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ANNUAL MEETING IN OCTOBER OF EACH YEAR.

EDITORIAL AND GENERAL.

THE "NATIONAL BANK" SCHEME.

A Bank is the indispensable organ of a mercantile community, by means of which its money capital flows freely where required. It is the distributing reservoir of the irrigant fluid, whereby capital is placed in ready and accessible relation with production and trade. We therefore heartily welcome as many banks, representing solid capital, as the amount of business in the country may encourage to set up their vaults and counters among us. Some scrutiny, however, seems called for when, to the direct functions of banking, it is proposed to add the creation and multiplication of currency by the issue of bank notes. A powerful company are demanding of the Legislature incorporation as a bank of issue. They propose to secure their notes by government bonds deposited with the Registrar, after the fashion of the U. S. National Banks. The objection at once arises that the security is very inferior to that of U. S. bonds—no better at any rate than the average city or county bonds in the States. A commercial flurry in Honolulu which might disable a bank from keeping up payment of specie on demand for its notes would be very apt to so depreciate the market value of the bonds on which they were secured as to make it impossible for holders to realize except at a serious loss. Unquestionably, Hawaiian bonds must be liable to fluctuations of value such as those of a first-class nation will not be. Banks of issue are more or less unsafe anywhere; supplying the promise for the substance, and when the substance must be had, often disabled by the very strait and pressure of the day from affording it. In the broad connections of a continent an issue system may be so perfected that the danger of suspension of specie payments is reduced to a minimum. In our isolation and narrowness the peril is great. The example of California is a wise one for us to adhere to, and avoid bank notes.

A very serious ground of apprehension arises with respect to the kind of coin in which the notes of the proposed bank are to be paid. This apprehension is justified by the fact that the promoters of this institution are the same parties who have contrived, in collusion with Mr. Gibson, and in utter contempt of the views of the business public, to force upon the country this enormous and ruinous flood of short silver which is now deranging our finances and driving up the price of exchange. Do they intend to pay their notes in the same short silver, or in gold? When one presents their promise to pay fifty dollars, will they give him only 100 halves worth $39 50? This the present law allows them to do. They claim to be able to secure any charter they wish. If so, they will likewise be able to prevent any change in the law which constitutes silver legal tender to the amount of fifty dollars. It seems needless to point out that bank notes so payable will be an intolerable nuisance, requiring separate estimates of value for notes of lower and those of higher denominations.

Another evil to be apprehended is that of an artificial inflation of our volume of currency. Besides the gold and silver now here, in amount more than ample for all the business of the country, there are to be added perhaps a million dollars of paper money. There is no principle of economics better established than that a plethora of money enhances prices, and increases nominal values. Rise of prices increases cost of living, wages, and cost of production. This doubly affects the planter. The cost of making a ton of sugar must increase just as the purchasing power of money diminishes. If the planter already can barely pay his way what will he do when, with an artificial plethora of money, prices have risen from five to ten per cent? Only the prices of exports will remain stationary.

The fact is that the whole scheme is one of those commonly successful combinations to divert the profits of the producer into the pockets of the middlemen. Of all devices to rob the laborer and the producer, there is none more thorough and complete than that of an artificially perverted currency, whether it consist of irredeemable greenbacks, short dollars or silver notes representing them. We seem likely to make full experiments for ourselves of this curse upon honest toil.

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ON THE ROOTS OF THE SUGAR-CANE.

The following interesting account of experiments on the roots of Sugar-cane will be of interest to our Planters. The paper was prepared by Mr. Hy. Ling Roth of Queensland, Australia.

"The knowledge of the growth of cane roots being important to planters, the following experiments were made at Foulden Plantation, Mackay (Queensland), with a view of gaining some information on this point.

A. On 20th November, 1882, a cask 30 inches deep, with the bottom knocked out, and 17 to 22 inches in diameter, was filled with manured garden soil well mixed down to 15 inches from the bottom, and sunk into the ground so that the top of the cask was on a level with the surrounding soil. In the cask were planted, 4 inches deep, two Rose-bamboo plants with three good eyes in each.

B. On the same date were planted a few feet distant from the above, two plants of the same variety of cane, with a like number of eyes and placed at the same depth. This plot trenched 4 feet square and 20 to 22 inches deep. The soil was a light black loam for the first 15 inches, then a heavier brown loam, which at 40 inches depth had merged into river sand. As far as has yet been ascertained, this sand extends down to beyond 6 feet. This plot was not manured.

The cask was raised on 6th August and knocked to pieces, leaving a compact mass of roots binding the earth firmly together. The soil was removed by means of washing with water, but the roots were so fragile that in spite of every precaution many were broken off; in fact, from the quantity of rootlets collected in the water afterwards, I should say that fully one-sixth were dissevered. Some of these roots had spread out laterally, and not being able to extend beyond the cask had gone downwards; other roots, again, had gone down at once. As it was not imagined that any roots would have descended to a greater depth than 30 inches (the depth of the cask) no precautions were taken to prevent the sundering of any roots which penetrated below that depth, is was afterwards found that almost all the roots had thrust themselves into the sand below the cask. The cane had been planted late in the season, but had grown fairly well, the diameter of the canes reached 1½ in., but the color of the leaves was pale and unhealthy, having become and remained so after five months growth, owing to the restrictions on the spreading of the roots by the cask. When taken out of the cask there appeared to be more roots than soil, and examined under the microscope, the fine roothairs (trichomes) showed a diameter of one-240th to one-275th of an inch. Where the roots had come across a lump of manure they had formed a compact net-work.

The roots of *B* were raised on 20th August, 1883. In digging out the roots of this cane, which was grown under perfectly normal conditions, ample room was allowed for the lateral roots, which were found to spread to a distance of over 3½ feet. Having found these, I dug down and gradually approached nearer, until having excavated enough soil at a depth of 5 feet, I began to look for tips of descending roots. The deepest root thus touched was at a depth of 4¾ feet, being 5 feet 1½ inches long from its departure from the cane plant to its tip in the sand (Plate II. Fig. 1). Another root (Plate II. Fig. 2*) was 3 feet 10½ inches long, and also grew almost perpendicularly downward. Starting from above again, the roots on the surface were not quite so dense as those in the cask, but were very close to a depth of nearly 2 feet, below which depth they thinned considerably. The cane, although, like the other, planted late, was fairly grown, with a good healthy color in the leaves, about 18 inches higher than the cane in the cask, and the canes from 1¾ to 1 7-8 inches in diameter. In Plate II. the tip of the long root (Fig. 1) was broken off in removal; but Fig. 2 shows the tip intact; its diameter at the broadest part was 5-16th of an inch. Nos. 4, 5, and 6 are tips of roots found at various depths (No. 6 as deep as No. 1); No. 4 are the surface or upper roots, the same as shown in Plate I. The two root stems Nos. 1 and 2 looked very naked; in reality they were not so, but in tracing them back to the planted pieces of cane, all the branches were broken off—their points of disconnection were plainly discernible; the rootlets were exceedingly brittle towards the lower end, and I feared that by attempting too much I might lose all. No roots tipped like Nos. 1 and 5 were found except with a downward tendency, that is to say, I found no lateral roots tipped like those. This, however, does not prove that the cane has two distinct classes of roots, for being very fragile, and being in the loam, which is not so easily disconnected as the sand, I may have missed them in consequence of the tips remaining in the soil.

