THE FIBRE INDUSTRY IN HAWAII.

No. 3.—Sisal.

BY L. G. BLACKMAN.

In the articles which have already appeared on the possibilities of the expansion of the fibre industry in Hawaii, the plants which have been dealt with offer attractions rather to those desirous of venturing upon new and unproved undertakings. Although the greatest fortune is usually reaped by the pioneers of a successful industry, and although the probability of good results awaiting the cultivation of such fibres as Ramie and Manila Hemp in Hawaii are as assured as can ever be foreseen before actual experiment, to the agriculturist seeking a sound investment, Sisal offers returns of no less promise but moreover in a concrete and already proved form. Indeed, after a careful review of the merits of other, but untried competitors, there appears to be little reason for advocating a diversity of fibre industries in these Islands, when Sisal offers a field for enterprise and expansion probably unsurpassed by any other rival. Unless peculiar local conditions of soil or climate render the introduction of other fibrous plants

advisable, the attention of prospective growers should first be given to a careful investigation of the advantages of Sisal. The establishment of a number of plantations devoted to the growth of this fibre would probably do more towards strengthening the agricultural resources of these Islands than the same number of similar undertakings engaged in the production of a diversity of fibrous plants. In the latter case, although our climate and soil offer such a variety of conditions that it is not difficult to select suitable localities for industries requiring widely different conditions, there is little doubt that some among these would not be attended with the success expected. The presence of a number of flourishing Sisal plantations would afford opportunities of comparison of data which would be of very material help not only to one another, but prove an invaluable precedent for the establishment of younger plantations. A direct result of such a colony of Sisal growers in Hawaii would be the establishment of permanent markets for the disposal of their fibre. The absence of a ready means of disposal of their product presents a most serious obstacle to the success of many new industries. The demand for Sisal fibre is continually increasing, even out of ratio to the numerous new companies which have recently been formed, and the price for the best qualities of the fibre has for some time steadily advanced. The Sisal which has already been marketed from these Islands is of exceptional quality and no effort should be spared to maintain this high standard, as the additional care bestowed upon the production of the highest grades is many times repaid by the enhanced prices which are commanded.

VALUE AND IMPORTATION.

The following extract from the Statistical Abstract of the United States, Washington, 1904, shows the qualities and values of the importations of Sisal for the last few years:

	Tons.	Value.	Per Ton.
1894	48,468	$ 3,742,073	$ 77.20
1895	47,596	2,743,396	59.76
1896	52,130	3,412,760	65.46
1897	63,266	3,834,732	60.61
1898	69,322	5,169,900	74.58
1899	71,898	9,211,377	128.12
1900	76,921	11,782,263	153.17

	Tons.	Value.	Ton. Per
1901	70,076	7,972,564	113.77
1902	89,583	11,961,213	134.00
1903	87,025	13,289,444	152.70

During the ten years cited it will be seen that the importations have not only nearly doubled, but the price obtained per ton has during the same time increased proportionately, making the value for 1903 approximately four times as much as that for 1894. The latest New York quotation for Hawaiian grown Sisal is $165 per ton. It is interesting to note that in 1903 the quantity of Manila fibre imported was 61,648 tons with a value of of $11,-885,510. The importation of both Manila and Sisal fibre in a raw state is free.

DESCRIPTION OF PLANT.

The Sisal plant of commerce belongs to a well known endogenous group, familiarly known as Agaves. The fibre extracted from it is therefore structural or foliaceous, and is found running in parallel layers throughout the leaves and underlying the external ligneous skin. Several species of Agaves are well known for their fibrous qualities—the Mexican one having been in use by the Aztecs long before the Spanish invasion of that country. It is, however, of the greatest importance to secure the best commercial species, as many inferior plants have been confounded with them. The leaves of the true species, and that which has made so successful a commencement in Hawaii, bear a single terminal spur and the plants are more sessile than other and less useful species. These latter are often provided with a well developed foot stalk and a row of sharp spiny thorns along the outside margins of each leaf. It should be noted, however, that young plants of the true Sisal (Agave rigida sisalana) show sharp serrations on the edges of their leaves which disappear as the plant matures. Agave rigida elongata—a variety of the former—has longer leaves than the above which possess well marked marginal thorns. It is reported to produce commercial fibre of good quality but its adoption should be tried with caution. Attempts at the cultivation of Sisal in Florida and the Bahamas have at times resulted in non-success through the introduction of the wrong species of agave. The first attempt at the cultivation of Sisal in the United States

