advanced. The surplus box is then put on. Another system of inserting cells is to cut the cell out as soon as it is sealed over, and place it in the queenless hive, either caged up so that the bees cannot tear it down or simply pinned on the comb. The bees will soon either secure it in its place or destroy it, when another must be given them. Should the cell be caged a supply of honey must be placed in the cage for the use of the young queen when she merges, for although the bees may feed her, it sometimes

happens they neglect her, when she will, unless immediately attended to, starve to death. The plan we prefer, however, is to raise our queens in a lamp nursery. This is made in accordance with the instructions given in the *A. B. C. of Bee Culture*, by A. J. Root, and consists simply of a hive made of tin with double walls giving a space of about one inch between the walls, round the ends and under the bottom for the circulation of hot water; a lamp underneath enables us to maintain the necessary temperature, which should be about 90 degrees. Root says: "The cells will be injured if it gets above 100 degrees, and it should not be allowed to fall below 80. The nursery should be covered by a blanket in order that the interior may be kept at a uniform heat and not affected by climate influences." In using a nursery, as here described, some care will be required to be shown regarding what frames are used in it, for other bees as well as queens will be hatched by this process. In order to prevent this, advantage must be taken of the fact that the queen matures five days before the worker, so that by getting all the eggs deposited about the same time we can return the frame to a hive requiring bees, as soon as the queens are all hatched. To do this we place a sheet of comb foundation in the center of the hive containing the imported queen, and as soon as eggs are deposited therein it is removed and placed in a strong queenless colony which has had all the brood removed from it. At once a large number of cells are started. On the fourteenth day after the eggs were deposited it is removed and placed in the nursery, the queens will come forth on the sixteenth day. The nursery must be frequently examined and the queens at once placed in the hives or nuclei waiting to receive them; a certain number will be rejected and killed, and although we have found the number refused even greater that by the first method, yet the pleasure afforded by handling all our young queens is such that we will continue to use it so long as we can rear enough to answer our requirements.—*M. Leader.*

COMPOSTS FOR POT PLANTS.

One of the most important matters connected with the cultivation of imported or acclimatized plants, which have to be cultivated mainly in pots or restricted borders, frequently under glass or carefully shaded houses, and have, as a consequence, to be constantly supplied with water by artificial means—must always be the constituents of the soil in which they are potted or planted. Although certain plants—the Croton for instance—appear to be not over particular as to what description of soil is used as a basis for a compost; yet even such plants attain to different degrees of health and vigor

when the soil most suited to their nature preponderates. Good culture in all other respects lessens the evils arising from a misapprehension of soils; but when a plant finds its element in this respect, and is otherwise properly cared for, its character is developed with more freshness and vigor.

We believe it is correct to say that the chief features of the horticulture of the present, as compared with that of the past, is, that complicated mixtures of soils and manures are less used and believed in as "the secret" of successful culture, and that the tendency is still in the direction of simplicity in this respect. Mixtures, when compounded from fancy and with little knowledge of the elements of chemistry, may or may not be compounds of evil. After many years of extensive practice, we are thoroughly convinced that the mixing of different sorts of soils and manures for potting plants in general is an evil to be avoided, and feel certain that a plant that thrives in loam will thrive better in it ultimately—make a more healthy and robust plant—if there are no animal or organic manures mixed with the turfy loam. We of course mean all organic manures of a rapidly changing character, which putrifies, even though in that process the substances formed are highly important to plant life All such, and humus of every description, are best left out of the soil in which all the slower growing and more hard-wooded plants are potted, if they are to be healthy, floriferous and long-lived. By so doing, the soil runs far less risk of becoming what is well understood by the term soured, and, of course, unhealthy. It may be asked, are the excrements of animals and decaying vegetation not beneficial to such plants? Undoubtedly they are, but not mixed in with the soil in a narrow, deep vessel like a flower-pot. Such highly stimulating, and more or less fermenting substances, are best applied as a top dressing when the plants require it. The turfy loam generally used for potting, possesses, at first, much organic matter, of a less rapidly changing (because, to some extent, differently incorporated with the soil), as well as of a more natural character; and, as a rule, no other manure need be mixed with the ball of earth in the pots, unless it be of a less rapidly changing character, such as ground bones. Take, for instance, a Croton and a Dracæna—plants of very diverse character. They thrive splendidly in light, turfy loam, and require nothing else till their pots get pretty well filled with roots. Then a top dressing of rich manure is of immense benefit to them, which is mixed with the soil at the time of potting, and is not only unnecessary, but positively injurious. The roots which these two plants make in the loam, pure and simple, with perhaps the addition of some charcoal and bones, are far more numerous, and of a different character to those produced in soil made rich and soft with rapidly decaying

manure, in which the roots are long and less twiggy, escaping more rapidly down among the drainage into simpler and sweeter fare.