In the fields, young cane which has sprouted to only 6 to 10 inches above ground will have fine roots going to a depth of 30 inches. All this would seem to indicate that cane like other plants requires plenty of room for the natural spread of its roots. When there was plenty of food and the soil was loose enough to allow of the roots to penetrate with ease, there the roots were thickest: where the soil was not in that condition, or there was no great quantity of food, there the roots were thinnest.

It is much to be regretted that so few writers on the Sugar-cane should have given any attention to the roots. In a new work on sugar-growing, a totally erroneous impression concerning the roots of the cane is conveyed to the mind of the reader. On page 15 a drawing of a cane is given with its so-called root, but the cane, as drawn, only goes so far as to give the point of its attachment to the parent plant-cane, and does not show either the root-stems or the roots. On page 19 another drawing, intended to explain how cane spreads, is also misleading; such a growth is quite abnormal, and might appear once in a man's lifetime. Both these illustrations are taken from "*The Sugar-cane*," written by Porter, and published in 1843. In that work, p. 14, Porter says: "The roots are very slender and almost cylindrical; they are never more than a foot in length; a few short fibres appear at their extremities." These words are copied *verbatim* by the authors of the new work, and how mistaken they are I have shown above.

The only work I have met with where cane is really correctly pictured is a Report by M. Ch. L. Fleischmann. In that Report, Fig. 29 *a* presents the underground attachment of a young cane with its rootlets. This drawing is correct so far as it goes, but if more rootlets had been figured a truer idea could be formed."

We find the above interesting remarks on the root-growth of sugar-cane in the *Gazette*, without credit being given to the publication from which it was taken, though we infer that it was from some Queensland paper. The subject to which it calls attention is one of special interest to planters, although very little has been written about it. In a conversation with Postmaster-General H. M. Whitney of this city, he stated that his attention had been attracted to it, rather accidentally, while engaged in cane planting at Keaiwa, Kau, on Hawaii. His account is given below:

"In 1881, while cultivating and hoeing some sugar-cane growing along the border of a dry gulch, the bottom of which was twelve or fifteen feet below the cane field, I had occasion to dig out a nest of loose stones near the outer hill of cane and on the edge of the ravine. The soil was a soft loam, and the roots easily traced and generally clinging around the stones and boulders. Seeing that these were very long, I pulled my foot rule from my pocket and measured several, the longest being six feet and three inches, or 75 inches from the stalk where it joined the seed. Probably longer roots could have been found, if I had had occasion to dig deeper. At another time and in a different field, I found cane roots six feet in length from the stalk, though only two feet below the service. I am fully satisfied that the roots of sugar-cane, planted in good soil, will grow to be as long as the stalks. And if cane stalks measure ten feet in length, the roots of the plant will be found to be of about the same length. The volcanic earth hills of Naalehu, Hilea and some parts of Pahala, in Kau, Hawaii, furnish excellent localities for examining the length of cane roots. If my memory serves me rightly, Mr. Charles N. Spencer of Hilea some years since informed me that in cutting a road along one of the Naalehu hills, he found roots of old and heavy cane, *twelve feet in length*, below the surface of the ground. Perhaps other planters can give their experiences on this subject, which will furnish a new topic for study.

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PLANTATION AGENCIES.

Nothing could be more unbusiness-like than the manner in which for years many of the agencies of sugar plantations have been undertaken and carried on, without the scratch of a pen to show the terms and conditions that either side expected or assented to. That the planter should have a good stock of blank check books, and that the agent should render quarterly accounts, showing a balance on one side or the other, have seemed to include about all of their mutual or reciprocal obligations. The planter in debt and the planter out of debt occupy, has, it is true, entirely different relations toward the agent, but in either case there is no reason why their respective rights and duties should not be fully defined.

The Chinese rice planter always has written contracts with his factor in which nothing is left indefinite or to be settled by the "custom of trade." He knows, as a rule, how often interest on the balance against him is to be compounded; from what date interest in his favor or against him is to begin to run; whether he is or is not to be consulted as to the sales of his crop; whether he is to have any benefit from exchange, is to pay taxes on what he owes, and so on. He does not generally buy his supplies of his factor, and no question is made of his right to buy them where he can buy to the best advantage.

When the sugar business of these islands began to receive the impetus which the treaty gave it in 1876, the supply of agencies really seemed to exceed the demand—so much so that the agent sometimes feared to demand security for his advances lest the planter might get another agent. Written contracts between the agent and sugar planter are to this day, we believe, the exception rather than the rule. This is not wise. Let every thing in business be done on strict business principles, leaving nothing unnecessarily to be decided by what "was the understanding." If the agent makes heavy advances and takes great risks he must have proportionately large profits from his agency. If, as part of his agency, he claims any of the benefits of exchange, or the right to ship the freight on vessels in which he is interested, or the right to furnish the supplies of the planter, or to sell the crop as he shall think fit, there is nothing wrong in that, but it should be distinctly agreed that he may exercise such rights.

We believe that the custom which even time could not honor, of the factor taking from the foreign consignee a "rebate" or share of the consignee's commission, is happily ended. It would not even bear publicity. No man can serve two masters alike. This truth applies to an agent of an insurance company, who performing his duty to his principal, will get the highest premiums on the fewest risks, and who will pay no losses which fairly ought to be contested. If the same person is also agent for the insured, his duty is to pay the lowest premiums which the risks insured will permit a sound company to take, and to be paid for all losses. It is not enough to say that one who is agent for divers interests is an honest man. Common honesty is, to be sure, always required, but human nature ought not to be tried too far. No one should willingly occupy an equivocal position unless he is selected as an umpire.

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THE DIFFUSION PROCESS.

R. Seig in N. O. Times-Democrat.

When this rational and valuable process was first brought out in Louisiana, under the most adverse circumstances imaginable, every mechanic who had looked into it predicted that it would be the process of the future and that it would revolutionize the whole sugar industry. The only objection then made to it was the expensiveness of the apparatus and some of the minor defects which invariably cling to every new thing at its birth.

These imperfections have been removed, and the sugar industry has been revolutionized, but unfortunately not here. In Europe the diffusion process has at last superseded all other methods of juice extraction, and through it principally the production has been increased within less than ten years about 1,000,000 tons. The total product will be nearly 2,220,000 tons, and of this immense quantity Germany alone produces this year 900,000 tons, of which more than 500,000 tons, or more than the entire sugar crop of Cuba, can be spared for exportation. And yet, notwithstanding this and the low price of four cents per pound for sugar of standard quality, polarizing 95° and 96°, the prosperity of the German sugar industry is so great that the capacity of the old factories has been constantly extended from year to year, and many new ones will be added to their number.

Under these circumstances the French sugar manufacturers were the first to discover that they could no longer afford to lose 15 to 20 per cent of their raw material, as before, by their double and multiple presses. And within a few years not only they, but many other sugar producers, have anxiously studied the diffusion process as the only one which, having made their rival so great, might be counted upon for a similar service to them.

It would take too much of your space if I was to explain why it is so utterly impossible to extract all the juice from the cells of any plant by any pressure, however powerful it may be. The structure of the cells, their combination, and the juice itself, are opposed to it. And all such attempts having proved more or less unsatisfactory, the problem had to be solved in a different manner.

FROM MECHANICS TO PHYSICS.

Or, rather, the substitution of physical to mechanical forces, there was only a short step, and here at last the sugar manufacturers, after experimenting a few years, were more fortunate; they found what they wanted. Two methods had been placed at their disposal—maceration, combined or not combined with mechanical pressure, and diffusion.

