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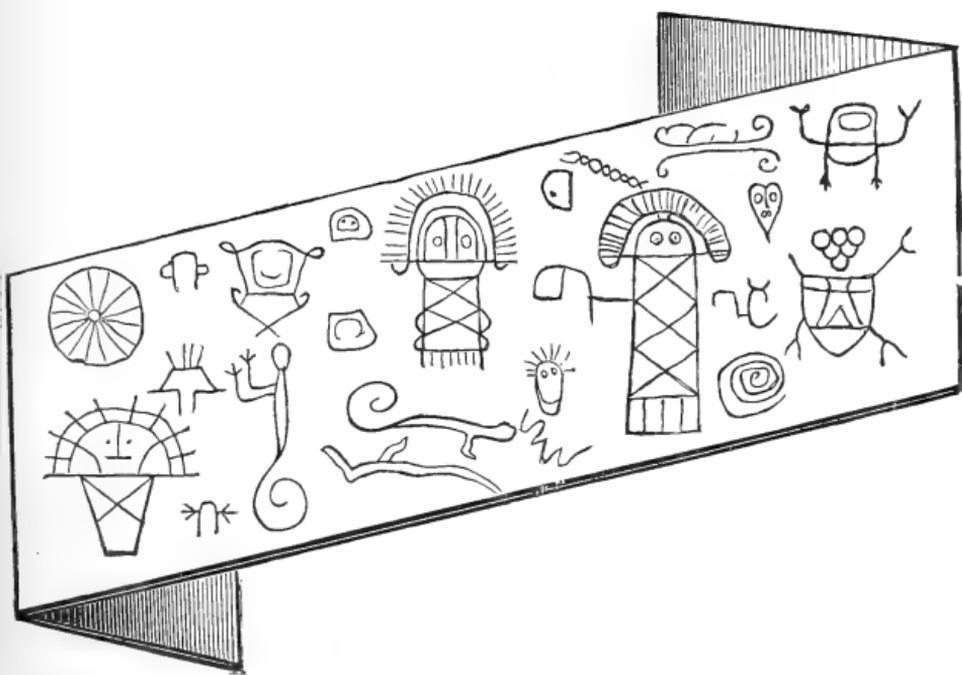


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CONTENTS.

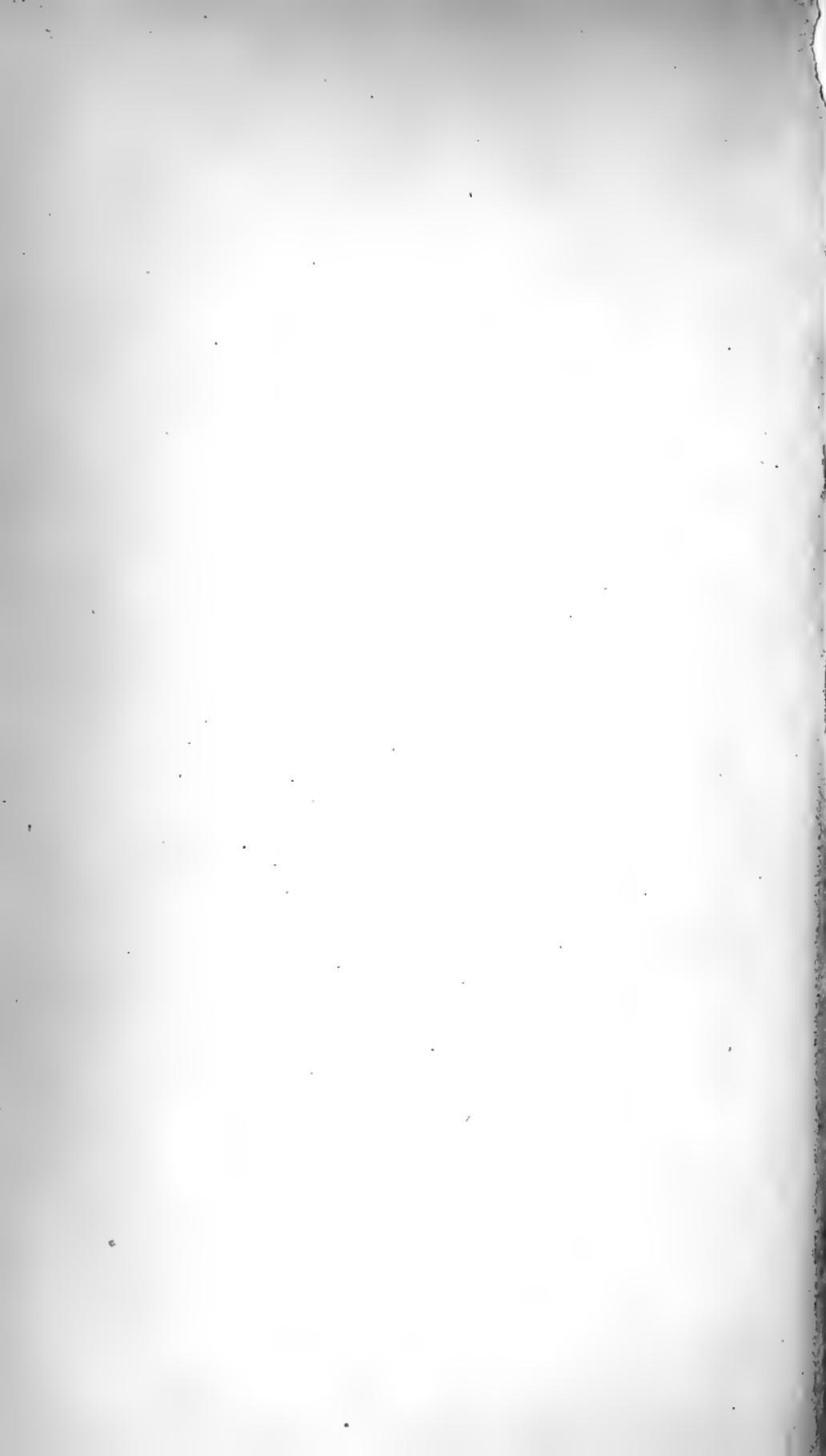
PAPERS.—*Our Muddy Shores*, by Alexander Winter; *The India-Rubber and Gutta-Percha Trees of British Guiana*, by G. S. Jenman, F.L.S., Government Botanist; *Essequibo, Berbice and Demerara under the Dutch*, by the Editor; *The Lime Industry in Dominica*, by H. Alford Nichols, M.D.; *Model Settlers, a Lesson in the Smaller Industries*, by G. S. Jenman; *By the Cuyooni to the Orinoco in 1857*, compiled from the diary of W. H. Campbell, L.L.D.

OCCASIONAL NOTES.—*Etymology of the word 'Grail-sticks'; Couvade; 'Jonah-myths'; Ocean currents on the shores of Guiana; New Plants from British Guiana.*

REPORT OF SOCIETY'S MEETINGS, from January to June, 1883; including notes by James H. Mann, and the Honourable W. Russell on *Cane Mills*, and by G. S. Jenman on *Native India-Rubbers*; and also a *Report on the Museum*, by the Curator.

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Our Muddy Shores.

By Alexander Winter.

“The Civil Law gives the owner of land a right to that increase which arises from *alluvion*, which is defined, an insensible increment, brought by the water.”—COWELL. (*Johnson's Dictionary.*)

BRITISH Guiana is composed of two districts, geologically very different. One portion, by far the larger in size though of lesser importance, is the upper district, commonly called the “interior of the country”. It is of considerable elevation—being well raised above the sea-level, and of a geological formation quite distinct from the coast region. This upper district commences at the sandhills, and stretches away back to the mountains of the interior. The other portion, from the line of sandhills to the sea, is the richest part of the colony, and is the only part that is cultivated, and inhabited by Europeans.

The sandhills, according to SCHOMBURGK, are “probably the boundary line of the gradual receding sea of a former era.” They extend, as stated by BARRINGTON BROWN, from the Hitia savannah on the Berbice river, eastward to the Orealla on the Corentyne, and westward

to the Madewine on the Demerara River, and in Essequibo along the coast from Aurora to the Pomeroon.

The tract on the sea-side of the line of sandhills is nearly a dead flat, most of it below the level of the sea at spring tides : it is of great depth, some two hundred feet ; and rests on a base of granite. It is composed of particles of sand and clay, with decayed vegetable matter, and is of extreme and almost inexhaustible fertility ; the only valuable ingredient in which it is deficient is lime, of which not a trace is to be found in the whole country, either in the upper or lower districts.

This coast district is entirely alluvial, and its limits are accurately defined in BARRINGTON BROWN'S Geological Map of British Guiana. It is entirely composed of a sediment deposited by the sea, and is of recent formation : recent, that is in the geological acceptation of the term, though doubtless, the process of deposition has been going on for many centuries.

It has hitherto been generally supposed that the particles composing this sediment were derived from the disintegration of the rocks of the interior, and of soil and vegetable *débris* brought down by our rivers. But this theory is now given up as incorrect.

In the first place our rivers are remarkably free from sediment in their upper reaches. Their waters, especially those of the tributaries, are discolored by an infusion of vegetable matter ; but if taken up in a glass, they appear perfectly clear. It is only in the sea-reaches that the rivers are muddy. If it were from sediment brought down by our rivers that the alluvial deposit was formed, we should find signs of it at the upper ends of the islands which are so

numerous in the estuaries of our large rivers ; but such is not the case. At the upper ends of all the islands both in Corentyn and Essequibo, the water is deep, and there is no projecting spit or sand bank, such as is invariably present at the lower or sea end of the island. This is very noticeable in going from Georgetown to Suddie. The steamers in rounding the upper ends of Leguan, Wakenaam, and Tiger Islands, pass very close inshore, while they have to give a wide berth to the lower end of Hog Island, to avoid the banks and mud-flats there, which are carefully buoyed off. Of this we can judge from our own observation ; and it is confirmed by men of science. BROWN writes :—

“ The water in the estuaries of the large rivers for some distance up from their mouths, and the sea water along the coasts oceanwards, for over twelve miles, is of a yellowish-gray muddy colour, from the enormous amount of fine earthy sediment in suspension. The water of the Rivers themselves, even when in flood, is never so highly charged with solid matter, so that this sediment must be stirred up by the currents and waves passing over the muddy shallows of the coast, and carried by the tide into the Rivers' mouths, as well as seaward.”

It is now generally admitted that we are indebted, not to our own rivers, but to the Amazon for the alluvial deposit forming the country in which we live and have our sugar estates ! And this seems probable when we consider the enormous quantity of soil in suspension that must be carried to the Atlantic by a river 100 miles wide at its mouth, and of unknown depth, fed by such tributaries as the Madeira, Topayos, Xingu and Rio Negro, all themselves immense rivers, and flowing through the richest tropical valley in the world.

The current of the Atlantic, from the point where this great store of wealth is poured into the ocean, sets di-

rectly toward our own shores. Of this we have, curiously enough, direct proof. There was picked up on the sand beach in Corentyn, a sealed bottle containing the following written memorandum :—

N. G. Barque Johann Heinderick of Altona. To ascertain the set of the current, this was thrown overboard on the seventh of December 1873, in Lat. $0^{\circ} 21' S.$, Long. $30^{\circ} 54' W.$

The person into whose hands this falls is kindly requested to publish the date and place where and whenever it was picked up.

E. HACKE, Master.

H. JANSON, Passenger.

This was picked up at the *Union* waterside, Corentyn, on Tuesday 17th February 1874, Lat. $6^{\circ} 5' N.$, Long. $57^{\circ} 15' W.$ It had thus travelled fifteen hundred and eighty one miles to the westward, and three hundred and eighty six to the north, in seventy two days ! With regard to the set of the great equatorial current of the Atlantic to the North-west, Sir CHARLES LYELL, the Geologist writes :—

“ Among the greatest deposits now in progress, and of which the distribution is chiefly determined by currents, we may class those between the mouth of the Amazon and the Southern coast of North America. Captain Sabine found that the Equatorial current was running with the rapidity of four miles an hour where it crosses the stream of the Amazon, which river preserves part of its original impulse, and has its waters not wholly mingled with those of the ocean at the distance of 300 miles from its mouth.

The sediment of the Amazon is thus constantly carried to the North-west as far as the mouths of the Orinoco, and immense tracts of swamp are formed along the coast of Guiana, with a long range of muddy shoals bordering the marshes and becoming land.”

Assuming therefore that the great store of materials for forming new alluvial deposits is brought from the Amazon by sea, we may trace its course from the mouth.

of that river, to the shores of Guiana. It would sweep the northern coast of South America, passing by Cayenne, where the land is high and mountainous, and its first great deposit would be in Dutch Guiana, where the land is low and swampy, and here we find a vast tract of alluvial land of recent formation. Next to Surinam is Berbice, which has been extensively enriched, judging from the distance of the sea coast from the line of sandhills, some thirty to forty miles. Demerara then gets its share, to the extent of about twenty-five miles. On reaching the large estuary of the Essequibo it would appear that the deposit had raised an archipelago of islands, as well as numerous banks and shoals. Beyond the mouth of the Essequibo, the supply of sediment would seem to have been nearly exhausted; for the Arabian Coast has only a narrow strip of alluvial land of two or three miles wide, between the sea and the line of sand hills. Beyond this coast, from the Pomeroon to the mouth of the Orinoco, again, is a very extensive tract of newly formed alluvial land. As this tract trends oceanwards directly north, it has probably been supplied with its sediment by the great Atlantic current, in its northerly course.

It is apparently in this way that the rich coast lands of Guiana have been formed. And the process is still in operation, as is evident from the many new islands and banks that have been formed within our own recollection, and the extensive additions to the land of many of the coast estates, in some cases to the extent of doubling the depth of the original grant.

The coast line of Guiana must therefore be extending sea-ward, and must continue to do so, as long as the

equatorial current of the Atlantic continues to set in its present direction.

But this extension is by no means at a uniform rate ; on the contrary, the land at times, instead of "making", is being washed away, to the serious danger of the land already empoldered, rendering new dams and, in some places, very costly sea defences, necessary to repel the encroachment of the ocean. But on the whole the great alluvial deposit must be increasing.

A very correct idea of the way this increase is effected may be obtained by watching the progress of the banks of drift-mud which, from time to time, are thrown up at our watersides. The scene is a very peculiar one. The spring tides bring in a vast amount of semi-fluid drift-mud, which extends for many miles along the coast, and for perhaps two or three miles seawards. This mud is neither so liquid that a boat can sail in it, nor so solid that a man can walk on it ; any one attempting to do the latter, would gradually sink down to his neck. The only way to travel over it, is by means of a "catamaran," which is a plank a foot wide, and about ten or twelve feet long. It is used by the fishermen, who by kneeling on it with one knee, and striking out with the right arm and left leg (or *vice versa*) propel themselves along the slimy surface with considerable speed, till they reach the edge of the water, where they can commence their fishing. The prospect is dreary and desolate in the extreme. There is not the slightest elevation to break the monotony, and nothing more dismal can be imagined, unless it be the frozen seas of the Arctic regions, to which it bears some resemblance. The only object that relieves the eye is the multitude of wad-

ing birds which move lightly along the surface, picking up the small fish left stranded in the mud by the receding tide. These birds are mostly the beautiful scarlet ibis, and the white egret, and when they rise together in flocks of forty or fifty the sight is very fine.

Where the drift-mud remains it becomes gradually more and more solid, the seeds of the courida, (*Avicenia nitida*), which are brought by the sea in great numbers, begin to germinate and take root, and in a wonderfully short time, a forest of young trees springs up. The mud becomes consolidated and hard, and a permanent addition is made to the land.

But this is by no means always the case; the banks of drift-mud frequently disappear as suddenly as they appeared. A single high spring tide will sweep them entirely away, and perhaps a "wash" may set in, instead. This action of the tides, in sometimes bringing in these deposits of mud, at other times sweeping them away and encroaching upon the solid land, is a problem that has yet to be solved. No fixed rules can be laid down respecting the formation of these deposits of alluvial soil. There seems something capricious in the action of the sea, both as to the permanence of the deposit and the nature of the sediment deposited.

Sometimes instead of mud, it is sand that is brought in; and a fine hard sand beach is formed for many miles along the coast, liable however to be washed away again or coated with a layer of muddy clay. At other times banks are thrown up composed entirely of small sea shells*. These banks are often of considerable extent

* These shells, Mr. BROWN tells us, are all of existing species.

and are very valuable, but they are less permanent than those either of mud or sand, for they frequently disappear entirely after a short interval. Reefs of these shells are to be found occasionally many miles inland, as on Plantation *Hope* on the East Coast of Demerara, and near *Goldstone Hall* in Canje. These shells supply the only calcareous substance in the colony and should be secured at once on arrival and carried inland to a place of safety beyond the reach of the tides, and there stored for future use ; instead of which they are generally left to be brought in at leisure, so that probably before one-tenth of the mass is secured a high spring tide comes and sweeps the rest away ! They form the very best covering for our roads, and if more diligence were used in collecting them, the supply would probably be found sufficient to cover the public roads from one end of the colony to the other ; a boon only to be appreciated by those who have had to burn earth for the purpose.

There is another curious substance occasionally brought in by the spring tides, which is called by the creoles, "coffee grounds" or "sawdust," and is supposed to be decayed courida wood. But there is no smell of decay about it, and when examined under the microscope, it has the appearance of a regular formation, and is probably some marine zoophyte.

The newly deposited drift-mud, though not of sufficient consistence to admit of being dug, is yet of sufficient consistence to be a hindrance to the passage of a stream of water through it ; and the drainage water from the kokers and sluices of the coast estates, not being able to force a channel through the mud to the sea, has either to spread itself over the surface or, if that is too high for it, to

creep along in shore before finding a passage to the sea. This stream is increased in bulk as it passes down the coast by the contributions from each of the several draining trenches it passes, until it is powerful enough to force a channel for itself, through the mud, to the sea.

It is in this way, doubtless, that many of our rivers were originally formed, as we may see by the map. In Surinam there are several large rivers whose course runs parallel to the sea. Our larger rivers, such as the Co-rentyn, the Berbice, the Demerara and the Essequibo, the sources of which are in the high lands of the interior, have sufficient volume and force to deliver their waters directly into the sea through channels already established ; but many of the smaller rivers, flowing through the recently formed land near the coast, have evidently had their course controlled, during the early stage of their formation, by a deposit of alluvium between them and the ocean. This is the case with the Canje, Abary, and Pomeroon, and in a very marked degree with the Waini and Barima ; and this is a further proof that the alluvial deposit is brought in from the sea. A glance at the two last named rivers on the map will convince any one.

But this alluvial deposit confers a still more important benefit on the colony than increasing its surface. It is to it, that we are indebted for our rivers being navigable, and for the vast system of water-carriage we enjoy, such as no other sugar colony, except Surinam, possesses. We are apt to look with envy at the beautiful blue water and sandy beaches of the West India Islands, and to wish that the bars were removed from the mouths of our rivers, so that our ports might be accessible to vessels of

a larger size ; but we are really better off as we are.

