THE HAWAIIAN PLANTERS' MONTHLY

PUBLISHED FOR THE

HAWAIIAN SUGAR PLANTERS' ASSOCIATION.

Vol. XVII.] HONOLULU, OCTOBER 15, 1899. [No. 10

THE SUGAR WAR NOT OVER.—It was announced, recently, that the American Sugar Refining Co., (the trust) had won a victory over independent refineries, by capturing the trade of the wholesale grocers. This is a mistake. A deal was made but has not been ratified by a sufficient number of grocers to make it a success. Hence the independent refineries are holding their own—in fact, are said to be getting more orders than the trust.—Louisiana Paper.

The splendid success of California growers in ridding their trees of scale pests by fumigating with hydrocyanic acid gas should give encouragement to orchardists everywhere. By this method the San Jose scale can be completely stamped out. The oyster shell bark louse, the cushiony scale, the red scale, are easily controlled. The process should be investigated by every farmer and fruit grower. The outfit need not be expensive and one will answer for a neighborhood.—Am. Ag.

It is stated in one of our exchanges that Mr. George M. Boote, who was the manager of the Spreckelsville Plantation on Maui for two years prior to its transfer to Hawaiian and American capitalists, has gone to Cuba to take charge of the property of the Trinidad Sugar Company. During his stay on these islands, he had opportunities of observing the working of some of the most successful factories to be found in any country, and will doubtless be able to introduce some of these into the factory which he has taken charge of.

THE SUGAR FLEET.

The following is a partial list of vessels that have loaded at these islands for Eastern American ports. One or two that have loaded at winded ports and sailed are not in the list, their cargoes not having been reported:

DATE.	VESSEL.	SUGAR--LBS.	VALUE.
Feb'y 2	St. Francis	5,820,576	$ 230,209 01
" 10	Nuuanu	3,642,800	127,515 50
March 3	Tillie E. Starbuck	6,399,730	247,742 32
" 4	W. F. Babcock	6,892,594	268,595 12
" 13	J. F. Chapman	6,693,412	263,791 00
" 21	St. Katherine	3,289,818	129,806 54
April 17	G. R. Skolfield	4,943,125	197,647 00
" 20	Henry B. Hyde	8,079,841	324,372 60
May 9	S. D. Carleton	5,941,960	207,968 60
" 23	J. B. Thomas	5,891,041	210,626 44
" 23	S. P. Hitchcock	7,110,454	312,432 00
" 18	A. J. Fuller	5,631,227	227,428 77
June 10	E. M. Phelps	10,229,620	435,512 92
July 11	Iroquois	6,660,638	282,110 48
		87,226,836	$ 3,465,758 30

For the next crop, nineteen vessels, the total tonnage of which exceeds 39,000 tons, have been chartered to bring sugar from the Hawaiian Islands to New York or Philadelphia. The vessels and their respective tonnages are as follows:

Ships—	Tons.
May Flint	3,288
H. B. Hyde	2,450
S. D. Carlton	1,788
John McDonald	2,172
St. Francis	1,811
R. D. Rice	2,106
A. J. Fuller	1,782
E. B. Stutton	1,639
A. G. Ropes	2,303
Tillie E. Starbuck	1,829
W. F. Babcock	2,029
Geo. Stetson	1,710
Dirigo	2,856
Henry Villard	1,453
Susquehanna	2,591
Erskine M. Phelps	2,715
Bangalore	1,559
Bark—	
Pactolus	1,535
Total	39,630

The average taxation in America has been reckoned as about $8.00 per head. In an article by M. Pelletan, of the Economist Francis, quoted in one of the late consular reports, the taxes in France are given as $14.48 per head; in England, $10.81; in Holland, $8.58; in Austria, $8.49; in Denmark, $6.64; in Germany, $5.89, and in Belgium, $5.82. As to the amount we have not much to boast, but no people are better able to pay their tax.

THE CAMPHOR TREE.—The camphor tree is an evergreen of very symmetrical proportions, resembling somewhat the linden. It has a white blossom and bears a red berry. The trees, if undisturbed, attain a great size and age. Some in Japan are upwards of three hundred years old and fifteen feet in diameter. Many of these venerable and graceful giants adorn the temple parks of that country, and are a delight to the eye with their constant greenness.

GRAPE FRUIT.—Not many people know, apparently, what a good grape fruit is, as the varieties of so called grape fruit are so many. Among them, no doubt, there are some fine ones, but the safest way is to get buds of the tested varieties from Florida, which are the kinds the market calls for. Of these the Marsh seedless is one of the most popular, and it is comparatively seedless, often not more than 3 or 4 seeds being found in a fruit. It is of large size, round, surface moderately smooth; color, brown yellow; peel thin, juicy, of best quality: at its best in February and March.—Jamaica Journal.

A veritable boom in well boring has been initiated in Southern California and the indications are favorable for gratifying results. This is one of the agreeable consequences of two seasons of distressingly inadequate rainfall, and holds forth the promise of immunity from any dire effects of similar seasons in the future. Much testimony has been adduced to show that vast quantities of water lie beneath the surface of this part of the country, and that what we need is a sufficient number of deep wells to tap the subterranean sources. It is beginning to look as though the real water problem is not so much one of quantity as it is of the location of the liquid wealth.—Rural Californian.

During April the average difference between the price of 96 test centrifugals and granulated sugar was 35 1-10 cents per

100 pounds. During 1898 it was 74 2-5 cents. In July, 1898, it was 95½ cents, dropping by December to 44½ cents. In 1897 the difference was 92 4-5 cents. The most modern refinery can refine sugar for about 40 cents per hundred pounds, which is just the average difference so far this year. During the nine years prior to the formation of the Sugar Trust, the average difference was 1.098 cents, and for the eleven years since the average was 95 2-5 cents, which brought a very large net profit —not less than half a cent per pound. At one-sixteenth of a cent per pound net profit, sugar refining is a very profitable industry.—Ex.

The agriculturist must not ask his land to give him crops year by year, without rendering to it a return for its bounty. If you want your soil to be liberal, you must make it "fat." The farmer, in his dealings with his fertile acres, cannot always be simply beneficiary; he must all the while be a benefactor also. The product of the soil must in some measure be returned to the soil if its fruitfulness is to continue. There are farmers who "skin" their land by constant cropping and no fertilizing; but it is ruinous economy for the owner, and a grave wrong to the community; for whoever reduces the wealth of the nation's soil and the sources of the supply of sustenance is guilty of unsocial conduct.—Washington Gladden.

A few months since, we sent printed circulars to planters throughout the group, inviting them to contribute to the pages of our monthly any experiences or suggestions which might be of interest to readers. We hope still to hear from them, as the past year has been a most prosperous one, almost every plantation having adopted some new method or practice, as an improvement on the old. One of our exchanges refers to this same subject in the following extract: "Believing that the most interesting part of an agricultural paper is the actual experience of farmers well related, we kindly solicit correspondence from them upon any subject of interest to them. We would like to be able to fill every column of our Journal with matter of this character. If you have a thought that you think will be interesting to your fellow workers write down and send it to us."

It may be admitted that we ought not permanently to annex a country whose inhabitants are incapable of attaining

capacity for self-government, and the climate of which forbids the migration of Americans or Europeans in numbers sufficient to eventually control political and social conditions. I do not claim that the Government of the United States is especially adapted to a colonial policy, or that its methods of administration qualify it, in any marked degree, to hold and govern dependencies in any portion of the world, proximate or remote. On the contrary, it is of doubtful expediency to hold colonies or dependencies at all, and such holding can only be justified by necessity. When, however, duty admits no escape without the sacrifice of National honor or dignity, the necessity then exists.—U. S. Senator Lindsay.

Artesian Irrigation in New South Wales.—No one can doubt the value of irrigation from this source of supply. We have in this Colony already nearly fifty million gallons of water rising to the surface from artesian wells every day. This would every day fill a channel 2 miles long, 60 feet deep, and 10 feet wide. The success of the Pera Bore Farm is well known. Where no vegetation exists around without irrigation, magnificent crops of maize, sorghum, millet, lucerne, grasses of all kinds, fruit of all kinds grow to the greatest perfection, and it has been proved that a settler can make a good living on 20,000 acres. Although most of the artesian waters have been proved to be suitable for irrigation, there are some charged with deleterious salts that it will be necessary to experiment with caution. Although the Special Irrigation Commissioner did not give very much encouragement as to the success of irrigation in New South Wales, I am strongly of opinion that by properly conserving water, and by the construction of weirs, irrigation will play a most important part in the advancement of agriculture in this Colony.

Note.—A cubic foot of water is equal to 6¼ gallons, or 62½ lb.; an inch of water over an acre of land will weigh 100 tons; one inch of water or an inch of rain means 22,687½ gallons per acre; 3,630 cubic feet weighing about 100 tons; a gallon of water weighs 10 lb.; a miner's inch of water running from a hole 1 inch square with a head or pressure of 6 inches.—N. S. Wales Ag. Report.

———:o:———

The next issue of the Planters' Monthly will be devoted mainly to the reports of Dr. Maxwell, on the various subjects assigned to him, and will appear early in November.

BUD VARIATIONS IN SUGAR CANES.

In reply to a letter addressed to him by the editor, Mr. Fairchild, manager of the Kealia Plantation, writes:

Kealia, Kauai, August 26th, 1899.

MR. H. M. WHITNEY,

Dear Sir:—* * * * In reply to your inquiry, I have not seen any more stalks of cane like the one sent down to you, and have not been able to locate the stool from which this one sprang. I do not know whether the stalk was of the same formation all the way down as only the short piece of it came under my observation. In cutting the ratoons from this piece I shall keep a lookout in the section of the field from which this one was picked up.

I have since learned that Mr. A. Wilcox at Hanamaulu has also seen cane with four rows of buds. I understood that it was planted but came up as all cane does. I have seen cane that had no eyes. On one field in particular this year, where we were picking up the lalas, we found many of them without eyes. It would be interesting to account for these freaks as it would be to understand why it is that cane does not tassel in some places.

GEO. H. FAIRCHILD.

(The following reprints were enclosed in Mr. Fairchild's letter.)

(Correspondence Dem. Argosy.)

Dear Sir:—In a letter received from Barbados, yesterday, the following paragraph occurs:

"On Friday last, at the Agricultural Society's rooms here, I saw a real instance of bud variation in a sugar cane. The upper 3-foot length of a cane had been sent in from Kirton Plantation, in St. Philip. This cane had lost its top by arrowing or otherwise, and four eyes had sent out shoots, two on either side of the stalk, and these shoots had grown into canes about 20 inches long. The two buds on the left of the stalk had produced purple and white-striped ribband canes, the two on the right bore canes with a pale greenish-yellow rind resembling that of the stalk."

My correspondent goes on to say that he thinks Professor Harrison has said "that he knew of no authentic instance of bud variation." In this matter, I find, however, he is mistaken. In the pamphlet entitled: "The Results of Recent

Scientific Researches into the Agricultural Improvement of the Sugar Cane," will be found our Government Analyst's true views on this subject. The first paragraph and the last of the section headed "Bud variation," give the views I have referred to. In between come instances of bud variation in various parts of the world, and you will notice that it is always canes of purple striped, or pale greenish-yellow color that produce these "sports," so that it would seem that the Barbadoes instance is in line with previous observations on this point. The "old Bourbon" does not seed readily or produce "sports." It was born good and it stayed good until the rind fungus came. It does not "swap around any," as our American friends would say. Might not this account for the "apathy" of the West Indian planter to improvement of the cane by selection of new varieties? He had a cane which was better than the purple and striped varieties, which, from their much stronger powers of seeding, etc., are now the principal hope of the scientific improver; he, therefore, was not tempted to change, and his old cane with its fixed characteristics and poor seeding powers, was not calculated to stimulate his hopes of good coming from efforts along lines now recognized as offering the greatest hope.