As a rule, we neglect far too much of nature's rule of potting and nourishing her children. We put manure of a too gross nature into the soil; nature lays it on the surface. We give a narrow, deep body of soil, with comparatively little surface exposed to the air, and that little is far too often a mass of gangrene and slime; on the other hand, nature, as a rule, gives a shallow body of earth, with a great wealth of surface clothed with living verdure of some sort. In all these respects we cannot, in small gardens or houses, follow the lead of nature in the culture of plants in pots. But the further the departure from her ways, the more likely we are to be in error. We can, however, top-dress more and mix less humus in our soils. Who will say that flower-pots would not be better if made a little shallower and a little wider? With regard to the mixing of stones or charcoal, or clean broken potsherd, this can be followed without any offense to the eye, or any extra space. This we have come to regard as a cardinal point in the pot culture of nearly all plants that are not of the grossest and most ephemeral kind. Who that has much to do with plant-growing and potting has not noticed that a plant that has clean crocks, or, best of all, charcoal mixed to a liberal extent with the soil in which it has been potted, has always been in a more satisfactory condition the next time it required a shift than when these substances find no place in the soil? Take any hard-wooded flowering or ornamental foliage plant, and in potting it fill one side of the pot with soil in which the charcoal is liberally mixed, and the other with soil devoid of that substance, and in twelve months, when the plant needs another shift, it will be found that there are double the number of rootlets on the side of the charcoal to what there is on the other. Wherever a few pieces of broken pot or charcoal are found in the ball or plant, there the roots are found to muster in greatest numbers and health.

The mixing of these substances, in imitation of nature's prodigality, is not practised to the hundredth part in plant culture that its good effects demand. Charcoal has a wondrous charm for roots, and is of the very foremost importance in the soil of nearly all pot-grown plants. It has a beneficial mechanical effect; has a sweetening tendency; is highly useful, absorbing ammonia and other plant food from air and water and from all decaying substances in its vicinity, while its own character is most enchangeable. It prevents stagnant water, and being such a storehouse, is a safeguard against extreme drought. In the case of nine plants out of every ten, it would be well if charcoal formed a fifth part of the whole compost in which they are potted.—*Indian Gardener.*

MANURES FOR VINES AND PEACHES.

For vines and peach trees I mix the following materials in the following proportions: 4 bushels of lime, 10 bushels of good fresh soot, 20 bushels of wood ashes, 2 cwt. of guano, or 6 cwt. of night-soil. Put water on the lime to slack it, then carefully mix all the materials well together, and as soon as it has got well heated, turn it over three or four times, when it is fit for use. Put the mixture about 1 inch thick all over the vine borders, both inside and out, and then lightly fork it in. After this operation give the inside a good watering with diluted liquid manure. I give my vine borders a dressing every year with this manure as soon as the grapes are cut, and have used this first-class fertilizer for many years with the best results. It destroys insects in the soil and prevents milldew.—*Gardeners' Chronicle.*

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M. Licht, in speaking of the contemplated changes in the German sugar duties, and their mode of levying them, says: "The proposed new law on sugar duties sent in to the Federal Council includes a tax on beets of 50pf. per cwt., and a drawback on export of 5 marks per cwt. of sugar, along with the introduction of a tax on consumption of 5 marks per cwt. on all sugar passing into use in Germany. According to the results of last year's working, this system of taxation, supposing the cost of collection, etc., to be the same, would give the following figures, which also contain those of the current year for the sake of comparison:

	Present mode of levying the tax. viz.. 85 pf per cwt of beets and 9 marks drawback per cwt. of sugar exported.	Government proposal. viz. 50pf. tax on beets. 5 marks on consumption, and 5 marks drawback on export.
Receipts from the tax on beets	141,000,000	83,000,000
Tax on consumption.....	.....	40,000,000
	141,000,000	123,000,000
Deduct drawback on 12,000,000 centners sugar exported	108,000,000	60,000,000
Leaving	33,000,000	63,000,000
Deduct cost of collection.....	6,000,000	6,000,000
Net yield..... ...	27,000,000 against	57,000,000

Calculating 8.2 cwts. of beets to 1 cwt. of sugar, the tax per cwt. of sugar is .....7m. 05pf. against 4m. 15pf.
and the excess on that exported is 1m. 95pf. against 0m. 85pf.