The two processes were similar and distinguished principally in this, that maceration was effected in open tanks, mostly placed on different levels, and that in diffusion the tanks were closed and put upon the same level. The exposure to the air by the former was found to be injurious to their contents, and as the machinery was really not as simple as it seemed it was soon abandoned.

In the diffusion process a number of tanks are always connected with each other through valves and pipes, so that a pressure put upon one acts through all simultaneously. In reality diffusion is nothing but a stream of water, beginning at a certain elevation and ending at a lower point, and this stream, in its passage through the tanks filled with sliced cane, absorbs very nearly all the sugar contained in the cane cells, leaving behind in them mere traces of sugar, but a large proportion of the impurities also contained in the cells. This is entirely different from the extraction by the mills which have to burst all the cells to let the juice and impurities out.

Time had shown that heat greatly accelerated the extraction, and as it also protected the juice against fermentation, means were devised to keep the juice, as it flowed from tank to tank, constantly at a higher temperature. As the sugar cane may be kept at a much higher temperature, and as its cells are proportionately larger than the cells of the beet, it stands to reason that the sugar cane is in reality better adapted by nature to the diffusion process than the beet. As the greater heat coagulates most of the albumen in the cells, and as some other impurities are less diffusable than sugar, it is not difficult to understand why diffusion juice should be purer than mill juice; and this, indeed, has been so fully proven by experience and practice that nobody thinks seriously of disputing the fact.

As the experiments here in Louisiana with the machinery used ten years ago could not serve as a criterion for the real capacity of the process, and the efficacy assured to it by later improvements, I shall not refer to them, except in so far as Mr. Minchin, of Aska, who started diffusion several years earlier than we did, has in the meantime thought proper to compare his work with the work done here. But there were really no possible points of comparison between the two, since his sugar-house had a far superior outfit, and especially his evaporation, the most vital organ of a sugar-house, was almost perfect. Even his diffusers, although old and of the most rude construction, were much more correct in principle than ours, even after the changes or nominal improvements made upon them.

In using diffusion or any other method of extraction it is a rule, which cannot be violated with impunity, that at least evaporation sufficient to bring the juice to a certain point of concentration must be provided. Upon this depends not alone the quantity, but the quality of the work.

As Mr. Minchin, who only employed a double effect for this purpose, has been capable of doing this, notwithstanding his less rich juice and his less woody bagasse, without using any other fuel than this, it stands to reason that the Cuban sugar manufacturer will fare still better with his triple effects—his richer juice and cane of a heavier fibre.

From a previously printed report of Mr. Minchin, which he presented with most of his products in different stages at the Exposition Universelle of Paris in 1878, I am enabled to give some details, which will be of greater interest to our planters than our own reports. Mr. Minchin very properly sets out with an

EXACT ANALYSIS OF HIS CANE,

Which, for this purpose, had been divided into three nearly equal parts, consisting of the butts, the middle and top pieces. For the sake of brevity, I shall give only the averages of the entire cane, which were as follows:

	Bagasse fibre	Water	Soluble solids
Average in tops	7.63	79.29	13.08
" in middlings and roots	8.47	75.96	15.57
Average in the whole cane	8.20	76.94	14.86

The bagasse consisted of: Fibre and cellulose, 8.0; inorganic—silix, lime, 0.2; total, 8.2.

The bagasse just after diffusion was composed of: Mineral matter, 0.33; fibre and cellulose, 11.17; bagasse proper, 11.50; sugar, 0.413; glucose, 0.076; gums, albumen, etc., 0.245; ash, 0.066; water, 87.700.

As the cane itself had contained only 8.2 bagasse proper in 100 pounds, it will be seen that the above 100 pounds of diffusion bagasse was in reality derived from 11.5 multiplied by 100 divided by 8.2 equals 140 pounds of cane, which, if pressed out by a mill of the ordinary capacity (60 per cent) would have furnished 56 pounds of bagasse.

After drying, ready to be used as fuel, the bagasse contains from 5 to 17 per cent of water; the following analysis shows percentages of combustible matter in this substance: Mineral matter, 2.33; fibre and cellulose, 77.14; sugar, 2.85; glucose, 0.526; gums, albumen, 1.696; water, 15.000; total combustible matter, 82.214,

As far as we know, Minchin uses nothing but this dried bagasae for fuel, and as the chips are generally longer and have more body than the bagasse from a very powerful mill, they would seem to be more suitable for fuel than such heavily crushed mill bagasse.

In that season about seventeen-twentieths of the sugar of the cane were obtained, when no bone-black was used, and about three-fourths of it with char.

During another season they obtained about 5.6 per cent in first sugar, 2.5 in second, and 4.2 in molasses; but in 1881, when, probably, they had learned to work to greater advantage, or because they were compelled to work faster, the following results were obtained from cane of the following average description: Bagasse or fibre, 9.0; water, 76.0; sugar, of which 12 per cent was glucose and 3 per cent ash, 15.0—total, 100 pounds. In this season about 9,000 tons (of 2240 lbs.) of cane were cut up and diffused, and from it 9,000 bags of white sugar were made. Each bag contained 164 lbs., thus bringing the yield to 7.3 per cent of pure white sugar. The weight of masse-cuite obtained was 1136 tons, equal to 12½ per cent of the weight of cane. If the molasses coming from the first products, usually sent to the distillery, had been worked into sugar also, the total yield should have reached between 9 and 10 per cent.

However, as will be seen hereafter, the French sugar-chemist, Mr. Riffard, who since 1879 experimented with diffusion, and that, too, with a more perfect apparatus, considered the above results not quite so satisfactory as they should have been. In fact, Minchin's apparatus, one of the old, primitive style, was so defective that he had at last replaced it by a newer and better one.

Mr. Riffard, who studied the process in all its bearings, did not confine his investigations to the cane alone, but experimented with the diffusion of bagasse also, and through this he came to the conclusions reached by us since 1877, viz: That as an intermediate step it would, perhaps, be even preferable to the diffusion of cane, and then the change from the mill would be more gradual, while the result would be all the more striking.

The cane of Guadaloupe, where those experiments were made, had a normal juice of 1.063 average density. The juice contained 15.3 per cent of sugar; therefore, 13.77 pounds of crystalizable sugar were contained in 100 pounds of cane.

The extraction by the first mill, combined with imbibitions (hot water injections) and supplemental mills, gave 85 per cent diluted juice, composed of:

	Total Extraction. Per cent.	Normal Juice. Pounds.
By first mill	60	60
By imbibition and second mill	25	11
	85 gross.	71 net.

These 71 multified by 15.3 divided by 100 consequently contained 10.86 sugar, the loss in the bagasse amounting to 2.91.

The 10.86 per cent of sugar extracted represented 12.05 masse-cuite, yielding in first, second and third sugars 9.25 per cent; sugar left in the molasses, 0.75; sugar lost in manufacturing, 0.86; total, 10.86 pounds.

As the rendement changes according to the quality of the products, while the ratio of extraction is very nearly constant, it may be assumed that three pounds of sugar are generally lost on one hundred pounds of cane, being left in the bagasse, even with imbibition.

DIFFUSION OF BAGASSE.

As the bagasse coming from the first mill is too unevenly and insufficiently divided to admit of a satisfactory and economical extraction, it is necessary to cut it up with a fodder or straw-cutter. By means of this, it was possible to charge the diffusers more compactly and get a better effect from the water employed. And under such conditions the density or the value of extraction increased rapidly and very evenly.