I am forwarding my copy of Professor Harrison's pamphlet to you, with the two paragraphs referred to in the earlier part of this letter, marked. I would suggest that you should publish them with this letter if the matter seems of interest to you.

Yours faithfully.

FRED. C. S. BASCOM.

May 4th, 1899.

[Note—Until recently this mode (bud variation) of attaining an improved variety of cane appeared to be a favorite one with the authorities at Kew. By "bud variety" is meant the production of a variety distinct from that of the parent cane by means of a shoot springing from an eye. As the search of these "bud variations" has been recommended by such high authority it is of some interest to ascertain on what grounds the assertion that "bud variation" occurs in the sugar cane is based. Neither Mr. Jenman nor myself during our long individual experiences with the scientific observation of the sugar cane—experiences probably as extensive as that of any other scientific observers—have ever seen anything resembling a "bud variation" in case of the sugar cane, and think that we

are justified in assuming that if such variation ever occurs it is only in exceedingly rare cases.]

"It must be admitted that the evidence, so far as it is available, with regard to the occurrence of "bud" sports in the sugar cane, is somewhat meagre, but that, on the whole, it points to the occurrence of bud variation as a very rare manifestation on the part of the sugar cane. Hence, I do not consider that the improvement of the sugar cane by means of bud sports can be considered as a practical method, or one likely to repay the enormous amount of work necessary to search through many square miles of sugar canes in search of what, at the best, must be of extremely rare occurrence."—Dem. Argosy.

———:o:———

HAWAIIAN REPTILES.

The Smithsonian Institute of Washington has recently issued in pamphlet form a description of Hawaiian geckos and skinks, commonly known as lizards, having received specimens of these reptiles from the late Mr. V. Knudsen, of Kauai, the late Mr. R. W. Meyer, of Molokai, and Mr. H. W. Henshaw, of Hawaii. We quote a few paragraphs from the pamphlet, of which Mr. L. Stejneger is the author:

"It is quite significant that there are no true land reptiles in the Hawaiian Archipelago other than a few species of lizards, and particularly that all the species known to occur there belong to the cosmopolitan families, the geckos and the skinks. It is further to be observed that all three skinks and three of the four species of geckos belong to species widely distributed over the Indo-Polynesian island world, and, finally, that the remaining gecko has close relatives in New Caledonia, Java, Sumatra, and Ceylon.

This distribution does not sustain the theory of a once continuous land connection between the various island groups. On the contrary, the limited number and wide range of this fauna go to show that at the time of immigration the Hawaiian Islands, at least, were separated, and probably widely so, from whatever land masses may have connected other islands at that time or earlier.

If the meteorlogic and hydrographic conditions at that time were anything like what they are at present, it is not likely that these frail land vertebrates were distributed over thousands of miles of ocean by ordinary means. Currents and wind

would have prevented their distribution, and such obstacles which have appeared to some authors so formidable as to make them dubious concerning the western origin of the Polynesian navigators themselves seem insurmountable for small land vertebrates incapable of flight.

It is a well-known fact, however, that these small lizards are easily transported in vessels and among household goods over great distances, and when looking for the means by which these animals may have reached the Hawaiian Islands it is not possible to escape the conclusion that they have been introduced by man's agency. From the circumstances that the true home of these lizards is to the south and west of Hawaii; that nearly all the species were collected there as early as the visit of the United States Exploring Expedition under Wilkes; and that the species are more or less common on the principal islands of the Hawaiian group; from these circumstances it is permissible to conclude that the lizards immigrated to the islands with the ancestors of the Hawaiians.

"At the present stage of our knowledge, the distribution of these animals throws very little light upon the question by which route they and man—if it be true that they accompanied him—reached the archipelago. It should be added, however, that a better and more detailed knowledge of all the forms inhabiting Polynesia might give better results. Not until specimens from all the groups have been brought together in sufficient numbers will it be possible to affirm with certainty that these widely distributed species have not differentiated into local forms by which, however slight the characters, it might become possible to trace their evolution and incidentally their migrations. The only point which can be claimed with certainty is that they came from the west. One or two of the species, it is true, have also been found in a few localities in America, but their distribution here is purely local and, no doubt, is due to introduction by man, much in the same way as they reached the Hawaiian Islands, though probably much later. If, then, it be true that these lizards have accompanied the Polynesians in their migrations, the conclusions to be drawn add to the mass of evidence available against any theory of their having originated in America, though this addition may perhaps be superfluous at the present day.

I am not aware of records of any of the marine snakes having been taken at the Hawaiian Islands. Some are known to occur as far east as the Society Islands; but the only surpris-

ing feature is that *Hydrus platurus*, which is recorded from Japan, Tahiti, and the west coast of Mexico, has not been found in Hawaiian waters, at least occasionally.

The marine turtles living in the seas surrounding the Hawaiian Archipelago and breeding on some of its outlying islets are, as yet, too imperfectly known to make it profitable to discuss them on the present occasion, hence the limitation of this paper to the terrestrial reptiles of the islands."

———:o:———

A SENSATION IN SUGAR.

The American Sugar Refining Company at the opening of business yesterday announced a reduction of 3-16c per pound on granulated and other grades of common use, and continued their guarantee of prices to buyers until January 1. The independent refiners immediately reduced their prices to correspond, and the Arbuckles went still better and announced a horizontal reduction of 1-4c. The Sugar Trust's grades that suffered reductions other than 3-16c were standard and coarse powdered, which are cut 1-4c; and XXXX powdered, which was reduced 5-16c. The Arbuckles withdrew their guarantee on prices.

The reductions in prices at this season are much more important than is reflected by the actual quotations, as they apply to business already transacted as well as to future business. It is estimated that the refiners have the following contracts outstanding, and which must now be filled at the reduced prices even should an advance be immediately put into force:

Sugar Trust	1,500,000
Arbuckle Brothers	100,000
Doscher	100,000
Howell refineries	100,000
Total	1,800,000

These figures are trade estimates, but there is every reason to believe that they are not wide of the mark. It will, therefore, be seen that the Sugar Trust is by far the greatest sufferer by the decline.

The reduction was ordered by President Havemeyer when he found that outside refiners were quietly cutting prices, and that some wholesale grocers were themselves selling at 1-16c below list prices.—N. Y. Journal of Commerce.

THE REFINED SUGAR WAR.

It is difficult to write intelligently of the position of the refined sugar market. If we say that the demand has been light for new business and large for contract deliveries we only state the current business as shown on the surface. Beneath the surface much is transpiring of the greatest importance to the future conduct of the trade in refined. Exactly what this is cannot be stated at present, as negotiations are not yet fully completed. As far as understood a committee of the National Grocers' Association of the United States are hard at work on a plan which contemplates the purchase by them of a large amount of refined sugars for delivery to their members as wanted by the American Sugar Refining Company, and in consideration of their large and exclusive purchase from the American Sugar Refining Company the latter allow 1-2c per pound in addition to the present rebates given all buyers.

The independent refiners are doing their best to prevent the consummation of this deal, their representatives having held conferences with wholesale grocers in Chicago, Milwaukee, Minneapolis and other Western cities, and being reported as saying that if the deal is consummated the independent refiners will wage a more violent war than ever, which is taken to mean that they will endeavor to undermine any such arrangements by selling their sugars to the customers of all in the combine. Under such circumstances, it is impossible to decide what special conditions the refined sugar trade will take to itself in the near future. The American Sugar Refining Company are apparently indifferent spectators of the situation, but at the same time willing to accept any proposal for the relief of the jobbers who are in conflict, which is not detrimental to their interests. It remains to be seen if the national committee can devise such a plan as will harmonize all interests. So many difficulties have already arisen that it announced today that the matter is indefinitely postponed. It looks like a large undertaking and not likely to succeed, so for the present it is well for buyers to purchase for their wants as usual and carry a good stock, as, with new or old arrangement or with 1-8c more rebate, the net current price of granulated is not likely to be less than 52c per 100 pounds above the price of centrifugals as it stands now. An eighth more discount don't necessarily mean a difference of 40c between raws and refined, as some may imagine. There is not likely

to be any decline in the net price of refined, whatever happens, so it will be well to take a suggestion and buy as freely as your wants require on the present basis.—Willett and Gray's Circular.

———:o:———

WITH OUR READERS.

The leading article in this number of the Planter's Monthly on scale insects, contains many details relative to the disinfecting of plants brought from abroad and in what way it can be done best. More attention is being paid to this subject in other countries than formerly, and in most cases with good results.

Another article, entitled "Fifty Acres in Tea," refers to the successful cultivation of this plant in South Carolina. From this account it would seem to be clear that Dr. Shepherd is succeeding much better than formerly in his efforts to establish this new industry. The principal obstacle that he has to contend with now is the labor required in picking the leaves. In China and India, labor is very cheap—only a few cents a day for women and children, who for this purpose are preferred to males, as they are more expert with their fingers. The doctor can never find such cheap labor in Carolina—that is, permanent and reliable labor, to be had when wanted. But as the cotton gin opened the way for cheap production of cotton, so the invention of a tea picker may revolutionize the tea industry, and transfer its profitable production from Asia to America. It only needs the inventive genius of another Eli Whitney in the fields of Carolina to turn its wastes into blooming gardens. Such things have happened, and may happen again. All interested in our new industries should peruse the very interesting story of Dr. Shepherd's successful "tea garden."

The improvement of the sugar cane is another subject which is receiving much attention, and is referred to in the article on "Seedling Canes at the Royal Botanic Gardens in Trinidad," This island is a British Colony, near the northern coast of South America, where is established one of the best experimental gardens in existence. For ten or fifteen years, experiments have been made there and elsewhere, having in view the improvement of the sugar cane by the selection and propagation of seedlings. Some of the new varieties give promise of success, but it takes years to determine whether any improvement noticed is permanent or not. In several ways this is sought, viz: in finding a cane, seedling or graft, that will yield

more sugar to the acre or ton than the present varieties, or one that will mature in a shorter period, say twelve months or less, from the planting; or a more hardy variety capable of withstanding cold snaps, if planted in higher altitudes than usual, remaining equally profitable as a sugar producer. In each of these directions there is quite as much room for experimenting and for encouragement to those who are engaged in the task, as there is in the line of fruits, flowers and vegetables—to say nothing of beets, in which such marvelous advances have been made during the past thirty years, or in the efforts to produce orange trees that will resist frosts and cold snaps, thus insuring the ripening of their fruits in localities where they will not now ripen. The century now opening to us will undoubtedly see great improvement in this line, and results will be obtained more marvelous than any yet witnessed.

———:o:———

MUCH ADO ABOUT NOTHING.

Our usually quiet and very peaceable community has lately been disturbed by a ridiculously small matter—so small as hardly to deserve mention, except for the purpose of quieting the nerves of any who might possibly have had their rest disturbed by ugly dreams of an impending crisis.

It seems that some adventurous Yankees, bent on a lark, audaciously "squatted" on several of the choicest garden spots of Olaa, on Hawaii, having previously, no doubt, had tips that a great sugar plantation was to be located in that district. They then defied heaven and earth to put them off, apparently feeling as secure as though they had "squatted" on a western prairie of the Mainland. When warned off by the local authorities, they appealed to the President of the United States, who, is in duty bound, referred their petition to his Attorney-General.