Our rivers, in their upper reaches, are mostly very deep. The Canje, at eighty miles from its mouth, is forty or forty-five feet deep. The Berbice has a uniform depth of forty feet for a hundred miles, and at the junction of the Virognie, over fifty feet. Now, if it were not for the bars at the mouth, the shallows in the sea-reaches, and the moderate rise and fall of the tides, rarely exceeding ten feet, our rivers would run dry at low water, and instead of a river navigable at all times of the tide, we should only have deep muddy ravines, and the numerous tributary creeks would at low water become mere dirty ditches! This is the case with some rivers in other countries ; the Avon for instance, runs nearly dry at low tide, though at high water there is a depth of forty feet up to the City of Bristol.

The effect of the banks of mud and sand brought in by the tide, and which extend up the "sea-reaches" of all the rivers of Guiana, is, that a large portion of the fresh water is kept back and not allowed to run to waste, and consequently the rivers are at all times navigable. Hence our invaluable "water-carriage."

And this water-carriage is not only available for the shipment of our produce when manufactured, but by means of an extensive system of navigable canals, the canes instead of being carried in carts, or on the backs of animals, as in other countries, are brought to the mill in punts, of which a single pair of mules can tow as many as will contain canes enough for a hhd. of sugar !

It is this system of water-carriage that has rendered possible the great extension of the sugar estates in this colony ; for by simply connecting the navigable canals

of several estates together, the planters have succeeded in extending their cultivation on the gigantic scale that is now common, so that crops are reckoned by thousands instead of hundreds of tons! Thus is practically tested the principle that "magnitude of operation is an element of cheapness," and the investment of large capital is rendered profitable!

So that probably, of all the advantages possessed by this colony, for which we are not half sufficiently thankful, perhaps the most important of all is due to our much abused "Muddy Shores."



*The India-Rubber and Gutta-Percha Trees of British Guiana.**

By G. S. Jenman, F.L.S., Government Botanist of British Guiana.



ON the publication in *Timehri*, the Journal of the Royal Agricultural and Commercial Society of British Guiana, of my report to the Government on *Hevea Spruceana*, inquiries were addressed to me by persons interested in the matter for more specific information than that report contained as to the yield of this newly-found species of *Hevea*, the age at which it might profitably be tapped for its juice, and the nature of the land best suited for its growth under cultivation. These were subjects which the time at my disposal only permitted me to investigate partially on my former journey, and on the receipt of the applications alluded to above, I deemed it important that the information should be obtained. As soon, therefore, as I had the time to spare I obtained permission to visit the interior to acquire it, as far as might be possible.

The journey which was the subject-matter of my former report on this species of *Hevea* was made on the Essequibo and Mazaruni rivers, where in certain creeks, and in scattered and often distant localities on the banks of the main rivers, I found, by my own investigation, and by inquiry from the Indians and other residents,

* This paper is, in substance, reprinted from an official report by Mr. JENMAN to His Excellency the Governor.

that the tree prevails in more or less abundance. This being so, it appeared to me that, on this occasion, while carrying out the primary objects of my mission, I might make further acquaintance with its distribution ; and to accomplish this in the best way, I deemed it would be advisable not to return to the rivers with which I was already acquainted, but to visit another part of the country. It was necessary, however, to determine in advance that the region I might decide to take was not destitute of this tree ; and finding, on inquiry, I could accomplish my object on the Pomeroon River, which flows through a region that was hitherto unknown to me, and divided by a wide tract of country from the rivers I have mentioned, I took this river for my operations. Mr. IM THURN, the Special Magistrate of the district, was good enough to ascertain for my assistance the situation of some of the best localities, to save me any delay in seeking this information on my arrival ; and I may here acknowledge the material assistance I derived from him in this and other ways. Indeed without his aid I should have found my movements very difficult at times, with the sparse population of the region, and under the bad weather which I, unfortunately, experienced.

To make the information in this report intelligible to readers who may not have the former one to refer to, it will be necessary as I proceed to touch occasionally on matter which that contained ; and in this connection I may mention that the Indian names of *Hevea Spruceana*—taking the tribes who inhabit the belt of country in which its distribution is principally embraced—are, *Arawack*, *Hatie* :—*Caribisi*, *Poomui* :—*Ackawoi*, *Sibisibi*,

of which the *Arawack* name is the most generally known by the river residents; and that it is a tree very similar in general appearance to *Hevea brasiliensis* which yields the valuable Para rubber, and which is at present the most important of the caoutchouc trees worked for market. Both trees attain about the same dimensions, and appear to grow under precisely the same conditions. Indeed the description of the ground on the Amazon given by the collector CROSS, would apply literally to the ground on the rivers of this colony occupied by *H. Spruceana*.

At this time of year (December), which is the height of the winter rainy season, the land is partially flooded, but the cessation of rain for a few days together makes a great difference in the quantity of water diffused over it. The water lies in shallow pools between the trees, or is spread in sheets, when deeper, over wide spaces of ground, and the surface-soil generally, especially where this tree most abounds, is hardly more firm or dense than mud. It will give an idea of its character when I say that I wore a pair of high laced-up shooting boots, but with the best care in moving about, and stepping mostly on the more solid soil which is usually found in hillocks around the butts of trees, or on the fallen bits of wood which stretch between them, in spite of my care, I was constantly sinking to their tops and over, so that my socks were coated with mud. I am speaking, as I have said, of the wet season of the year, but even in the dry, the ground continues in a very moist condition. The land is usually very densely shaded, and in many places, probably in consequence, produces very little undergrowth. It appears probable that ground

such as I have described is essential to the best development of *Hevea*, as where these conditions most uniformly prevail in the localities where it is found, there most of the trees occur ; and to this circumstance I am disposed to ascribe its greater prevalence on the creeks than on the main rivers. On the latter the banks are rather higher than they are on the former, and in many instances higher than the land within them. The surface drainage of the country is in the first instance into the creeks, and their banks are marked with numerous and contiguous shallow channels,—a feature which the banks of the main rivers do not so characteristically exhibit. This is more particularly observable where the land is a little elevated above the water level. All this region of the Pomeroon is very low, and so prevalent is water on the land abutting the creeks, that on one occasion on this journey I travelled the greater part of the day before I found a place to land, where the ground was sufficiently dry to allow of my moving about. In using the word creek, which is applied in this colony to all the tributaries of a main river, some of which are very large, and even navigable to large craft for many miles, I speak of the smaller ones over which the trees on each hand more or less meet, for on these I have found the *Hatie* to be most abundant.

I have taken the occasion to describe rather fully the character of the land, as it is important that persons contemplating the cultivation of this species of *Hevea* should be well informed as to the conditions which prevail in its native haunts. Doubtless the tree might be grown on dry land, or land dry comparatively to

what I have described, but the conditions which accompany its distribution in a state of nature are the most reliable guide as to what it requires for its best development in the shortest time; and these favour the presumption that the growth would be slower on such land than on land approximating in character to that on which it is found naturally. In this, as in other similar cases, the nearer the natural conditions are copied in cultivation the greater the probability of attaining the highest success. I have had unquestionable evidence from observation of plants in the Botanic Gardens of the sensitive nature of this tree under conditions which diverge materially from those which I have described, though I must acknowledge that the *Hevea*, among trees inhabiting the same low alluvium, is not singular in this particular.

As to the rate at which the Hatie grows, I can only adduce the evidence gathered from residents of the rivers and forests of the colony. A very intelligent half-breed, who has been acquainted with this tree from his youth, and for many years resided on the Essequibo where it is particularly common, described it to be of very quick growth, though it is always slender in proportion to its height, and appears, comparatively, more so by the absence which it uniformly exhibits of branches while young, of which it makes very few at any period of its life. He estimated, speaking of it, of course, in its native habitats, that it attains a diameter of eight or nine inches in five or six years. If this be correct, I think it must be its extreme rate of development under the most favourable conditions, for from what has been experienced of the growth of *Hevea brasiliensis*, which,

as I have said, is a very similar plant, under cultivation in the several countries where it has been tried, under, however, I believe, generally, conditions which conform but little to those which prevail in its native haunts, one would infer it not to be so great. Yet I feel convinced that had the Brazilian plants been tried on alluvial ground, well sheltered from wind, with a very moist atmosphere, and shaded by large trees, their growth would have been much greater; and perhaps, so much improved as, considering the relative very moderate dimensions of the members of the genus, to be regarded as rapid.

My experience on the Pomeroon of the ultimate development of *Hevea Spruceana* agrees with the conclusions I arrived at regarding it on the Essequibo and Mazaruni rivers. At its best it is not a large tree, and rarely, I believe, exceeds twenty inches in diameter, squaring for timber to about fourteen inches. The wood is hard, but how durable I do not know, and it appears to be of a character to be easily worked. The sap wood is white, but large trees have a few inches of dark centre, and its specific gravity is less than that of water. The bark is rather thin and smooth, and it adheres tenaciously to the wood. On trees a foot or more in diameter, it is not a quarter of an inch thick. When found in high forest, surrounded by others, the trees are quite straight and erect, and attain a height of sixty feet or more, with a few branches at the head. The upright trees are more conveniently tapped than those which, standing on the banks, lean out over the water; the position of which is both awkward for cutting the bark and catching the flowing juice.

I may here again call attention to the facilities which this colony affords on all its rivers—and on that portion of them too which is accessible without difficulty or much expense, *i.e.*, that below the falls—for the cultivation of *Hevea*. To have the trees close together, as they would be under a state of cultivation, for the convenience of the collector, would be an important desideratum and reduce the cost of collecting to a minimum. The waste of time which the most systematic collectors experience when the trees are growing in a natural state, scattered as they are through the forest, must very considerably enhance the cost of the labour. The cultivation might be successfully pursued, not only where the trees are found spontaneously but, as well, on land of a similar, or identical, character, where, through other circumstances, they are not naturally established. The labour required would be very inconsiderable, and a few hundred acres, treated with care and intelligence, would prove in the course of years a source of considerable profit to the proprietor. If planters in Ceylon and India speak hopefully, as they do, of the eventual success of *Hevea* cultivation in those countries, here, possessing all the natural conditions, and the advantages derived from an intimate acquaintance with these under the actual occupation of the trees, the success should be assured. Wherever the tree is found, in the fruiting season—April to June—seed may be procured in fair abundance. If sown at once under the trees in nursery beds prepared from the lighter soil and leaf-mould which the forest affords in places, the plants would spring up rapidly, when they might be carefully lifted, with their rootlets unbroken, and planted at intervals under the other trees.

Where the latter are too close to admit the amount of light required, they should be thinned out first; and it might be necessary to carry this on with care from time to time with the increasing requirements, both for room and light, of the planted trees. In some seasons and places it would be unnecessary to collect and sow seeds, as natural seedlings may be gathered under the trees. I think, though my opportunities of observation have not been extensive on the matter, that the spontaneous production of seedlings depends very much on the character of the season when the seeds fall. If the rains have been very heavy and the land is flooded, they lie in the water where they drop and decay; but if the rain has been light, or if the water has subsided, they drop into the muddy surface and germinate. This, too, is the only way I can account for their abundance in one place and almost entire absence in another where the parent trees equally prevail. A good many seeds are consumed by animals; for fish and birds, and probably such quadrupeds as acourie and labba, are fond of them. The *Hevea* cultivator should be prepared to wait for his crop, but meanwhile any trees already on the ground might be utilised and the produce sold. Seeing the increasing demand for india-rubber, with the daily extension of its application, and, particularly, the value of *Hevea* rubber, as compared with other kinds, the result of the enterprise might be looked forward to with the utmost confidence. Manufacturers will take all they can obtain, and were it only more abundant in the market, and cheaper, many new uses might be found for it. To give an idea of the importance of the Brazilian trade in rubber, I may mention that the exports from Para for the half-year ended June

last reached the value of \$12,350,000. It illustrates as well, the value of the industry which is within our reach. The present market value of Para rubber is 4/6 per lb. The cultivation might be carried on in conjunction with wood-cutting, plantain growing, or any other immediately remunerative industry, which would enable the cultivator to tide over the time till the trees reached the age of production.

With regard to the question of the yield of *Hevea Spruceana*, it seems to me from my late experience and what I have been able to gather of the yield of *H. brasiliensis*, to be not less productive than that species. It must be remembered that though the Para tree has gained so great a commercial reputation and importance, its yield of milk each day is exceedingly small. CROSS, the collector for the India Office, to whom I have already alluded, says that fifteen of the cups used on the Amazon by the collectors make an English Imperial pint. Rarely, however, a cut produces a cupfull, for he adds, "the quantity of milk that flows from each cut varies, but if the tree is large, and has not been much tapped, the majority of cups will be more than half full, and occasionally a few may be filled to the brim." And of trees which have been wrought in previous years he says: "though tapped in only two or three places, the quantity of milk obtained is surprisingly little." Now I came to the conclusion while experimenting on the Hatie that the yield of good trees was hardly, if any, less than this. The chief difficulty experienced is in the method and means of collecting the juice; every drop is of value, and it is important that there should be no waste either by imperfection of contrivance for catching it as it issues

from the bark, or by the employment of unsuitable vessels. The instant an incision is made, the milk begins to run, and it naturally runs faster at first than it does later, so that the collector must be prepared immediately to apply, in a dexterous and effectual manner, his apparatus for catching it. Again, if unsuitable vessels are used as to character or size, waste will be experienced by the diffusion of the milk over unnecessary surface, to which it adheres in a very surprising manner. The little loss, or reduction, which occurs in drying in the change from milk to rubber, and the considerable bulk of the latter resulting from the process, also strike one, though it is probable that the quality of the milk, as well as its quantity, depends upon the age of the tree. I was under the impression that the nature of the vessels employed in collecting the juice was a matter of little consequence, and therefore I prepared none of a definite character. I shall have occasion to speak further on of another mode of collecting, but for this which I am describing I am disposed to approve of the kind of cups used on the Amazon, and also of the methods there practised in the operation. These cups are round or flat or slightly concave; the latter forms being most in use, as they fit more closely when pressed against the tree. They are made of burnt clay. Our Caribisi Indians, who are potters for themselves and the various other tribes, would no doubt produce similar vessels at a very cheap rate. They are stuck to the tree immediately under the incision made in the bark by the collector's axe, with a small lump of well wrought clay. On the Pomeroon where the trees grow, on the banks of the creeks I found a very suitable clay, which I employed in

my operations. It is necessary to smooth a little of it over the edge of the cup, so as to direct the juice in. For gashing the bark, I think a small axe with a short handle, for use with one hand, would be the best adapted instrument. This could be used with ease, and, it is of very material importance in carrying out the work that everything employed should be of a character to enable the operator to manipulate it with dexterity. The Para plan of making a single circle of incisions each day is too, I consider, the best to pursue. Nothing is gained by making numerous cuts close together; the flow of juice should be allowed to take place by a few rather than several exudations. If it occurs from too many for a certain area, so little is obtained from each as to be a mere drop or two in a vessel, which, diffused over the large surface of the several receptacles, involves a proportionally large loss by surface adhesion, in addition to the time and labour taken up by the extra work. A circle of incisions is made each day, extending from as high as one can reach and working downwards, day by day, to the base of tree. They should be made about six or eight inches apart; the incisions in the circles being in quincunx order.

I recommend this system as the most economical for collecting the fresh juice; but were the waste of the trees not a vital consideration, a less conservative plan might be practised. Much more is obtained in one operation by cutting the tree down and tapping its bark the full length of the trunk, than by the above method. The yield I found in this way several times greater as the immediate result. But to the permanent loss of the tree as a rubber producing agent, though the timber might

perhaps be turned to account, must be added the considerable waste which occurs in collecting the milk by the number of vessels, or wide leaf surface, required to catch it. I employed pieces of banana or trooly (*Manicaria saccifera*) leaves, from which in part, the men, as well, made the cups which were used when the trees were tapped standing, laid under the prostrate trunk, which I ringed at intervals of ten or twelve inches. But, as I have said, it is a wasteful method, destroying for a single crop a tree which might be cropped for years; and much of the milk adheres to the leaf surface. Yet I fear that when collectors turn their attention to Hatie and other india-rubber trees, this will be the system they will adopt, as it is already established by practice in the colony wherever balata is gathered. From large trees thus destroyed a pound of rubber might be obtained on an average each, but I do not think more. The market value of this, supposing it to be of the same quality as Para rubber, and cleanly gathered, would be from three shillings to four shillings and six pence; which, though collectors may accept as a price that pays them for their labour, seems an insignificant sum to destroy a tree for. I doubt, however, considering the low relative price which balata fetches, though the tree which produces it is so much more prolific in milk, and so much larger than the Hatie, whether the trees destroyed by balata collectors return, for balata alone, so much as three and six pence each on an average.

In my former report, guided by certain leading evidence, I expressed a belief that other species of *Hevea* might be found in Guiana; but up to now none has directly

come under my personal notice. I have been informed, however, that there grows on the Mazaruni, in that part where the rise in the country first begins, above the first falls, a tree, which the Arawack Indians calls Hatie-balli, from its resemblance to the Hatie, producing a similar but smaller fruit. From what I can gather, and the inference which may justly be drawn from the usual acuteness of Indians as to the affinity of plants, I am under the impression that this will prove to be a second species of *Hevea*.