The original density of the juice was 10.63. According to the following table the diffusion juice attained a density of 1.047 in the seventh and of 1.051 in the eighth diffusion tank. At this point it ceased to increase, even by passing it again through fresh bagasse.

As the juice had a normal density of 10.63=15.3, and the diffusion juice in No. 7 being 1.047=11.7, and in No. 8 1.051=12.6 per cent, the dilution in No. 7 had reached 31 per cent and in No. 8 =22 per cent water. The following table shows the inside working of the battery approximately:

Number of diffusers.	Temperature in calorization	Time of diffusion.	Density at plus 30° C.
1	95	27 min.	1.015= 3.9 per cent
2	90	22 min.	1.025= 6.4 per cent
3	77	17 min.	1.023= 7.1 per cent
4	75	22 min.	1.035= 8.8 per cent
5	65	25 min.	1.040=10.0 per cent
6	70	24 min.	1.043=10.7 per cent
7	95	20 min.	1.047=11.7 per cent
8	90	20 min.	1.051=12.6 per cent

The diffusers being very small, measuring but 10 cubic feet, they could hold only about 16 pounds of bagasse cuttings per cubic foot. By using diffusers of larger dimensions, as required for the work on a commercial scale, these proportions can probably be improved by filling the diffusers more compactly and employing less water.

By diffusion were obtained about 22 pounds of normal juice plus 5.5 to 7 pounds of water from the 40 pounds of bagasse dropped by the first mill; therefore, on 100 pounds of cane the yield was as follows: By the first mill, 60 pounds; by diffusion of the bagasse, 22 pounds; by additional water, 6 pounds; total, 88 pounds. There was consequently, on 88 multiplied by 100, divided by 82, equals 7.3 per cent dilution.

If we compare this with the results obtained by imbibition and a second pressure of the bagasse we find:

	Imbibition Juice.	Diffusion Juice.
Extraction by first mill	60 pounds	60 pounds
Extraction from the bagasse	11 pounds	22 pounds
Excess of water	14 pounds	6 pounds
Diluted juice	85 pounds	88 pounds

Imbibition and supplemental pressure were, therefore, oniy half as effective as diffusion, while the dilution was more than double.

If we compare the percentages of sugar extracted we find: By the mill, 60 pounds of juice at 15.3, equal to 9.18 pounds; by imbibition, 71 pounds juice at 15.3, equal to 10.86 pounds; by diffusion, 82 pounds juice at 15.3, equal to 12.55 pounds.

Converting these different percentages of sugar into masse-cuite, by allowing 9 per cent for water, we have from 100 pounds of cane:

By mill in 60 lbs.		By imbibition in 85 lbs.	
Masse-cuite	10.01	Masse-cuite	11.84
Water	49.99	Water	73.16

Equal to 4.99 pounds of water, which must be evaporated for every pound of the masse-cuite

Equal to 6.17 pounds of water, which must be evaporated for every pound of the masse-cuite.

By diffusion in 88 lbs.

Masse cuite	13.68
Water	74.32

Equal to 5.43 pounds of water, which must be evaporated for every pound of the masse-cuite produced.

The difference between the evaporation of the 60 pounds of mill juice and the 88 pounds of diffusion juice would be 24.33 pounds of water, and this can be easily effected with four pounds of coal, which, at $5 per ton, would cause an extra expense of one cent on the 22 pounds of sugar recovered from the bagasse of 100 pounds of cane.

Between the expense of running a double mill supplied with hot water injections and a diffusion battery for the bagasse there can be no difference, because if the latter should reqnire a little more heat the former would consume more steam to drive the supplemental rollers. And in reality nearly all the heat employed to keep the juice in a diffusion battery at the proper point would be economized in the defecators where it arrives at a temperature averaging 45° C. to 113° F.

If the diffusion bagasse has to be used for fuel it would be necessary to pass it through some light power-press, similar to those employed in the beet-sugar industry, for the purpose of removing a portion of the absorbed water.

Whilst one cubic foot space in the diffusers holds only about sixteen pounds of bagasse cuttings, it will accommodate from thirty to thirty-three pounds of sliced cane, and as this, without any preliminary pressure, diffuses even more readily and in a shorter time, it follows that a diffusion battery calculated for a certain amount of daily work will be able to do this in either form—that is, either direct as sliced cane, or as bagasse after passing through the mill.

THE ONLY DIFFERENCE BETWEEN THE TWO

Would be in the mode of cutting the cane in to bagasse, but both these machines are inexpensive and require very little power in working. As the cost of a good diffusion apparatus would scarcely be one-half of what a good mill would cost, the other half of the money saved in the acquisition of the former should be employed to procure either a double or triple effect for the evaporation, and this is an expense which our planters must make sooner or later if they wish to increase the capacity of their sugar-houses without prolonging the work into the dangerous season of alternate frosts and rains.

After the most careful observations, Mr. R. comes to the conclusion that diffusion can be most advantageously applied to bagasse; that it will yield at least 22 pounds of normal juice, and that the purity of the juice should be equal if not superior to the juice obtained by imbibition, provided the work be done with the requisite expedition.

Although, as we have seen, the bagasse lends itself very nicely to the extraction of its juice by diffusion, it is nevertheless not quite so profitable as the direct treatment of the cane itself, by the same process. And especially where the residue of the cane must be used as fuel, the sliced cane being in slips of from five to twelve inches long, is preferable to the chopped up and shorter pieces of bagasse, It is, besides, a great advantage to economize entirely the first cost of a mill, the expense of repairs, the two-thirds of power needlessly wasted, and at the same time not to run the risk of breaking down. Now, if we consider that the expense of cutting, loading and transporting the cane to the mill represents from 30 to 50 per cent of the cost of producing it, it must be conceded that the worst place for washing any part of this precious raw material would be in the sugar-house. And nevertheless it is here, where under the present wasteful methods of working, the planter meets with his most serious losses.

If the mill extracts about sixty pounds of juice—and most of the mills in use cannot even do this—there would be a gain of about twenty-two pounds from the diffusion of the bagasse, and a gain of over twenty-four pounds of juice from the direct application of diffusion to the cane. As in the latter process about six to eight pounds more water would be added to the juice, the extra expenditure for fuel would be increased from four pounds to five and a half or six pounds of coal altogether.

Where the diffusion process is run alone, without employing the mill engine at all, from forty to fifty horse-power may be economized, and these, I believe, consume fully as much as the steam needed for the heating of the juice in the battery. And if it is considered that our planters at least acknowledge a loss of five to 10 per cent, caused by their present mode of defecation, a loss which, under the most favorable circumstances, must always be in direct proportion with the amount of skimmings, it will be seen where another leak can be stopped by diffusion. Because, as Mr. Minchin has shown, he gets from a defecating pan containing 500 imperial gallons of juice scarcely scums enough to fill a breakfast-bowl.

As a portion of the albumen and other impurities are either coagulated or not diffusable, the process itself performs a part of the work, thrown with the mill-juice entirely upon the defecators. At the same time the juice undergoes a kind of filtration in the diffusers by which all the loose fibres or debris of the cane are prevented from passing along with the juice and giving trouble afterwards.

Some wiseacres have suggested that by diffusion some of the pectine of the cane was dissolved, but these will be surprised to learn that this substance is peculiar to the beets and a few other plants, but that it is entirely absent in the cane. If we look into

THE EXTRA LABOR IMPOSED BY DIFFUSION.