This officer, finding an old law which would head off the squatters most effectually, replied to President McKinley that all public lands of the United States, and this he decided should include Hawaii, could only be disposed of by act of Congress. This decision, which President McKinley was bound to accept, unfortunately struck both ways. It shut down on the "squatters," and compelled the President to issue a proclamation forbidding the sale of any public lands of Hawaii, and the annulment of any sales that had been made. The opinion of the Attorney-General and the Newland's resolution being thus in

conflict with each other, it remains for Congress, by resolution or otherwise, to correct the matter.

The Newland's resolution, passed by Congress, clearly gives full authority to the Government of Hawaii to continue the same practice as before annexation, in all branches of the Government, including land sales. In strong confirmation of this, is the letter of Mr. Sewall, Special Agent of the United States to Hawaii, to the Hawaiian Government, from which this extract is quoted:

"Resolution provides that land laws of the United States shall not apply to public lands in Hawaii, and that municipal legislation of Hawaii generally shall remain in force."

The Hawaiian Government has acted on the instructions which it received, and as they were understood by Congress and by the President, until the opinion of the Attorney-General was given, which overturned the whole. No one had probably thought of this old law of Congress, as applicable to Hawaii, until it was unearthed by the Attorney-General, and made to apply primarily to the petition of the squatters on Hawaii. But, having been quoted against them, its application should, in his opinion, cover all sales of government land. Congress will undoubtedly rectify this conflict of authority, and by resolution or otherwise, make legal all land sales that have been made here.

To sum up this whole matter:

1. The Hawaiian Government, in selling public lands, has done only what it was clearly authorized to do by Congress and by the President.

2. As these sales were made in good faith, and by authority, they will undoubtedly be confirmed by special act of Congress.

So the curtain will drop, and the scene will close with no one to blame, but the irrepressable squatter.

———:o:———

NEW YORK SUGAR MARKET.—SEPTEMBER 14.

RAWS.—The market has ruled very quiet throughout the week. The cargo of Javas at the Breakwater, which remained unsold at the close of last week, was finally placed at 4⅜c., basis 96° test, with the American Sugar Refining Company, they being the only buyers willing to treat for so large a cargo at that time. Refiners would doubtless be willing to go on at 4⅜c. for Centrifugals and 3⅞c for Muscovados, but there are no sugars offering for sale at present and the market closes nom-

inally at these quotations. Practically all the sugars which will be received for a month or so to come have been sold to arrive.

REFINED.—The interest of the trade was centered in the refined sugar market this week. It was decided by the Committee of the National Wholesale Grocers' Association not to wait for action by grocers at Saratoga or elsewhere, but they completed their arrangements with the American Sugar Refining Co. and furnished the Company with a revised plan for the distribution of sugar, given herewith, which the Company announced on the 8th inst. they would adopt. The new plan went into effect on the 11th inst. and it remains to be seen whether the individual members of the various associations will give support to this action of their committee. At the office of the American Co. it is said that the intention is to pay the $\frac{1}{8}$c. gratuity only to those buyers who handle the American Co.'s sugars exclusively (excepting domestic cane and beet sugars), although the word "exclusively" is omitted in the wording of the plan. Many think that this omission can be taken advantage of by the Company, if advisable, under certain circumstances. On the 11th inst. not only the American Sugar Refining Co., but also Messrs. B. H. Howell, Son & Co., and Arbuckle Bros. offered their sugars on the terms of the new plan, except, of course, Howell and Arbuckle do not require their buyers to handle their sugars exclusively.

American and Howell made no change in their list prices for Granulated of 5.31c., but the new terms of less 3-16c., 1% and $\frac{1}{8}$c. reduces their net prices from 5.02c. to 4.96c.

Arbuckle Bros. list price is still 5.25c., but their net price is reduced by present conditions from 4.96c. to 4.886c.

Doscher opened the market unchanged, but later he discontinued the trade discount and reduced his list price to 5c., with 1 per cent. for cash, equals 4.95c. net, which makes but little change in his net price.

The Old Factor plan having been superceded by the New Plan, sugars will no longer be "consigned" by refiners under the agreement provided by former conditions. Contracts used hereafter will be the ordinary form of purchase and sale note.

Withdrawals under old guarantee contracts continue to be large and shipments are delayed two to five days. New business is light, however, and a good proportion of such orders goes to Arbuckle because of his lower price.

Howell and Arbuckle will pay grocers the $\frac{1}{8}$c. rebate at end

of 60 days, but manufacturers who buy of them will receive this rebate immediately. A. S. R. Co. intend to pay the rebate to both manufacturers and grocers in 60 days.

Many grocers complain that their profits are reduced one-half under the New Plan as the 3-16c will be given away and the 1% trade discount being discontinued makes a loss of about ¼c. against a gain of only the new "gratuity" of ⅛c.

The Saratoga Convention of the New York State Wholesale Grocers' Association considered the New Factor Plan in secret session. It was decided not to take any action as an Association, but individually the new plan for the sale of sugars was accepted. It was provided, however, that no member was bound to buy of any particular refinery, nor to sell at any fixed price, as the plan gives the wholesalers permission to deduct the 3-16c. from list price or not, as they may see fit. The opinion was expressed that no improvement had been effected by the change.

Reports from the West indicate that the trade is divided in its opinion as to the working of the new plan. Meanwhile a hand-to-mouth policy is being preserved, which, in a measure, will restrict actual consumption.

The American Company are willing to give this plan a fair trial. They believe that it will result in the grocers maintaining prices more firmly than heretofore, and that its enforcement will bring a larger percentage of business to the company, particularly as they are the only refiners who can supply all of the standard grades of refined sugars.

The grocers having apparently favored the Company in this new arrangement, they will help to put the independent refiners more than ever on the defensive if the Committee's action is supported generally.

The independent refiners, however, do not believe that the payment of ⅛c. gratuity can legally be withheld from any buyer because he does not handle the American sugars exclusively, and do not think it would be good "policy" for it to be withheld, whether any legal question is involved or not. The independents intend to go on selling their sugar, preferably to the wholesalers, on conditions favored by the grocers, and offering inducements which they think sufficient to secure a good share of the business. They expect to demonstrate the impracticability of carrying out the new plan successfully while these refiners are left out of the arrangement. If the wholesalers cut loose from the independents there may be more demoralization in the trade during the immediate future than formerly, and developments are awaited with much interest.—Willett & Gray's Circular, Sept. 14.

SCALE INSECTS, REMEDIAL MEASURES AND INSECTICIDES.

By E. E. Green, F. E. S.*

In the following pages I have endeavored to bring together scattered information on the various methods that have been employed in dealing with insects pests of the family Coccidae. Though such treatment may in many cases be found suitable to insect pests of other families, I do not propose to give here a general treatise on insecticides, but to confine myself on measures applicable to the subject of the present work.

Little or no originality can be claimed for the following remarks. They are very largely compiled from the published work of trained entomologists (chiefly American) in different parts of the world. America has long been in the forefront in the practical application of economic entomology.

Remedial measures may be discussed under two main headings: Prevention and Cure. The former, being by far the more important, will be dealt with first:

PREVENTIVE MEASURES.—Of first importance among preventive measures, I would place Quarantine Regulations. It is a fact, repeatedly demonstrated, that imported pests are the most serious. An insect may attract little or no attention in its original home, where it is kept in check by its own natural enemies, a system recognized as "the Balance of Nature." But take it away from its home; place it in a congenial climate with an ample supply of suitable food, and it will multiply without the checks that have prevented its increase in its original habitat. The very fact of extensive damage by any insect may of itself almost be accepted as proof of its foreign origin. Looking through the list of the different scale-insects occurring in Ceylon, I find that all the more troublesome species have been previously described from some other country, and are, therefore, presumably imported insects. The home of the "Lantana bug" (Orthezia insignis) is now supposed to be some where in South America; and there is evidence in favor of the supposition that we owe our "green coffee bug" (Lecanium viride) to Western Africa. Aspidiotus cydoniae, Chionaspis biclavis and Mytilaspis citricola, were originally described from America. Aspidiotus camelliae. A. cyanophylli, Chionaspis aspidistrae, and Dactylopius citri, are

*From "The Coccidae of Ceylon," Pt. II., Dulau & Co., London, 1899.

all well known on the continent of Europe. Aspidiotus aurantii and Pulvineria psidii have their home in Australasia. Our former coffee pest, the "brown bug" (Lecanium coffeae) might perhaps be quoted as an exception to this rule, as it was first recorded from Ceylon. But this insect is now considered to be merely a local variety of Lecanium hemisphaericum, an insect found all over the world, and whose origin is uncertain. On the other hand, not a single undoubtedly native species has attracted any notice as an insect pest in Ceylon.

We have only to recognize these facts to appreciate the importance of a properly conducted system of quarantine for all imported plants and fruit. Our insular position in Ceylon, with but one main port of entry, gives us a peculiar advantage in carrying out such a system. A single quarantine station, with a single fumigatorium, will be sufficient in our case to deal with the whole importations of the island. It is true that, in spite of quarantine regulations, particular pests have found their way into protected countries. In such cases failure must be attributed to incompleteness of execution. And, though some few pests may have evaded all precautions, how many others must have been refused entry? The records of existing quarantine establishments give long lists of dangerous insects detected on arrival and destroyed before they have had the chance of obtaining a footing in the new country. I believe it is the custom at most quarantine stations to examine imported plants and fruit, and, if they appear to be free from blights, to pass them without treatment. But I maintain that not even the most experienced entomologist could guarantee a plant as absolutely free from insect life. Minute larvae and eggs may lurk beneath bud-scales, in the axils of leaves, or in unnoticed crevices of the bark. To be really effective, quarantine must be complete. Every live plant and fresh fruit should be subjected to treatment, whether it appear to be free from disease or not.

The only sure way of reaching every hidden insect is by fumigation. If properly conducted, there is little danger of permanent injury, to the plant. Even though some few delicate plants may be injured, or actually killed by the process, this is a very small consideration in comparison with the damage that may be effected by a single imported pest. What, for instance, must have been the pecuniary loss to the colony from the ravages of the "green bug"—a loss that in all probability might have been prevented. And compare this loss with the

value of all the delicate plants that have ever been imported into Ceylon! But, for such tender plants, it is possible to employ other treatment than is recommended for hardy shrubs and trees.

For wholesale fumigation of plants and fruit there is nothing to equal hydrocyanic acid gas, generated by mixing cyanide of potassium, water and sulphuric acid in certain proportions. This treatment is cheap and effectual. The gas is of the most deadly nature, and will penetrate every crack and crevice, and do its work thoroughly. The application is quite simple. All that is required is a close fitting chamber, provided with a flue for the escape of the gas after the operation. The more air-tight the chamber, the more complete will be the work. It should be fitted with racks to receive removable trays, upon which fruit may be spread. The objects to be fumigated are placed into position, the chemicals are mixed in a leaden or earthenware pan and placed on the floor, the door shut, and the room kept closed for from half to three-quarters of an hour. The flue is then opened, and, after a sufficient time (about half an hour) has been allowed for ventilation, the door is unlocked, and the plants, etc., removed. It is not advisable to take the subjected plants directly into the open air if the sun is shining. They should be kept for a few hours under shade, which will greatly lessen any danger of damage.

Mr. C. P. Lounsbury, Official Entomologist at Cape Town, has kindly supplied me with full particulars of the work of the fumigatorium at that place. From his letters and reports I have extracted the following directions and suggestions:

For each 300 cubic feet of space enclosed (and in proportion for greater and smaller spaces) 1 ounce of 98 per cent. potassium cyanide, 1 ounce of sulphuric acid, and 2 ounces of water will be required to generate gas of sufficient strength to kill the insects. Double this strength, or the same amount of materials to 150 cubic feet enclosed, may be used upon woody plants without danger of seriously injuring them. The greater strength should be employed whenever practicable, as it will ensure the death of the eggs as well as of the active insects.