BIRD'S-EYE VIEW OF SISAL PLANTATION, EWA, OAHU.

was in Florida in 1834 when the plant was introduced from Yucatan. From Florida the industry has spread in recent years not only to the West Indian Islands but to many parts of the globe. The chief centre is the Bahamas and it is also largely grown in Trinidad, Mauritius, Caicos, Grenada, St. Lucia, Antigua, the British Colonies in South Africa and Australia, and the Fijis. The importation to the Hawaiian Islands was from Florida and the plants are now flourishing on nearly all the islands of this group.

SOIL.

Probably no crop requires less care to bring it to perfection, or grows under more apparently adverse circumstances than Sisal. The land which is best fitted for a plantation in these islands may be generally described as poor, arid and rocky, and such that is well nigh worthless for the growth of any other crop. Many thousands of acres of poor rock-strewn land now sedulously devoted to lantana and kindred scrub are well suited for Sisal and could be brought into yield with little preparation, as the plant requires no irrigation and produces the best fibre in situation where other plants would have to struggle for existence. Soil which does not drain readily is quite unsuited to Sisal and although good land increases the rapidity of growth it is at the expense of fibrous qualities. The plants are well suited to resist protracted drought, but a comparatively moist warm atmosphere is necessary, and light rains and proximity to the sea are beneficial. The best fibre has generally been obtained on porous limestone or coral land. A moderate supply of mineral salts in the soil tends to increase the quantity of fibre. Analysis of the ash of the green plant shows lime, potash and magnesia to be its most important constituents in the order named.

No one unacquainted with the habit and requirements of this plant, who had seen the proposed site of the Sisal plantation at Ewa, could have predicted the splendid results which were to be achieved in so short a time upon land of such little promise. Yet in spite of this noteworthy example much excellent Sisal land is neglected and allowed to remain unproductive. The work of the lantana has already been done, and well done, upon much of our formerly sterile lands. In a few years this much despised plant has disintegrated the surface of the soil and en-

riched it with a valuable layer of humus. The time has now come when a proper use of those lands which have been well worked by the lantana would repay the time they have lain idle,

PROPAGATION.

Sisal may be propagated from either "pole plants" or "suckers." The latter proceed from the root and appear around the parent plant about the third year of growth. The use of suckers is to be preferred to other methods of propagation as they arrive at maturity much sooner than the "pole plant." They are however not nearly so numerous as the latter, which fact would probably preclude their use for entirely stocking a large plantation on account of their greater value and the difficulty of obtaining them. Pole plants are produced by the florescence of the parent plant. At the age of about eight years a tall central stalk or pole is thrust up to a height of from eighteen to thirty-five feet upon which a number of minute green blossoms are borne. These in time develop small sisal "bulbs" which ripen and fall to the ground. In many instances two and even three thousand new plants are produced upon one pole. Florescence is the culminating effort of the plant and marks the end of its life from a fibre yielding point of view. From this time it commences to wither and should be removed and replaced by a new plant. Judicious management, chiefly in cutting and in the choice of a not too impoverished soil, may prolong the fibre producing life to from twelve to fifteen years. The growth of successive sisal crops upon the same ground, it is needless to say, exhausts the soil of the necessary constituents of nourishment, but as a rule this is a question of many years and may greatly be obviated by allowing the land to lie fallow for a time after the plants have poled.

Another and excellent suggestion, intended to avoid depletion of the land, is to set the plants out as usual with the exception of doubling the distance between the rows. As soon as the first lot of plants begin to yield, it is proposed to fill the vacant spaces with young suckers—which by this time will have appeared around the other plants—and to cut down and burn the old ones when the second series comes into yield. A third crop of young suckers should then take the place of the first lot, and so on indefinitely. The advantage of this system is not only the economy of the soil constituents, but prevention of loss through premature "poling" which has often been complained

of. It is probable that this undesirable condition is often brought about by improvident and excessive harvesting of the leaves, which has a tendency to stimulate the development of the florescence before its usual time. About 40 or 50 leaves per annum is a very fair allowance to take from each plant and where this is generally exceeded the period of yielding has been shortened. As only from four to five per cent. of the leaf is fibre, the return of the rejected pulp to the land by the drays, which would otherwise go back to the fields from the mill empty, would be a wise provision.