Upon the increase of 35 to 40 per cent more juice which it yields, this will be found quite insignificant also. The labor of putting the cane upon the carrier is the same as with the mill; once on the carrier, it requires no further watching; the cane has to go straight through the cutting machines. In working 100 or 150 tons of cane per day, it requires:

1. One man for attending to the sharpening and and changing of the knives twice a day.
2. One man for closing the diffusers above.
3. Another man for closing them below; these two men have ample time to work together in emptying the diffusers.
4. One man for the manipulation of the valves, the shifting of the shutes from one diffuser to another, etc.

As with the fastest work there would be only one change in the position of two or three valves every ten or twelve minutes, and as this labor requires more intelligence than strength, this task is neither hard nor difficult to learn. However, it is advisable to trust this part of the work only to the hands of a sober and industrious person, as upon its more or less faithful performance the more or less complete extraction of the juice depends.

In examining the work done by the diffusion process at Aska more closely, Mr. Riffard did, of course, not overlook the chemical changes which the juice might undergo from the contact of heated juice with the sliced cane. As the water passes through seven or eight diffusers to extract the juice from the cane more completely, and as for every new tank filled with fresh slices another tank, in which the slices have been exhausted, is emptied, the time which these operations require is the unit of speed, multiplied by the number of diffusers actually working. The extraction can go on at a uniform speed of ten minutes, or it may be extended to fifteen minutes per diffuser. It would therefore take from eighty to 120 minutes to pass the juice through the battery. Between these limits the most careful and repeated tests have shown neither inverting of sugar nor any other deleterious changes in the quality of the juice.

As neither we in Louisiana nor Mr. Minchin at first had cane enough delivered to us, and also on account of the imperfections of the old system, it was impossible to fill our diffusers, which were entirely too large, in so short a time. We therefore were compelled to work slower than we ought to, and partly on this account and partly from the needlessly increased size and extensive radiating surfaces of the old arrangement, too much heat was absorbed and wasted, while the juice suffered somewhat from this and other causes then existing, but now removed.

In working 100 tons of cane with diffusion we should make a gain equal to 35 to 40 tons per day, and on 150 tons of cane our savings should amount to 52 to 60 tons. As the cane delivered at the sugar-house has a value according to its quality of $4 50 to $5 per ton, our total economies would reach $200 to $300 per day. As this, however, would be only the economy on the raw material, we must add to this either a part of the manufacturing profits, which are increased in a similar proportion on the saving on general expenses which, if not materially reduced, are at least charged against a much larger daily output, making every pound of sugar produced a fraction of a penny cheaper than before.

As the Cuban cane-juice contains about 18 to 20 per cent of soluble solids the 24 pounds of juice gained by diffusion would contain nearly 5 pounds of sugar and other soluble solids. These would give us about 18 pounds of water to evaporate, which, with the 17 pounds of water employed in their extraction, would leave about 35 pounds more water to be evaporated for every 100 pounds of cane. But as this could be easily effected with 5 pounds of coal the result would be very nearly the same as if 5 pounds of coal were exchanged for 5 pounds of sugar. Calculated upon one ton of cane, this would require 100 pounds of coal, and for the 40 or 60 tons of cane economized by diffusion, the extra expenditure for fuel would amount to 4000 or 6000 pounds of coal per day, always presuming that the dried bagasse should not suffice for this also.

THE PROFITS ON 100 TONS OF CANE

May, therefore, be estimated, at the lowest, thus: Forty tons of cane at $5, $200; manufacturing profits on 24 tons of juice, at 25 per cent of cost, $50; total, $250; deducting extra expenditures for 4 to 5 men per day ($10), and for additional fuel, 2 tons ($15), $25; minimum, $225.

Beginning with a diffusion apparatus calculated for a daily task of 100 tons at the slowest rate of speed that should be permitted, viz.: 15 minutes per diffuser, the work might afterward be increased to 150 tons merely by increasing the speed 10 minutes; and this, instead of being detrimental to the working, would on the contrary actually benefit the quantity of the juice by guarding it against inverting.

Here again the great superiority of the sugar cane over the beets, with diffusion applied to both, can be clearly seen. The Austrian sugar manufacturers get about 180 pounds, and the Germans about 150 pounds, of diffusion juice from 100 pounds of beets, while in taking 100 pounds of diffusion juice from 100 pounds of cane we could not only get more sugar from it than they, but our evaporation would be from 50 to 80 per cent less expensive than theirs. Of course no evaporators, unless their number or their sizes are augmented in proportion, can be made to do 50 or 60 per cent more work, and this is one of the great misfortunes of many planters, that they are condemned to

WORK WITH BAD MILLS,

Solely because their evaporators are either equally bad, if not worse, while they are not able to pay for better mills and better evaporators at the same time. So, the most expensive evaporators, the open-air pans, are kept from year to year to suit the most wasteful methods of extraction, for, if the latter should be improved, the former would immediately give out. It is like the lame and the blind man in the fable, who clung to each other in their distress, because, if separated, both would have been incapable of tramping it through the world alone.

In the annexed table Mr. Riffard showed the composition or the different kinds of juice as analyzed by him:

COMPARATIVE ANALYSIS DURING THE DAY.

	Normal mill juice........	Second mill & imbib'n..	Mixture of both.........	Diffusion juice.		
				A.	B.	C.
Density............................	1.063	1.040	1.056	1.066	1.060	1.064
Sugar per hectolitre..............	14.74	10.97	13.30	15.82	14.31	15.10
Uncrystalliza per hectolitre.....	1.04	0.67	0.80	0.85	0.92	1.09
Sugar per 100.......................	13.88	10.48	12.60	14.84	13.57	14.19
Uncrystall per 100 sugar	7.0	6.6	6.6	5.4	6.4	7.2
Purity.................................	87.6	87.3	87.4	88.43	88.29	87.00

This analysis reveals the sometimes disputed fact that the juice left in the bagasse and obtainable from it by imbibition is equal to that obtained by the first pressure of the mill. Imbibition, like diffusion, prevents fermentation.

In examing the data given by Minchin in 1878, Mr. R. found on an average of the cane consumed at their works 11.30 per cent glucose in the middle pieces, while the masse-cuite showed an average of 15.50, or a difference of 4.3 per cent, due perhaps, to the greater amount of glucose in the tops. However, as in the colonial sugar industry, the non-immersion of sugar is of the greatest importance; he adds, that nothing in his opinion justified the great increase of it, shown in this instance, and that by a strict adherence to the laws of the process, by not allowing the sliced cane to accumulate, by preventing their contact with air, and by avoiding any delays in the work, the coefficient of inversion ought, in well directed sugar-houses, never to be more than 2 or 3 per cent.

Here it would seem as if Mr. R. made a similar mistake in his criticism, as Mr. M., who overlooked that we had only open kettles to work with, neither we nor he had the advantage of working with so perfect an apparatus as our French competitor.

In summing up the many advantages which the diffusion process when applied to the sugar cane, has over all others, Mr. Riffard names the following in particular: A considerable reduction in the cost of installation and motive power; and the simplification of its machinery, which is not subject to the inconveniences and expense of heavy repairs; an almost absolute extraction of the sugar and superior purity of the juice; facility and economy in the defecation and in the work with the filter presses, the radical suppression of bone-black filters; and, in the end, a very remunerative yield of sugar.