I have now to speak of another india-rubber tree which I became acquainted with on this journey, the discovery of which I regard as of great interest and probable importance. While carrying out my investigations with the Hatie, Mr. IM THURN informed me that he had often seen in the possession of Caribisi Indians balls of india-rubber, which were exceedingly elastic. The Macusis on the Rupununi savannah certainly collect it regularly (they call it "Queena") and use it as balls (play). This appeared to me to accord with the stories brought home by the early travellers in the West Indies, when the islands were occupied by Caribs, and which also some existing travellers in this colony have told me they had witnessed, of india-rubber balls used in the festive games of the Indians when assembled at paiwarie feasts, an instance of which I had never met with in my own travels. I therefore determined at once to visit the country where these Indians described their residence to be, and gather what information they might be able to give as to this rubber and the tree which produced it. I was not certain, however, that it was not the production of the Hatie ; but I thought this improbable,

as I had met no Indians anywhere who possessed any knowledge of the rubber produced by the *Hatic*. The weather at this time was exceedingly wet and the downfall of rain nearly continuous. On reaching the waterside on Myrack Creek just before midnight, after a tedious pull for several hours through the darkness, I found the land flooded within the banks, and the sheets of water bridged over by long logs. Most of these sylvan bridges were covered six or eight inches deep with water, and the footing was, to me, in the profound darkness of the forest, treacherous and uncertain to a degree. A walk of about four miles through deep forest on an Indian trail brought us to the settlement, only to discover that my guide had mistaken the creek and, consequently, come to the wrong people. This was, however, I found the neighbourhood of the tree I was in search of, and the next day the collector of the gum, as the river inhabitants term every substance which exudes from a tree, was found at Comageguru, the next creek. He had in his possession seven or eight balls of various sizes, the larger ones weighing nearly a pound and a half. I could not discover that he had had any definite object in view in gathering them*. The larger balls were, I should think, too big for employment in any Indian games. His object may have been merely the speculation that he might barter them on the river, or down at the coast, as they do *balata*, considering it an analogous substance. In the afternoon, when the rain stopped, he took me to the same trees from which he had

* Small quantities of this rubber have for a long time, for the last half dozen years to my knowledge, found a sale to the traders in the

collected the rubber in the balls. They were situated near a newly-made clearing intended for a provision ground, about an hour and a half's walk through the forest from the landing place on the creek to which I had come the night before. Passing over the cleared ground, on which the bush had not yet been burned, we had to dive again into the forest to reach the trees. I have noticed a good deal of destruction in places of valuable timber in the clearings made for provision grounds, and this more particularly with the half-breeds who live on the lower parts of the river and grow plantains, which require a stiff soil upon which some of the better woods grow. Only recently I came on a bit of forest which had been underbushed for a provision field, the standing timber of which consisted of greenheart and other valuable trees. Whether any of this new rubber tree had perished in this clearing, it did not occur to me at the time to ascertain, but it is not improbable, as those I examined stood on the skirt of the ground. The trees were large individuals, four or five feet in diameter of trunk, and one hundred and twenty or more feet high. Their trunks were long, straight and unbranched for sixty or seventy feet from the ground. The lowest six feet of one had been scarred, and from the scars the milk had run and was dried in tears or strings several inches long on the bark. Most of the congealed rubber was, however, contained in the fissures made by the cutlass cuts, from which places it was rather hard to extract it because of the tenacity with which it held to the inner bark from which it had oozed. I gather-

district and on the Arabian coast. What becomes of it afterward I don't know.—ED.

ed and made a ball, following the Indian plan of winding it up like twine, of what was on this tree. They scar the trunk and then leave it, the milk oozes from the wounds, trickles down the bark, and coagulates and becomes dry in a few days. My guide said it took three days to dry, but I should have supposed a shorter time might accomplish the change, the little rivulets are so very thin. That which was in the old cuts—cuts probably a year or more old—had turned black, but that in those recently made was nearly milk-white. The Indian boys, who are perhaps accustomed to play with the balls, as I noticed from several which they brought me they never make them large, stripped the dry strings very dexterously from the bark, taking good care to extract the larger portion to which I have alluded partly concealed in the incisions, and stretching it with a good deal of tension, wound it up. These balls have wonderful elasticity and bound with very little impulsion several feet off the ground. The rubber too seems exceedingly tenacious and strong. This method of collecting is that pursued in Ceara, the province of Brasil which produces *Manihot Glaziovii*. It is very economical of time, for it saves the tedious operation of catching the milk in a vessel as it issues from the wound, which is the most troublesome of all the operations. The principal objection to it is, that the rubber becomes soiled by the dirt adhering to the bark, a little of which it retains, and no doubt this would deteriorate its market value; but this cause of depreciation might be reduced to a minimum by carefully brushing the surface down prior to commencing collecting operations. Rubber which has foreign matter incorporated with it, is classed under the

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term negrohead in the market, and its value depends on the measure of its freedom from dirt or other substance, having regard of course to the quality of the rubber itself when clean.

The branches of the trees I saw were so high that the character of the foliage could not be distinguished from the ground, and, as there was no means of ascending trunks so stout, I had to resort to the aid of a gun, and with this shot some branchlets off. It was, I was sorry to find, not the flowering season, but judging from the foliage alone, the tree appears to be a species of *Ficus* or *Urostigma*, but in the absence of flowers and fruit it could only be identified conjecturally. The colony abounds in different plants of the above genera, of which, presumably, other species to this are also valuable. Some of them are known to attain large dimensions. The seeds are dispersed by birds and other animals, and they germinate on other kinds of trees, principally palms, among the leaves, from whence they throw a root to the ground which again emits branches, and these with the main root in course of time amalgamate and form the base of the tree. It is curious to notice how these root-branches fuse together and form eventually a concrete trunk. I regard the discovery of this tree as of great interest and probable importance, attaining as it does such a vast size, and producing a material of apparently excellent quality. The Indians know it under two names, the *Caribisi* calling it Touckpong and the *Arawacks* Cumakaballi. Noble in all its proportions, lifting and spreading its massive head above its neighbours, it is one of the largest trees of the forest, and has a wide and general distribution over the deep belt of low

country in the colony.* Samples of the rubber of both this and the Hatie I have sent to England to be tested as to their probable commercial value.

Attempts have been made to extract caoutchouc by chemical means from the bark containing it. If this could be carried out successfully, and with paying results, every part of the bark might be utilised, just as the bark of *Cinchona* is in the production of quinine. The milk vessels abound all over a tree, as may be seen alike by cutting the bark of the stem, or that of a twig, and in breaking off a leaf; though they are proportionally more plentiful in any given species the thicker the bark is. Seeing this, it has always appeared to me a loss that so small a portion of the surface is operated upon. Where the tree is not cut down, only about eight feet of the trunk is utilized; and even when a tree is felled it is not thought worth while by collectors to spend time tapping the less productive parts which can be devoted to the best parts of fresh ones. I speak of existing circumstances; they might act differently if the trees were less plentiful. I gathered samples of the bark of the Hatie and Touckpong, and also of the Balata or Bullet-tree, for the Government Analyst, Mr. FRANCIS, to make trial of; but, as the following extract from a letter he has sent me shows, he does not regard, from the single experiment which he describes, the object as feasible from a commercial point of view. He writes:—

“ I found no difficulty in extracting the india-rubber from the sample of bark you sent me called Touckpong. I placed eight ounces (3,500

* This tree (or one, the rubber of which appears to be identical) certainly occurs on the *high* lands (though perhaps in swampy places) of the Roopoonooni.—ED.

grains) of the finely broken bark in a glass vessel, and just covered it with a liquid called bisulphide of carbon. After standing for twelve hours, the bisulphide of carbon was squeezed out from the bark through a cloth. The partially exhausted bark was again treated with bisulphide of carbon in the same way, and then the whole of the latter was evaporated down to dryness in a porcelain basin, and left a residue consisting of about 100 grains of india-rubber. The result barely represents three per cent. of rubber in the bark, and it is doubtful whether such a small quantity would pay for extraction.

“ I recommend petroleum ether as being a better solvent to use in this process than bisulphide of carbon. The latter would contaminate the india-rubber with free sulphur that is nearly always present in it as an impurity.

“ Petroleum ether is a cheap—almost a waste—product, but unfortunately owing to the great inflammability it cannot be imported into this colony except under a duty of three dollars a gallon.

“ Of course in the practical working of a process like this, the solvent employed—whether bisulphide of carbon or petroleum ether—would be recovered by distillation from the india-rubber and so could be used over and over again.”

In face of this unfavourable result, it would be worth while to experiment with all the india-rubber and gutta-percha barks produced in the colony. If no other good came of it, it would determine the relative yield of the different trees.

In a few places I met with the bullet or balata tree and the Indians told me it was scattered sparsely over a wide extent of the banks of the river and its creeks. I was surprised to hear that the trees were being felled by the Indians for the balata they yield, at the instance of traders who travel on the river purchasing the products procurable from the native inhabitants. The privilege Indians are allowed in regard to cutting timber of a specified limit as to size, “to be used by them or to be disposed of by them in the shape of squared timber,” appears to confer no right to cut for this purpose, and therefore

in felling, or in tapping trees for the juice of their barks, they are committing a depredation for which they should be held responsible on detection. Much more should the men who instigate them to it for their own profit, knowing that they could not do it with impunity themselves, be severely punished for their villainy. As to this, however, there seems to exist some difficulty. In response to a communication which I addressed to him on the subject, Mr. IM THURN writes :—

“ The bullet-tree (*Mimusops balata*) appears to be widely but somewhat thinly scattered throughout the Pomeroon District as a whole ; but in places it occurs in great plenty. One of the places is said to be at the head of the Akaiwini creek, which runs into the Pomeroon just opposite Hackney. And that this information is correct is apparent from the large amount of balata which is collected and brought down from the Crown lands up that creek. I have myself seen a bateau coming from there with over 300 lbs. of this substance. It is collected, by the most injurious method of felling the trees, chiefly by one man, a coloured man from the coast, who makes his living, and it is apparently no bad one, by collecting this balata and a small quantity of locust gum. This is of course wholesale robbery and wilful destruction of Crown property ; and I am the Superintendent of Crown lands in this district ! But though I can lay my hands on this robber, and perhaps on others, almost any day, I have no power to deal with such cases.”

Having had my special attention called to this matter by his Excellency the Governor, I availed myself of every opportunity either for inquiry or of observation. On the very limited ground I was able to cover on the main river, as I have said, I met with very few balata trees, and no tree that had been destroyed. The creek mentioned by Mr. IM THURN I ascended as far as the time at my disposal would permit, but, unfortunately, as the land was everywhere flooded, I could land in very few places. The Akaiwini is, in fact, however, a very considerable river, and the whole period of my leave, could I

have spared it, might have been occupied in its exploration. Only its higher reaches appear to be occupied by Indians, and here the balata tree is said to be more plentiful. So far as I can ascertain, none of this gum is gathered on the Essequibo or any of its tributary rivers. A wonderful impetus must have been given to the trade in Berbice within the last two years. In 1881, 93,573 lbs. was exported, or more than double the quantity of any previous year.* From the products of our forest which are utilised, important as they undoubtedly are, the colony derives hardly any profit, while the forests are impoverished by wanton waste and the depredations of the dishonest, and the trade is in the hands of a few merchants. As to the balata trade, unless some efficient method of utilising the whole of the bark be discovered, felling should be prohibited; and, if, with this rule, an export tax were imposed, and every package containing the gum required to bear a special brand belonging to the grant on which it was gathered, which would show the production of each grant, a very salutary change would be effected in the trade.

As the privileges accorded to the aboriginal Indians are now under review by the Government, it may be hoped that the damage done by the nefarious acts of traders and others, which they are enabled to perpetrate by means of these people, will not much longer continue; though only a new and comprehensive forest law will meet the whole forest question of the country.

* The export of balata for 1882 was 105,112 lbs., valued at £5,849. 3. 10½.



Essequibo, Berbice and Demerara under the Dutch.

PART I.

By the Editor.

I.  *HE Discovery of Guiana.* Rumours of the existence in the New World, just discovered beyond the Atlantic, of an empire and city inexpressibly rich in gold and other treasure floated through the chief places of the civilized world in the very beginning of the 16th century. Just before these arose CHRISTOPHER COLUMBUS had discovered America, and soon after, in 1506, he died, yet in the belief that the land which, having crossed the Atlantic, he first had touched was but an eastern point of Asia of the Old World. Very soon those who followed COLUMBUS announced that the newly discovered land was no part of Asia but a New World. It is difficulty for us to realize the full effect of such news. If we try to imagine that in the present day men, having sailed into perfectly unknown seas, returned with news that they had discovered a new continent, huge and rich, we can only very faintly realize the successive incredulity, wonder, acceptance of proof, and admiration following on conviction which would be caused. Yet it was news of this sort that each ship returning from across the Atlantic made more certain. And it was not only news of a New World; it was of a world in which existed nations of a very high degree of civilization, and of wealth such as had as yet only been imagined in dreams; moreover these nations

proved utterly powerless to retain their wealth from the free-booting European soldiers of those days. Nor had much of the century elapsed before Mexico and Peru were forced to pour their wealth into European treasure-houses. It is, therefore, not surprising that the eyes of all men of enterprize were turned to the West. For the travellers did not bring back only tales and precious metals; their ships came freighted with innumerable strange and rich products from the new country, products which, however familiar to us now, must then have appeared wonderful beyond all conception.

Especially, these ships brought much gold. Some valuable and available commodity must be found in all new countries before these can attract a new population. It was gold which first drew white men to America: and it was gold, or rather the rumour of gold, which drew them to Guiana. For, strangely enough, though then, and till quite recently, Guiana had produced no gold, yet it was to that land that the early explorers pointed as the richest in that metal. To such elusive tales Guiana owed its fame and owes its earliest civilization and colonization.

In treating of the first period in the history of Guiana, the period of its discovery, it is necessary to treat the country as a whole, and not as distributed, as it afterward became, into several colonies and to several nations. Accordingly we must for the present regard Guiana as extending from the Orinoco on the north to the Amazon on the south, and from the Atlantic Ocean to an indefinite point, not even yet determined, on the west. The origin of the name Guiana is not certain, but it is probably derived from the name of the large

but little known Waini River, which runs into the Atlantic somewhat south of the Orinoco. Such was the district which, unknown till the very last years of the 15th century, was regarded during the 16th century as a mysterious land full of many marvellous things, and, during the 17th, 18th and 19th centuries was developed into the more or less flourishing colonies of the Venezuelan, British, Dutch and French Guianas.

Rumour said that Guiana was the seat of an empire not inferior to those of Mexico and Peru ; so that, though even according to the rumours then current, gold occurred there in a natural condition, yet it was not this chiefly which attracted the whole host of explorers. Most of these looked, not so much for gold which was yet to be extracted with much labour from the earth, as for a treasure of gold ready wrought by art into a variety of forms, of a richness and value such as were only conceivable to the high-pitched, romantic imaginations of the men of that picturesque age. These treasures, they thought existed in a great city, called Manoa, or sometimes El Dorado, the capital of the empire of Guiana. Rumour had long proclaimed the existence of El Dorado, but had not always placed it in Guiana. At first it was supposed to be in New Granada ; but after even early in the 16th century, it was by common consent said to be in Guiana. In Sir WALTER RALEIGH'S time, despite the fact that the rumour of Manoa had existed long before the conquest of Peru, it was believed that the empire of Guiana was founded after the capture of Peru by a member of the royal family of that empire, who fled with many of his countrymen, and, carrying with him much treasure, founded

the empire of Guiana. RALEIGH, who quotes from FRANCISCO LOPEZ an account of the possessions of GUAYNACAPA, Inca of Peru and "ancestor to the Emperor of Guiana", was evidently inclined to believe that a court equalling, if not surpassing, that of Peru existed at Manoa. "All the vessels of his home"—he quotes from LOPEZ—"table and kitchen were of gold and silver, and the meanest of silver and copper for the strength and hardness of the metal. He had in his wardrobe hollow statues of gold which seemed giants, and the figures in proportion and bigness of all the beasts, birds, trees and herbs, that the earth bringeth forth; and of all the fishes that the sea or waters of his kingdom breedeth. He also had ropes, budgets, chests and troughs of gold and silver, heaps of billets of gold that seemed wood marked out to burn. Finally there was nothing in his country whereof he had not the counterfeit in gold. Yea, and they say, the Incas had a garden of pleasure in an island near Puna, where they went to recreate themselves, when they would take the air of the sea, which had all kinds of garden herbs, flowers, and trees of gold and silver, an invention and magnificence till then never seen. Besides this he had an infinite variety of silver and gold unwrought in Cuzco, which was lost by the death of HUASCAR, for the Indians hid it, seeing that the Spaniards took it and sent it into Spain". Comparing with this the supposititious empire of Guiana, RALEIGH further says—"The empire of Guiana is directly east from Peru towards the sea, and lieth under the equinoctial line, and it hath more abundance of gold than any part of Peru, and as many and more great cities than ever Peru had when it flourished most; it is governed by the same

laws, and the Emperor and people observe the same religion, and the same form and policies in government as was used in Peru, not differing in any part: and as I have been assured by such of the Spaniards as have seen Manoa, the imperial city of Guiana, which the Spaniards call El Dorado, that for greatness, for the riches, and for the excellent seat, it far exceedeth any of the world, at least of so much of the world as is known to the Spanish nation: it is founded upon a lake of salt water of 200 leagues long like unto the Caspian Sea." These passages exhibit the magnificent conception of Guiana which attracted to those shores so many knightly adventurers from so many countries.

While so many sought Manoa, one man, according to his own account, saw it. This was a certain Spaniard named JUAN MARTINEZ, who when dying at Porto Rico, presumably about the year 1532, gave an account of his adventure to certain friars of that place. These friars having deposited the written account in the chancery of that place, a copy came by some means into the hands of DON ANTONIO BERREO, Governor of Trinidad at the time of Sir WALTER RALEIGH'S first expedition in search of Guiana.

MARTINEZ' story was as follows:—DON DIEGO DE ORDAZ led an expedition, which ended in his own death, up the Orinoco in 1531. Before the expedition came to its fatal end, MARTINEZ, who was one of the party, fell into trouble and was parted from his companions. The whole store of gunpowder carried by the expedition exploded, and the blame being attributed to MARTINEZ, he was accordingly condemned to death. At the entreaty of the soldiers, with whom he was a great favourite, life

was granted to him by ORDAZ; but he was turned adrift in a canoe, with his arms, but without provisions, to drift down the river. Certain people of Guiana rescued him and, never before having seen a man of his colour or kind, carried him to the city of Manoa as a curiosity. The journey occupied fourteen or fifteen days, during which time he was led blindfolded by the Indians. At last they reached the end of their journey; and MARTINEZ, his eyes being at last unbound, entering the vast city at noon one day, travelled through it all that day and from the rising to the setting of the sun on the next day, before he reached the palace of the Inca. The Inca receiving him kindly, entertained him in his palace for seven months. MARTINEZ gave a wonderful account of the wealth and beauty of the city. It was he who gave the city its name of El Dorado; for he said "at the times of their solemn feasts when the Emperor carouseth with his captains, tributories, and governors, the manner is thus: All those that pledge him are first stripped naked, and their bodies anointed all over with a kind of white balsamum of which there is a great plenty and yet very dear among them, and it is of all others the most precious, of which we have had good experience: when they are anointed all over, certain servants of the Emperor, having prepared gold made into fine powder, blow it through hollow canes upon their naked bodies until they be all shining from the foot to the head, and in this sort they sit drinking by twenties and hundreds and continue in drunkenness sometimes six or seven days together. . . . Upon this sight and for the abundance of gold which he saw in the city, the images of gold in their temples, the armours, and shields

of gold which they use in their wars, he called it El Dorado." At last, at the end of seven months, the Inca, having loaded MARTINEZ with presents, allowed him to depart, and sent an escort of Guianians with him. All went well until the party came near the Orinoco, where lived the Orenoqueponi. These people fell upon him, drove back his escort, and robbed him of all but some gourds which were really full of curiously wrought gold beads, but which they supposed contained only provision for the journey. They however allowed him to pass; and he went down the Orinoco by canoe to Trinidad; whence he passed to Marguerita and finally to Porto Rico, where he died.