Imported plants are usually in a more or less dormant condition which lessens danger of injury. Mr. Lounsbury writes, in his report of June, 1897, "Injury to the tips of new growth generally results. This injury is in no wise serious, and is quickly outgrown. The operators consider it a favorable indication, as when such injury results it is quite certain that the

gas has been present in sufficient strength to destroy all of the insects."

With respect to fruit, I again quote from Mr. Lounsbury's letter: "I had lemons and oranges analysed after treatment, and found that after few hours not more than a trace of the gas remained in the rind. There is much more natural cyanogen in a single seed (so the analyst told me) than what remains in the fruit from fumigation. We have no complaints of any effect on the keeping qualities of the fruit."

To generate the gas "the required quantities of cyanide and water are first placed in the generating vessel, the cyanide be ing broken into small pieces about the size of lump sugar. The operator then adds the acid, pouring it slowly into the vessel to avoid splashing, and immediately withdraws."

The above treatment is suitable for fruit and hardy plants. Tender garden plants are usually imported in Wardian cases, and may be treated separately. We have—in the "Wardian case"—an air-tight chamber ready to hand, in which the plants can be fumigated before their removal. After a large series of experiments with various fumigating media, I find that hydrocyanic acid gas remains by far the most efficient insecticide and the least injurious to the plants. But with, delicate succulent plants I find it has to be applied rather differently. A more concentrated dose of the gas applied for a shorter period is most satisfactory in its results. In a Wardian case, containing about sixteen cubic feet, I find a dose of half ounce cyanide, half ounce acid, and one ounce water with an exposure of half an hour will kill every individual of a colony of Orthezia (the most resistent of all Coccids) without in the least affecting the plants. The treatment should be carried out only after sunset. According to Mr. Lounsbury's tables, these proportions of chemicals should be sufficient for a space of 140 cubic feet with a longer exposure. The other materials tested were (1) a preparation of concentrated nicotine, sold by the XL-all company; (2) McDougall's fumigation paper; (3) Jeyes' fluid; (4) naphthaline; and (5) common tobacco leaves. Nos. 1, 3 and 4 were evaporated by means of a small spirit lamp inside the case; Nos. 2 and 5 were lighted and allowed to smoulder. All these materials applied in different strength and for different lengths of time, resulted similarly in more or less complete injury to the plants, and very incomplete destruction of the insects.

If there be no government quarantine establishment in the

general planting interests, importers should safeguard themselves individually by properly disinfecting all foreign plants before distributing them or putting them out in their gardens.

Perhaps of equal importance as a preventive measure is the maintenance of plants in a vigorous free-growing condition. This is a fact that has been recognized by gardeners for many generations. Anything that interferes with the free flow of sap immediately lays a plant open to attack from its insect enemies. A weakly, hide-bound plant falls an easy prey to every pest. Scale insects in particular, with a few exceptions (and such exceptions chiefly imported scales), seem to avoid a free-growing plant, possibly finding the healthy rush of sap too strong for them. Unremitting attention to cultivation will go far towards the prevention of insect pests. Amongst causes predisposing to disease may be mentioned: (1) Careless selection of plants and the retention of weakly seedlings; (2) Insufficient or injudicious drainage; (3) Unsuitable condition of soil, want of tillage, and—perhaps—of fertilizers.

Under the category of remedial measures may be mentioned the use of resistant stock. In the history of nearly every extensive plant disease it has been observed that individual plants—or established varieties of the plant—may show a marked freedom from the disease prevalent upon the less favored type. By breeding from such individuals, or accidental varieties, a more or less completely resistant stock may be established. This fortunate fact has been frequently used with great success in dealing with fungal diseases. Thus a special variety of the potato plant—proof against the well known potato disease—has been extensively cultivated. Some varieties of wheat are found to suffer but little from "wheat rust" (Puccinia). We have also examples of certain established strains of cultivated plants that repel particular insect pests. In Europe the vine growers have found an American stock that to a larger extent resists the attack of the dreaded Phylloxera; and by grafting on to this hardy stock they have been able to immunise their more delicate and valuable varieties. In Ceylon we have the strongest evidence that certain varieties of the plant (especially the Assam indigenous stock) are most markedly free from injury by the so-called "mosquito blight" (Helopeltis). In any serious epidemic that may theaten the profitable cultivation of an economic plant we should at once be on the look out for any accidental varieties or strains that may prove resistant to that particular

disease. In cases where the hardier stock is not otherwise so profitable as the more delicate variety, by grafting upon it a more valuable scion the latter may sometimes be rendered equally immune.

CURATIVE MEASURES.—Where preventive measures have failed, as even with the greatest care—must often happen, recourse must be had to curative measures.

In no single connection can the old proverb, "A stitch in time saves nine," be more aptly applied than in dealing with insect pests. In this case the "stitch in time" is more likely to save ninety, or nine hundred, or nine thousand!

If a pest is to be eradicated, immediate treatment is the most important part of the process.

And the first step towards treatment should, when possible, be the isolation of the infected area. All ordinary work amongst the affected trees should be deferred until after treatment. The young larvae of scale-insects are very minute and active, and one of the most fertile sources of their distribution is by means of clothing.

Another important point is that the treatment should be applied on the spot. If the infected branches are cut down and carried off to some other part to be burned, they may be shedding the germs of the disease all along the way.

It is difficult to lay down hard-and-fast rules for action, so much depends upon circumstances, e.g. the nature of the particular pest, its extent, the nature and value of the plant attacked, etc., etc. But, for the sake of example, we will suppose a case in which three or four tea bushes are found to be infested by some scale-insect that is considered to be a dangerous pest. First dig a fair-sized hole in the midst of the affected clump, and place in it some dry grass and sticks as foundations for a fire. Fill two or three buckets with one of the insecticide washes described below. Prune back the branches one by one; immerse each branch completely in the insecticide and throw it into the hole, until nothing but the bare framework of the tree is left. Sweep all fallen leaves and rubbish from beneath the trees into the hole. Next, paint over the bare stems with the same insecticide, using a large paint brush and taking great care to saturate the entire surface down to the ground. Then set fire to the heap of prunings, and cover up the remains with earth. To kill off possible strugglers, the unpruned trees immediately surrounding the affected patch should be thoroughly sprayed with the mixture. If carried out in time,

these measures will probably stamp out the pest; but a careful watch should be kept for any fresh outbreak.

The above treatment is suitable only for such plants as may be cut down without permanent injury. We may now consider the case of some larger tree to which this method would be inapplicable—say an orange or cocoa tree. In this case the gas treatment is the most suitable. The application should be repeated after an interval of about a fortnight, to ensure the death of larvae subsequently hatched from eggs that may have survived the first operation. Full directions for gas treatment are given in the next Bulletin.

In other cases a combination of these two methods might be adopted. If two or three coffee trees should require treatment, all superfluous branches might be pruned, dipped, and burned, and the standing trees fumigated with gas. Modifications of the treatment will be required to suit particular cases.

When a serious pest has once firmly and widely established itself, little hope can be entertained of exterminating it, though much may still be done to keep it in check.

Where trees are large and more or less detached, as in orange groves, and the crop a valuable one, the gas treatment is again the most satisfactory one. But where the cultivation is denser, and the crop not so concentrated, spraying is found to be more practicable.

The choice of the insecticide must be regulated by the nature of the crop. Arsenious compounds cannot be safely applied to food crops—such as fruit and vegetables—during the cropping season. And they can on no account be recommended for such a product as tea, unless employed exclusively after pruning. For, however minute may be the actual amount of active poison deposited on a single leaf, when we consider that it takes some 400 pounds of leaf to make sufficient tea to fill a chest, and that about 3,000 of the green leaves go to the pound, or 12,000 leaves to a pound of the finished product, it is evident that the amount of poison in a single chest of tea might be considerable. And further, during the processes of packing and transport, it is by no means improbable that this mineral poison which would dry off in fine powder might gravitate and become condensed towards the bottom of the chest, with dangerous results to the consumer. The danger may be considered far-fetched; but I think it should be recognized.

For the above reasons no patent preparations should be em-

ployed to any large extent, unless the ingredients are well known. Such mixtures, being designed for general use, may contain several different poisons acting in different ways, either externally by contact, or internally through the alimentary system. The proprietors of patent insecticides not unnaturally object to disclose their formulae, and put off any questions by asserting that the amount of active poison in the mixture is so very small as to be practically harmless. This may very well be true in most circumstances; but, as shown above, in other cases the poison might become concentrated into a small portion of the product.

For other reasons compounds that depend upon arsenic or other mineral poisons for their killing properties are of little use against Coccidae. Insects that subsist upon the sap of the plants should be treated with insecticides that kill by contact, such as soap, petroleum, pyrethrum, etc. Arsenic, which adheres to the surface of the plants, is useful only against pests such as caterpillars, grubs and slugs; that take in solid food. Mr. Maskell puts the matter concisely. He says: "Whatever damage is done by (scale insects) is effected by the sucking of the juices of the plant through the rostrum (beak) of the insect. It follows from this that applications of any fluid to the tree externally, with the object of poisoning the insects in their feeding, would be useless, as their food is drawn from beneath the surface.

There are many substances fatal to insect life, but perfectly harmless to the higher animals, that may be safely used. A list of the principal insecticides, with directions for their preparation and application, is appended. (See next Bulletin.)

The most suitable season for spraying is when the young larvae are hatching. They are then in the most unprotected condition. In temperate climates this season varies with different species, and should be made the subject of careful observation. In tropical countries many species, and those naturally the most pernicious, appear to produce a constant succession of broods throughout the year.

To produce any permanent result, spraying must be very thorough. The success of the treatment depends upon the actual contact of the liquid with the individual insects. Even when the work is done by a trained man, it is practically impossible to secure the destruction of every individual. The difficulty is greatly increased when the work has to be intrusted to natives. In conducting the operation, the position of the

insects upon the branches and foliage must be carefully noted, and the nozzle of the machine manipulated accordingly, so as to throw the spray upwards against the backs of the leaves, or downward on the upper surface, or horizontally against the stems and branches.

A few words may be said as to the apparatus for spraying. This is not the place to advertise any particular make of machine; but some general principles may be given to help the would-be purchaser in his choice.

Points to be considered in the selection of a machine should be:— 1. Adaptability to Transport.—For ordinary use, where small trees only have to be treated, there is no form so convenient as the knapsack pump. This consists of a metal vessel that rests upon the back, and is supported by straps passing over the shoulders of the operator. The handle of the pump (in the best patterns) comes forward under the left arm, and is worked by the left hand, leaving the right hand free to direct the nozzle which is attached by a flexible rubber tube. The vessel usually contains the pump cylinder, and space for about four gallons of liquid. Where a large apparatus is required, a barrel pump may be used. In this form the pumping apparatus is fixed in a barrel to which the handles are attached, so that the whole apparatus can be carried from place to place by two men. Where the land is flat the barrel, or a metal tank, may be mounted on wheels for transport; but it should be designed so that the vessel may be dismounted and carried by hand to such places as are inaccessible to the wheeled vehicle. Where the lay of land is suitable, and large trees have to be treated, a more powerful apparatus may be mounted on a cart and drawn by horse or bullock power. In such cases two or more lines of hose and nozzles can be worked from the same tank.