Consequently, the manufacturer must obtain in the open market 1m. 10pf. more than at present to prevent loss from the proposed alteration in the duties."

IS BRAZIL A FERTILE COUNTRY?

There is a very generally received opinion, in the United States and Europe, that Brazil is is a wonderfully fertile region; many persons, well-informed ones too, probably regard it as the richest land in the world. There are plenty of authorities to support this idea. Scores of travellers have described its exuberance in glowing terms; cyclopædies and school-geographies have pictured the undoubted luxuriance of its forests and prairies; it is known to be the great coffee-producing country of the world, and its sugar, cotton and tobacco have long figured in commerce; the Brazillians themselves are thoroughly convinced that the agricultural resources of the empire are boundless, only needing an influx of foreign labour to develop them. In venturing a somewhat diverse opinion I shall be regarded as a heretic, unfriendly to the country and unworthy of attention. But let us look at the facts.

At present agriculture in Brazil is nearly confined to a comparatively narrow belt extending along the coast from Cape St. Roque southwards. This region is, in the main, very fertile; the decomposition of the gneiss rocks, which form most of the mountains and hills, has given rise to a rich reddish soil, generally deep and affording excellent crops of coffee, cane and other products even with the miserable no-cultivation which is in vogue. There are, however, considerable tracts of stony or badly-watered land, which, collectively, are of great importance, but must practically be subtracted from the agricultural lands of the coast region.

The Amazon valley is a vast steaming forest, generally (in Para at least) with the poorest possible soil; luxuriant as the vegetable growth is, it covers a ground composed of sharp white sand, or at best, of a poor clay, almost devoid of the elements which nourish forests in other parts of the world. Most of the few plantations are on the alluvial iron-bottoms, or tracts of *terra preta* (black land), which was formed centuries ago by the rubbish and rotting palm thatchets of Indian villages. Nevertheless, the Amazon valley is well adapted for certain crops, and with the introduction of improved agricultural implements, it will give good returns to the farmer. The forest is nourished, not from the ground, but by the air, which is always surcharged with moisture; some kinds of trees will flourish for weeks after they are cut. This excess of moisture also tends to support the growth of certain cultivated plants, especially sugar-cane, coffee and tobacco. And if the ground, ever this poor clay and sand, were properly prepared to receive the roots of the plants, good crops could be obtained almost everywhere. As it is, comparatively little of the land is regarded as fit for plantations, and these are generally abandoned after a few years.

All the great interior region, comprehending the Brazilian table-land, is covered with *compo*, interrupted here and there by little patches of forest on hillsides and along the banks of streams. Botanists who have travelled through the *sertao* have been struck with the immense variety of families and species to be found among the *campo* plants, and they have naturally fallen into the error of regarding it remarkably adapted for plant growth. The tauth is that nearly all the Brazilian table-land is a howling sandy desert with a wonderfully rich desert vegetation. The botanists may find a thousand species of plants on a square league of land; but I doubt if the same land would produce a thousand bushels of corn or potatoes. Much of the country is adapted for pasturage, but only in the wet season; during the dry months cattle must be driven away to the lowlands. The little strips of forest-land can be used for planting and in some places they give good crops; but they form only a small part of the whole. A large district comprising part of Ceara, Piauhy, Rio Grande do Norte, Pernambuco and Bahia, are subject to periodical droughts, which destroy the cattle and plantations and reduce the entire population to the utmost poverty—often to starvation.

Two elements which go far to determine the fertility of Europe and the United States are almost or quite wanting in Brazil; the winters and the action of earth-worms. Our northern winters are of immense assistance in the formation of vegetable mould. The herbs, grass and forest leaves die away in the autumn and lie in thick beds on the ground, where they are speedily covered with snow; successions of thaws, and finally the spring rains, reduce these leaves to sudden masses; as the sun returns they decay slowly, forming a rich, dark soil, rich with the elements of new plant-growth. In the tropics, the leaves and herbs fall singly, are baked in the sun, broken by the wind, and finally pass away almost entirely in the form of gasses, hardly anything being added to the soil. Add to this fact the influence of frost in breaking up and disintegrating of rocks, and the importance of winter cold in the formation of soils will readily be seen.