NURSERY.

The first work to be done after the plantation site is decided (which should be where rail or water transportation and a copious water supply for washing the fibre, are available) is to mark the position of the mill and other buildings and to stake out the land in squares intersected by transportation roads. The position of the nursery in which to start the young plants should now occupy attention. The chief desiderata to be sought in the establishment of this important department are a well drained soil and protection from wind. After careful preparation of the soil, the young plants should be set in rows from 9 to 10 inches apart, a distance of about 18 inches separating each row. A light watering should be given to start the roots and this may be repeated occasionally if necessary. The water, however, must not be used too copiously or allowed to stand round the young plants. Apart from this the nursery will require little work except keeping free from weeds.

TRANSPLANTING.

Whilst the young plants are developing in the nursery, the mill should be erected in a central part of the plantation at the intersection of the two main roads. The land should also be prepared by cutting down the scrub, distributing it over the ground and burning it. Holes may then be prepared in rows from 6 to 8 feet apart and from 10 to 12 feet between each row. On some plantations the distances are less, but too close setting prevents facility of passing among the leaves, whose dangerous spur is always ready to inflict a wound on the unwary. In windy sites if the plants are too near together they

are liable to injury from the leaf-spurs of those adjoining them. From 700 to 1000 plants per acre is a very general average—although the latter number is not advisable except on very poor soils. At the age of twelve months the plants in the nursery should be about 18 inches high and ready for transplanting. Upon removal to the fields the roots are removed close to the plant and the outer leaves cut off. Care should be taken not to allow the moisture of the plants to evaporate before planting as this is likely to retard their development. No earth must be allowed among the leaves, and the plants must be set in an upright position or passing between them when they are grown will be difficult. Little attention will now be required beyond removal of weeds which at first are likely to spring up in the holes around the young plants.

HARVESTING.

After about three years from the time of leaving the nursery harvesting may be commenced. The leaves of the sisal plant spring from the stem close to the ground and radiate upward from a central crown. The older and outer leaves which are darker in color than the newer, are first ready for cutting. The new leaves make their appearance from the centre of the crown from which they gradually decline outward and down, by the growth of others and by the removal of the mature leaves in harvesting. Those most nearly horizontal are in best condition for cutting, though all leaves within an angle of 60 degrees with the ground are sometimes removed—a matter of questionable economy. Upon a well regulated plantation of sufficient size the harvesting might be confined to exterior leaves only. This would insure a more uniform quality of fibre and greatly increase the value of the crop. The leaves must be severed close to the stem with an upward cut, and after removal of the terminal spur and arrangement in alternate directions to pack compactly, tied into bundles of from 50 to 100. One man is able to cut and bind upwards of 1200 leaves per day. The plantation may under favorable circumstances be worked over every four or five months when the ripe leaves may be harvested. The annual production of each plant at the period of full yield will be from 40 to 50 weighing nearly 60 pounds. Nearly four per cent. of clean fibre can generally be obtained which represents a yield of about 2 pounds per plant. Allowing 1000 plants per

acre about one ton of fibre should be realized, valued at from $140 to $175. Under favorable conditions and with economical machinery this quantity is often materially increased and over two tons per acre have been obtained.

MACHINERY.