II. Strength.—The materials employed in the construction of the machine should be such as are not readily corroded by the mixtures used. Mr. Lounsbury, in his report for the year 1896, gives the following very practical hints on this subject:

'Iron is so quickly corroded by many of the common insecticides and fungicides that pumps in which the working parts are of this metal are not desirable. These parts of the pumps should always be made of hard brass. For the sake of economy, the bodies of most pumps are made of iron, but even here the use of brass lends greater durability, and is an advantage which in the end will probably pay for the addi-

tional initial cost. Rod-like parts and thin handles of cast iron are objectionable because so easily fractured. Any parts of rubber are damaged by contact with paraffin. Ignorance of this fact has led to the ruin of a large number of Vermarel knapsack pumps, in which a circular rubber disc is used for the propulsion of the liquid. The paraffin causes the rubber to swell, and thus become useless for its purpose.

'Copper is the best metal for tanks in knapsack pumps, and attention should be paid to the thickness of this metal. Thin copper will rapidly wear through. Tanks of sheet iron or tin are soon ruined by contact with liquids containing copper compounds, such as Bordeaux mixture and Paris green, and these preparations are also injuriously affected. But even copper tanks are not suitable for use with all spraying mixtures, since this metal is acted upon by the sulphur in such compounds as "eau grison" and lime-sulphur-salt mixture. In these cases, the sulphur leaves the lime, with which it has united during the process of cooking, and unites with the copper to form copper sulphide. This compound forms in a thin black layer over the copper, which, if it would remain intact, would preserve the metal from further action; but, unfortunately, some of it usually breaks away, exposing fresh surface to the injurious action, and also proving an annoyance by passing through the hose and clogging the nozzle. For these reasons it is best not to use these sulphur mixtures in knapsack pumps.'

III.—Simplicity.—All the parts of the pump should be readily accessible and removable, so that, should anything go wrong, they may be taken to pieces and cleaned, or damaged parts renewed. The want of these facilities is a serious fault in many machines, the slightest injury necessitating the sending of the whole apparatus to the repairers.

IV.—The production of a Uniform and Effective Spray.—The continuity and force of the flow is dependent upon an air chamber in the pump, this feature constituting a 'force-pump.' On this account all hand syringes are almost useless. The nature of the spray is regulated by the form of nozzle employed. The chief object is to break up the liquid into such a fine spray that it will penetrate the thickest foliage in the form of a dense mist and come in contact with every part. For this purpose one of the 'cyclone nozzles' is most admirably adapted. But where it is necessary to throw the liquid to a considerable distance, as, in spraying large trees, a nozzle throwing a coarser spray must be used. It is advisable to have several

interchangeable nozzles to suit the different kinds of work. There should always be a detachable cap to the nozzle, so that any obstruction may be quickly and easily removed. Many nozzles are provided with a fine point, held back by a spring, but which, when pushed forward, clears the aperture.

A few further remarks may be quoted from Mr. Lounsbury's report in which he gives some recommendations for the care of spray pumps. "Before a spray pump of any kind is put away after use, it should be thoroughly washed and clear water pumped through it; hot water answers much better than cold if sticky or soapy washes have been used. The working parts should be occasionally oiled, and if the paint on the iron parts becomes worn it should be renewed. Attention to these details will preserve the pump for a long period, while, if they are neglected, the pump may never save its initial cost.'

Before quitting the subject of general remedial measures and entering upon detailed descriptions of particular processes, something should be said upon the important question of the introduction of 'natural enemies' of the Coccidae. The same circumstances that make an imported pest so exceptionally dangerous, act in our favor in the importation of beneficial insects. Just as the absence of its established natural enemies enables an insect to multiply without hindrance, so the introduction of a beneficial insect without its own natural checks will also permit of its rapid increase as long as an ample supply of congenial food is obtainable. There need be little fear that, when the food supply has been exhausted, the imported insect will itself become a pest. A predatory insect, by which is understood one that preys upon other insects or animals, will seldom, if ever, alter its diet and become a vegetarian.

It is noticeable that an insect seldom assumes any importance in its original home unless through some accidental or artificial interference with the balance of nature in that part. (For instance, it has been asserted that the wide-spread destruction of moles in England has resulted in a marked increase of damage to pasture land from the grubs and the 'cockchafer' beetles and 'crane-flies,' upon which the moles fed.) Consequently, if we are to obtain any benefit from the use of natural agents, we must endeavor to reproduce the conditions prevailing in the country where the insect in question is known to occur, though without attracting notice as a pest. Or, if the original home of the injurious insect is unknown, we may reasonably hope for good results from the introduction of an

insect that is found to prey upon some allied pest in another country.

The most important natural enemies of the scale insects, or, at least, those that have attracted most attention, belong to a family of small beetles popularly known as 'lady-birds.' The complete success attending the introduction of an Australian lady bird (Vedalia cardinalis) into California, where it cleared the orange orchards of the destructive 'Fluted-scale' (Icerya purchasi) has led to numerous other experiments of a similar kind. These experiments have not always been successful. There must, of necessity, be many failures. We are still only in the experimental stage of the work. Even when the beneficial insect has been successfully established in a country, it is by no means certain that it will thrive. There may be climatic or other conditions against it. In that case, all we can do is to try another insect. Occasional or even repeated, failures should not discourage the repetition of the attempt. The value of a single success will far outweigh the cost of many failures. In the course of such experiments the causes of failure will in time be ascertained, and improved methods be employed. The freezing method recommended by Mr. Koebele seems to be rather an uncertain one, and has led to many disappointments. I am inclined to hope for more satisfactory results from the employment of 'Wardian cases,' as suggested to me by Mr. Lounsbury. In these the insects will remain active and be supplied with food. There are certain obvious dangers connected with this method, such as is the possible introduction of the insect pest upon which the 'lady-birds' have been supported during the voyage. For this reason the business should be conducted under the supervision of trained entomologists only. In choosing the food supply, an insect that already occurs in the country to which the lady-birds are consigned should, if possible, be selected.* But, under any circumstances, the imported beetles should not be liberated immediately, but should be transferred to fresh breeding cages and supplied with local food, and the cage in which they arrive should at once be thoroughly disinfected. In sending stocks by Wardian case, the larvae of the beetles may with advantage be included. These will complete their trans-

* In a recent consignment of 'lady-birds' received from the Cape of Good Hope, the cochineal insect (Coccus cacti) was very judiciously chosen for the purpose. This insect is practically confined to the 'Prickly Pear' cactus, and is therefore not liable to become a pest.

formations during transit, and are more likely to survive the voyage than the adult insects.

There are other natural enemies of the Coccidae that may some day be advantageously employed in the same way. Amongst the two-winged flies (Diptera)? we find the Lestophonus iceryae, which attacks the 'Fluted-scale.' Nearly every species of scale insect is subject to minute internal parasites belonging to the wasp family (Hymenoptera). The family Neuroptera supplies the 'Lace-wing flies,' the larvae of which are known as 'Aphis-lions,' from the voracious way in which they feed upon Aphides and scale-insects. Even the butterflies and moths (Lepidoptera) provide a few coccid-eating species, such as the caterpillars of the butterfly Spalgis epius and of several moths of the genus Eublemma. The 'Lady-birds' are included in the family Coleoptera.

Besides natural enemies belonging to the animal kingdom, scale insects are subject to diseases belonging to the vegetable world. There are several parasitic fungi that render great assistance in reducing the numbers of our Coccid pests. In Ceylon during the wetter months of the year, the 'green bug' (Lecanium viride) dies off to a large extent, attacked by a greyish mould which, after killing the insect, spreads outwards as a delicate fringe of interlacing whitish threads. A bright orange-colored fungus (Septoria? sp.) is useful in checking the increase of Fiorinia fioriniae and Chionaspis biclavis on the tea plant, and Aspidiotus aurantii on orange trees. A very similar fungus (Sphaerostilbe coccophila) that attacks Aspidiotus perniciosus in Florida (U. S. A.) has been the subject of some very interesting experiments to test the possibility of communicating the disease to previously healthy colonies of the insect. Dr. L. O. Howard gives the following particulars of the experiment:

An interesting and important development of the past two seasons' work has been the identification and study of the parasitic fungus, Sphaerostilbe coccophila. Professor Rolfs, of the Florida Station, has devoted a bulletin largely to the consideration of this fungus, which, as previously stated, seems to be prevalent throughout the Southern States. He has shown experimentally that the fungus may be transferred to trees affected with San Jose scale, and the disease produced among the scales. His process was to inoculate acid bread with pure cultures of the fungus, and three weeks later the application was made in the following way:—A piece of the bread about

an inch square was placed in cold water and shaken until the bread was broken up and the spores distributed in the water. This water was then applied to the scaly tree by means of a sponge, or cloth, or sprayed on. The applications were made in Midsummer of 1896, and observations were made as to the results late in February, 1897. Four of his experiments resulted successfully, and three unsuccessfully, while in the eighth experiment the result was doubtful on account of the tree having died between the times of treatment and inspection. Twigs from Florida containing San Jose scales, infested by the fungus, were sent to Mr. Horace Roberts, at Fellowship, N. J., about the middle of June. On September 25th Dr. Smith found the fungus upon almost, if not quite, all the trees on which twigs had been tied. A number of instances have come to our observation of the death of the scale in a wholesale manner from the spontaneous work of this disease, or from some other cause. For example, we received scale-infested cuttings in January, 1897, from an orchard which was said to have been freed from scales by this fungus disease. Careful examination showed that upon one cutting, out of 183 scales, but four were living; on a second cutting, out of 723, but two were living; on a third cutting, out of 579, but twenty-eight were living, giving thirty-four livng scales out of 1,485—a mortality rate of 97.7.'

I have, myself, repeatedly succeeded in disseminating the disease affecting Lecanium viride by tying branches with diseased insects on to trees on which the bug had hitherto remained quite healthy.

There are several methods by which spores of these parasitic fungi may be dissemited. As in the last-mentioned experiment, they may sometimes be communicated by merely transferring affected branches to the neighborhood of the healthy insects. In such cases the spores are carried by the wind to their destination. But in some of these fungi the spores are gelatinous and agglutinated, in which case the wind would fail to disperse them. Fungi of this kind may be crushed up in water and used as a spray; or artificial cultures may be made and mixed with water, to be used in the same way. In the ordinary course of nature these gelatinous spores are probably carried from tree to tree on the feet of birds.—Jamaica Bulletin.

FIFTY ACRES IN TEA.

The Experiment at the Pinehurst Tea Gardens.

The only tea gardens in the United States are at Pinehurst, S C.. These gardens are the property of Dr. Charles U. Shepard, who for the last ten years has been experimenting with tea culture on a scale and with a degree of thoroughness never before attempted in this country. Tea culture has been undertaken in a small way in the South at various times during the last one hundred years, the Department of Agriculture having frequently furnished seeds and plants for this purpose, but Dr. Shepard is the first person who can be said to have been successful in the business, and even he told me when I visited his place recently that although he had been in the work for so long it was not until the crop of 1898 was being harvested that he felt justified in saying that he had been successful.