The elaborate studies of Mr. Darwin have shown that the despised earth-worms are the preservers of our farms and gardens; unseen workers, they are ever bringing up the rich subsoil and strewing it over the surface; boring the ground in all directions, they keep it loose and soft, and fit it for the roots of even tender plants. Now, earth-worms are by no means common in Brazil; they are altogether wanting in the *campos*, and even in the forest they are rarely seen except along the banks of streams. Probably the sandy soils so prevalent in Brazil are ill adapted to them; very likely, too, they would be of less use in ground which, by its nature, is friable and easily pierced

by roots. At all events they are an element, of greater or less importance, which is nearly wanting in Brazil.

I have written all this in no harsh spirit—rather as a friend of Brazil. I wish to point out a mistake which might in the future lead to grave troubles. The first element of success in the individual, or in a new country, is a thorough knowledge of the resources of the weak points which must determine success or failure. Brazil has great resources; it has elements of agricultural wealth which are far from importants; but by overrating its own riches it may be tempted to waste them; by resting too securely on agricultural industries it may neglect the no less important ends of manufactures, mining, grazing and commerce. Brazil is far too large and important a country to be content with one element of success. She should seek for all. HERBERT H. SMITH.

THE COST OF A DEMERARA SUGAR ESTATE.

(From the Demerara "Argosy.")

SIR,—I see the *Produce Markets' Review*, of December 6, wishes for information concerning capital invested in a Demerara estate. Below is the cost of one to make 1,000 hhds. or 900 tons of Sugar per annum. What such an estate could be purchased for just now would be certainly much less. The generally accepted selling price of a Demerara estate, viz., "One year's gross crop value," would make it about 80,000 dollars, but proprietors are hardly yet reduced to sell at such a figure. The *P. M. R.*, in comparing cost of production in Demerara and Barbados, puts the profits, on a 1,000-ton estate in the latter place, at £2,500. He cannot be aware that a 1,000-ton estate in Barbados would cost £100,000 at least; and that, until the past year, it would have given its proprietor £10,000 to £15,000 per annum. It is this land value which causes the distress amongst the proprietary body there. Most estates are owned by families whose capital is invested in them at interest. With present prices and present system of manufacture, the Sugar pays the cost of production and leaves a small surplus, but quite insufficient to pay the interest on the capital, which is usually about £5 per hogshead. By erecting Central Factories, with improved machinery, Barbadians will obtain 10 per cent of Sugar from the Canes instead of 5 per cent as at present, and the price of land may then remain at nearly £100 per acre. If the present system be continued, the existing proprietors will have to live on their properties, and out of them, or let them go out of their possession.

The *P. M. R.* appears to think that the Sugar made into rum could be retained as Sugar. This may be possible in the future, but at present we cannot manufacture Sugar without debasing

at least 40 per cent of the weight recovered. As to the charges imposed upon the Sugar hhd. from the time it leaves the estate, until it reaches the customer, there is a good deal of mystery in their nature. To the uninitiated, 1s. 6d. per cwt. freight, 3d. insurance, and 3d. commissions, dock charges, &c., would appear to be sufficient, as £2 per ton appear to pay very well for outward cargoes, even if the vessel returns with ballast; but when items such as primage, effecting insurance, del credere, brokerage, discount, &c., creep in, the total charge per cwt. mount up sometimes to 4s. About a year or more ago there was a correspondence in the *P. M. R.* about these charges which was never satisfactorily concluded. Perhaps the editor will publish a clear account of the various charges necessarily incurred by one cwt. Sugar in transit from the estate to the buyer. Then one of our correspondents will give the actual charges, and some expert will explain to the unlearned what they mean, who gets the money, and what he gets it for.—I am, Sir, your obedient Servant, C.

COST OF DEMERARA ESTATE OF 1,000 HHD.

	Dollars.
Purchased 750 acres land at $10	7,500
Cultivating 500 acres till reaping begins, at $100	50,000
Buildings to make 50 tons per week at £30 per ton	72,000
Dwellings for 500 labourers, 200 rooms at $100	20,000
Hospital	8,000
Managers' and Overseers' Dwellings	13,000
Stock	2,000
Punt for Canes $8,000. Do. Shipping $3,000	11,000
Immigration expenses first year	6,000
Sluices, kokers, for drainage and water supply	10,000
Contingencies 10 per cent on $199,500	19,950
	$219,450

To the Editor, Argosy: The current charges for bag Sugar consigned to Merchants in the old way, and on the basis of a price of 5s. per cwt. should work out as follows:

	s.	d.
Freight per Royal Mail Steam	1	4½
London wharf charges, with one month's rent	0	3½
Marine Insurance (R. M. S. all the year, 12s. 6d. per cwt.)	0	1½
Fire Insurance in London, at 6s. per cent per ann.		
Brokerage at 1½ per cent	0	1
London public sale charges	0	0½
Merchants' Commission at 2½ per cent	0	4½
	2	3½