The machinery necessary for the extraction of sisal fibre is simple. In Yucatan and Mexico many primitive machines known as "raspadors" are in operation upon small plantations with good results. In its early form the raspador consists of a frame, a table and a large revolving wheel under which the leaves are fed. The broad tyre of the wheel is crossed with a number of parallel brass bars or teeth which beat down upon the soft leaf and rasp or scrape away the pulp. In the Mauritius a machine called the Gratte is in successful operation. A machine manufactured by Messrs. Deathe and Ellwood, and others called the "Marabal" and "Kennedy," are now used largely in Mexico and Yucatan. They are all improvements of the raspador type, cost from about $120 to $140 each and are capable of dealing annually with the product of about 100 acres. A number of such small machines is sometimes preferred to the larger and more expensive ones, but on large modern plantations the latter are more economical. The machine in use at Ewa by the Hawaiian Fibre Company is known as the "Todd." It is of the raspador type, belongs to the new order of things and is giving good results. The following table quoted from *Planting Opinion* shows the different machines in use in Yucatan, with various data of their capacities, requirements and cost:

Machine.	No. leaves cleaned in 10 hours.	Actual Horse-power.	No. men required.	Cost in Dollars.		No. in Use.
				Mex.	U. S.	
Lanaux	130,000	35	3	$6.000	$2,856	6
Prieto	125,000	60	3	7,000	3,332	90
Stephens	150,000	70	3	11,000	5,236	6
Soils (Raspador)	9,000	6	2	250	119	1,200
Torroella	80,000	30	3	5,000	2,380	20
Villamor	70,000	35	3	6,000	2,856	?

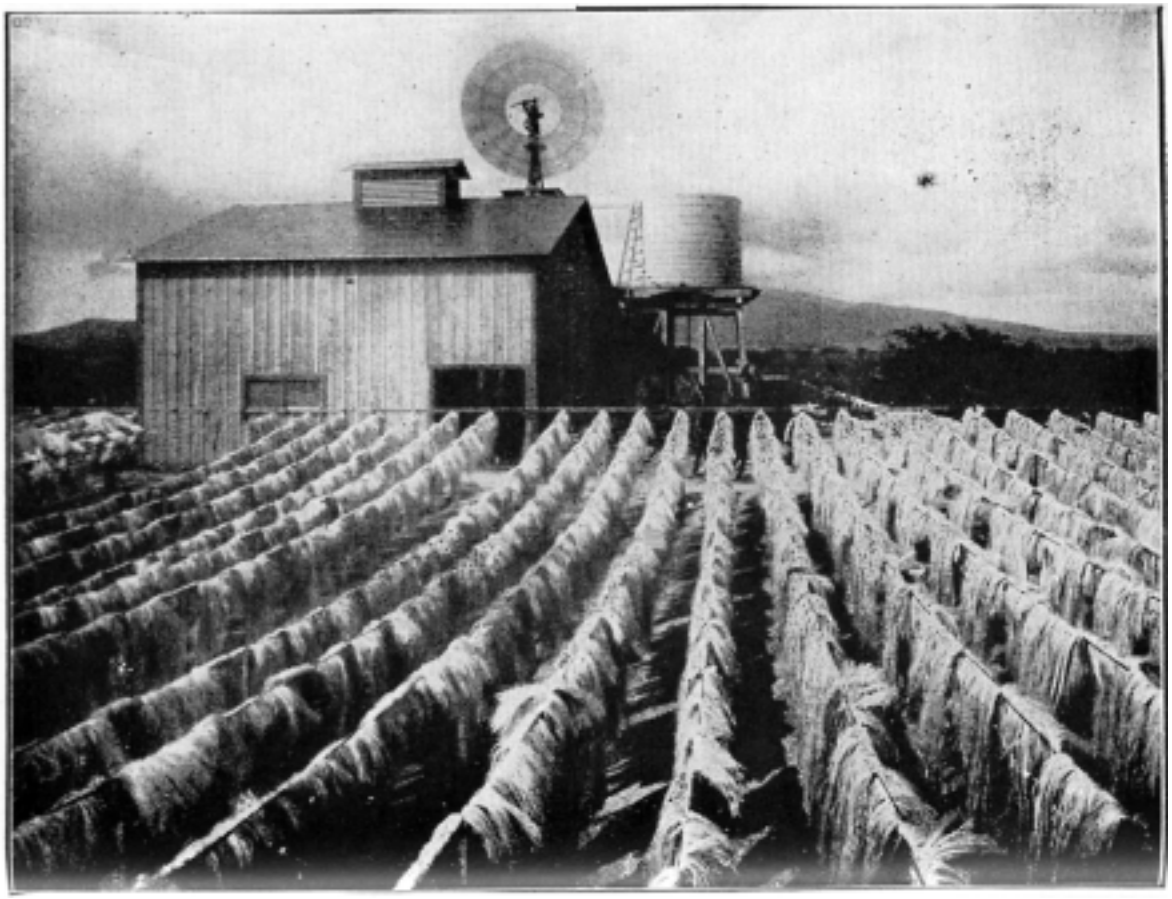
METHOD OF EXTRACTION.