He also remarks that it is necessary at its installation to reckon with the

INCREASED VOLUME OF THE JUICE,

Which he estimates at 100 litres for every 100 kils. of cane, while with a single mill it would be only sixty litres, and by imbibition about ninety litres. In other words, the increase in evaporation would be correlative with the yield in normal juice extracted which in these several cases would be: By one pressure mills 63 kils. by double mills with imbibition, 75 maxima; by diffusion, 85 minimum.

In the experiments with his small apparatus Mr. Riffard obtained 84.5 to 84.9 per cent juice, plus 6 to 8 per cent water only. If he had diluted his juice a little more freely, he could have increased the percentage of extraction 1 or 2 per cent. He had kept his juice as nearly as possible at 70° to 95° C., observing that at this temperature and excluding air, no inversion takes place.

The following table shows the inside working of the process and the progressive enrichment of the juice in the battery:

Number of Diffusers.	Duration of Diffusion.		Density at 28° C.	
	A.	B.	A.	B.
1	25 min.	15 min.	1·020= 5.0	1.020= 5.0
2	15 min.	15 min.	1.037= 9.2	1.032= 8.0
3	10 min.	10 min.	1.050=12.3	1.047=11.6
4	15 min.	10 min.	1.053=13.5	1.055=13.5
5	10 min.	20 min.	1.056=13.8	1.063=15.3
6	10 min.	10 min.	1.060=14.7	1.068=16.5
	1h 35m	1h 20m		

In leaving the diffusers the juice is quite clear and of a yellowish color, like wine; the strongest proof of its great purity is that it requires only from twenty to twenty-five grammes caustic, but slackened lime per hectolitre juice of 1.058 density equals one-fourth per mille.

Mr. R. likewise refutes the notion that the cane contains percene, a substance which Walekhopp and others, many years ago, used as their strongest argument against the application of diffusion to the beets, which really do contain it. But this argument fell to the ground and diffusion walked right over its learned detractors.

Another question has been naively asked: "If diffusion could really work as fast as the mills?" Why should it not? In fact, this is one of the principal causes for its so very rapid adoption in Germany and Austria. Formerly the German sugar factories were small. They did not average over 400 tons of sugar per season. And this is nearly twice as much as the average in Louisiana and about as much as the average yield of the 1,100 sugar-houses in Cuba.

At present the average capacity of German sugar houses is over 2,200 tons sugar per season, and the majority of those lately constructed or planned will work from 200 to 500 tons of beets per day, which, as we have seen before, means the evaporation and manipulation of 300 to 750 tons of juice as they take it.

In Germany the juice is allowed from ten to fifteen minutes' time for each diffuser and passes through eight or nine of them. With cane the juice could be finished in ten to twelve minutes for every diffuser, and after passing through seven or eight the extraction would be complete. Hence, with a properly constructed apparatus for cane, the one can be worked as fast, and, upon the whole, perhaps more easily than the other.

Of course, a larger apparatus must always be cheaper in proportion than a smaller one but there is no appreciable difference between the quality of their work; one can be made just as effective as the other. And whether the diffusers have a capacity of ten cubic feet or of 100 and more, they all can be made to yield the same percentages of extraction.

There is no other way of doing such a thing except by double hydraulic pressure, but this is too expensive and very troublesome. The diffusion process is, therefore, pre-eminently, the friend of the small planter or of a number of their club; being together for the acquisition of an apparatus and the evaporators, both can be increased by subsequent additions, and the two combined will lay the foundation for a solid superstructure of future prosperity; because in extracting the whole juice and treating it properly, the producer of the cane will get the full value of his raw material. And even if he should leave the finishing of his products to others, his gains on 4000 or 5000 tons of cane would be amply sufficient to cover his first outlay in one year, and if desirable he might, by adding to the outfit of the sugar-house, either enlarge its capacity or carry the quality of his productions to the highest state of perfection.

As a rule, it may be said that the poorer the cane and the higher the price of labor, the dearer will the sugar be, and the less able the planter to leave any part of it either in the bagasse, in his skimmings or even in his molasses.

COMMUNICATIONS.

BENEFITS FROM USING THE JARVIS FURNACE FOR BURNING WET TRASH FROM ROLLS DIRECT.

Pioneer Sugar Mill,
Lahaina, Maui, May 4, 1884.

Editor Monthly:—In answer to many inquiries made in relation to the comparative performed duty of the Jarvis Patent Furnace for burning wet fuel, fresh cane trash, direct from the rolls with the same boilers, set in the usual way, and using dry trash with wood and coal for fuel.

The boilers for the mill are three pairs of the compound construction, set tandem, with Jarvis furnaces complete at the front, and supplied with the fresh trash from the carrier delivered at the furnace doors. The best combustion of the trash is attained by using the Risdon Grate Bar, first applied to the Jarvis furnace by Mr. F. S. Dunn, the engineer of the mill, and now endorsed by the Jarvis Company in preference to the Cuba Grate Bar. The first boiler is six feet in diameter and 19 feet long, with one Cornish flue three feet in diameter. The second boiler is also six feet in diameter and 15 feet long, with 81 tubes four inches in diameter, and the next pair of boilers is six feet in diameter, each 12 feet long, and tubed as the others, making the battery of six boilers and generating all the steam for driving the machinery and evaporating purposes of the works. The

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Which he estimates at 100 litres for every 100 kils. of cane, while with a single mill it would be only sixty litres, and by imbibition about ninety litres. In other words, the increase in evaporation would be correlative with the yield in normal juice extracted which in these several cases would be: By one pressure mills 63 kils. by double mills with imbibition, 75 maxima; by diffusion, 85 minimum.

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Steam is also used for one Blake pump for the double effect, capacity, 15 tons in ten hours. The two effects have 1,600 square feet of heating surface, copper tubes and brass heads. The vacuum pan has three coils of three-inch copper pipe taking steam from the boilers at sixty pounds pressure.

There are also two No. 3 Blake pumps for feeding the boilers at a temperature of 210 degrees Fahrenheit; one No. 3 Blake pump for molasses; one G service pump, taking juice from the mill to the clarifiers at a speed of about 35 gallons per minute; one No. 5 Knowles pump to supply the double effect tanks; one pump of same size for scum press; one No. 1 Blake pump for taking syrup to the double effect, and one work pump of 60 gallons per minute for the boiling room.

There are six clarifiers of 500 Imp. gallons each, using direct steam from the boilers, one cleaning pan with a 2-inch coil, one blow-up tank with 1-inch pipe, using live steam from the boilers; one 10-inch lathe and large pipe-cutter.

The mill buildings consist of one main part 130 feet long by 53 feet wide; sugar room, 110x25 feet; boiler house, 80x40 feet; one chimney of iron 5 feet in diameter and 85 feet high.

The comparative difference or gain in the Jarvis patent setting of the same boilers over the usual or the compound setting is found to average in this mill for 105 days steady run and producing in the above time 1,400 tons of sugar from the burning of wet trash, and about 50 cords of wood, an average of one-half cord per day, against the burning of all dry trash at the average cost of $400 per month for the labor in drying and the monthly consumption of 50 tons of coal and about six cords of wood, which for the above 105 days run would make the additional cost of 230 tons of coal and about 40 cords of wood for the same length of running time. The average quantity of wet trash more than necessary for making all steam used in the mill is about equal to two days run of mill per week.

We most cordially invite the planters and sugar manufacturers to see our furnaces and to judge for themselves of the difference in the Jarvis and the common or compound setting of steam boilers. H. TURTON.