The charges for hogsheads come to more, and the housing and other charges at the docks are considerably higher, both for hogsheads and bags, than those given above, after allowing for the "discount" of 1s. 6d. per ton. The dock charges, however, cover two months' rent, and the fire insurance cost less there. Primage and effecting insurance appear quite unnecessary charges; and as no credit is given in the London market,

no del credere ought to be debited to the planter. "C," in his original letter (quoted at length in the *P. M. R.* for the 29th November, 1884, and remarked on in the issue of the 6th December), does not appear to have allowed enough for dock and other charges hereby about 9½d. per cwt. This would bring up his estimate of the landed cost in London, including all charges, of Demerara Sugar to 15s. 7½d. per cwt. Interest at 5 per cent on the cost of the estate given above would be 2s. 9d. per cwt., which can be included or not according to the views of the calculator on such points. If the Planter extracts the saccharine from the Molasses as the Germans do, there would be no Rum, but the more valuable Sugar instead.

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FORESTS AND CLIMATE.

At a meeting of the Meterological Society of Berlin, Professor Muttrich gave a short historical review of the arrangements in connection with the forest meterological stations in Prussia, seventeen of which were in operation. They were established on as uniform a system as possible over regions of very wide varieties of climate, on plains and at different levels above the sea, in districts having a more continental, and in districts having a more oceanic climate, and in leaf and Pine forests. In all these places, moreover, observations were made according to precisely the same regulations. Each station was twofold, having one equipment in the wood, another in the field, both as a rule at a distance of 200 meters from the edge of the wood. The observations comprised the atmospheric pressure, the temperature of the air and of the ground, the wind, moisture, cloudiness, atmospheric precipitation, and the evaporation of an open mass of water. These observations were made twice a day—at 8 a. m. and 2 p. m. The observations thus obtained were collected at the station of Eberswalde, and published regularly in monthly and yearly reports.

As a result of his investigations, Professor Muttrich had arrived at certain definite conclusions respecting the influence of the forests on temperature, which may be stated as follows:—(1), the forest exercised a positive influence on the temperature of the air; (2), the daily variations of temperature were lessened by the forest, and in summer more than in winter; (3), the influence of the leafy forest was in summer greater than that of the Pine forest, while in winter the tempering influence of the Pine forest preponderated over that of the disfoliaged forest. An attempt to determine the influence of the forest on the mean annual temperature led to no sure results. —*Gardners' Chronicle.*

EUCALYPTUS THE TALLEST TREE IN THE WORLD.

The tallest accurately measured Sequoia (*Wellingtonia*) standing in the Calaveras Grove, California, measures 325 feet, and there is no positive evidence that any trees of this genus ever exceeded that height. Of late years, explorations in Gippsland, Victoria, have brought to light some marvellous specimens of Eucalyptus, and the State Surveyor of Forests measured a fallen tree on the banks of the Watts River, and found it to be 435 feet from the roots to the top of the trunk, The crest of this tree was broken off, but the trunk at the fracture was 9 feet in circumference, and the height of the tree when growing was estimated to have been more than 500 feet. The tree, however, was dead, though there is no doubt that it was far loftier than the tallest Sequoia. Near Fernshaw, in the Dandenong district, Victoria, there has recently been discovered a specimen of the Almond Leaf Gum (*Eucalyptus amygdalina*) measuring 380 feet to the topmast twig. This tree would over-top the tallest living Sequoia by 125 feet. Its girth is 85 feet, which is less than that of many Sequoias, buts as far as height is concerned, it must be considered the tallest living tree in the world.—*Scientific American.*

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SUGAR IN BRITISH GUIANA.

The weather since sailing of last mail has been to dry for planting operations, but lately rain has fallen in abundance all over the country, gladdening the hearts of our planter friends. The growing crops in this country are described as very fine and above an average. The same may be said of Essequebo, but Berbice has suffered severely from drought, and the rains have come too late to admit of making up leeway. Nothing much doing in the way of sugar-making beyond a few pieces to give plants, and the juice is poor in saccharine. Strange to say, with complaints rife of want of work on the part of transient laborers, we hear great complaints from planters of their work being kept back for want of hands, at fair rates of wages. Some put this down to the very liberal wages which are paid by those prosecuting the minor industries. Where $6 per acre is readily paid for cutting down an acre of sage, ready for fire stick and the fork, and $16 per acre is paid for forking an acre of ground all over (and this work can be done in a fortnight by an able-bodied man, which means $8 per week), the cane planters have, indeed, formidable opponents to compete with.—*Royal Gazette.*

WOOD PULP INSTEAD OF PLASTER OF PARIS.