Such was the story told by MARTINEZ. It appeared credible to many at the time, and encouraged many in their search for Manoa. Of course we now know that it was a fiction; but it is worth noting that it was apparently concocted by a man who had really been in the country of which he told. Various matters, each slight in itself, point to this conclusion. A few of these will suffice as examples. In the first place, MARTINEZ said that he was 15 or 16 days in reaching Manoa from the banks of the Orinoco; now this would really be about the time occupied in reaching the place which trustworthy authorities have now fixed as the supposed site of Manoa. In the second place, the account of the festivals of the Guianians reads exceedingly like a very greatly exaggerated account of the paiwari-feasts now, and probably then, held by the Indians. When, he said, the people of Manoa were about to commence their drinking bouts, they used to anoint their naked bodies with a kind of balsamum, and gold dust was then blown

on to their bodies until they shone from head to foot, and that in this state they sat drinking by twenties and hundreds sometimes for six or seven days together. Now, before their paiwari-feasts the Indians gather together in great numbers, anoint their naked bodies with various kinds of oil, and then having covered themselves with paints, red, blue, white and yellow, and having put on gorgeous feather ornaments and much other finery, they drink and enjoy themselves incessantly for many days and nights.

Again another circumstance, noted, not specially by MARTINEZ, but by nearly all the explorers of the 16th century, confirms this supposition that "the Guianians" were really only the Indians of the country, the ancestors of those who inhabit the country to this day. The gold and precious metals obtained from the Guianians were most frequently in the shape of crescents; "croissants of gold, for of that form the Guianians most commonly make them" wrote RALEIGH. These can hardly be anything else than the crescent-shaped nose-pieces and earrings, made now-a-days of such baser metals as silver and copper, which are worn, suspended from the cartilage of the nose or from the ears, by the Macusis, Wapianas, and, probably, by other Indians. The Macusis now inhabit the very district, between the Roopoonooni and the Rio Branco, where was the supposed site of El Dorado; and, as Sir ROBERT SCHOMBURGK has pointed out, there is good reason for supposing that this tribe in the 16th century lived also on, or near, the Orinoco.

HUMBOLDT and others have shown that the physical features which were attributed to the sight of Manoa occur at a plain, called Lake Amoooco, which lies between

the Roopoonooni, the Takootoo, and the Rio Branco. There seems every reason for supposing that this is really the spot, known then only slightly from accounts received by Indians, upon which the imagination of Europeans placed Manoa. This was the point which all strove vainly to reach. Had any reached it, they would have found no gorgeous city, but only mountains rising from a grass plain inhabited by a few scattered, naked Indians and flooded in wet seasons by the rivulets which at other times run across it. All these circumstances tend to show that there was some very slight foundation of fact underlying the gorgeous fables of Guiana. But these fables themselves at present claim our notice.

The wealth of Guiana was not the only marvel told of the place. The land was, indeed, full of marvels. A very curious map of Guiana published in the 16th century, not only has some of the wonders of the country depicted on its face, but is accompanied by descriptions and plates of the Amazons, of men of the headless tribe, and of other remarkable Guianians. The Amazons were a tribe of women who lived and fought by themselves except for a day or two during each year, when they received male visitors from other tribes. All children born of them, if boys were killed, if girls were trained up as Amazons. They would seem to have been most bitter man-haters. The plate devoted to them shows two men, their naked bodies transfixcd with arrows, tied to the branch of a tree, each by one leg. A party of nine women are shooting more arrows into these poor wretches, while another woman carefully tends a slow, or at least a very smoky, fire directly under the victims. In the back

ground a band of Amazons is repelling a party of men who, undeterred by the fate of the two other members of their sex, are attempting to land from a canoe. Another plate represents the headless people of Guiana, whose hair grew from their shoulders, whose faces were on their breasts.

Throughout the 16th century, adventurers stirred by these reports of wealth and marvels, and excited by thoughts of the vast and splendid treasure plundered from Mexico and Peru, sought for Guiana. Spaniards, Portuguese, Englishmen, Frenchmen, each jealous of the other, strove to be the first to explore and take hold of El Dorado. Nor were the Dutch behind hand; though these, ever mindful of commerce, devoted themselves not so much to a search for gold as to developing a trade with Guiana. Probably this difference in aim was also due to some extent to the fact that the hereditary leaders of the Dutch—and it was the nobles of the other nations who chiefly instigated, and even led, the expeditions in search of gold—were fully occupied at home in freeing their country from the dominion of Spain and in erecting the Dutch Republic. So it happened that of the Dutch voyagers to the New World, most were traders. We shall presently see how, not to the gold-seeking nations, but to these Dutch traders, was chiefly due the creation, in the land which during the 16th century was only just discernible behind a cloud of fanciful myths, of such business-like colonies as the Guianas of the 18th and 19th century.

Having sketched the object of the search, it is necessary now to give some account of the adventures of the seekers.

Whether COLUMBUS himself ever saw Guiana is a disputed question, to which no certain answer will now probably ever be given. It is, however, at least certain that, if he did not reach the coast of Guiana, he was very near its most northerly point.

Two of the little band of daring voyagers of whom COLUMBUS had been the leader very soon afterward passed close along the shores of Guiana or the "Wild Coast" as it was soon afterward called. One of them ALONZO DE OJEDA, in 1499 reached the point where Surinam now is, and coasted northward past the mouths of the Essequibo and the Orinoco. The other, VINCENTE JANEZ PINZON, brother of the more famous man of the same name, in the same or the following year discovered the mouth of the Maranon, or as it was afterward called, the Amazon. The discovery of the mouth, and nothing but the mouth, of the great river Amazon will presently gain further interest from the story of another voyager. From the Maranon, PINZON also coasted northward along the shores of Guiana. During these and similar expeditions the Spaniards seem to have ascended more than one of the rivers of Guiana for some distance, and were surprised, says HERERA, at their size and appearance. It appears to have been about this time also (1500) that, not only vague rumours of the existence of treasure, but more certain news that Manoa existed in that country, a long way behind the Wild Coast, reached the Spaniards and, through them, the rest of the world. Then the search began in earnest.

At first the Orinoco, which bounds Guiana on the north, was regarded as the most feasible route to Manoa. The Spaniards were already established in Trinidad just

opposite one of the mouths of that river; that island, therefore, served as the starting point for many adventurous expeditions, all directed to one end. There is no need or space to chronicle all of these; but a few may be mentioned. In 1531 DON DIEGO DE ORDAZ, who had been in Mexico with CORTEZ, taking MARTINEZ as his "master of the munition" ascended the Orinoco as far as the cataract of Atures, where, principally owing to the hostility of the Indians, he was obliged to turn back. It is worth noting that from first to last the search expeditions of the Spaniards seem to have failed especially from one cause—their treatment of the Indians through whose lands they passed. The expedition of ORDAZ is principally interesting from two causes; firstly, it was that in which MARTINEZ got into the trouble which, as has already been told, led to his visit to Manoa; and secondly, because ORDAZ either found or more probably formed a small Spanish settlement at the mouth of Caroni. This settlement afterward became the town of Santo Thomé de Guiana which, after having been destroyed by the Dutch in 1579, was again rebuilt and became memorable in connection with Sir WALTER RALEIGH'S second voyage to Guiana. Again in 1533 another Spaniard, ALONZO DE HERERA, tried to force his way up the same river: but he, also, getting into trouble with the Indians, was killed by a poisoned arrow.

The most daring of all the expeditions the aim of which was the discovery of Manoa must now be told. All history contains no more amazingly bold story of travel than that which tells how FRANCISCO ORELLANA crossed the perfectly unknown continent of America from west to east, by way of the Amazon, and thus first

of all white men passed along the southern limit of Guiana. In 1540, GONZALO PIZARRO accompanied by ORELLANA, they having heard a rumour that the river Coca, which flows westward from Quito and which in its lower course takes the name of Napo, ran into a great river on which stood the long sought Golden City,* started to prove the truth of this rumour. Soon after reaching the Napo, PIZARRO and ORELLANA parted, the expedition being in great difficulties owing to illness and want of provisions. ORELLANA was sent forward in search of food. But before long, perhaps alarmed at the strength of the current which had carried him so far and dreading the difficulty of returning, or, more probably, eager himself to lead an expedition of adventure, he determined to leave PIZARRO to his fate and to continue his own course. Past him ran the swift river which had borne him so far and which flowed, he knew not how, into a great, utterly unknown and, to an extent now hard to realize, marvellous-seeming country. To return even from the point where he then was would have been difficult, but with each day's further journey return would become more and more hopelessly impossible. Yet, with apparently little or no hesitation, he determined to go on with the river; and thus, as it were, he hurled himself and his companions into the unknown. And in the end, having been carried by the river right across the southern continent of America, he was delivered by it to the Atlantic.

* It is curious that this rumour was so far correct that the supposed site of Manoa is on the small river Pirara, the waters of which find their way through the Ireng, Takootoo, Rio Branco and Rio Negro into the "Great river" *i.e.* the Amazon.

The Napo had carried him into a vast river, and that had carried him into the ocean on the eastern side of America. The river mouth through which he passed to the sea was recognised as that same 'mouth of the Maranon' which PINZON had discovered in 1499. PINZON had indeed discovered the mouth of the greatest river of South America, but ORELLANA had traversed its whole course.

There was some attempt to change the name from Maranon to that of its first explorer; but though ORELLANA did indeed give the river its modern name, that name was, not his own, but one which was derived from a story told by him. He, the boaster, told many tales of the difficulties and marvels through which he had forced his way. He had not seen Manoa but he had passed through nations incredibly rich in gold. He had had many battles to fight with these Indians. He had fought not only with fierce men, but with women more warlike than the men; and these warrior-women were, he thought, the Amazons whose existence in America, had before been rumoured. It was from this last story that the river took its name, and was called the Amazon.

As the Orinoco bounds Guiana on the north, so the Amazon bounds it on the south. ORELLANA was, therefore, the first to define these southern limits of Guiana.

After the discovery of the course of the Amazon, it was regarded as rivalling the Orinoco as a probable route by which Manoa might be reached. More especially, the French, who even before this had been in the habit of trading with the Indians of Brazil for native produce, made more than one fruitless expedition up that river in search for El Dorado.

Meanwhile the Dutch, who throughout the latter half of that century seem to have occupied themselves in establishing a trade in the native products of Guiana, began in 1580 to establish their earliest settlements on the Wild Coast. A settlement was established in 1580 by a party of Dutch traders on or near the Pomeroon River; and other, similar settlements were founded just within the mouth of the Essequibo. As early as 1581 the Dutch States General took official and approving notice of these settlements; but the further progress of this movement, which finally resulted in the establishment of various colonies, does not come within our present notice.

When the century closed, the search for El Dorado was still in progress. DON ANTONIO DE BERREO, Governor of Trinidad in 1595, before that time had vainly attempted to make his way into Guiana. Even while he was preparing a third expedition for the same purpose, on the 23rd of March, 1595, Sir WALTER RALEIGH arrived in Trinidad, on his way to Guiana, and took BERREO prisoner. At first BERREO grudgingly tried to dissuade RALEIGH from his enterprize; but finding this useless, having shown his copy of the dying declaration of JUAN MARTINEZ, he more than ever confirmed RALEIGH in his determination to continue.

RALEIGH'S expeditions, two in number, were after all not very successful. On the first occasion he ascended the winding course of the Orinoco for 250 miles to the mouth of the River Caroni, and actually saw the Pacaraima mountains the other side of which is the plain of Manoa, but from that point he was obliged to turn homeward. He had however established most friendly relations with

the natives, one of whom voluntarily returned with him to England. Undeterred he made up his mind to return, and adds that if he fails "and if any else shall be enabled thereunto, and conquers the same, I assure him thus much he shall perform more than ever was done in Mexico, by CORTEZ, or in Peru by PIZARRO, whereof the one conquered the Empire of Montezuma, the other of Huascar and Atahualpa." From these words it is evident that he still retained his belief in the riches of Guiana, while from other passages it is evident that he, in common with the rest of the world, now expected to obtain not only imperial treasures from Guiana, but vast quantities of gold and precious metals from mines which he supposed to exist.

RALEIGH tells his adventures during this expedition so vividly that the traveller who has had experience of that part of the world, as he reads, sees the whole scene before him. Much of the country remains to-day as it was in the beginning of the 17th century. The long monotonous river-reaches reflecting a burning sun, the densely tree-covered banks, the forms of animal life, the occasional appearance of canoes filled with Indians, the terrified flight of these Indians at the first sight of the white man, their hospitality and kindness when persuaded of the peaceful intentions of their strange visitor, their habits, their feasts, their large promises of help, their performance of some of these promises, their lazy, careless, good-tempered delay in the performance of others, all these details and many others are incidents in the life of the traveller of to-day exactly as in that of RALEIGH and his party. The modern traveller sees the adventures of that band of 17th century

explorers far more clearly than it is generally possible to see from a distance of two centuries and a half.

Another feature in RALEIGH'S voyage is of special interest. Throughout the whole account of the expedition the reader can not but feel much satisfaction at the evidence of the leader's kindly treatment of the natives, a kindness to which he owed any small success which he had. In the course of a few years, RALEIGH by gentle measures more nearly penetrated into Guiana than former explorers because of their savage and thoughtless cruelty had done in more than a century. RALEIGH endeared himself to the natives in a way which ought for ever to add lustre to his name. Long after his departure we hear that the Indians of the Orinoco looked and longed for his promised return. But they were never again to see him.

RALEIGH, after the failure of his first expedition, did not abandon his design on Guiana. Two expeditions were despatched by him to Guiana; one under Captain LAURENCE KEYMIS in 1596, and the second under Captain LEONARD BERRIE, in the end of the same year. KEYMIS'S voyage has considerable interest in that he explored for some distance from their mouths, several rivers between the Orinoco and the Amazon; and, counting these rivers, he found that they were sixty-seven in number.

But after the death of Queen ELIZABETH, RALEIGH, being in great disgrace with her successor, was thrown into the Tower, and was tried for high treason in 1603. The trial resulted in the well known iniquitous sentence of death. The execution of the sentence was, however, long deferred and RALEIGH languished for a long time in the Tower. During this time

of captivity he seems frequently to have turned his thoughts to Guiana. At last, in 1617 he bribed the avaricious JAMES, by continually setting forth the wealth to be acquired from Guiana and the importance of its conquest, to allow him freedom and opportunity to sail westward once more. There is surely something pathetic in the story of this brilliant and accomplished gentleman languishing in prison, planning and longing for another hazardous journey into the wild, free and unknown forests of Guiana, at last gaining freedom and, as it appeared, pardon, and setting sail. Nor is the end of the story, the failure of the expedition, the return of the adventurer, and the cold-blooded execution of the long delayed sentence of death any less pathetic. If the myth of the Golden City on the shores of the white lake gives a romantic tinge to the first period of the history of Guiana, the story of Sir WALTER certainly imparts a yet more vivid and a deeper dye.

On the 20th of March 1617 RALEIGH, with his son, sailed in the "Destiny" from London on the second voyage to Guiana. Five other ships accompanied him. The little fleet was driven by foul weather into Cork; from which place they did not again set sail till the 19th of August. Much sickness, many deaths, and long continuance of foul weather befell the expedition before they anchored on the other side of the Atlantic at Cape Orange, on the 11th of November. Some time was spent at the mouth of the Cayenne river in cleaning the ships and refreshing the crews. On the 10th of December from a group of islands which RALEIGH calls "the Triangles," he sent a party, with which went his own

son, under command of Captain KEYMIS to make for the Orinoco. Meanwhile he himself, sick and despondent, with the rest of the fleet sailed for Trinidad, where he lay waiting till the 13th of February, in long and anxious suspense as to the fate of the Orinoco expedition. At last the suspense ended. A letter giving an account of his failure was received from KEYMIS.

The expedition had reached the town of Santo Thomé, near the mouth of the Caroni, on the 12th of January, (1618); and in an assault on the town made that night young WALTER RALEIGH had been killed. The Spaniards had been expelled from the town; but the English had been disappointed in their hope of finding treasure. KEYMIS, having established himself in Santo Thomé, had sent an exploring party up the river as far as the mouth of the Guarico, a distance of 110 leagues; but the party had returned at the end of 20 days without having found a way into Guiana. At last, in want of provisions, and continually harassed by the ejected Spaniards, KEYMIS, about the end of January, had made up his mind to return.

Such was the news contained in the letter received by RALEIGH; and it was after a time followed by the arrival of KEYMIS and his party. When the two old friends and fellow-travellers met, KEYMIS seems hastily to have made somewhat ungracious excuses for the misfortunes which had overtaken him. RALEIGH, who with a true instinct foresaw his own ruin in the failure of the expedition, answered bitterly in the tone of a fallen man deceived by a former friend and faithful servant. Full of self-reproach and stung to the quick by the rebuke, KEYMIS first shot and then stabbed himself. "His

boy going into the cabin found him lying upon his bed with much blood by him, and looking into his face saw that he was dead."

A few words suffice to finish the story. RALEIGH'S return to England, his surrender of himself, and the execution on him of the suspended sentence of death, nominally for the old offence, but really in order to satisfy the Spanish Ambassador, who was loudly complaining of the attack on Santo Thomè and of other of RALEIGH'S deeds against the Spaniards, not only form the closing scene in the life of the great English seeker for the Golden City, but also coincide virtually with the time at which Guiana became no longer the scene of that famous search for imaginary gold but of a trade in the real wealth of its natural products.

2. *The founding of the Colonies, A. D. 1580—1745.* In passing from the romance of the discovery of Guiana to the history of its colonization, it is as well to try to realize the nature of the land of Guiana as it appeared to its earlier colonists. They still only knew its seaboard and the lower reaches of some of the big rivers. The courses of the Orinoco and the Amazon, were sufficiently known to serve as the boundaries of Guiana on the North West and South East. Of the rivers between these, the Pomeroon, the Essequibo, the Berbice, the Surinam, and the Cayenne, the lower reaches were early settled, but it was long before these were penetrated to any great distance from the sea.

The interior of the country was, in fact, entirely unknown except from the accounts of the Indians and of the one or two travellers, not of the most trustworthy kind,

who claimed to have been there. There was, therefore, no certainty as to how far Guiana extended to the west. Two views seem to have been held. One was that the Amazon and the Orinoco started from the same point and that these two rivers thus bounded two sides, not of a quadrilateral, but of a triangular land of which the Atlantic formed the remaining side. A slight variation of this view was that not these two great rivers, but a branch from each somewhere met*; and curiously enough it is actually a fact that it is possible to pass from the Orinoco to the Amazon by water. The second view as to the western limit of Guiana was that it was formed only by the sea on the other side of the continent; for in a grant of the date 1663, to which I shall presently have occasion to refer, Guiana, is described as "extending from the sea southwards to the heads of certain rivers and thence by direct lines to the South Sea."† But the question as to how far from the Atlantic, Guiana might extend was rather of speculative than of practical interest to the early colonists; for they found that the task of founding colonies even on the sea-board was almost more than they could accomplish.

The natives in a new country are often the greatest hindrance to settlers, but in Guiana the Indians, who were the only inhabitants, were, when well treated, the very opposite. We shall presently see how those settlers who used the Indians kindly almost always survived and flourished, while those who did the opposite perished. At the present day the Indians, wherever they retain their own peculiar habits, will do anything for a

* Description of Guiana (by Major John Scott ?) among Sloane MSS.