The description of the process of extraction of the fibre which follows relates chiefly to the machinery in operation at Ewa. Upon arrival at the mill the bundles are uncut and the leaves received by

a man who lays them in rows and guides them under the feeding chains. These grip them at the centre and carry them beneath the first heckling wheel. The diameter of this is about six feet and its broad tyre is crossed by parallel flanges or scrapers which crush the leaf and remove its pulp. A liberal supply of water flowing from above assists the process and thoroughly cleanses the fibre. In this way the fibre of one-half of the leaf is exposed, the other part of the leaf still being intact and held below the guiding chains. The first half of the leaf is now held by the chains and the part just released by them is carried beneath the second heckling wheel—similar to the first but situated on the opposite side of the bed of the machine. The whole leaf is in this manner divested of pulp, and a woman stationed at the other end of the bed receives the fibre as it is presented by the machine and places it in heaps to be carried to the drying ground. The whole process of extracting the fibre is continuous, and the time occupied by the leaves in passing through the machine occupies but a few seconds. The fibre comes from the machine beautifully white and clean, and requires no other process before marketing except drying. It should be noted that if the leaves are allowed to lie long after cutting, they become dry and discolored, and the process of manufacture is not only not so easy but the lustre and color of the fibre is impaired. Most writers have laid stress on the fact that even a week or so after cutting is soon enough to mill, but as on a well regulated plantation the supply from the field can easily be accommodated to the capacity of the machinery, there seems little good in subjecting the leaves to any treatment which must certainly be calculated to lessen their moisture and to depreciate the quality of the fibre. It should be remembered that with almost all other fibrous plants the delay of even a day in this respect either renders the extraction almost impossible or lowers the quality of lustre, color and pliability.

DRYING AND BALING.

In all cases the appearance of fibre is an excellent criterion as to strength and general value, and filaments of the best sisal should be of good equal length, almost white, straight with no tendency to "kink," lustrous, perfectly clean and free from extraneous matter of any kind. Immature fibre or fibre not thoroughly dried is apt to be more or less greenish, and neglect



SISAL MILL AT SISAL AND SOME OF THE PRODUCT BEING BLEACHED IN THE SUN.

to extract the fibre soon after cutting makes it yellow, brown or reddish and sometimes discolored with black spots.

The drying ground should be situated immediately adjoining the mill and should be protected if possible from the direct rays of the sun, whose action is liable to make the fibre become dull in appearance and brittle. A good breeze assists the drying process which it is important to render thorough. An excellent plan of exposing the fibre for drying is in use at Ewa. A wooden rail framework about five feet above the ground is erected and across this are stretched lines of doubled cord. Each line is firmly held at one end, but is free to revolve by attachment to a swivel at the other. The fibre to be dried is placed in whisps between the double line, commencing at the fixed end. After each whisp is inserted the line is given a half turn and the process is continued until the line is filled. In this manner the fibre is securely held against the wind or accident, but is readily drawn out by pulling. When thoroughly dry the fibre is placed in a hydraulic press capable of a weight of a hundred tons, and baled. The most usual size of the bales is about five feet long and the weight should be either 250 or 500 pounds—the latter is probably the best and is that in use at Ewa. Before the weight is removed from the bale the door of the press is removed and wire is run through grooves left in the top and bottom, and the bale securely bound. It is then ready for transportation, but a sack cover may be used to protect it from dust and dirt.

ENEMIES OF SISAL.