An important discovery has just been made at the Sognedal pulp factory in Norway, after several years' experimenting, wood pulp being used for the manufacture of the kinds of building ornaments which are generally made in plaster of Paris. The pulp is first ground from wood, and then, by a machine, pressed into any kind of ornament, such as ceilings, friezes, bas-reliefs, rosettes, etc., which are quite as well finished as similar articles of plaster of Paris. Another feature is that the articles made from the pulp show painting or gilding to great advantage. Tests have also been made with regard to their strength, by dropping them from various hights or hurling them against stone walls, the results being highly satisfactory. Thus, for instance, a bar of this material one foot in length, one inch in thickness, and five inches in width, neither broke nor sustained any serious injury on being hurled with full force against a stone wall a couple of yards distant. Naturally, too, this material is far lighter than plaster of Paris, an important advantage, as no great harm would be caused to a person by ornaments made from it falling upon him, which is otherwise with those made from plaster of Paris It should also be mentioned that pulp ceilings, friezes, etc., are, by the hardness and compactness of the material, impervious to wet, and that they may, if desired, be fastened by nails or screws. Finally, the inventors state that ornaments made from this material cost only half the price of similar ones made from plaster of Paris. This discovery will, it is believed, give great impetus to the pulp factories which are now quite unprofitable through the low prices of paper, and the utter failures which have attended the vast production of the latter, direct from wood pulp.

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TREATMENT OF MILCH COWS.

It is a common thing for a farmer who have a number of cows to dry them off afrer eight, ten, or at most twelve months if the greatest flow of milk have passed. This is good policy for those thus situated, as a cow giving only three to five or six quarts daily is worth more to fatten than to keep for what milk she will give. But for a small family, where but little milk or butter is required, a good farrow cow may prove a desirable requisition. A really good cow may be milked two years, or even three or four, with careful management, and give nearly a constant mess during that time. It is the drain on the cow from the calf she is carrying which necesarily shortens the milking period, however good the feeding.

An American contemporary states that during the past season there were put up 48,508,248 cans of tomatoes in the United States, being one-third less than the pack of 1883, the decrease in acreage being heaviest in the Eastern States. It is said that a farmer in Salem country, New Jersey, last season, raised 83 tons of tomatoes on 6 acres of land. The crop was sold in the canning establishment for 7 dollars (nearly 30s.) per ton.—*Journal of Horticulture.* [Why can't something be done with tomatoes here.—ED.]

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PROSPERITY MUST BEGIN AT THE BOTTOM.

When the agricultural community is free from debt and reasonably prosperous, then the whole country will be on the upward grade. Material progress is to be measured, not by great and brilliant speculations on the Stock Exchange, but by the independent condition of the agricultural and laboring classes. Prosperity must begin at the bottom. A state of business which creates a few score or hundreds of millionaires and leaves the masses in debt, is a very deplorable one. To know whether times are good, look at the farmers and see how they are faring. In this connection a brief extract from the report of Hon. John T. Henderson, Commissioner of Agriculture for Georgia, may be interesting:

"The Georgia farmer is improving his condition slowly, but surely. In two years he has reduced his indebtedness 24 per cent. This is a good showing, when we remember that at the close of the war we had to go in debt for everything, and have been paying usurious interest ever since. There is also a steady improvement in raising their supplies at home. A few years ago there was a wonderful change when the oat crop of the State jumped from 2,000,000 to 11,000,000 bushels. Since then the farmers have gradually raised their supplies more at home. It is getting to be an exception to find an all-cotton farmer—that is, a farmer who raises nothing but cotton, and buys everything to make it with. Five years ago it was an exception to find a man who was not an all-cotton planter. There is an increase in the grass acreage, in stock, in corn, in meat making, and Georgia is looking less every year to the Western smokehouses and crops for her meat and bread."

This is an indication of what is going on in other Southern States. Mississippi farmers are establishing creameries and dairies and are shipping hay northward. In Louisiana, where the farmers are diversifying their crops, they are doing well, and when they shall learn to make cotton and sugar as the surplus and not as the sole crop, they will have reached the summit of wisdom. Then they will be independent.