† Calendar of State Papers, Col. Series, Vol. v. p. 131.

white man who is kind to them ; and from very many contemporary statements, it is very evident that their bearing was the same to the early settlers. For example, in an English State-paper concerning Guiana, dated 1663, it is said that ‘ the Christians in these parts take no pains or labour for anything ; the Indians house them, and bring them victuals, receiving iron-work, or glass beads or such like contemptible things in return.’* Had their simplicity and kindness been everywhere rightly used, not only would the early settlers have met with much less misfortune, but the Indians would by this time have been turned into useful labourers. At any rate, it may be safely affirmed that the Indians were naturally of a friendly disposition towards the first white visitors.

The various European nations which had engaged in the search for Guiana all after its discovery struggled to make settlements in the land and to possess it. The degree of success which attended the efforts of each was various and not always proportionate to the success which had attended the endeavour of each to discover. No nation had sought more eagerly for Guiana than had Spain ; and alone of the competing nations Spain had no success in colonizing the discovered land on the southern side of the Orinoco. France, too, made some efforts both to discover and to settle, but without very important result. The two chief colonizing nations were the Dutch and the English ; and of these the former had from the first laboured to settle rather than to explore.

From the date of the formation of the first successful

* Calendar of State Papers. Col. Series. Vol. i. p. 36.

settlement, in 1580, for more than eighty years, till 1663, France, Holland and England were competing with more or less success against each other for the possession of Guiana. Each of these three nations at first tried to form settlements at various points along the whole coast; but each after a time succeeded in gaining a footing along a distinct part of the coast, the Dutch nearest the Orinoco, the English eastward of the Dutch and the French eastward of the English. A brief sketch of the success of these three nations, and of the abortive efforts of Spain, during this period of eighty years, must suffice.

Despite their ultimate failure, to Spain belongs the merit of having founded the earliest settlement in Guiana. As early as 1531, or perhaps in the following year, DIEGO DE ORDAZ of whom mention has already been made, founded a settlement at the mouth of the River Caroni, on the eastern bank of the Orinoco. This, which afterward received the name of Santo Thomè de Guayana, was destroyed by the Dutch in 1579, and, being rebuilt near the old site, was again destroyed, as has been told, by KEYMIS in 1618.* A second settlement is also said to have been formed by Spaniards, under GASPARD DE SOTELLE, at Cayenne, in 1568, but this, having endured for five years, was then destroyed by the Indians of the district.† This latter is as far as I know, the only recorded Spanish settlement south of the Orinoco. But in 1593 BERREO,

* RALEIGH'S 'Discoverie of Guiana'—Hakluyt Society, p. 79. This settlement is also mentioned in the MS 'Description of Guiana' which is in the Sloane Collection, but the founder is there said to have been, not ORDAZ, but PEDRO DE ACOSTA.

† See the same MS. 'Description of Guiana.'

the Spanish Governor of Trinidad, the same who was afterward RALEIGH'S great opponent, formally took possession of Guiana for his master PHILIP the Second. Two years later RALEIGH reached Guiana and broke the shadow of Spanish power along the whole of that coast. It is perhaps worth noting that Guiana, which is the only civilised district of South America which was never for any time subject to Spaniards or to their kindred the Portuguese, is also the district in which order and civilization have been most uniformly maintained.

All the French attempts to settle in Guiana took place within the eighty years (1580-1660) which, as I have pointed out, formed the chief period of colonization. The first settlement was in 1607 on the Wiapoca, not far from the Cayenne for the cultivation of tobacco. These settlers after a time quarrelled with the Indians, and were by them almost entirely annihilated in 1609. A second party of Frenchmen tried to settle in 1613 at Cayenne, where, as we have seen, Spaniards had before settled and been destroyed by the Indians; but the new comers too were, some destroyed, some driven away, within a few months by the natives. Yet another attempt was made in 1625, when two shiploads of French settlers landed at Meriwinia; but another ship coming to the same place not long afterward found no single one of those settlers in that place. Again, in 1626 a party of Frenchmen established themselves on the Suramaco; but these, after lingering for three years, removed to the island of St. Christopher. In 1639 a second French settlement was formed on the Suramaco, but was again destroyed by Indians, all the settlers being killed in a single day. Yet once more, in or about 1642, Frenchmen settled on

the Suramaco and at Cayenne.* Of these last settlers, though a great many were again killed by Indians, some perhaps survived at Cayenne and formed the nucleus of the present French colony at that place ; at any rate, it seems certain that that colony dates from about this time. It represents the only successful attempt at colonization by the French in Guiana. I shall have occasion to mention it but once more.

The story of the Dutch settlements, to which we now turn, is one of far greater success. It may be repeated that while most of the settlements which have already been mentioned perished through the wantonly provoked ill-will of the Indians, those of the Dutch, who exerted themselves to establish friendly relations with the Indians, flourished in spite of many vicissitudes. As showing another cause of this success, it is also note-worthy that the Dutch, devoting themselves from the first simply to the establishment of a trade in the known and useful products of the Guiana coast, left it to other nations to search for the expected gold and other treasure, and that they would, had they been allowed, have led a peaceful life without disturbing the colonists of other nations near them. Moreover, certain similarities between the natural features of Guiana and those of their old homes in Holland made their new home less repellent and disheartening to the Dutch than to men from other countries. Guiana, like the Netherlands, was a country of rich soil, barely on a level with the sea ; such a place, while it would offer but few attractions to others, seemed home-like to the Dutch,

* On all these French colonies see the Sloane Collection M.S. 'Description of Guiana'.

and at the same time seemed little likely to be permanently occupied by other nations.

As early as 1580 certain Dutch traders established a settlement on the eastern bank of the Pomeroon River ; and even in the first year after its formation this settlement was recognised by the home government. A Dutch population gradually spread along the banks of this river and long flourished, though never developing a colony with a distinct government. At a considerably later period, in fact between 1650-'60, a vain attempt to give new vitality to the settlements on the Pomeroon was made, by building the two towns of New Zealand and New Middleburg. Traces of Dutch life on this river are still to be seen on the deserted river-banks, in abandoned coffee plantations, in groves of arnatto plants, long cultivated as a culinary dye used in place of cochineal, in ruined wells and remains of walls built of small, very regular Dutch bricks, in solitary cocconut, and other foreign palms, in huge splendidly graceful and most stately clumps of bamboos, in solitary tomb-stones under these bamboos, and, it is said, in the remains of a canal which once connected the Pomeroon with the mouth of the Essequibo. No colony, however, ever developed itself on the Pomeroon ; though it was from there that the first settlers were sent to the Essequibo,* there to found the earliest of the permanent settlements of Guiana.

In, or about, the same year in which settlements were formed from the Pomeroon at the mouth of the

* The origin of the name of the Essequibo is not certain. It is usually said to have been named after JUAN D'EZQUIBEL, a companion of COLUMBUS. But it should be observed that the Carib Indian name for the river is Scapi or, more correctly Esscapi.

neighbouring river Essequibo another settlement was made on the Abary, a small river which runs into the sea about half way between the Demerara and the Berbice. The latter of these settlements seems to have had a much shorter, and even less eventful life than those on the Pomeroon; but the former, that on Essequibo, was the germ which afterwards developed into the colony of the same name which was the first, and long the most important colony in Guiana. The settlers at first took more and more land into cultivation at the mouth of the river and developed a very considerable trade with the Indians. But in 1596 this prosperity began to be roughly disturbed by roving bands of Spaniards; the settlements were again and again destroyed, and the inhabitants were (in 1616?) compelled to retire some forty miles up the river, to the point where the Cuyuni joins the Mazeruni just before the latter river flows into the Essequibo. There they established their head quarters on a tiny island to which they gave the name Kykoverall, from the wide view along three huge rivers which it affords, and on which they found the remains of a small Portuguese fort, the earlier history of which was, and is, entirely unknown. After this, Dutch cultivation spread rapidly along both banks of the Essequibo for some distance up its course, and, somewhat less extensively, along the Mazeruni and Cuyuni.

To turn for a moment from the colony of Essequibo: In the year 1615, two hundred and fifty Dutchmen from Zealand had landed at Cayenne; but, probably because other colonists, Spanish and French, had attempted that place before and had left an evil reputation, these Dutch-

men for once failed to establish friendly relations with the Indians ; in default of which they were obliged to quit the place within the year of their arrival.

The year 1616 was an eventful one in Essequibo ; for the chief authority there then fell into the hands of a man named GROMWEAGLE who seems to have been qualified in a very remarkable degree for the work which he had to perform. To him that colony, the mother of all the others which grew up in what is now British Guiana, owed much of its success. The recorded events of history, unfortunately few in number, therefore deserve some notice.

GROMWEAGLE * was a Dutchman, born in 1581, who, serving in various Spanish expeditions in the Orinoco, acquired so great a liking for the adventures incident to a life in Guiana that, having heard that his own countrymen from Zeeland were establishing themselves more firmly on the Essequibo than the Spaniards were likely ever to do in any part of Guiana, he asked for employment from his own countrymen and was sent out from Zeeland, in what capacity does not appear very certainly, in 1616 with three ships, 'and was the first man who took firm footing on Guiana by the good liking of the nations, whose humours the gentleman perfectly understood.' According to the document from which I am now quoting, it was he who erected the fort on the island of Kykoverall ; but, from other sources, it seems almost certain that he only strengthened it and adopted it as his stronghold. All his time the colony flourished ;

* For the facts of this story I am indebted once more to certain M.S.S. in the Sloane Collection, to which my attention was especially called by my friend N. DARNELL DAVIS, to whom I take this opportunity of offering great thanks for this, and much other kindness.

he traded largely even with the Spaniards, and behaved himself in a friendly way to all colonists in that part of the world, and especially to the English who were then newly established in Barbados. Having served the colony for forty-eight years he died in 1664. The reason of his success it is not difficult to find, and has already been told; it lay especially in his wise treatment of the Indians and also in his neglect to spend time and means in harassing Europeans of other nationalities in neighbouring colonies. The following well illustrates his habits in both of these ways. A certain man named POWELL, who had served with GROMWEAGLE under the King of Spain in the West Indies, took possession of the island of Barbados about 1625 and founded an English settlement there. The new settlers had no stock of food-producing plants suited to their new home, nor even if they had had them, would they have known how to cultivate such. In this emergency POWELL sent his son THOMAS to his old comrade GROMWEAGLE in Essequibo with a request for such things as were proper to plant for food and for trade. GROMWEAGLE "willing to gratify an old friend, persuaded a family of Arawacoes, consisting of forty persons, to attend POWELL to Barbados, to learn the English to plant, and to carry with them cassava, yams, Indian corn, and other pulses, plantains, bananas, oranges, lemons, limes, the pine-apple, melons, &c., and, for to produce a trade, they carried over tobacco, cotton, and annatta, a rich dye (a commodity the English never yet know how to manage*); to all which Barbados was naturally a stran-

* It must be remembered that this was written by an Englishman, one well acquainted with Barbados, and, at the time he wrote, hostile to the Dutch.

ger. The Indians fell to planting soon after their arrival at Barbados, and all things grew well and came to great perfection, agreeing with the soil and clime, and they soon had all things necessary for life. Captain GROMWEAGLE had undertaken . . . that at the expiration of two years, if they did not like the country, or should upon any other occasion desire to go back to Dissekeeb, they should be transported with their reward, which was to be fifty pounds sterling in axes, bills, hoes, knives, looking-glasses, and beades." This certainly shows that the influence of GROMWEAGLE was great with the Indians, and also considerable generosity to the English who were even then very jealous of the Dutch in Guiana. Unfortunately GROMWEAGLE afterward had considerable reason to regret his kind action. POWELL himself behaved well in the matter ; but he kept his authority in Barbados only for three years, after which he was superseded by other English governors, who repudiated his share of the bargain, and, the Indians objecting, "made slaves of them, separating the husbands and wives of some, parents and children of others, one from another." At last one of these Indians escaped, and, getting on board a Dutch ship, reached Essequibo and there told the story to the rest of his tribe : "which proved of all consequence to Captain GROMWEAGLE, who had like to have lost his colonie for that cause only, and was forced to marry a woman of the Careebee nation, to balance the power of the Arawacoes, and afterward was at the charge of great presents to make up the business between the Dutch and the Arawacoes nation." It is evident that GROMWEAGLE understood the value of the balance of power and was prepared to go to any length to maintain it.

Various internal affairs of great importance also happened in Essequibo during the rule of GROMWEAGLE. The traders to the colony were incorporated in 1621 into the Dutch West India Company, into whose hands passed what was virtually a monopoly of trade between this part of Guiana and the world beyond. The first act of this company, or indeed it may be said, the purpose for which it was instituted, was to introduce negroes as slaves into Guiana. This was part of the natural course of events. The trade in negroes, which had been begun, by the Portugese, in the middle of the 15th century, was flourishing in the 17th century. In Guiana the soil was rich and promising; but this was almost useless to its owners owing to the climate, which is such as to prevent Europeans from seriously undertaking field labour; nor were the natives of the country, the Indians, apt for continued hard work. The natives of Africa were the very people to do what was required, to extract the wealth of Guiana for their Dutch owners. It was an eventful undertaking.

The plantations at once became yet more flourishing; nor were they much longer confined to the Essequibo. In 1626, JAN VAN PEERE, a man from Flushing, settled on the Berbice River, and there soon put a considerable extent of ground under cultivation. It was in 1614 that, by the official recognition of the Dutch government, the settlements on the Essequibo became a colony. Berbice became a colony in the same way in 1627, when the government of the Seven Provinces extended such rights of trade as they had before given to the West India Company to VAN PEERE.

Passing on to 1650, it must be noted that in that year

there was a large accession of Dutchmen to the number of those in the settlements on the Pomeroon, which had by this time spread to the neighbouring small river Moroo-ca; and, once more, in the following year "a great colony of Dutch and of Jews, driven off from Brazil by the Portuguese, settled there, and, being experienced planters, that soon grew a flourishing colony.*"

It is as well here to try to realize the relative position of the three centres of Dutch population by that time established in Guiana, on the Pomeroon, the Essequibo and the Berbice. Each stood, as it were, in a clearing in a land otherwise everywhere covered with dense forest down to the edge of the water. Between these clearings there was no road and no means of communication except by water. Between them lay a dense trackless forest, inhabited only by Indians. Gradually, however, in spite of this isolation, the settlers on the Essequibo on the one side, and on the Berbice on the other began to extend their cultivation towards the then hardly known Demerara river, which lies between the two. The Demerara, a river of large size was known, but so little was it regarded that when, at as late a time as 1672, the boundary between the two settlements of Essequibo and Berbice was defined, not the Demerara, but the small river Abary, probably because of the insignificant settlement which, as has been mentioned, had existed for a very brief time on it, was selected for the purpose.

It is time to turn to the history of the efforts of the English to colonize Guiana. The first serious attempt was made in 1604, or twenty years after the

* Sloane M.S. 'Description of Guiana.'

Dutch had succeeded in gaining a footing, when one Captain CHARLES LEIGH with fifty Englishmen arrived in the ship "Olive Plant" at the mouth of the river Wyapoca (now called the Oyapocko), a river somewhat to the east of the Cayenne, and there formed a settlement, to which he gave the name of Caroleigh. By the ship which had brought him he sent a letter to the Privy Council in England, in which, after announcing his safe arrival, he told that the Indians of the district had received him kindly and urged him to stay among them, that he had determined to accept this invitation, and that therefore, having kept forty of his men with him, he now sent the other ten back to England, together with four Indian chiefs as pledges; and he finished with a petition for the King's protection both to himself and to all such as might be willing to join him.* Having thus written he waited patiently for reinforcements and stores from England; but these supplies, which left the Thames in May of 1605, never reached LEIGH. After enduring very great hardships for some four years, during which LEIGH himself and many of the others died, the surviving settlers, apparently fifteen in number, finally took passage in a passing Dutch vessel and abandoned the place.

Soon after this the English began to grow anxious lest some other nation, and especially the Spanish, should forestall them in obtaining possession of the unoccupied land of Guiana. Urging the value of Guiana and confirming this fear of Spain, Sir THOMAS ROWE, writing to Lord SALISBURY from Trinidad on the 28th February,

* Calendar of State Papers. Col. Series. Vol. i. p. 5.

1611, after speaking of himself as having seen more of the country from the river Amazon to the Orinoco than any Englishman alive, seeing that he had passed along the 'wild coast' and reached Port d'Espagne, alludes significantly to the design of the King of Spain 'to plant Orinoco', but he added, that, as it seemed to him, the military power of Spain was of little account and that their designs 'all will be turned to smoke.'* Whether in consequence of this report by ROWE or not, the first royal English grant of Guiana was made soon afterwards, on the 20th August 1613; it was to ROBERT HARCOURT, Sir THOMAS CHALLONER and JOHN RAVENSON and to the heirs of HARCOURT, "of all that part of Guiana on the continent of America between the Rivers Amazon and Dollesquebe." The limits of the tract granted were, therefore, roughly such as would avoid encroaching on that part of Guiana which was at that time occupied by the Dutch. This ROBERT HARCOURT had reached Guiana in 1608, and formed a settlement on the Wyapoco, near the spot where LEIGH had failed a few years before.

The next enterprise of importance was that first undertaken by Captain ROGER NORTH, a brother of Lord DUDLEY NORTH, in 1650. Among the State Papers, exist documents in the handwriting of NORTH himself in which he pleads, that, he having informed the King that year of His Majesty's right to Guiana, the King had granted to him and to all who would engage in an adventure to that country a patent and certain privilege; that an expedition had been eagerly prepared for the

* Calendar of State Papers. Col. Series. Vol. 1. p. 11.

purpose ; but that, the Spaniards, and of them especially their ambassador GONDAMAR, trying by every means to stop the undertaking and falsely affirming that the King of Spain already held those countries, the King had yielded to these clamours and had sent sudden orders to suspend the expedition, even while it lay at Plymouth ready to put to sea. The writer continues that, in this difficulty, the Duke of Richmond and others having assured him that 'the world expected he should go without bidding,' he, NORTH, had put to sea.* GONDAMAR, enraged at this, induced the most timid of kings to issue a proclamation on the 15th of May against NORTH and his companions, in which he declared "his utter dislike of their rash and foolish attempt, revoking any commission they may pretend to hold from his Majesty, and commanding their immediate return and surrender, or their seizure by any vessels that may meet with them." Such property as NORTH had in England was also sequestered at the demand of the Spanish ambassador. Meanwhile, NORTH and his companions sailed to Guiana, which they reached in about seven weeks, then an average passage. There they left 100 gentlemen and others, many of whom remained for many years, making use of thousands of Indians, who 'were rewarded with glass beads and such like contemptible stuff'. NORTH himself sailed back to England, which he reached in December of the same year, having heard no word of the proclamation which had been issued against him. He was thrown into the Tower, but was released within six months, and before long managed to obtain restoration of his property.

* For the details of this expedition see Calendar of State Papers. Col. Series. Vol. i. pp. 23, 77, 78.