The sisal industry has heretofore been remarkably free from the ravages of disease of any note, but within the last year or two the presence of a fungoid growth has been noted in the Bahamas. The following letter from Mr. Lyster H. Dewey, Botanist in charge of fibre plants for the U. S. Department of Agriculture, dated from Washington, D. C., January 16, 1903, has already been published, but in view of the report of a similar disease having occurred on the sisal plants in these Islands it is of sufficient importance to be reprinted:

> "My Dear Mr. Smith: I have just written Knudsen Brothers of Kauai, Hawaii, cautioning them to look out for the introduction of diseased plants in the new sisal plantation which they are starting, and I write you, giving you the same information, for I regard it as of the utmost importance to the

sisal industry in Hawaii that the introduction of disease be prevented if possible.

"When I was in the Bahamas last May, I noticed that there were, in a few localities, indications of a diseased condition of the sisal plants. I brought back with me some specimens, and referred them to Mr. Woods, who reported that there was a fungus on the leaves, but that it was not in a condition for determination. Recently I have received from one of the principal growers in the Bahamas a letter stating that while the disease condition seems to be confined to small areas, it is spreading, and is causing some alarm lest it may in time prove destructive.

"The symptoms are described as follows: 'Yellowish spots or patches first appear on the leaves. These spots spread. The leaf gets dry and curls, usually about half way down from the point, the edge of the leaf becoming pinkish in color. In a week or two, sometimes longer, the leaf dries and becomes black and hard. Usually the upper half of the leaf is affected, the lower half remaining green much longer. Sometimes the funnel, as it is called in the Bahamas, consisting of the unopened leaves, is attacked at the tip. The disease usually affects only five or six inches of the upper part of the funnel, but sometimes extends clear to the base.' This condition has not been observed in the Bahamas until within the past year. It may have existed there before, but to so small an extent as to be regarded as of no importance.

"I would suggest that the sisal growers of the Islands be warned in regard to the possible introduction of such diseases, and that they be urged to go through their plantations and, if any sisal plants are found exhibiting symptoms of the character described, that they be grubbed out and destroyed."

Besides the fungoid disease reported above, a mealy bug, which has also recently been reported locally, has been injurious to the crop in the West India Inlands. Prompt spraying with kerosene emulsion should eradicate this pest. In this connection Bulletin No. 3 issued by the Office of Experiment Station of this Territory and entitled "Insecticides for Use in Hawaii," by D. L. Van Dine, contains much useful information.

OTHER NOTEWORTHY PLANTS.

Besides the various species of Agaves which yield fibre there are many plants which possess excellent fibre deposed in such a manner as to be easily extracted by machinery adapted to sisal. Conspicuous among these may be mentioned Furcraea gigantea, a plant somewhat similar in appearance to Agave rigida and which

is found in many of our gardens. The leaves of this enormous plant are often ten, twelve or even more feet in length. The popular name for the product of furcraea is "Pita" and in Central America its great strength has long been made it of use for excellent netting, hammocks and harness. In Mauritius, Tobago and Trinidad its cultivation has been very successful. The yield of pita per acre is about equal to that of sisal and its habit of growth and cultivatons are about the same. Its market value, however, is not quite so great as sisal, attributable in a measure to its not being so well known. Little attention has been given to this plant in the United States ,although its excellent qualities render it worthy of greater recognition. The fibre from its long leaves is often over ten feet in length. It is of good quality, beautifully glossy and white and well suited for cordage and netting. A still more remarkable fibre yieldng plant, probably capable of being cleaned by sisal machinery, is Sansevieria zeylanica. This plant is indigenous to New Zealand and is known to the natives of Java, Guinea and China in which countries it is used extensively for bowstrings, and is called "Bow String Hemp." The plant is a stemless perennial belong to the Liliceae and is well known in Honolulu gardens. It is often seen flourishing in a bowl of water and pebbles in the windows of many small Japanese stores. Its dark green radical leaves are linear-lanceolate in shape and are freely spotted on each side with lighter shades of the same color. The fibre yielded by Sanservieria possesses in a wonderful degree those properties demanded of a first-class cordage material. It is white, fine, soft, pliant and lustrous and resembles pineapple fibre in many of these qualities. Its resistance to moisture is very marked and its tenacity is about equal to sisal, to which in most other respects it is superior. The propagation of this plant is by division of the rhizomes, or the leaves may be cut into lengths of a few inches and placed in the ground, when suckers will show in a few weeks. The plants soon become established and a full crop may be harvested in about two years. After cutting the growth becomes denser and the plants will continue productive for many years. No extremes of rain or drought need be feared as Sansevieria appears almost indifferent to either. Forty pounds of leaves yield about one pound of dry fibre, and two crops, consisting in all of about 3500 pounds, are said to be obtained from an acre of about 3000 plants. The introduction of the cultivation of this fibre to these Islands appears to be of great promise as its qualities, when