The farms of the United States are worth $10,197,000 while all other real estate, including the dwellings and warehouses of the cities, the business and the water-power besides, is but $9,881,000,000 : railroads and their equipments are worth but $5,336,000,000 ; and mines, including petroleum wells, gold and silver bonanzas, and stone and other quarries, are worth but $880,000,000.—*N. Y. Observer.*

SELECTIONS.

UTILIZING BONES.

Among the waste materials on the farm there are few, if any, that are richer in one of the most important elements of plant food than bones, when made soluble in water. Just how to do this in the cheapest, and at the same time the best manner, is a question that is frequently answered by the farmer, and is so often asked by those who have no practical knowledge of the matter, that the farmer is frequently misled, and spends so much time to no purpose, that he becomes discouraged and sells the waste bones of the farm at a very low price, or neglects altogether to pick them up.

The simplest and cheapest way to reduce bones to make them available for plant food, is to burn them; but to do this is a great loss of valuable plant food, as it consumes all of the nitrogen; yet the ashes are very rich in phosphate, being about 80 per cent. It also contains 16 per cent. of carbonate of lime, 2 or 3 per cent. of phosphate of magnesia, soda, and potash. All of these substances are indispensable to vegetable growth. The process of burning bones is so simple that some contend that when only small quantities are to be reduced it is the best way, even though the nitrogen be lost. It would certainly be better to burn them than to sell them for half a cent, or even a cent a pound. It is very poor policy for the farmer to sell the bones from the farm; in fact, when he can buy at less than a cent a pound he had better buy what he can, though he have to resort to burning them to make them available for plant food; but as this is a wasteful process, the ashes should be resorted to when they can be readily obtained. In some portions of the States small establishments have been erected to steam and grind bones. By extracting the grease and gelatine the bones are easily ground; this leaves in the bones about one-half of the nitrogen, the other half may be saved by compositing the liquid with dry muck. Some of the owners of these mills are willing to steam and grind bones for a fair consideration. When such mills can be found within a reasonable distance, this is the best way to get a small, or even a large lot of bones worked up into plant food.—*Massachusetts Ploughman.*

CELEBRATING THE MULE.

A stubborn fact about mules, *The New Orleans Democrat* maintains, is that the $1,500,000 which Louisiana pays the West each year for 10,000 of these opinionated but useful animals ought to be kept in the State by breeding a home supply. That journal quotes from Mr. Adolph Sutro this curious information of their behaviour underground:

"It has been said that they have a strong propensity for kicking, but I have never seen them kick when in the tunnel. They become very tame

—in fact, they become the miners' pets. The men become quite attached to them; and as the shift-mules pass by the men at lunch, they will often receive from one a piece of pie and from another a cup of coffee, etc. When a signal is given to fire a blast the mules understand the signal, and will try to get out of the way of it just as the men do. Of course, underground it is very dark, and the mules become so accustomed to the darkness that even when they go out into the sunlight they cannot sée very well, and when they go back into the sunlight from the mine they cannot see at all. So we are in the habit of covering one eye with a piece of cloth whenever they go out, and keep the covering over the eye until they go into the tunnel again; we then remove the cloth, so they have one good eye to see with. We had to adopt this plan for preserving their sight, because the mule is so stubborn that he will not pull unless he can see his way ahead. We have found out another thing about mules. We tried horses at first, but we found that whenever anything touched the ears of a horse he would throw up his head and break his skull against the overhanging rock; but if you touch a mule's ears he drops his head. For that reason we could not use horses. We employed mules and they have answered very well."—*N. Y Tribune.*

MALARIA AND THE EUCALYPTUS.

Mr. Welsh, American Consul at Florence, Italy, has recently submitted to the Department of State a report, accompanied with a map, showing the extent of the ravages of malarial disease in Italy, and giving an account of the measures adopted by the Italian Government for eradicating, or at least lessening the evil. From the map it appears that Florence is the only city that is comparatively free from malaria, although the death-rate there is high, chiefly from diseases of the respiratory organs and consumption.

Of the sixty-nine provinces into which Italy is divided, only six are considered completely free from malaria. The rest are more or less affected. Of the men composing the army more than ten per cent. suffer from fever every year, entailing an expense of about 10,000,000 francs for their treatment.

Scientific men have given their attention to the causes of malaria in Italy, and it is regarded by many as due to the destruction of trees and forests during the past quarter of a century and the construction of railways, these works requiring not only excavations which develop into fever pools, but so much timber as to impoverish the forests.

The remedy which has been commenced and it is hoped will be carried out, is the planting and nursing of trees. The eucalyptus has been adopted as the most effective. At Bentimiglia, which place was impregnated with fever in 1875, there was planted about 800 eucalyptus trees, and in two years' time malarial fever disappeared. Great success has also attended the planting of these trees along the lines of railway and at the stations. An important nursery has been established by the Roman Railway Company at Nola, near Caserta, and there are also many nurseries due to private enterprise. The Government having become satisfied by investigation that by gradual development of groves of the eucalyptus, malarial fever may be, if not exterminated to a great degree, lessened, they have decided to offer a liberal reward to all who will plant and raise eucalyptus trees, The effect of the eucalyptus upon a wet soil is illustrated in the following article from the Pacific *Rural Press:*

Where there is surplus moisture to dispose of, as, for example, a cesspool to keep dry, a large eucalyptus will accomplish not a little, and a group of them will dispose of a vast amount of house sewerage. But if you have water which you do not wish to exhaust, as in a good well, it would be wise to put the eucalyptus very far away. Daniel Sweet, of Bay Island Farm, Alameda county, recently found a curious root formation of the eucalyptus in the bottom of his well, about sixteen feet below the surface. The trees to which the roots belonged stand fifty feet from the well. Two shoots pierced through the brick wall of the well, and sending off millions of fibres, formed a dense mat that completely covered the bottom of the well. Most of these fibres are no larger than threads and are so woven and intertwisted as to form a mat as impenetrable and strong as though regularly woven in a loom. The mat when first taken out of the well was water-soaked and covered with mud and nearly all a man could lift, but when it was dry it was nearly as soft to the touch as wool, and weighed only a few ounces. This is a good illustration of how the eucalyptus absorbs moisture, its roots going so far to find water, pushing themselves through a brick wall, and then developing enormously after the water is reached. Mr. Sweet thinks one of the causes of the drying up of wells is the insatiable thirst of these vegetable monsters.—*N. Y. Observer.*

GOOD BUTTER-MAKING.—Butter is *finished* in the dairy, but *not made there.* The stamp of the dairywomen puts the gold in market form; but the work must be commenced in the field or in the feeding stables; and this leads at once to the consideration of feeding for butter. During the early summer months, when nature is profuse of favors, there is little to be done beyond accepting her bounty. The tender grasses are full of the needed nutrition, and they afford the constant supply of moisture, without which the secretion of milk is greatly lessened. Yet, at this season, as well as all others, a pure supply of water is absolutely necessary. It does not meet the requirements if cattle have a wet hole full of surface drainage in the pasture, or a frog pond. While it is not probable that the tadpoles and wrigglers, sometimes found in city milk, have been drunk by the thirsty cow, many infusions do exist in such pools that are hardly eliminated or rendered entirely harmless by the wonderful milk secretions of the animal. The cattle should drink from spring-fed boxes ; and as often as these, under the hot sun are seen to produce green growth or floating scum, a pail of coarse salt may be put in, and the current checked until the fresh water growths are killed ; the salt water is then drawn off, and for a long time the trough will remain pure and the water bright—*Breeder's Gazette.*

VALUE OF THE SUNFLOWER.