But NORTH was not yet deterred from his project. In 1623 he submitted to the king further statements of the advantages of Guiana, of the injustice of the Spanish claim, and added that the newly formed Dutch West India Company, though they had not as yet gained footing to the east of Essequibo, in the district covered by the English king's grant, were then designing to send two or three ships to take possession of that part of the country. The Dutch expedition to which this referred was that which in the following year, 1624, did in fact take possession of the Berbice and there formed the colony of that name. But NORTH'S petition seems to have met with no immediate response.

Yet in 1626 the Attorney General of England was directed to prepare a bill for the incorporation of the 'Amazon Company' for the formation of which NORTH had so long striven. Accordingly a grant was prepared, which, though dated on the 19th of May 1625, did not pass the great seal till the following month, by which a company was incorporated under the title of 'the Governor and Company of Noblemen and Gentlemen for the planting of Guiana'.* The company consisted of the Duke of Buckingham, as Governor, and fifty-five other noblemen and gentlemen, of whom each had subscribed, some one hundred and fifty, some a hundred, and some fifty pounds; and ROGER NORTH himself was appointed first Deputy Governor.†

Even then the company does not seem to have flourished; for about two years later a petition was presented to the King to take 'the adventure to Guiana' under his

* Calendar of State Papers. Col. Series. Vol. 1. p. 79, 84.

† Ibid. p. 85.

own protection. From the terms of this petition it would appear that the settlers were much harassed by enemies. The king was prayed to send, and to maintain at his own charge for four years, 3,000 men, 100 pieces of ordnance, together with ammunition and a certain number of ships for transport and for the protection of the settlers; the probable expense of this is somewhat oddly estimated 'at £48,000, or £15,000 ready money'; and the inducement held out was that after the four years the colony would probably be able to pay to His Majesty or to his successor a sum of £50,000 per annum for twenty-one years.* No serious attention seems to have been paid to this naive petition, though a warrant exists, also among the State papers, for sending four small pieces of ordnance (drakes) for the use of the company.

The next and only other occasions on which the affairs of the company can be brought prominently into the light is in 1635, when the King was urged to prevent certain Dutch who seemed likely to find their way to Guiana, lest their settlement there should "cause quarrel and bloodshed between the two nations;" † and in 1638, when one GEORGE GRIFFITH, an English merchant of Guiana, presented another petition to the king, who must surely by this time have been weary of the unprofitable business, in which, after expressing mighty fears that the Dutch were likely to take possession of those parts and complaining bitterly of the apathy of the old company, the writer craves that the King will once

* Calendar of State Papers. Col. Series. Vol. i. p. 101.

† Ibid. p. 218.

more interfere.* From that time the company disappears from the story; it may be dismissed with the remark that it never had any real success.

The next attempts at settlement were made on the Surinam and some neighbouring rivers, probably in 1643. A considerable number of English families, under a man named MARSHALL, were sent by the Earl of WARWICK to settle there, to plant tobacco. The headquarters of this undertaking was at the old Indian village of Paramaribo, on the site of the present chief town of Dutch Guiana. The history of this settlement has never been satisfactorily traced, but it seems certain that it was abandoned within a few years after its formation. But on its site rose a few years later the only settlement which the English ever really established in Guiana.

Owing especially to the exertions of FRANCIS, Lord WILLOUGHBY of Parham, who was then stationed in Barbados, Englishmen began to arrive once more in the Surinam in considerable numbers in 1650; and in 1652 Lord WILLOUGHBY went himself to his new colony, to provide for its organization and defence; † and at this time and for long afterward he spent much labour and large sums of money on its development. At the time of this his first visit, according to a contemporary document, there were already in the colony "one hundred and fifty lusty, well-armed men," ‡ besides many others. In recompense for his exertions and expenditure Lord WILLOUGHBY asked for a grant of that part of the country: and his request was, in 1654, favourably recom-

* Calendar of State Papers. Col. Series. Vol. i. p. 270.

† Ibid. Vol. v. p. xli.

‡ Ibid. Vol. i. p. 374.

mended to the notice of the king by the Council of State, the members of which informed His Majesty that his possessions were in all about 350 square leagues in extent, and extended to the Amocco, at the mouth of the Orinoco—thus ignoring entirely the perfect right, both in justice and by possession, of the Dutch to their own settlements. Of this tract, WILLOUGHBY asked for thirty leagues for himself; * and a warrant was actually prepared, being dated on the 9th of July 1660, by which the district asked was granted, the condition being the payment of two white horses by WILLOUGHBY or his heirs when the king or his successors landed in the country. † But this grant was strongly objected to, not only at home by the Committee of Foreign Plantations, the members of which thought the tract far too extensive, but also by some at least of the colonists in Surinam, on the alleged ground of the unhappiness of their position should they and their fields be delivered over absolutely as subjects to one who was himself a subject, of the king. Probably other more private reasons induced some of the colonists to oppose Lord WILLOUGHBY. ‡ It is at least certain that there was some very bitter feeling. Either at this time or perhaps a few years later, this ill will took a form very serious to Lord WILLOUGHBY. A certain landed proprietor named ALLEN, who had been charged with blasphemy but had cleared himself of the charge, and who even after this escape ventured to hold ‘strange opinions . . . as that no subject could be . . . Lord Proprietor, because

* Calendar of State Papers. Col. Series. Vol. v. p. xli.

† Ibid, Vol. i. p. 483.

‡ Ibid, Vol. v. p. xli.

it doth clip the wings of Monarchy and infringes the liberty of the subject,' and who also seems to have believed that Lord WILLOUGHBY coveted his estates, attacked his Lordship, cutting off two of his fingers and wounding him in the head, expecting at the same time to have slain him; after which strong measures, ALLEN poisoned himself. Moreover, 'several people this year left Surinam, strange jealousies having possessed them, which broke out into great discontents.'* However in spite of all opposition, CHARLES the Second in 1663 granted to Lord WILLOUGHBY jointly with LAURENCE HYDE, the second son of the Earl of Clarendon, certain crown rights being reserved, all that part of Guiana then called Surinam, but which was thenceforth to be called Willoughby-land, except about 30,000 acres. † The tract granted was defined as 'all that part lying westerly one mile beyond the River Copenaam, and easterly one mile beyond the River Marawyn, containing from east to west forty leagues or thereabouts, and extending from the sea southwards to the heads of those rivers, and thence by direct line to the South Sea'. It is perhaps worth noting that, with a curious abuse of language, the proprietors were especially allowed to fight in case of *invasion* by the *natives*. ‡

There still exists a letter written from Surinam, in the same year in which this grant was made, by RENATUS ENYS to Secretary Sir HENRY BENNET in which particulars are given of the state of the colony. The natives

* SLOANE MS. 'Description of Guiana' (by Major JOHN SCOTT?) in which, however, the date of the ALLEN incident is put as late as 1665.

† Calendar of State Papers. Col. Series. Vol. v. p. xli.

‡ Ibid. Vol. v. p. 131.

were not numerous and were at peace with the English. The colony was in good order, being nobly upheld by the power and prudence of those at the helm, who, though hitherto not commissioned by His Majesty, expected the immediate arrival of Lord WILLOUGHBY and 'those bottomed on royal authority.' There were about 4000 inhabitants. The country began to be populous, there being new arrivals weekly. The chief commodity was sugar—'better can not be made.' Negro slaves were much wanted. And the Barbadians continued, as before, great enemies and runners down of the colony. Very soon after this letter was written those 'bottomed on royal authority' must have arrived among the loyal and the disloyal settlers on the Surinam, bringing with them news of the long expected official recognition of those settlements as a colony. Thus closes the history of English attempts to found colonies in Guiana.

It is convenient to pause again for a moment, to re-call to memory the number and nature of the centres of population then in Guiana. North-westward were the settlements on the twin rivers Pomeroon and Moroooca, which had no definite and distinct government and can not therefore be called colonies. Next, to the eastward, was the colony of Essequibo and, still more to the east, the colony of Berbice. These places had all been founded by Dutchmen and were in the possession of Dutchmen. Again, still more to the east, on the Surinam was the new colony called Willoughby-land, round the central town of which were doubtless a few scattered settlements, unimportant and dependent. Lastly, and still more to the east, there were a few scattered French

settlers on the Cayenne. That exhausts the list of Europeans then in Guiana.

No sooner had the English thus obtained standing ground than they seem to have turned their attention to harrassing the people of the neighbouring colonies. The war which at that time raged between the English, French and Dutch nations in the outer world affected these same nations in Guiana. In 1664 Lord WILLOUGHBY wrote home regarding the Dutch seizure of several places in Guiana,—as though these so-called seizures had not been made before, and with more justification than, that which the English had made—and advised that they should be attacked before they grew too strong; * and in the following year Sir THOMAS MODDYFORD submitted his proposition for rooting the Dutch out of Guiana and out of the West Indies generally. † Accordingly, in this latter year, Lord WILLOUGHBY set out himself to attack the Dutch in various places, and sent ‡ Major JOHN SCOTT with a small fleet and a regiment of foot “against the Dutch on Tobago, and at New Zealand, Desse Cuba (Essequibo) and Timberan (?) on the main of Guiana.” § SCOTT in 1666 “by the assistance of the Caribbee nation . . . burnt and destroyed the enemy’s towns, forts and goods, and settlements to the value of £160,000 and disbursed for His Majesty’s service 73,788 lbs of muscovado sugar.” From a certain state-paper it appears that the settlements taken by SCOTT were those on the Pomeroun and

* Calendar of State Papers. Col. Series. Vol. v. p. 246.

† Ibid. Vol. v. p. 281.

‡ Ibid. Vol. v. p. 355.

§ Ibid. Vol. v. p. 481.

Essequibo.* SCOTT left some of his men in possession of these captured places.†

A few other, unimportant settlements, Dutch and French, having also been taken in 1665 by the English, Major SCOTT, or whoever was the writer of the "Description of Guiana" from which I have so often quoted, could write at the end of that year—"This year the English could boast of the possession of all that part of Guiana, abutting on the Atlantic Ocean, from Cayan on the south-east to Oronoque on the north-west, (except a small colony on the river Berbishees,) which is not less than six hundred English miles." And the said colony of Berbice was even then being attacked; and it surrendered in the beginning of 1666.

As he has figured so largely in the story, it may not be out of place to state here, by way of parenthesis, that Lord WILLOUGHBY died about this time; but that his policy was continued by his successors.

Very soon indeed the Dutch reprisals began. In February 1667 a Dutch fleet with 1000 men, under Admiral CRYNSENS, appeared before the fort of Surinam. The Governor, Lieutenant-General WILLIAM BYAM, at first refused to surrender, but, after a few hours' fighting,

* SLOANE M.S. Description of Guiana, and State Papers, Col. Series, vol. v. p. 448.

† Calendar of State Papers. Col. Series. Vol. v. p. 355. The names there given are 'Boromeo and Issikebb'. Of course the Editor of that volume of papers is right in identifying the latter place as Essequibo; but I think he is mistaken in supposing that Boromeo means Paramaribo. The name which is now written Pomeroon appears in papers of that date in very various forms, among which perhaps the commonest is Bouroume; and I cannot but suppose that Boromeo is merely another variation on this.

being left with but fifty pounds of powder, he was obliged. Very favourable terms were granted. The place was to be given over to the Dutch; but all Englishmen actually in the colony were to retain their property and enjoy equal rights with the Dutch. Only the property of absentees was confiscated.* In the terms of capitulation mention was made of the men whom Major SCOTT had left to guard the settlements which he had captured on the Pomeroon and Essequibo. These had been attacked, had suffered great misery, and had been much reduced in number. Of them, a certain Lieutenant EVERARD was in command in Essequibo with twelve men under him 'who were all that were left of our men at Bowrooma and Dissekebe, all the rest perishing for want of supplies'.† They were soon forced to surrender to the Dutch, who then possessed exactly that same Guiana of the possession of which the English had been able to boast but a few months earlier.

But the tide turned once more. In the August following the February in which the Dutch had captured Surinam, the English, under Sir JOHN HARMAN and Lieutenant General HENRY WILLOUGHBY, appeared before the French settlement at Cayenne, which, though it was very gallantly defended, was soon taken and sacked. "The forts and strong buildings were demolished, the stock of Cayenne fully destroyed, . . . and more plunder, consisting of negroes, sugar, coppers, stills, mills, cattle and horses, carried away than will ever be known." ‡ Some of the people were carried away pri-

* Calendar of State Papers. Col. Series. Vol. v. p. 448.

† Ibid. Vol. v. p. 449.

‡ Ibid. Vol. v. p. 487.

soners, the rest were left, " seized of the island, but with little to defend themselves with against the natives, as the French have complained since."

An incident in the behaviour of the English in Cayenne on this occasion throws light both upon the absence of friendly feeling between the Indians and the French of that district and upon the high value of those much desired commodities, negro slaves, in the West Indies in those days. An Indian chief came to HENRY WILLOUGHBY and offered his assistance and that of his tribe, in re-capturing and delivering to the English such negroes as had managed to escape in the confusion into the surrounding forest, an offer which, because of the value of the prize, was eagerly accepted.*

Having disposed of their booty, the English sailed in October from Cayenne and appeared before Surinam, which was at the time almost undefended, the fleet by which it had been captured in the beginning of the year being at the time engaged in an expedition against Tobago. The place was soon compelled to surrender once more to the English commanders, who leaving a sufficient guard in it, then sailed to Barbados.

HENRY WILLOUGHBY, who had been in joint command of the fleet which thus re-took Surinam and who seems to have acted as agent for WILLIAM, heir of FRANCIS, Lord WILLOUGHBY, and to that place, returned there with the intention, which he partly carried out of removing the slaves, and the movable and valuable part of the colony generally, to Antigua. Apparently the owner had by this time found that his possession of Surinam was so insecure that he must abandon all hope of any

* SLOANE M. S. Description of Guiana.

profit from it. Nor were his fears without foundation; for in that same year, by the Treaty of Breda, Surinam was awarded to the Dutch.

Then came to pass that evil which had been foreseen by those who objected to the absolute grant of Surinam to a subject. For now, His Majesty at home might make what treaties he pleased, WILLIAM, Lord WILLOUGHBY, was not going to give up his South American possessions without a struggle. He resisted and retarded the delivery of the colony to the Dutch by every means in his power: among others by commissioning a certain Major NEEDHAM to attack the 'Arwacas' Indians (i.e. the Arawaks) who were the great allies of the Dutch, as the Caribs were of the English. The Dutch authorities in Europe laid bitter complaint against WILLOUGHBY before the English King. At last CHARLES the Second wrote to his refractory subject expressing his surprise and anger at his conduct and ordering the immediate delivery of Surinam in accordance with the articles of the Treaty of Breda. Lord WILLOUGHBY and his defenders answered with many excuses; and especially, as regards NEEDHAM'S attacks on the Arawaks, they asserted that "this nation is one of the most powerful on the Coast of Guiana, mortal enemies to the Caribs, who were and still are our firm friends, and that during the war they committed horrid cruelties against the English." * However at last WILLOUGHBY yielded; and the English remarked enviously that 'the Dutch now seem to lay claim to the whole main, having gotten a part from the English'.† In truth, they had a right to do so.

* Calendar of State Papers. Col. Series. Vol. v. p. 487.

† Ibid. Vol. v. p. 598.

After the peace of Breda had thus been carried into effect, the Dutch, being long left to themselves in Guiana, busied themselves in developing the colonies which already existed there. Only one new one was founded; but that one has since proved itself the first of them all. The history of its formation is briefly this. It has been said that the River Demerara lay unused, and almost unknown, between the Essequibo and Berbice long after these two rivers had been settled and had given their names to colonies. Things remained somewhat in this condition till about 1739, by which time cultivation, spreading from Berbice on the one side and Essequibo on the other, had gradually approached the Demerara. By that time there was a settlement, an offset from Berbice, on the Mahaicony to the east of the Demerara; and there were some few plantations, offsets from Essequibo, on what is now called the west coast of Demerara. In 1745 an elaborate plan was drawn up and accepted for the cultivation of the intermediate lands, at the mouth of the Demerara. From the plan it is evident that it was Essequibo, and not Berbice, which eventually gave birth to Demerara. It was stipulated that the people of the mother colony should be allowed for ten years to remove to the Demerara; but those who availed themselves of this permission were strictly enjoined to obey the authority of Essequibo. It was not till 1765 that Demerary obtained a separate Governor. This may, therefore, be considered the date of the separate existence of Demerara. There were at the time about 130 estates, chiefly planted with coffee, and sugar, in cultivation. The government was at first carried on from Borselen, an

island some twenty miles up the river ; but it was removed in 1775 to the newly-built town of Stabroek, at the mouth of the river, the same which is now known as Georgetown.

Thus the history of the foundation of each of the colonies of Guiana which are now, or ever were, in the hand of the English has been told.

(To be continued.)



The Lime Industry in Dominica.

By H. A. Alford Nicholls, M.D., Corresponding Member of the New York Academy of Sciences, and of the Chamber of Agriculture of Basseterre, Guadeloupe.



THE lime-tree belongs to the natural order *Aurantiaceæ* and to the genus *Citrus*, and it is now known to botanists by the name of *Citrus limetta* given to it by RISSO in his celebrated monograph on the orange family. Like many other plants, it has been described under various names, the principal of which are *Citrus acida*, *Citrus medica acida*, and *Citrus silvestris*.

The question as to the right of the orange, lemon, lime, citron, shaddock, and forbidden fruit to be considered specific types of the genus *Citrus*, is one that has given rise to some controversy amongst botanists. Some consider that the lime, the lemon, and the bergamot orange are merely varieties of the citron (*Citrus medica*), whilst others, amongst whom are the leading Indian botanists, believe the lime to be a distinct species; and Dr. ROXBURGH, in the *Hortus Bengalensis*, describes it as such, under the name of *Citrus acida*.

The orange, the lime, the citron, and their various varieties were cultivated from the earliest times; and although it is difficult to determine the parts of the world from whence they first came, it is now generally believed by botanists that they are all of Asiatic origin; indeed, at the present time, they are found wild in the valleys of Nepaul. From India they were carried eastward to

China, and westward to Arabia and Media, whence they were introduced into Italy and the north of Africa soon after the Christian era. The citron and the lime were known to the Romans, and are well described by PLINY in chapter III. of his 13th Book. As an interesting fact, it may here be mentioned that the orange was not carried into Italy until a thousand years afterwards. The lime was introduced into England in 1648; but it was established in the West Indies before that date, having probably been brought over by the Spaniards in some of their earlier voyages. It at once took to soil and climate, and grew more luxuriantly than in its own habitat; and now, running far ahead of its allied types, it has escaped from cultivation and become wild in Central America, Jamaica, and other American countries.