Dr. Shepard's estate comprises about seven hundred acres, of which between fifty acres and one hundred acres are now planted to tea. This acreage is increased each year by the setting out of new gardens. It might be thought that so large an amount of land devoted to one crop would be spoken of as a tea farm or tea plantation, but I have the authority of the Department of Agriculture for saying that in all tea-growing countries the plantations are called tea gardens. "Whether the area under cultivation is one acre or one thousand acres, it is recognized as a garden, and in all features of this industry this appellation is universally employed." Parts of the estate which differ in the variety of the plant, or in the date of setting out, are spoken of as different gardens. One of the oldest and most flourishing at Pinehurst is known as the "Rose Garden." It takes the bushes in a garden four or five years from the time of planting to grow large enough to be picked regularly. Once established, though, Dr. Shepard says he sees no practical limit to their productiveness, since some of the best gardens in China have been picked regularly for two hundred years. After a bush has reached maturity it can be picked once in ten days during the time of harvest, which, in South Carolina, extends over the six months from May to October. Only the tips and first leaves are picked. Each new growth which admits of picking in this way is spoken of as a "flush," and the word "crop" applies only to the yield of the entire season. The bushes when in good condition are about three feet tall, and look like well-pruned willows, although the leaves are a little

darker and more glossy. The green leaves when chewed have a pleasant aromatic taste, not unlike that of the little New England plant known as "pipsisseway."

Pinehurst is two miles from Summerville, and Summerville is twenty miles inland from Charleston, on the line of railroad which connects that city with Columbia. When I rang the bell at Pinehurst and asked for Dr. Shepard, word was brought me from that gentleman that he was busy at the tea-house at work which he could not leave, and would I not come out to him there. I found the tea-house to be a neat two-story wooden cottage, standing, like all the buildings of the place, beneath superb Southern pines. The tall, straight trunks of these trees, branchless until far above the houses, and the softened light which their interlacing boughs sent down to the ground made me feel all of the time that I was at Pinehurst as if I was walking between the pillars of some vast old English cathedral.

Dr. Shepard was just weighing a pick of green tea leaves. He stood inside an open window of the tea-house, with a set of scoop scales on a table before him. On the veranda outside the window, or on the ground in front of the tea-house, were some thirty negro boys and girls of various ages. The boys were all small; some of the girls might have been sixteen or seventeen years old. Each one had an ordinary trout basket slung by a strap over one shoulder. The doctor would call out "Jinny" or "Sam" or "Hannibal," and the owner of the name would step to the window, unsling his or her basket and hand it in. The contents would be turned into the scoop of the scales, weighed and the amount credited to the owner's name on a check-list which lay on the table beside the scales. Some of the older pickers tallied over two pounds; others had only a few ounces of green leaf. While the green tea leaves are being picked they must not be packed tightly or allowed to lie long in a mass, because if they do fermentation, or a process very similar to it, quickly sets in. On this account the pickers are not allowed to stay out longer than two hours at the most before bringing their pick to the tea-house to be taken care of. Trout baskets have been found convenient receptacles because the tips or leaves can be dropped one by one through the square hole in the cover and lie lightly in the basket until removed. The children are paid at the rate of so many cents a pound for the green leaves, and are supplied with a wholesome lunch. A good picker will make from thirty to fifty cents a day. They were all neat, both in dress and in person, a fact which is pleasant to remember when one is drinking Pinehurst tea.

The question of how the tea should be picked was one of the most serious problems which Dr. Shepard had to consider. This part of the work must be done by hand, and the difference in the price of labor in the United States and in Asiatic countries will always increase the cost of tea grown here. The cost of picking in India or Ceylon is only a fraction of a cent for a pound of dry tea. In South Carolina the cost is from six to ten cents. Experience has shown that a bright boy or a grown girl can pick from a good flush about twenty pounds of green leaf in ten hours. This quantity ought to make about five pounds of dry tea. Even with the question of wages put one side, Dr. Shepard found himself embarrassed for pickers. If he was able to get enough hands for one flush there was no certainty that they would be available when the next flush was ready.

Dr. Shepard finally evolved a scheme which has worked excellently and which has seemed to me to be in itself a worthy piece of philanthrophy. He built a comfortable schoolhouse and equipped it with all the requisites for successful teaching. Then he hired a competent teacher and invited all of the colored families to send their children to school, free of charge. They would be taught all the branches usually taught in a primary school, and they would also be taught to pick tea, and given an opportunity to earn money to help buy food and clothing. The offer was favorably received, and the school has a large number of scholars from whom such pickers as are required are drawn. Many of the children when they first come to the school are too small to work, but they soon acquire the strength and skill necessary. At first they have to be very carefully taught. While I was watching the children at the tea-house one boy turned in a basket in which there were so many coarse leaves that he was severely reprimanded by the doctor. The other children hung their heads as if they were ashamed for him.

After the leaves were weighed they were collected in large tin tubs. When a tub was filled it was carried into one of the upper rooms in the tea-house and the leaves spread thinly on the floor to be "wilted." As soon as the leaves have been sufficiently softened in this way they are put into a hopper worked with a peculiar oscillatory motion which rolls the tender leaves into the tight little cylinders of commercial tea, and at the same time breaks the oily cells so as to make the contents readily extracted when boiling water is poured on them. The hopper, which is run by steam power, is of copper

burnished outside and in, until it shines like gold, and the floors where the leaves are spread to wilt are clean enough to eat from. The rolling by copper machinery too is certainly preferable to hand rolling. After the tea comes from the hopper it is still damp; and before being dried is set in shallow pans in a room where the temperature can be delicately adjusted to a moderately high degree. A few hours here accomplishes a change once thought to be simply that of fermentation, but now more accurately described as ovidation. This changes the color of tea, darkens it, and makes it what is known as "black" tea.

Most people suppose, unless they have visited a tea garden and have seen the process of manufacture, that black tea and green tea differ because made from different species of the tea-plant. This is not so. Certain varieties of the plant have been found better adapted for making one kind than the other, but the real difference comes wholly from the process of manufacture. Leaves which are to be made into green tea are not wilted, nor are they subjected to the process of oxidation. As yet the Pinehurst house makes only black tea, but Dr. Shepard told me that he hoped at some time to introduce the processes necessary for making green tea. After the process of oxidation is completed the tea is dried and packed. Dr. Shepard packs much of his in neat tin boxes holding pounds, or fractions of a pound. Tea made from the contents of boxes which he gave me has been greatly liked by persons to whom I have given it. The flavor is much like that of English breakfast tea.

In picking the tea only the tip of the shoot and the most tender leaves are taken. The number of leaves picked with the tip gives us certain other familiar terms, associated with tea, but the real meaning of which I had never understood. If only the tender, unexpanded leaf bud at the end of the shoot is taken the tea is called 'flowery Pekoe." If the first leaf, almost as tender as the bud, is included, it makes "orange Pekoe." If the second leaf, slightly firmer, goes in, it becomes simply "Pekoe tea." The addition of the next two leaves, in the same way, makes first and second "Souchong." At Pinehurst never more than the second Souchong leaf is included.

In order to insure a vigorous, fresh growth from which a succession of pickings can be had it is necessary to prune the bushes freely. The pruning is done in the winter. The native home of the tea plant was in the dark and sickly swamps along

the Brahmapootra River. In the moist forests there, unpruned, the plants attain a height of thirty feet. The botanical name of the tea plant is camellia thea. It is a near relative of the familiar hothouse plant, camelia Japonica. It is probable that the tea plant was introduced into China and Japan as much as fifteen hundred years ago. In those colder climates varieties have been developed which are much dwarfed. The two best-known varieties now are the Chinese and the Assamese. Dr. Shepard has experimented with seed from many countries, often brought here at very great expense. The seed comes packed in dry, powdered charcoal, in a hermetically sealed metallic case, the latter enclosed in an iron-bound wooden box. Eighty pounds of tea seed is called a "maund," and should contain about 30,000 seeds, but the life of the embryo is so delicate that only a small proportion of these will germinate.

The seeds are planted in the fall. When they begin to come up it is necessary to protect them from the direct rays of the sun, and at Pinehurst one sees what looks from a distance like great villages of South Sea Island houses. These prove to be platforms thatched with palmetto leaves, built over the beds of seedlings.

Dr. Shepard tried innumerable experiments in drainage, fertilizers, cultivation and curing before he arrived at the degree of success which he now enjoys. A brief resume of the history of the "Rose Garden" will give the best idea of the methods and results employed at present. The site of the "Rose Garden" was an old piney wood pond. The ground was thoroughly drained, sweetened with burnt marl and deeply plowed. One thousand plants of Assam-hybrid tea were set out, six by six feet apart. The area is not quite an acre. The garden was planted in 1890. At present the garden contains about 800 vigorous plants and 200 younger plants which have been set out to take the place of those which have died. The crop has risen from 150 pounds of green leaf in 1894 to 1,200 pounds in 1898, the equivalent of very nearly 300 of standard Pinehurst dry black tea. This year's crop will be much larger. Dr. Shepard calculates that the cost of this was 27½ cents a pound, but thinks increased acreage will lower the cost of production a little. Two other large gardens planted with Darjeeling seedlings promise to rival the Rose Garden in a few years.

Dr. Shepard has summed up his conclusions as follows: "The Rose Garden has apparently demonstrated that commercial tea can be successfully grown in South Carolina. The utiliza-

tion of this knowledge may be along several lines, but they all involve the erection of a suitable factory, costing from a few thousand dollars upward, according to the proposed scale of operations. In some countries the bulk of the tea leaf is raised by small farmers who, at the most, only prepare it sufficiently to insure its safe delivery at the factories in the larger and often distant towns. In other countries the large estates erect factories which will handle their own output and that of the small producers.

"There is a large class of people who might profitably add the cultivation of tea to that of fruit, flowers and vegetables, filling out the corners of their gardens with tea bushes, as they do in China, or substituting useful as well as ornamental evergreen hedges of that plant for the present unsightly and costly and frequently unreliable fences. Cultivated in this way the outlay of time, labor and money could not be burdensome; and, as one result, the household would be able to supply its own tea, pure, strong and wholesome, instead of the wishy-washy stuff, often far from cheap, generally sold throughout the country.

"As these little tea gardens are extended and multiply, factories will be established in each neighborhood for the larger manufacture of commercial tea, whither the products of the surrounding gardens can be brought and sold, precisely as canning factories and dairies consume the surplus production of fruit and milk."

MAX BENNETT THRASHER.

:o:

GREEN MANURING.

Our northern friends lay great stress upon the plowing under of green crops such as clover as a means for the improvement of the land, and many people have been misled in the south by these writers into supposing that the same practices will be of value in the south. It is well known to all the readers of farm papers that the writer has, in season and out of season insisted upon the great necessity for the restoration to our worn soils of the humus or vegetable matter that they have been deprived of by our course of improvident culture.

A soil, particularly a sandy soil, that is barren of vegetable matter, will not give the same results from the use of commercial fertilizers as one abounding in humus will. It behooves the southern cultivator, then, to consider carefully how he can

best restore the exhausted humus and thus bring up the productive capacity of his land. We have said that some of our southern friends have been misled by the writings of northern men into supposing that the same practices that prevail there can be used in the south, and many to their sorrow have tried the plowing under of green crops, only to find that the result in a sandy soil and warm climate is damaging instead of beneficial. Now, we wish to say that we don't believe in green manuring as it is understood in the north, and we have always warned our friends against the practive. Even in a northern climate and on the clay soils where the practice originated, we do not think the plowing under of green crops in the height of summer is the best we can do for our lands.

In the growing of leguminous plants for the improvement of the soil it is well known that the benefit to the soil comes largely from the fixation of nitrogen in the land through the agency of the rot microbes, and that this work is not done in the earlier stages of the plant's growth, but as it matures. If, then, we cut short the work the plant is doing for us when it is less than half done, and bury the whole in the soil, we not only run the imminent risk of souring the land, but we lose what the plant would have done for us had we allowed it to complete its growth. Then, too, we do not get the amount of humus we would have gotten from the full growth. So we would not use the term green manuring at all, as it is misleading to inexperienced cultivators. Use the leguminous crops for the restoration of the humus by all means, since through their help you can get the needed vegetable matter in the soil more cheaply than in any other manner, but let the legumes do all they can for you before you plow them under, and never plow them under green in hot weather.