appreciated, would bring it a better price than sisal. The adaptability of Sansevieria to our climate, its rapid and vigorous growth, its quick harvest, and the facility of its cultivation should recommend it to all sisal growers as a crop which may perhaps prove more remunerative to grow than the Agave.

BY-PRODUCTS.

In days when the success of an industry is often dependent upon the value of what are termed "by-products" it is of interest to enquire into the possibilities of sisal in this direction. The following lines are from the Cyclopaedia of India (Balfour): "An extract of the leaves is used to make a lather, like soap; and the leaves split longitudinally, are employed to sharpen razors on, serving the purposes of a strap, owing to the particles of silica they contain. The roots are diuretic and antisyphilitic, and are brought to Europe mixed with sarsaparilla. The Mexicans make a paper of the fibres of Agave leaves laid in layers."

The Dictionary of the Economic Products of India (Watt) contains the following: "For paper manufacture this fibre seems likely to command a good market. 'It is the most highly approved of all the paper fibres, making a strong, tough, smooth paper which feels like oiled paper, and, even while unsized, may be written upon, without the ink running' (Spons Encyclop.) The juice is made into soap. For this purpose it is expressed and the watery part evaporated either by artificial heat or by simple exposure to the sun. On its reaching a thick consistence it is made into balls along with lye-ash. This soap lathers with salt as well as with fresh water. A gallon of the sap yields about a pound of soft extract."

Other writers record the use of its dried flowering stem as a substitute for cork; its juice is recommended to impregnate wall plaster to prevent the ravages of ants; and sugar, vinegar and a kind of beer are made from its sap.

The value of the saponaceous juice of Sisal as a material for the manufacture of soap has been investigated and seems likely to be of practical use.

HAWAIIAN STATISTICS.

The following statistics, published May 17, 1903, and compiled from the original entries, represent the cost of preparing the land,

planting, cultivating, harvesting and shipping the sisal fibre produced by the Hawaiian Sisal Co. since its inception. They afford an invaluable criterion as to the expense to be encountered in establishing a plantation in these Islands.

COST OF PLANTING AND CULTIVATING 595 ACRES OF SISAL FROM DATE OF COMMENCEMENT, DECEMBER 15, 1898, TO MARCH 1st, 1903.

Labor Account	$17,239.32	
Less labor paid for cutting, loading, hauling, clearing, milling, and baling 31¼ tons fibre by contract at the rate of $42 pert ton charged to this account	1,312.50	$15,926.82
Tools		431.81
Surveying		5.30
Salaries		6,225.00
Repairs		48.20
Promotion		2,000.00
Sisal Plants		402.31
Office Expense		58.37
Nursery Plants		64.00
Mill Expense		11.70
Stamps		4.00
Legal Expense		171.50
Interest		42.67
General Expense		9.65
Fire Insurance		234.87
Freight		341.48
Advertising		72.00
Traveling		81.95
Drying Rack		23.76
Harness Account		43.25
Planting		52.00
Machinery Repairs		10.15
Clearing Account		125.00
Total cost of growing crops, 595 acres to March 1st, 1903		$26,385.79

RECAPITULATION OF COST.

Cost per ton of Fibre.		Gross Cost.
$ 9.86	Labor, material, etc., to maturity.....	$26,385.79
	This amount has been expended on 595 acres of now mature and growing plants, expected to yield nine crops. This is equal to $4.93 per crop per acre, or $9.86 per ton of fibre.	
42.00	Harvesting—Labor by contract—31¼ tons fibre baled and loaded on to cars.....	1,312.50
7.99	Team Account—Feeding animals—while harvesting and baling 31¼ tons.....	249.87
14.90	Fuel and machine oil used while harvesting 31¼ tons fibre.....	465.58
	Rent of Land	237.13
9.75	7% on receipts for 24⅓ tons netting $3,387.54.	
13.60	Fibre transportation— For 24⅓ tons including Marine Insurance	317.76
Total $98.10		

PRODUCTION AND PROFIT TO DATE (MAY, 1903).