The date of the introduction of the lime into Dominica is unrecorded; but it was most probably brought hither by the early French settlers from Martinique who established themselves in the south part of the island about 1691, notwithstanding the fact that the English and French had engaged by treaty to leave the land to the undisturbed possession of the native Caribs. The tree must have spread rapidly however; for exactly a century afterwards—namely in 1791—ATWOOD, the historian of Dominica writes as follows:—"The lemon and the lime trees bear also very aromatic scented blossoms; and the fruit of both is in great abundance, large, and of excellent quality. Of these, the latter especially, great quantities are often sent in barrels to England and America; the neighbouring English islands are likewise often supplied with them from this country, especially those of Antigua and Barbados". This statement is most inter-

esting; for it is the earliest record of an export fruit trade in the West Indies, and it shows that the exportation of limes from Montserrat and Jamaica is not a new, but merely the revival of an old Dominica, industry.

Notwithstanding the luxuriance of growth and easy propagation of the lime-tree, it was cultivated to a slight extent only, for the sake of its fruit, which possesses antiscorbutic properties; and, until the late Dr. IMRAY demonstrated the fact by successful experiment, no one would have imagined that the lime-tree was destined to help to restore the prosperity of a "decaying sugar island", by furnishing to commerce the raw material from which to manufacture citric acid, a chemical substance extensively used in the arts and manufactures. To Dr. IMRAY belongs the honour of the origination of this new cultivation; but I must mention that soon after this public benefactor had established the lime groves on the *Batalie* estate in Dominica, the Messrs. STURGE—quite independently and without any knowledge of Dr. IMRAY'S experiments—set to work to establish similar cultivation in Montserrat.

The lime-tree is so well known to the readers of *Timehri* that any minute description of its characteristics is unnecessary in this article. I may mention, however, as bearing on its cultivation, that its mode of growth and appearance is rather that of a large shrub than a tree. It has many diffused branches, set with sharp and stout spines at the bases of the leafstalks; and the main limbs start from, or near the ground. In Dominica it commonly attains a height of 25 feet or even more; and such a tree may cover a space equal to about 400 square feet. The tree blossoms all the year

round, except in very dry weather, and every heavy shower of rain is invariably followed by the putting forth of new flower buds. The fruit, when ripe, is of a brilliant yellow colour, and it is borne in great profusion on the new wood of the younger branches, either singly, or in bunches of from three to eight or even more; indeed, I have often counted as many as fourteen large fruits on a single bunch on some of my trees at *St. Aroment*. The slender branches are sometimes so heavily laden that the weight of the fruit bears them down to the ground; and, in the height of the crop season, men have to be sent round the fields to prop the branches with poles and forked sticks; for unless this be done, these being unable to sustain their burden of fruit, may be torn off from the main stems.

The principal flowering commences in March or April, and the full crop begins in June and continues to December. I have made some calculations from my last two years crop on the *St. Aroment* estate, for the figures so obtained will give a better idea of the return in the various months than any general statements. If the crop of an estate be taken at a thousand barrels of limes in the year, the yield, according to my calculations, would be as follows for the various months.—

	Barrels.		Barrels.
January ...	16	July ...	227
February ...	5	August ...	221
March ...	<i>nil</i>	September ...	165
April ...	2	October ...	145
May ...	3	November ...	111
June ...	30	December ...	75

It is thus seen that the crop commences in June, reaches its maximum in July, and gradually ceases in

January, although a few barrels may be gathered afterwards.

Like all plants of the orange family, limes delight in a rich soil, and in Dominica they grow best and fastest in the valleys near the sea coast, where there is a deep black soil, composed partly of alluvial deposits and partly of decomposed volcanic rocks. In these situations the lime-trees are very large and plentiful, and the juice is of greater density, and it contains a larger proportion of citric acid. The plant thrives well, however, in other localities; for some of the principal lime-estates are established on the hills, at elevations ranging from 300 to 800 feet above the sea. In these places the soil varies, being clayey in some and rocky in others; indeed, I have seen fine trees laden with fruit growing on land which consists of a substratum of rocks covered with a layer of earth no more than two feet in thickness. The rocky and apparently barren land on some parts of the leeward coasts of Dominica is well adapted for lime cultivation; for such is the hardy nature of the tree that it will thrive in situations where no other cultivation can be attempted. But it must be said that on such lands there is difficulty in establishing the trees, and they take much longer to come into bearing.

In making a lime plantation, the first consideration is to prepare nurseries for seedling plants; and for this purpose narrow beds may be laid out in a situation sheltered from the afternoon sun. The seeds should be planted fresh from the fruit; and, if the land be dry, frequent watering will be found necessary, for unless this be done many of the infant plants will be lost.

The system of planting about a dozen seeds out in the

fields in each of the places when the plants are to remain is frequently adopted, and sometimes with great success; but the seedlings require considerable care, as they are liable to be choked by fast-growing weeds. When they become about ten inches high, all but the strongest plant must be removed; and some of those taken up will be useful for supplying the vacant holes. Whether the seeds be sown in nurseries or in the fields, precautions must be taken to preserve them from rats; for these animals—the natural enemies of the West Indian planter—appear to consider germinating lime seeds as a delicacy that rewards the labour of digging to procure. Quite recently I planted a large lime nursery, and in a few days the rats had devoured the greater portion of the seeds.

The lime-tree is a fast grower and, as the seeds readily germinate, the young plants need not to be kept in the beds longer than a year. No hardening off is necessary; the seedlings may be taken out of the nurseries and planted in the places prepared for them, with but little danger of failure, if the weather be wet and ordinary care be observed in the removal. If the roots are broken it is wise to trim these off with a sharp pruning knife; and, in order to restore the balance between those parts of the plant above and below the ground, it is well to cut back the stem or to remove the greater number of the leaves.

The usual distances at which lime-trees are planted in Dominica varies from 10 to 18 feet, and this gives an average distance of 14 feet between each plant and between the rows; but it is a most unsafe proceeding to adopt the same distances of planting for all lands. On steep hill-sides 10 feet will not be too close, whilst on

rich "bottom lands" 18 feet, if anything, will be too near. In the latter situations the best plan is to plant the limes 20 feet apart, and to allow the same distance between the rows; and in ten or twelve years the ground will be entirely covered.

After the young lime-trees are planted out they must be kept clear of weeds, but care should be observed that the weeders do not injure the superficial roots. If low pasture grass can be established on the plantation so much the better; for it will prevent the parching of the soil in dry weather and the washing of it in heavy rains; besides which, the pasture will prove useful in raising cattle, as was done by the late Dr. IMRAY at Batalie, the pioneer lime-estate in the West Indies. No goats or sheep should be allowed on the plantation, as they frequently destroy the lime-trees by stripping off the young bark, of which they appear to be extremely fond. If it be impracticable to establish a carpet of low grass on the land, the young-plants to their advantage may be mulched with cane-trash or with dead weeds during the dry season.

The trees once established will be found to grow rapidly, and a small crop may be looked for in three years after the seedling plants are put out; and in five years the plantation will be in full bearing.

Beyond removing the dead branches and those that lie too close to the ground, no pruning is necessary; indeed, the cultivation of the lime-tree is simplicity itself, for the more the tree is left to its natural growth the better will be the results.

The gathering in of the crops is done in Dominica by women and children, who are paid according to the num-

ber of barrels of fruit they bring to the works, an ordinary flour barrel being the measure usually employed. The prices vary, according to the scarcity of the fruit and the distance of carriage, from three-pence to six-pence a barrel. The limes are not picked from the trees, but allowed to fall to the ground; for the riper the fruit the greater will be the return of juice. Care is usually taken to prevent the lime gatherers from shaking and beating the trees—as they are disposed to do when the limes on the ground are not over plentiful; for the crop would then be lessened, by many flowers and much young fruit being thrown down. The lime gatherers are provided with roughly made wooden rakes wherewith they jerk the limes from under the trees, as, on account of the prickles, it is dangerous work to grope in amongst the branches.

The fruit having been brought to the works and measured in the presence of the overseer, the next thing is to obtain the juice by the simple process of crushing the limes between the rollers of a mill. On some estates the old cane-mills have been utilized; and by nice adjustment these mills can be arranged so as to extract all the juice. I have seen lime-skins thrown from one of these mills so dry, that they left no moisture on a board after having been pressed down upon it firmly with the foot. A small space is usually left between the first and second rollers in order that the lime may be burst and a portion of the juice allowed to pass off with the seeds; the second and third rollers are then approximated so closely that the burst lime is deprived of all its juice and most of its oil. The next operation is to strain the juice; which is done by pressing it through

copper sieves with the mesh sufficiently large to allow the juice and pulp to pass and to retain the seeds. Iron or brass sieves will not do, for the citric acid in the juice soon destroys them. The chemical affinity between the iron and citric acid is evidenced by the rapid way in which the iron rollers of the mills are "eaten away"—or converted into citrate of iron, to write more correctly. To obviate the loss caused by this decomposition of the citric acid, many lime-planters have mills with wooden rollers covered with sheets of perforated copper.

On the principal lime-estates the mills are run by water power, on others with cattle gear, and on some the limes are "ground" through mills with wooden copper-covered rollers, worked by hand power. At St. Aroment I have such a mill as that last mentioned. It is furnished with two very heavy fly-wheels, and it is turned by four men. With this mill it is possible to "grind" a barrel of limes in a minute and a half, and it is quite capable of taking off a crop of 5000 barrels in a year.

With many of the power mills, and with all the hand ones, a certain proportion of juice is left in the skins. This waste varies from 5 to 20 *per cent.* on the amount of juice capable of being extracted, which is about eight imperial gallons for each barrel of fruit. To prevent this loss I have the skins passed through a small cider press, and by this means all waste is obviated.

Although eight gallons of juice is obtainable from a barrel of limes, an average of seven gallons is the amount usually extracted on the Dominica estates, the loss of $12\frac{1}{2}$ *per cent.* being due to defective machinery. At present the planters appear to be well satisfied with

this return, but when the price of concentrated lime juice falls, as it most likely will, endeavours will be made to prevent so large a loss.

The lime juice may be shipped either raw or concentrated; but most of that exported from Dominica is concentrated, and used in England and America for the sole purpose of making citric acid. Raw lime juice to be of value must be carefully strained, and put in packages when quite fresh; for otherwise it will deteriorate greatly. If these precautions be adopted, the juice will remain in excellent condition for a considerable time; but should it be necessary to keep it for long periods all fermentation may be prevented by adding half an ounce of salicylic acid to every 50 gallons of the raw juice.

In Dominica the lime juice is concentrated in shallow copper or enamelled iron pans, of capacities varying from 40 to 120 gallons. These pans are "hung" in the same way as the iron taches used in the manufacture of muscovado sugar; and on most of the estates the old sugar works have been pressed into the service.

The degree of concentration usually followed is 12 to 1, six puncheons of raw juice being boiled down until they are reduced to 54 gallons of concentrated, or to about enough to fill a beer hogshead, which is the package mostly used for shipping the juice. This concentration I believe to be too high; for, as the bulk becomes reduced, the thick juice adheres to the sides of the boilers, and becomes charred (or carbonised) by the heat of the fires. Such high concentration, however, has several advantages, amongst which may be mentioned smaller bulk, greater portability, and therefore, decreased ex-

pense of packages and freight; but, on the other hand, in addition to the destruction of some of the acid there are the extra outlays on fuel, on labour in boiling, &c., and in the wear and tear of the boiler and works.

High concentration is liked in the American markets, but not cared for in the English; in fact the slight difference in London in the value of concentrated Sicilian lemon juice and concentrated Dominica lime juice—to the detriment of the latter—is, I am informed, entirely due to the high concentration of the latter. On my own estate I have adopted two forms of concentration, namely 8 to 1 and 6 to 1, with the following results:—My American agents inform me that 8 to 1 is too low, and my London agents say that 6 to 1 is rather too high a degree. The Sicilian lemon juice rules the price of the London market; and this is concentrated to such a degree as to give about 64 ounces of citric acid to the gallon of juice. My London correspondents, therefore, advise me to obtain a similar standard with the lime juice. From experiments conducted at St. Aroment, and from London analyses, I have been able to elicit the following facts:—When 6 gallons of raw lime juice are boiled to one gallon the resulting juice, at 60° F., will register 60° by the citrometer, and will contain 75 ounces of citric acid. But when similar juice is concentrated 8 to 1 the citrometer, at the same temperature, will register 71°, and there will be only 90 ounces of citric acid to every gallon. These figures indicate that 10 *per cent.* of the acid is lost by the higher concentration.

As a rule, better returns are realised for Dominica concentrated juice in America than in England, although the ruling prices are about the same in both markets.

This discrepancy, however, is due chiefly to the number of expenses usually charged in London. I cannot say that I have found much difference in the returns, for the analysis of my juice in England invariably shows more favourable results than in America; and, in this way, the extra expenses incurred by shipping "home" are neutralised.

In boiling down the lime juice considerable expense is occasioned by cutting and carrying the wood, and, where this is unobtainable, by the purchase of "patent fuel." I find that it takes two cords of wood to reduce 500 gallons of raw juice to 50 gallons of concentrated. The consumption of fuel of course depends greatly upon the construction of the furnaces &c.; but it may be said roundly that two cords of wood are required for every hogshead of concentrated juice; and to procure this wood is often a serious matter.

Anyone commencing to establish a lime plantation should give serious thought as to where the fuel for boiling down the juice is to come from; and I fear that this important matter has not been sufficiently considered by our planters. It seems to have been forgotten that the wood should be cropped in the same way as the limes; and that if woodlands are absolutely cleared, no fuel can be expected for several years afterwards, and then only in small quantities. The trees should not be cut down, with an almost certainty of losing them altogether; a portion of the branches should be removed every year, and then a never failing supply of wood will be kept up; and, in a series of years, it will be found that the wood-land will give an amount of fuel far in excess of what would be obtained by making a clean

sweep of everything, as is usually done in Dominica.

On commencing to establish a lime plantation the question of fuel should be one of the first considerations. If no woods exist on the land, or if they be of insufficient quantity, then indigenous fast growing trees suitable for fuel ought to be planted simultaneously with the limes; and the cultivation of wood for fuel should go hand in hand with the cultivation of the limes. As far as I know, the idea is a novel one, but I am satisfied that it will commend itself to those planters who are accustomed to look a few years ahead. The cost of establishing woods and coppices on odd corners of an estate will be comparatively trifling, and it will be returned over and over again in the saving effected in the purchase of fuel; besides which, on dry, cleared estates, to which these remarks are intended to apply, the planting of trees will act beneficially, by retaining moisture in the soil and thus rendering the air more humid.

A good system, where practicable, would be to separate the lime fields by wide belts of various kinds of trees; for a large unbroken stretch of one kind of cultivation is, I believe, a mistake. Where blights, terrible in their ravages, and in their results to agricultural interests, have appeared, it has been where man setting aside the lesson taught by nature, of a diversity of vegetable forms growing on the same land, has covered the face of a country with one kind of plant life. In such cases history shows that the blight, be it vegetable or animal, comes, and finding everything peculiarly suited to its well-being, it propagates itself with astonishing rapidity, and then disastrous results follow. Fortunately no serious blight has attacked our lime groves; but, judging by analogy, a

blight must come sooner or later, and now-a-days when science and scientific thought are brought to bear on all cultivation every precaution must be taken against possible difficulties.

Besides the lime juice a second product, essential oil, is obtainable from the limes. This oil is made in Montserrat and on several of the Dominica lime estates. There are two kinds of essential oil of limes, namely, the hand-made and the distilled. The hand-made oil is, of course, the most valuable, as its perfume is unaffected by the heat necessary in distillation. It is manufactured in several ways, the principal one being by the *écuelle*, which is a round copper shallow pan having a receptacle for the oil at its lowest part, and studded on its concavity by strong blunt spikes. The women, who generally make this oil, take the finest fruit and roll it gently but quickly around the inside of the *écuelle*; the spikes prick the *vittæ* or oil-sacs, whereupon the oil, running down the spikes and the concavity of the pan, collects in the reservoir at the lowest part. Sometimes the selected limes are put into buckets of water and taken thence by the women; for the water assists in carrying off the oil which easily separates afterwards. The oil is filtered through specially prepared blotting paper, then poured into clean clear glass bottles, in which the impurities are allowed to settle. The strong, clear and fragrant oil is then separated from the water and impurities, by means of a glass funnel with a stop-cock; and it is as pure as any essential oil can be.

Most of the oil exported from Dominica is manufactured by simple distillation from the lime juice which leaves the mill. It is of an inferior quality, and was

formerly used solely for adulterating the essential oil of lemons; but, lately, it has been employed for scenting soaps and in the manufacture of the common essences and perfumes, and, consequently, its price has risen considerably.

A fine and valuable product might be obtained by grating off the outer rind of the lime, and mixing the yellow substance thus obtained with water, and then extracting the oil by steam distillation. Unquestionably such an oil would command a high price in the markets; but the expense of a steam still is sufficient to deter all but our leading planters from giving serious consideration to the matter.

A good oil may also be obtained by expression of the substances rasped off the rind. This yellow pulp must be put into hard bags, and the oil forced out by high pressure exerted by a powerful press. A small "Boomer press", which exerts, I believe, a pressure of about three tons, would be admirably suited to such work. The expressed oil is inferior to that made by "riming", as the hand process is called, but it is far superior to that distilled from the juice.

Having described briefly the cultivation of the lime, and the preparation of the concentrated juice and essential oil, I must now say a few words on the yield from a plantation, and the annual profits likely to be realised.

A barrel of fruit may safely be reckoned upon as the average yield from each tree on a plantation, and if 200 trees be taken as the number to the acre, and seven gallons of juice be obtained from each barrel, the total of 1,400 gallons of raw juice per acre

per annum is arrived at. This I think is a safe estimate, although it must be mentioned that a larger yield may often be reckoned upon. If the raw juice be concentrated 12 to 1, about 116 gallons, or a little more than two hogsheads, will result; and these should bring in the English or American markets, at the present prices, about £20 each. It will thus be seen that about £45 per acre for the juice may be calculated on as the minimum return, when the lime trees are in full bearing; and, if essential oil be distilled from the juice, another £5 may be added, which brings the gross return per acre to £50 a year.

The expense of the estates including cultivation, manufacture, and all other items, is found to be in Dominica, about £10 per acre; and this, deducted from the gross return, leaves £30 a year clear profit for each acre under fully grown limes. Larger sums are made on well-managed estates, and the cultivation of limes in Dominica is found to be very profitable; indeed, it may be said with justice, that it has done much to bring back prosperity to an island which, when dependent on its sugar cultivation, was fast decaying in wealth and importance.

Having drawn so bright a picture of this new West Indian industry, some of my readers may be inclined to embark in its prosecution; but to such I would sound a note of warning. It can scarcely be expected that the present price of lime juice will be kept up, for the demand is limited and the cultivation is increasing. It may be predicted, therefore, that the price of concentrated lime juice will gradually fall, unless new uses be found for citric acid. The enlightened lime planters in Dominica foresee this fall, and are preparing for it

by raising plantations of cacao by the side of their lime groves, and by directing attention to the cultivation of Liberian coffee, oranges, spices, ceñra rubber, &c. The rich and well-watered soil of Dominica is capable of producing so many varieties of tropical produce, that, in a few years, no fears need be entertained of the island's future, even if the lime cultivation become unremunerative; but, that such may never be the case will I think be the wish of those who know anything of this neglected "land of the mountain and the flood", which is now slowly, but surely, becoming prosperous by the industry and intelligence of its few inhabitants.