Professor Bergstrand, of the Royal Agricultural Academy of Sweden, publishes a most laudatory report on the virtues of sunflower seed cake as food for cattle. He states that it presents a remarkable constancy of composition rarely if ever met with in other cakes as met with in commerce. It contains from 13 to 16 per cent. of fat, and 35 to 36 per cent. of protein substances, and has, therefore, a nutritive value far above that of most ordinary feeding stuffs, besides which it has a most agreeable taste, and is altogether free from bitter or any injurious matter. Careful experiments on its effects upon milch cows have been made at the Ultuna Agricultaral Institute by Baron Akerhjelm, wich tend to show that it both improves the quality and increases the quantity of their milk, the butter from which is also of exceptional excellence. Many practical farmers in the neighborhood have also made trial of the same food, and are unanimous in their favorable verdict. Their milch cows all took greedily to the cake from the first day it was fed to them, and in all cases an improvement in the quality of the milk was quickly noted. For draught oxen and fattening bullocks also it is equally suitable, especially for the latter, whose meat presents an unequalled richness of flavor when thus fed, and it may be given in small quantities to horses, with much advantage, mixed in a thick mash with chaff. In comparison with other feeding stuffs this cake is very cheap, and it can be given in larger quantities than most other cakes without any ill effect.—*N. Y. Observer.*

There is good sense and timely advice in the following : Every farmer and gardner should try to improve in culture and management each season. As a shrewd writer observes, "don't follow in the same rut this season as you did last, but do something differently. Save time, money and labor by using your brains, and having your plans for each day's work well matured the night before."—*N. Y. Observer.*

The black smut that appears on oleanders may be easily removed by showering the trees with weak, soapy water once or twice. Soapsuds from the washing of clothes is good enough.

Don't suppose that you can jam the roots of fruit trees into small holes of poor soil, and have them do well. Unless you are willing to do the work thoroughly, and to give them a fertile soil, better not plant fruit trees at all.

DIGGING WELLS.

The Massachusetts *Ploughman* some time since had the following directions in regard to digging wells:

"The old way of digging a well and stoning it up so as to leave it about three feet in diameter, is a very good one if the water is to be drawn up with buckets, but if only with a pump it is a very poor way; for if, as is the usual custom, the well be covered at the top, it leaves a very large space for dead air, which often becomes so bad that it affects the quality of the water, and also makes it unsafe to enter the well. When a well thus stoned has only a pump in it, the covering should be under water very near it; but if it is known that only a pump is to be used, the expense of stoning may be saved, and the water be kept in a much better condition. This is done by digging the well in a dry time, and, when dug as low as possible, a cement pipe some two feet in diameter and two or three feet long, is sunk at the bottom and worked down as low as possible by digging out the inside; the pipe should be covered over with a flat stone, through the middle of which a two-inch hole has been drilled; directly over this hole a stand-up drain-pipe, then begin to fill in the hole. When filled up as high as the top of the first piece of drain-pipe, put on another, being careful to have it straight with the other, and the line perpendicular; continue filling and adding drain-pipe until it is as high as the surrounding ground, or if the pump is not to stand directly over the well, then when it is filled within four feet of the surface put in the pump pipe, and lead it off in a trench to where the pump is to stand. When it is found that the pipe is all right, finish filling the well, leaving some durable mark that the position of the well may be known.

A well of this kind is reliable and permanent, requiring no repairs, the water is cool and free from impurities that open wells are subject to; no insects or animals can find their way into it, and the cost is not more than one-half that of a well that is stoned. If dug, as it should be, when the springs are low, a constant supply of water that is as pure as the underground springs, is procured. As the well is always full there is no chance for bad air to injure the water, and in fact but little danger of being polluted by surrounding cesspools compared to that of open wells.—*New York Observer*.

A correspondent of the *Rural New Yorker* describes the following method by which an extraordinary crop of watermelons was raised: Holes were dug ten feet apart each way, eighteen inches square and fifteen inches deep. These holes were filled with well rotted manure, which was thoroughly incorporated with the soil. A low flat hill was then made and seeds planted. When the vines were large enough to run, the whole surface was covered to the depth of one foot or fifteen inches with wheat straw. The straw was placed close up around the vines. No cultivation whatever was given afterward; no weeds or grass grew. The vines spread over the straw, and the melons matured clean and nice.

RESERVOIR MAKING.

The completion of a new reservoir covering 100 acres and holding 420,000,000 gallons of water for the supply of the important manufacturing town of Birmingham, in Warwickshire, is an illustration of the great improvement and facilities which have taken place of late in the construction of such works for the collecting and storage of water. It was completed from first to last in two years, with only one fatal accident, 800 to 900 men being constantly employed in the various operations connected with the work during that period. Four locomotives were used, nine portable steam engines, fifty horses, some hundreds of wagons, and ten miles of rails. The greatest width of the reservoir was a quarter of a mile, the greatest length, three-quarters, and the circumference about a mile and three-quarters, of the whole distance of which (the sides or edges of the lake) about one-third consists of the natural formation of the valley, and about two-thirds of artificial embankment. The bottom of the reservoir was composed first of about 14 or 15 feet deep of drift or glacial deposit, probably the formation of ages, below which was a solid mass of impervious marl or clay from 499 to 500 feet in thickness. The embankment is 237 feet wide at the base, and has a uniform breadth of 20 feet at the top, the slope inside being 4 to 1, and the outside 3 to 1. The embankment is 31 feet high, and has a puddle wall 6½ feet thick pugged and rammed into solid consistence like clay should be for brickmaking, and carried down through the drift into the solid mass of marl and clay beneath.

—WHY DO ANIMALS NEED SALT?—Professor James E. Johnson, of Scotland, says: "Upwards of half the saline matter of blood (fifty-seven per cent.) consists of common salt, and this is partly discharged every day, through the skin and kidneys. The necessity of continued supplies of it to the healthy body becomes sufficiently obvious. The bile also contains soda (one of the ingredients of salt) as a special and indispensible constituent, and so do all the cartilages of the body. Stint the supply of salt, therefore, and neither will the bile be able to properly assist digestion, nor the cartilage to build up again as it naturally wastes. It is better to place salt where stock can have free access to it, than to give it occasionally in large quantities. They will help themselves to what they need if allowed to do so at pleasure; otherwise if they become 'salt hungry,' they may take more than is wholesome."

—WHAT IS FARMING.—Having asked this potent question, the *Golden Rule* proceeds to answer it about as follows:—"It is more than selling hay, and potatoes, and bulks crops unanalyzed. Farming is a business, a practical and scientific operation whereby the soil is used for profit and improved under the operation. The process of nature must be understood and worked in harmony with the chemistry of the earth and air. The process of the elements must be understood, if not in their technical terms and language, in that sensible understanding, that common sense way that their own advantage and capabilities may be turned to the best accounts. The lawyer works by law and precedent, the physician works by symptoms and indications, the merchant by rules and observations, the mechanic by measures and capacities. The farmer must work by all —by rules, laws, observation and experience. He must be a practical lawyer, doctor, merchant and mechanic of the vegetable, the animal and the trade world about him. He must be a skilled workman in the productive, operative and commercial circles in which his business lies, and his sphere of circulation extends.—*Planter and Farmer.*