Our southern field or cow pea is the grandest of all legumes for the south, and if it is allowed to get perfectly mature and allowed to die on the land nothing but good will come from plowing it under, but do not let any green manure enthusiast, who never grew crops in his life, persuade you to sacrifice the pea crop, and at the same time run the risk of doing serious damage to your land by plowing them under green.

In no way can you better start the development of the productive powers of exhausted land than by growing cow peas on it for the purpose of plowing them under, and nowhere will the commercial fertilizers pay you better than on this same pea crop, for on the peas you can use only the cheaper forms

of mineral fertilizers in the shape of acid phosphate and potash will not get away from you, but are there to help the succeeding crop and you will find that the fertilizer applied to the peas will give you better returns in the sale crop following than if it had been applied directly to the sale crop. This, as I have for years insisted, is the true way to build up our lands by feeding liberally the crop that feeds the soil. I am not writing from mere theory, but what I have done myself and persuaded others to do who have found the practice the correct thing.

———:o:———

SEEDLING CANES AT THE ROYAL BOTANIC GARDENS, TRINIDAD.

We have received the report for the year 1898, forming the twelfth of the series annually submitted by the Superintendent, Mr. J. H. Hart, F.L.S., during his tenure of office. The report shows that as usual active and valuable work has been prosecuted, in connection both with the sugar industry and with the so-called minor industries, which form in Trinidad a much larger proportion than in most of the other West India Islands and British Guiana. It appears that we shall have to to wait until next year before we can have more exhaustive reports on the results obtained from some very promising seedling canes raised from Demerara and Barbados, as well as homegrown seed. Mr. Hart states openly that the end he has in view is the obtaining of "a hardy cane that will give a 20 per cent. field return," and judging by his past work he is not likely (if properly seconded) to give up until the end is attained, if it be within the limits of possibility. We have only space at present for the paragraphs devoted to sugar cane, (which are as under). We do not fully understand the remark that "the Bourbon planted by itself is infertile,"* and to prevent any misunderstanding it would have been better if the sentence had been more explanatory. We are not at all experienced botanists, much less experienced cane growers. It may be

[*The statement made by Mr. Hart that "the Bourbon cane planted by itself is infertile," probably means that in Trinidad it requires the pollen of some other variety of cane to fertilize it, and render it possible for the seeds to produce plants. Even then the offspring could hardly be termed a genuine Bourbon, but a cross, which, however, might prove to be more valuable than its parent.—Note by the Editor of Planters' Monthly.]

explained that in the following remarks D means Demerara, B Barbados, T Trinidad:

"The experimental cultivation of the Demerara and Barbados seedlings has been continued at St. Clair. A large number of both have been deleted, but the Demerara seedlings have so far proved the better of the lot. A report on the results of the trials was published in May, 1898, but as these results properly fall into the work of the year under report, a recapitulation of the principal points is given.

"The sugar cane year in Trinidad does not end until April or May, and the returns of course cannot be given until the crop is harvested. The experiments under report therefore are those of canes planted in April, 1897, and reaped in April, 1898. The next crop to be reported on will be reaped in April, 1899. A few observations on the growth of this lot since planting from cuttings in April, on 1898, are given, while the full report on the latter will be given as usual, after harvest. Some 2,000 seedlings were raised in the season 1896-7, out of which only 126 stools were selected for test, the remainder having to be discarded, as naturally follows where selection from seedlings is being carried on. Most of the 126 have been grown on for a second year's trial, for harvest in 1899. It has been found that there was a marked likeness to the maternal parent in many of the canes grown from seed. Those from D 95 gave stools having a high sugar value. The same feature appeared among seedlings raised from D 102, and in vegetable characters also these closely resembled their maternal parent. The sugar value of canes raised from "Caledonian Queen," considered by Harrison & Jenman to be synonymous with "White Transparent," is considerably lower than either of the foregoing. Canes raised here from seed harvested in Demerara (four) were of low sugar value. The highest sugar value was obtained from a cane raised in Trinidad (T 111) from seed of D 74, grown in Trinidad. The percentage of available sucrose in this cane was 21.3. Another cane T 2 gave 18.2 per cent.; while the original D 74 gave 18.2 per cent.; T 77 gave 18.3 per cent.; T 19, 20 per cent.; T 211, 18.8 per cent.; and T 43, 18.2 per cent. The best of the Demerara lot, so far as our experience goes appear to be D 74—D 78—D 115—D 102—and D 116. D 95 is the sweetest cane, but in vigor of growth and capability of resisting rust and other diseases, it is not equal to some of the others. I received at the end of the year three selections from the Demerara raisers, and six from Barbados.

These will be grown on for comparison with those previously raised, and as guides to the value of our own seedlings. Plots of one-twentieth of an acre of the best Demerara kinds are now standing at St. Clair and show clearly the well-marked characters of each variety.

"In cane growing, as in nearly every other cultivation, every grower has his fancy. In Barbados growers appear to prefer yellow canes, and the prejudice against a colored cane is somewhat marked. In Trinidad also the same view holds good on several large estates. Most of the Demerara seedlings of the first sets raised are colored more or less, but later acquisitions of the yellow strain have now been secured. It would be very convenient if growers could furnish a reason for the preference of yellow over dark colored. Of the Trinidad canes, the best so far is T 2, a colored cane raised from Barbados seed. In our first selection from seedlings, 20 varieties gave an average return of available sucrose of 18.6 per cent., while standard varieties grown on the same ground gave 14.7 per cent. only. Our seedlings raised from seed harvested in 1897 have grown well, and we have now some 2,000 on the ground, and selections from these will be tested in April and May next. It is considered that if two good canes per thousand are secured the work is all that can be desired, and if only one good cane in every 5,000 is secured the work is highly successful; for if the end in view is ultimately attained—namely, the raising of a hardy cane will give a twenty per cent. field return, the growth of a thousand canes more or less is a matter of little moment. So far the growth of the plant canes from the seedlings of 1896-7 is all that could be desired, but it is not expected that more than one-tenth of these will be considered fit to pass on for the third year's trial, through the absence of qualities which go to make up a "good all round" cane.

"Number T 111, the cane showing highest available yield of sugar, has done fairly well, and will stand for its second examination in April next, and will then go on for its third year's trial. Whether it will prove good enough to pass on for further trials is a question for the future; for every cane in the selector's hands must stand or fall on its own merits, otherwise there would be no regularity, and the tests would be of no value. No matter how much a cane may strike the eye, it must go to the manure heap, unless it can successfully pass repeated trials.

"The seedlings of 1897-8 (i. e.) seedlings raised from seeds

sown November, 1897, were late in being planted, owing to the press of new work on hand, and many of them have not had a chance to make sufficient growth to show their characters well during the coming harvest. The canes on certain of the first planted areas, however, show sufficient character to enable us to judge them qualified to pass their first field test, and will come on for examination in April.

"The later growth, however, must await the following season. Not more than 5 per cent. of loss occurred from planting out the young seedlings in the field, as we took great care to well harden them previous to planting. They were attacked however by mole crickets, and many were cut when over two feet in height. A remedy was eventually devised to stop this loss. It consisted in placing a collar of bamboo over the plant, and pressing it slightly into the ground, allowing the plant to grow through, until it obtained sufficient strength to resist the attack.

"The crop of seed harvested in November, 1898, was very small, owing principally to the transfer of the work from the old establishment, but a good germination took place and we have quite sufficient for the year's work, some 3,000 plants.

"The varieties received from the Barbados station were B 147, B 347, B 306, B 208, B 156, and B 254. Of these B 147 is very highly spoken of. It is a yellow cane of the Bourbon type, and all the others possess similar characters.

"I obtained seeds of the Bourbon cane from various planters during the season of November, 1898. In all some forty bags were received, but with all this material not a single plant was raised. Our experience goes to show that the Bourbon planted by itself is infertile.

"Close observation of the seedling canes show that they have a period of ripening, differing with each kind. Some require as much as twelve months to ripen, some fifteen months, while not a few are ready for the mill in nine or ten months of good weather. D 74—planted in April, arrowed (flowered) and produced fertile seed in November, and will be fully ripe at twelve months old. D 61, on the contrary, will not be ripe until over fourteen months old, being quite grassy up to six months old; and T 2 is of a similar character. The Bourbon, as usually planted, takes some fifteen months; in fact, it is the rule to plant in the months of October and November for the crop to be reaped some fifteen months afterwards. The cane crop in

Trinidad commences some time in January, but often is not general until February and often continues until April or May.

"If a cane could be raised that would come to maturity regularly in ten or twelve months, it should be of great advantage to the sugar planter, and even if one could be obtained which would ripen in nine months, it would in many ways be a boon to the planter. Some say that this would be no advantage, as during the months previous to taking off crop, labor would be wasted if they had no planting to do, and that it is better to grow canes for fifteen months before cutting them. It would appear but reasonable, however, that where growing and manufacturing are separated, it would be better, and to the advantage of the farmers, to get their crops to maturity as quickly as possible. I find that many of the seedlings show a precocity for ripening early, and a watch will be kept to secure, if possible, any variety which may be valuable for this reason.

"A very curious kind of cane has been received from Kew called the Japanese cane. The growth, so far, is decidedly weedy, but it shows strong vitality, and it may be found useful for bearing seed for experiment. Its sugar content will be tested in April.

"To prevent applications being made, to which we are unable to respond, it is to be noted that we have only a single plant of a seedling the first year, and some eight or ten the second year, but during the third season moderate numbers will be available for distribution. When plants of the best kinds are available they will be duly advertised, but it would not be in any way a wise proceeding to take plants on a first, or even on a second analysis, as subsequent trials might prove them completely unable to maintain any superiority which they might have shown on the first or second occasion."—Int. Sugar Journal.

———:o:———

"Unconditional surrender" are the only terms President McKinley will accept. He's a worthy successor of Grant.

Orange trees are very long-lived. In the orangery at Versailles is a tree, raised from seed, planted in 1421. There is another in the convent of St. Sabina, in Rome, said to have been planted by St. Dominic in 1200. In the neighborhood of Finale is a tree which bears nearly 8000 oranges in a single year. In Holland are many trees which have been in the same family for from 200 to 300 years.

FOOD VALUE OF SUGAR.

The popular idea of sugar is that it is something that has a pleasant taste and may be used as an adjunct to articles of food to improve their taste, or as a confection. The taste for sugar is looked upon as something effeminate in men, as something peculiar to childhood, which adults ought to be ashamed to confess to or indulge.

The utter falsity of this view cannot be too often or too clearly pointed out. Sugar is not only an adjunct to other foods, not merely an improver of taste. It is in the truest and best sense of the word itself a food, and, what is more, one of the most easily assimilated of all foods and richest in nourishment of the kind most required by the human body. It is not so well known as it ought to be, that the amount of tissue building food required by the human system is quite small, whereas the amount of those which furnish energy is very great. Of the former—nitrogenous bodies or albuminoids—about 9 per cent. is sufficient, whereas of the latter 69 per cent. is the proper ratio, the balance of 22 per cent. being left for fats, etc.