24⅓ tons already sold at 7½ cents lb.....	$3,705.30
*24 tons (20 at mill and 4 unharvested), value at 7½ cents lb.....	3,600.00
Gross sales	$7,305.30
Less cost per ton— 48⅔ tons at $98.10.....	4,708.67
Profit	$2,596.63

*Note—The above 24 tons at sale realized 8c per lb.

ESTIMATED CROP FOR REST OF YEAR (1903).

90 tons at 7c per lb	$12,600.00
Less cost at $98.10	8,829.00
Estimated profit	3,371.00
Estimated sale of plants	2,500.00
Total	$ 6,271.00

The enterprise at the date referred to had hitherto been conducted on an experimental basis in Hawaii, and consequently the cost of production given above is somewhat above normal. The following table represents the cost anticipated by the Company for future crops.

Clearing, planting, cultivating ...	$ 9.86	per ton
Harvesting, cleaning, baling, etc...	35.00	"
Feeding teams	5.00	"
Fuel and machine oil	5.00	"
Transportation and Marine Ins....	10.00	"
Rent of land 7% on $100 per ton		
Less transportation 10		
$ 90	6.30	"
Taxes and Incidentals, say	2.84	"
Total expenses delivered in San Francisco	$74.00	"

It is believed that the above estimate of cost has been generally realized.

The following miscellaneous data relative to industry and gathered chiefly from the reports of the Company's officers at their annual meeting are noteworthy:

Present average cost of clearing per acre, $12.06.
Present average cost of planting per acre, $4.75.
Present average cost of weeding per acre, $2.60.
Area of Nursery at inception, ½ acre.
Area of Nursery at present time, 6 acres.
Plants in Nursery, half grown, 350,000.
Suckers growing in fields (estimated), 200,000.
Young plants on hand sufficient to stock 1,000 acres.

Area in cultivation May, 1903, 595 acres.

Area in cultivation at present time, 752 acres.

Latest New York quotation 8¼ cents per lb., ($165 per ton).

Estimate value in England of sample of Hawaiian Sisal Fibre sent to London last July, from £34 to £35 per ton.

"The Cultivation of Sisal in Hawaii" by Mr. Frank E. Conter, published by the U. S. Agricultural Experiment Station, Honolulu, is a Bulletin containing much valuable data which should be carefully read by Sisal growers. It may be obtained free from Jared G. Smith, Special Agent in Charge of the Station.

CRATES FOR BARBADOS BANANAS.

The following is an extract from a letter from Messrs. Pink & Sons to the Imperial Commissioner of Agriculture for the West Indies dated, May 2, 1904, dealing with the matter of suitable crates for Barbados bananas:

"The object of shippers is, I take it, to economize room on board ship. If the growers were to be a little more careful about the size of the crates, it would make all the difference. For instance, in the last cargo, No. 86 packed a bunch weighing 56 lbs. in a crate, 2 feet 3 inches by 14 inches, which arrived in splendid condition. This was a most neat package, just large enough and not too large. Again No. 77 sent a bunch weighing 69 lbs. in a crate, 3 feet by 1 foot 5 inches, which was about 6 inches too long and 3 inches too wide at the least. I regret to say most of the bananas are packed in these large crates, whereas smaller crates would cost less and take much less room, while the bananas themselves would arrive in an equally good condition.

If you would compare the crates sent from the West Indies with the crates sent from the Canary Islands, the difference in size is very marked. The West Indian crates not only require much more space on board the ship, but they take up much more store-room at this end. Another matter is the strength of the crate. One shipper packs his double bunches in pinewood crates, which will not stand the carriage of delivery to our store and then to our customers. It is true the fruit he sends is excellent; but his crates will not stand the weight. They require to be made of a tough wood that will not split.

It is noticed that one shipper packs his fruit in crates that never break. The wood in this instance is light but strong. —The Agricultural News.

LABORERS CUTTING FIBRE ON HAWAIIAN SISAL PLANTATION.