The bulk of the foods from which the body derives its energy enters the system in some form of starch, be it from a cereal, potato, fruit or other source. Now, all this food is converted in the human body into a form of sugar before it is capable of assimilation by the system. It ought to be plain enough that it is an advantage to supply such food in the form of sugar instead of starch in order to relieve the body of a good share of its labor of digestion, and that sugar, for such reasons, is one of the most perfect foods ever contrived. The objection that it is not good to relieve the digestive organs of the functions naturally falling to them on the ground that health can be maintained only by the exercise of all the natural functions of every organ in the body, is readily met by pointing out that with the mode of life prevailing at present the stomach is continually overburdened and called upon to do a great deal more than its natural share of work, hence, any relief from this excessive burden is bound to be beneficial.

The above remarks are suggested by a paper read at the recent annual meeting of the Central Association of the Beet Sugar Industry of Austria-Hungary, by F. Strohmer of Vienna. The substance of this interesting and highly instructive paper is herewith subjoined.

Among the carbahydrates which are important as foods it is starch and sugar that occupy first place. Starch is not absorbed by the human system in its orginal condition, but is converted into grape sugar by the enzymes, or chemical ferments, contained in the saliva and the juices of the digestive organs. This is a slow process that requires considerable labor on the part of the body and consumes more or less of its energy. It is one of the great virtues of cane sugar—the term is here used in its chemical sense, meaning a sugar of certain chemical composition and properties without regard to origin, and embracing both the sugar produced from the sugar cane and beet sugar—that it dispenses with this process of digestion. Upon reaching the digestive juices it falls at once into its two components, which are equivalent, as far as their nutritive value is concerned, viz., grape sugar and fruit sugar, which are at once absorbed and assimilated. Albuminous foods and fats also undergo extensive and complicated chemical changes in the digestive organs before becoming capable of assimilation by the system. Sugar, therefore, is the most easily digestible among the leading foods.

The great importance of sugar as a nutrient is shown by its occurrence in nature, where it forms the first food of the human child, the carbohydrates which constitute the principal share of nourishment in human milk occurring therein in the form of sugar of milk, which, when reduced to a water-free state, has the same chemical composition as cane sugar. It was claimed at one time that cane sugar was not so well suited as an adjunct to milk for infants as sugar of milk, but this assertion is not true. The author made extensive experiments and demonstrated the equal value of these two sugars for purposes of nutrition, which experience is confirmed by numerous physicians. The pure albuminoids and fats, as well as starch, are mostly indifferent in taste if not disagreeable, and for that reason all our foods contain certain substances, either by nature or artificially, intended for seasoning only so as to make the foods suitable for consumption. Sugar, however, possesses by nature a pleasant effect upon the nerves of taste and, as medical science shows, a gratefully stimulating influence upon the digestive apparatus. In the matter of taste, therefore, sugar is likewise far ahead of most other foods.

The great importance of the carbohydrates, including sugar, for nutrition does not become clear until one begins to inquire into the sources of muscular energy in the human body. Sugar

being a typical carbohydrate, plays a similar part as all the bodies of this description do in the metabolism of the human system. It has this great advantage over other carbohydrates, that it is virtually predigested, that is, ready for absorption when it enters the system, hence peculiarly fitted to supply energy to the body. The foodstuff is prepared chemically by the juices of the miuth, the stomach and intestines for treatment by the liver, whereby it is changed into glycogen, a compound of the carbohydrate class. This body is subsequently split up into grape sugar and in that shape carried in the blood to the cell. Inasmuch as the sugars can be converted into glycogen without any residue of by-products, which is not the case with most other foods, they are far superior to a majority of food articles in that respect. Even starch, the most common of all food articles, requires to be first transformed before being absorbed into the alimentary channel. It follows that sugar is the most easily assimilated of all foods.

The various foodstuffs can take each other's places according to their value as heat producers. In that sense 100 g. of fat would possess an equal nutritive value to 237.3 g. of cane sugar. Considering, however, that the fat requires to be first transformed into glycogen, which conversion cannot be total, the proper comparison would be between the glycogen produced from the cane sugar and the fat respectively. Now, 100 parts of cane sugar yield 94.7 parts of glycogen, and 100 parts of fat yield 144 parts of glycogen. Hence, 152 parts of cane sugar are equivalent to 100 parts of fat as producers of energy. Chaveau examined this question in 1897 by experiments on dogs and found in fact that in food sufficient to make up the —work of the muscles, 152 parts of cane sugar were equivalent to 100 of fat, which agrees with the figures calculated by our author.

The comparison is still more favorable to sugar in the case of albumen. In the best case, 100 parts of albumen yield 51.5 parts of glycogen. Considering that lean meat contains about 20 per cent. of albumen, it follows that 100 parts of this food will yield only a maximum of 16.3 parts of glycogen. Meat without fat, therefore, notwithstanding many advantages, as being readily digestible and capable of being eaten continually without becoming offensive, is a very inferior food article, and since the albumen in meat is much higher in price than cane sugar, it must be called extravagance to increase the muscular work by eating more meat.

The great importance of sugar as a source of muscular energy was also shown by other experimental researches in which the work performed was actually measured. Thus, in 1893, Ugolino Mosso, by the aid of an ergograph, constructed by himself, made experiments with himself, by which he showed that the muscular work decreased far less when he used sugar than without sugar, and that the supply of sugar in food form quickly restored energy to the tired muscle. The English physician, Vaughan Harley, made experiments on the same line, arriving at similar results. In the case of Mosso's experiment the psychical influence was not altogether avoided. So Dr. Schumburg, staff physician of Berlin, repeated them in 1895, both with persons of strong muscles and with weak ones, none of the subjects being acquainted with the objects of the experiments. The practical conclusion drawn by Schumburg from his experiments was that the use of sugar, even in moderate quantities, was peculiarly suited to produce extraordinary muscular work. Schumburg repeated his tests last year and arrived at the same results.

What is shown by these experiments concerning the value of sugar as a food for the muscles is also confirmed by observing the mode of living of many tribes of people and hard-working individuals. Most tropical tribes, who use very little or no meat, eat large amounts of sweet fruits and often do heavy physical work. The Dutchman, Birnie, introduced sugar training for rowing contests, and the men trained in that way stood the exertion much better and trained much longer than those who fed in the usual way, using chiefly meat. On the strength of these experiences sugar training was introduced among rowing crews in Berlin with great success. Janssen, the director of the Mont Blanc observatory, recommends the use of sugar for the purpose of creating a supply of muscular energy in climbing mountains. The author himself observed that the guides in the Swiss mountains provide themselves amply with sugar for their laborious work, and himself uses this food with much profit for hard mountain excursions and wheel rides. By virtue of the increase of internal and external muscular work and great digestibility, sugar often furnishes a means to the physician to influence materially the condition of sick or convalescent persons. The alleged injurious influence upon the teeth that was formerly ascribed of sugar has long been recognized as a myth. The negroes, who indulge largely in the use of sugar, are noted for their fine teeth.

The great value of sugar as an article of food remains largely unknown, not only to the mass of the people, but to the educated and generally well-informed classes as well. Thus, on the occasion of an excursion up a mountain the author found in the provender provided at the cottage on the mountain saccharine tablets for sweetening the food, although saccharine is absolutely worthless as a food. This happened despite the fact the provisions were prepared by the German-Austrian Alpine Society, under the advice of a scientist of repute, who ought to have been acquainted with the results of modern researches in nutriton and foods.

The author advises introducing more knowledge of nutrition and foods in the public schools and giving sugar a proper place among foods, also the promotion of fruit culture which; in his judgment, would lead to the preparation of more fruit products containing sugar. The use of sugar is very great in England, where sweet cheap marmalades and jams also are extensively eaten. The author recommends the use of sugar in feeding the army to a far greater extent than is the case at present. Up to the present time it has been used only in the English and French armies, but of late the German government has been examining the question, experiments being under way at some maneuvers. Some of the army physicians are strongly advising the extensive use of sugar for soldiers.—Beet Sugar Gazette.

———:o:———

HOW TO MEASURE AN ACRE.

Farmers would often be glad to know the area of oddly-shaped fields without having recourse to a surveyor. The following may prove of some use:—Five yards wide by 988 yards long contains one acre; 10 yards wide by 484 yards long contains one acre; 40 yards wide by 121 yards long contains one acre; 70 yards wide by 69½ yards long contains one acre; 80 yards wide by 60½ yards long contains one acre; 60 feet wide by 726 feet long contains once acre; 110 feet wide by 397 feet long contains one acre; 130 feet wide by 363 feet long contains one acre; 220 feet wide by 181½ feet long contains one acre; 440 feet wide by 99 feet long contains one acre.—Queensland Agricultural Journal, January.

REPORT FOR MONTH ENDING SEPT. 30, 1899, OF INCORPORATED HAWAIIAN SUGAR COMPANIES.

NAME OF INCORPORATED CO.	Authorized Capital.	Par Value, Shares	Number of Shares Authorized	Shares reported as sold past Month	Highest	Lowest
American S. Co. ($750,000 paid up)	$ 1,500,000	$ 100	15,000	....	....	.....
Ewa Plantation Co	5,000,000	20	250,000	1136	$30	$26½
Haiku Sugar Co	500,000	100	5 000	.....	.....	.....
Hawaiian Agricultural Co	1,000,000	100	10,000	80	301½	300
Hawaiian Sugar Co	2,000,000	100	20,000	245	227½	222½
Hamoa Plant. Co. (not listed)	175,000	100	1,750	.	.	.....
Honokaa Sugar Co	2,000,000	20	100,000	1935	33¾	31
Honomu Sugar Co	750,000	100	7,500	.....	.. ..	.....
Hawaiian Com. Sugar Co*	10,000,000	100	100,000	.....	.....	.....
Hutchinson S. Plant. Co*	2,500,000	50	50,000	...	.....	. . .
Hakalau Sugar Co*	1,000,000	100	10,000	....	...	.....
Hana Plantation Co*	5,000,000	100	50,000	.....	.....	. . .
Kilauea Sugar Co*	2.000,000	50	40,000		. ..	.....
Kahuku Plantation Co	500,000	100	5,000	10	....	160
Kihei Plantation Co. ($1,500,000 paid up	3,000,000	50	60,000	40	. .	40
Koloa Sugar Co	300,000	100	3,000	. . .	....	....
Kipahulu Sugar Co	160,050	100	1,600	.....	.. ..	.....
Kona Sugar Co, ($180,000 paid up)	500,000	100	5,000	.....	....	. . .
Maunalei S. Co, ($100,000 paid up)	1,000,000	100	10,000	.....		.
McBryde Sugar Co	5,000,000	20	250,000	245	19½	19
Nahiku Sugar Co	750,000	20	37,500	.....	.....	.....
Oahu Sugar Co	2,400,000	100	24,000	320	205	170
Onomea Sugar Co	1,000,000	100	10,000	.	. . .	.....
Ookala Sugar Co	500,000	20	25,000	1577	22	20
Olowalu Sugar Co	150,000	100	1,500	.. .	.. .	....
Olaa Sugar Co	5,000,000	20	250,000	305	15	13
Paauhau Plantation Co*	5,000,000	50	100,000	.....	.....	.
Pacific Sugar Mill	500,000	100	5,000	.....	. ...	....
Paia Plantation Co	750,000	100	7,500	. .	....	.....
Pepeekeo Sugar Co	750,000	100	7,500	.	. ...	.....
Pioneer Mill Co	2,000.000	100	20,000	185	255	250
Wailuku Sugar Co	700,000	100	7,000	....	. . .	...
Waianae Sugar Co	300,000	100	3,000	. ....	. . .	....
Waialua Agricultural Co. ($1,500,000 paid up)	3,500,000	100	35,000	270	165	150
Waimanalo Sugar Co	252,000	100	2,520	15	150	140
Waimea Sugar Mill	125,000	100	1,250	.....	. ..	..

* Incorporated in California. Sales in San Francisco reported.