Model Settlers,—A lesson in the ‘ Small Industries.’

By G. S. Fenman, F.L.S., Government Botanist of British Guiana.

O judge from the indefinite and fruitless discussion which occasionally takes place on the subject, there appears to be no local question so difficult of satisfactory solution as that the subject of which is known here under the name of the “small industries.” How are these to be established; and how are men with moderate means, or perhaps men of no means, immigrants and others, possessing only a spirit of industry, to take a place in the community as contributors to the wealth of the land by the surplus products of their labour? This colony, taking the van of the West Indies, has attained its present position, of late years, by a single great industry—an industry, as here conducted, requiring large capital for its successful working; and the problem confronts men who take a broad view of what is best for the permanent welfare of the country, how lesser industries may be established, so that, in their pursuit, a kind of yeomanry class be formed, such as exists, and is the strength, of almost every well-founded state. As a rule, at present such a class of agricultural population may be said hardly to exist, so few are the representatives of it. From the more prosperous Portuguese, Chinese and other provision cultivators, coffee and cocoa growers, graziers and woodcutters, such a class may, however, in the future grow up. But my object is not to discuss the question in its broad as-

pect, but, only, to point to an instance of successful colonization worth imitating, which contains a valuable lesson for the general working community that deserves to be widely known. The native peasantry, it is acknowledged, have withdrawn very largely from the sugar industry, and have taken to nothing else instead. Indeed, the village communities have become a bye-word in the country, and the despair of every one, as to their improvement. This is apparent; but a remedy for it is not so generally obvious. Light may be thrown on the issue by the condition of the Chinese settlers on the Cammooni Creek, whom I recently visited.

The existence of a thriving community of Chinese near the mouth of Cammooni Creek on the Demerara river is well known; very few are however acquainted with what they are doing. Their occupation is divided between agriculture, burning charcoal, cutting wallaba posts, staves and shingles, and raising cattle, pigs, poultry and garden produce. The settlement straggles along the creek for several miles. At intervals on the banks the dwellings and store houses occur; and a road for foot traffic, well kept up, extends along the front, affording communication from dwelling to dwelling. This is intersected at short intervals by the draining trenches from the cultivation, which lies aback; and the trenches are bridged by logs, which are usually squared or sawn into thick planks, to afford good footing—not a characteristic feature of such bridges in this colony. To give an idea of their size, I may mention that at the time of our visit, one of the draining trenches was in course of being dug. It was twenty-four feet wide at the top, narrowing gradually to the base by

a series of shelf-like parapets. The depth appeared to be about fourteen feet. Most of the trenches near this were nearly as large. On the banks of the trenches are good foot walks, clean and well formed, leading to the cultivation. The latter is of the most diversified character as regards subjects; but for system and completeness, admitting its limited character, is second only to the cane cultivation of the colony. Cassava, sweet potatoes, tannias, plantains, bananas and rice are the principal subjects, and are all largely grown. The ground is laid out in large plots, and thrown up into narrow beds or ridges. To get the surface sufficiently high and dry, the intervening drains are made nearly as wide as the beds. In their native country, these drains would be turned to account and put under rice, but here they leave them open. Being subsoil, it is probably sour, and, with so much land at command, not worth cultivating. The system and neatness and general absence of weeds, reminded us at first sight of a London market-garden. Rice is grown on the ground when first cleared of forest, before it is drained for other crops. That which we saw, which a number of clean, tidy, bright-faced maidens were gathering with great dexterity, which, however, did not prevent their indulging in a continuance of cheery, girlish fun and banter, appeared to be an excellent crop, though the proprietor said the rice generally, even on this moist new land, would be much better could it be conveniently irrigated. In the store-houses we witnessed the very ingenious contrivances, made by themselves, for husking and cleaning the grain. But the industry and ingenuity of the inhabitants are seen at every turn. If a door-hinge is wanted, a bottle is inverted in the

ground as a pivot or socket for the door to swing on ; and this effective resource is apparent in all they do. Their boats are carefully housed, in docks cut out of the solid bank, over which strong sheds are built. If the path is steep from the waterside, steps are neatly cut in it. If the water is too shallow for landing, a simple quay is made of posts driven into the ground close together, and the enclosure is filled up with soil. Their staves, shingles and posts are the brightest and best looking of any, and their charcoal of the first quality. The kilns in which the latter is burned are made with that elaborate finish and attention to detail which ages of sharp competition have so markedly induced in the race. Their hogs are the fattest, and are the only ones I have seen in the West Indies grown on the principle of high feeding. The poultry are allowed to eat all the rice they can. One man told us his crop of rice would be from sixty to seventy bags, which would realise in Georgetown three dollars per bag. Seeing that such fine crops of rice could be grown on unirrigated land, a stranger might be surprised that it should be necessary, with so much unemployed labour as is seen about, to import any. Unfortunately, for the progress of the country, the unemployed labour is not due to want of openings for its employment. Whether their much-loved opium is habitually or ever used by these people we had no opportunity to discover, but in doors or out we met no idle person, and a spirit of diligence and industry, such as we have never elsewhere witnessed in the West Indies, pervaded the whole settlement. I do not say that all we saw was perfect according to our ideas—they might, for instance, enlarge the scope of their cultivation and improve some of their methods ;

but the greater part of what we saw left nothing to be desired; and to account for it all, there was evident a spirit of untiring industry, perseverance and unity of action—qualities which these colonists show will as unquestionably command success here as in any part of the world,—a fact which is not sufficiently recognised in the colony. It is unnecessary to say anything on the controversial questions as to the maintenance of roads and drainage here, which, it is said, has crushed out settlers and villagers on the coast and river-banks, and, admittedly, in some cases has pressed heavily on men of little means. Living so far up the river, in an isolated state, these people are not yet affected by road ordinances, but I have shown that to the extent, which is not inconsiderable, to which they require roads and trenches, they have amply provided both for themselves. If they are not troubled by the tax-gatherers, they in turn ask for nothing to be done for them. Further, having adopted Christianity, they appear to have spent a considerable sum in erecting one of the most commodious country churches in the colony, and in making a landing jetty with steps and walks to reach it. My companion remarked as we walked through the settlement:—"the Chinese are the ants of the human race; working has become an instinctive passion with them, apparently exercising as strong an influence as the ordinary passions do over other races."



By the Cuyooni to the Orinoco, in 1857.

Extracted from the diary of W. H. Campbell.

[*Editorial Note.* About the year 1857 there was a true gold-fever in British Guiana. Gold had been found in considerable quantity in more than one part of Venezuela close to the frontier of British Guiana, and gold in small quantity had even been found in the latter colony, and a company had there been formed for the purpose of extracting more. This gold-fever was of serious importance to British Guiana in three ways; in the first place it had raised the old, and even now unsettled, question of the boundary between British and Venezuelan Guianas; in the second place it threatened to drain the sugar-estates and the staple industry of the colony of the already too scanty supply of labour; and in the third place, there were ugly rumours that the many, not only from the hand-labouring classes but some even from classes somewhat higher, who had rushed to risk success at the gold-fields, found at those same fields, not gold but a speedy death from disease and starvation. To gather information as to the true state of the case, an expedition was sent, with the sanction of Lieutenant Governor WILLIAM WALKER, to explore the Cuyooni River, which was, it was thought, the chief seat of gold in British Guiana, and to visit the gold-fields which were even then being worked at the head of that river but in Venezuelan territory. The members of that expedition were Dr. BLAIR, then Colonial Surgeon General, Sir WILLIAM HOLMES, then Provost Marshal, and Mr. WILLIAM HUNTER CAMPBELL. These three set out, and being accompanied part of the way by Mr. McCLINTOCK, who was then living on the Pomeroon River as Postholder, reached the goal of their journey safely, and returned in safety as far as the mouth of the Orinoco; at that point, however, they all fell victims, under peculiar and noteworthy conditions, to severe fever. Brought back to Georgetown, Dr. BLAIR died on the next day; Sir WILLIAM HOLMES recovered, but died, partly it is believed owing to the effects of this expedition, within a short time; and only Mr. CAMPBELL, happily, recovered. Owing to the most unfortunate termination of the expedition, no account, save a very brief one in the minutes of the Court of Policy, has ever been published, though each of the three members of the expedition kept a careful diary, two at least of which, those of Dr.

BLAIR and Mr. CAMPBELL, remain. These two diaries have been placed in my hands. At first I intended to combine the two into one narrative; but I found that, in that way, much or all of the freshness of the story as written from day to day was lost. I have, therefore, determined to print Mr. CAMPBELL'S diary, his being the most full, but with the omission of a considerable amount of personal matter, such omission being rendered necessary by the great length of the original diary. As, however, there are in Dr. BLAIR'S journal certain interesting notes, on Indian habits and kindred topics, some of these have been added as footnotes, and others I propose to publish on some future occasion—probably in the “Occasional Notes.”]



OUR party, consisting of Sir WILLIAM HOLMES Dr. BLAIR and myself, left Georgetown in the schooner “Pheasant,” at 3 p.m. on Thursday, the 27th August, 1857, to proceed, by the Waini River, to the ‘gold diggings’ at Tupuquen, on the river Yurawari, in or near the boundary of the Venezuelan province of Upata. We had arranged to meet Mr. MC CLINTOCK, with a party of Indians, at an island in the Waini just below the junction of the Barimanni with that river. At 6 p.m. the next day, we anchored off the mouth of the Waini, but found the stream of that river so strong that, without a breeze it would be difficult to make way against it, even by towing; we therefore started the next day in the batteau to proceed to the Indian settlement of Coomacka,* on the Barima River, to endeavour to procure Indians to assist in towing. The way lay through the Mora channel,† which is on the left bank of

* ‘Coomacka’ means ‘Silk-cotton tree’ (*Eriodendron anfractuosum*). The word ‘Cabacabouri’ has the same meaning in Arawak.—ED.

† This passage is called by the Indians *Morawhanna*; Mora means the æta-palm (*Mauritia flexuosa*), whanna in Warrau mean ‘passage’ or ‘creek.’—ED.

the Waini, about 3 miles from its mouth. At the junction this channel appears to run parallel with the Waini, though it afterwards turns toward the Barima, and connects the two rivers by a tolerably wide and deep channel, about 6 to 8 miles long, through which a schooner might be towed. In an hour and a half the Barima was reached, at a point where, though said to be 40 miles from the mouth, it is a fine, broad and deep stream, with water perfectly fresh and very good though dark-coloured. Turning up the Barima, the Arooka creek, apparently as large as the Barima itself, was reached; and in less than an hour we came to the small creek, on the right hand going up, which leads to the settlement at Coomacka.* In going up the Arooka, three hills, seen before entering the Waini, are approached; one of these is much larger than the others and is probably from 150 to 200 feet high. We rested for two and a half hours at the Indian settlement, which is near the summit of one of these hills; but we found it impossible to induce any Indians to accompany us, most of them being from home. Returning, we reached the Waini at about 10 p.m., and soon got on board the schooner, which was then lying at a considerable distance above the mouth of the Mora.

August 30th.—We set sail about 11 a.m., and, with light winds, were enabled to tack up about 15 or 20 miles. The river, about 10 miles above the Mora, becomes narrower and deeper. Up to that distance the bank on

* This settlement appears to have been, not the true Coomacka, which is some small distance off, but the Atopani at which the brothers SCHOMBURGK made some considerable stay in 1840 (See Richard Schomburgk's *Reisen in Britisch Guiana*, Vol i. p 146). According to them the hills there are composed of indurated clay, highly ochreous.—ED.

the west side is very abrupt, the water shallowing suddenly from 3 to $2\frac{1}{2}$ fathoms. Above that the bank disappears, and the channel is deep close to the bush on both sides. The bush, from the mouth of the river upwards, varies little in appearance, and consists almost entirely of mangroves (*Rhizophora mangal*), behind which there are lagoons and swamps, where large numbers of wild fowl breed or resort for food. The stillness and monotony of the scene is almost oppressive. Nowhere is the hand of man or his presence to be traced, and the idea presents itself to the mind that here the face of the earth presents the same features as when it came from the hands of the Creator and vast antediluvian reptiles were the only and undisputed occupants of its surface. Some of the bends and reaches were very beautiful, resembling lake and wood-land park, but without a hill or height or distinctive object of any description to give expression or character to any one particular scene; each was so like the other that only the practised eye could detect any land-mark.

August 31st.—There being very little wind, and that usually contrary, we made only 10 or 12 miles during the day. The river still presented the same unvaried features, being dark, dirty and deep, with an offensive odour, arising probably from the nitrogenous elements in the decaying roots of the mangrove trees.

September 1st.—There being still little prospect of rapid advance in the schooner, about 7 a.m. we started in the batteau, with two days provisions, for the island near the mouth of the Barimanni where we were to meet McCLINTOCK. For some distance the river-banks were still mangrove swamps; and we could scarcely find

standing room to kindle a fire for breakfast. But as we approached the Barimanni, the mangroves became less dense and mora-trees were occasionally seen. Reaching our island, we found it to be of granite rock, rounded and water-worn from the summit to the water's edge. We were somewhat disappointed at not finding MCCLINTOCK at the *rendez-vous*, after having exerted ourselves to keep the appointment.

September 2nd.—Making a minute examination of our island, we found it to consist of three rocks of granite,* separated by passages, narrow but wide enough to admit our batteau. The one on which we were encamped was oval and about 40 by 30 feet in diameter, with a rounded and grooved surface sloping regularly and by no means abruptly from the centre to the circumference. † The second rock presents a very different appearance, the sides being almost perpendicular for 4 or 5 feet above the surface of the water; nor has it the same abraded, grooved and water-worn surface. The third rock is smaller and lower, and is so covered with bush that we could not land on it.

Having to wait here for the schooner and for MCCLINTOCK, we went on an excursion up the river; and, having passed the Barimanni, about an hour beyond that, on our right, we came to a large granite rock, sloping toward the river, and grooved. It was about 30 feet high and

* 'The granite here seems the same as that of the hill on which the Penal Settlement is situated', writes Dr. BLAIR.

† 'The grooves on this rock radiate from what seems to be the apex of a cone; they are from four inches deep at the commencement, but widen and deepen towards the water's edge, where they are about eighteen inches deep'.—Dr. BLAIR.

apparently part of a ledge of rock *in situ*, extending in a north-westerly direction. Near by were boulders of the same rock, all grooved in a similar way.

A few minutes later we reached a small creek, called by the Indians Warrapocka, which wound in a remarkable manner to the foot of a hill, on which is a settlement. On landing we found several large boulders of similar granite to that met with in the morning; one of these was marked in a singular manner, with circular indentations, on the upper surface, a foot in diameter and from one to three inches in depth. The settlement was inhabited by some of the Spanish Arawaks who left Venezuela during the war of independence, fearing enforced service in the army. To our surprise we met a Liverpool man named WILLIAM KENDAL, who had been settled here for the last 12 years, and had married the daughter of one of the head-men of the settlement.* He seemed intelligent and well acquainted with Indian habits and customs. He showed us the provision grounds of the settlement, where plantains, bananas of an unusually large kind, Indian corn of the largest kind and some with the seeds variously coloured, yellow, white, blueish, and lilac, with cassava and sugar-cane, all grew luxuriantly. He told us that these grounds were

* 'He was then about 30 years of age, and had for some time been a servant in a livery-stable in Georgetown'—writes Dr. BLAIR; and he afterwards adds of this same man, KENDAL, who accompanied the travellers on their further journey, that he occasionally threw aside his clothes and went as an Indian, without any apparent ill effect on his health.

Having recently made enquiries about this man at the settlement of Warrapocka, I find that he died there more than 20 years ago. His is one of not a few instances in which solitary white men have lived a happy, if not very ambitious, life among the Indians of Guiana.—ED.

cultivated in common and that the produce was used by the different families* at the settlement as they required them. The place, he said, was very healthy; the most common malady was 'buck-sickness', which was readily curable by native remedies. There was plenty of game, so that it was necessary to buy little besides salt and clothes. The houses were good and clean-looking and better furnished than usual. KENDAL had chairs in his, covered with the skins of tiger-cats and deer. We also saw a rude mill, composed of two wooden rollers turned by the hand, for squeezing sugar-cane, the juice of which is converted into sling, to be used either by the makers themselves or to be sold to the Indians of the Morooka. KENDAL informed us that the Upata Mission could be reached, overland, in about 6 days from Kariakoo on the Barama; and, being asked to accompany us to Tupuquen, he promised to give us an answer on the next day. All around this settlement we saw numerous boulders of granite, much grooved and marked, as if subjected to the action of glaciers, and also large portions of similar rocks apparently *in situ*. KENDAL informed us that there were many of these boulders in the neighbourhood of the mass near the mouth of the creek, but that there were none in the immediate neighbourhood of the three island rocks on which was our camp.

September 3rd.—Having returned to our camp last night we found that neither the schooner nor MCCLINTOCK had arrived; but the former came in sight early this morning. Leaving a letter in a bottle for MCCLINTOCK at the islands, we moved our camp to Warrapocka.

* The 'different families' must certainly have been elder, younger, and collateral branches of the same family.—ED.

In so doing, we had not long left the islands when we saw two Indians in a canoe chasing a deer, which had taken to the water; a small dog was following, swimming faster than the deer, but was kicked off whenever he took hold. We joined in the exciting chase,* and I caught the deer by the ear and fore-leg, but could not keep my hold. At last one of the two Indians in the canoe caught it by the hind-leg, and held it under until it was drowned, after which it was dragged into the canoe, the dog following without assistance and never quitting his grip until the deer was dead.

The manatee or sea-cow is occasionally caught in this river, by taking a portion of the flower of the moco-moco (*Caladium arborescens*) and hanging this—taking care not to handle it except through the medium of a leaf—over, and almost touching, the water, near where the manatee is supposed to be; and as the manatee approaches the bait, it is shot with arrows. †

In Warrapocka creek we saw the large Indian bamboo, which has spines on the stem and has the advantage over the bamboo common on the coast of being free from the

* 'Much to the alarm of the Indians, who feared that we should shoot, in which case the deer would sink,' adds Dr. BLAIR.

Indians are most unwilling to shoot an animal in the water, for fear that it will sink; but if they cannot avoid doing so, they wait for a certain time after the animal has sunk, for it to rise to the surface. This time, they say, varies with each different kind of animal; and they can without hesitation tell how long, for instance, a tapir will take to rise (3 hours), how long a deer will take, and so on.—ED.

† At the mouths of the Waini, Barima and Amacooroo, the manatee, which is there very abundant, is caught by means of special and very large harpoons. At the chief settlement at the mouth of the last of the above mentioned three rivers, I was assured that for about half the year manatee meat (which is most excellent food) is never to be had.—ED.

attacks of insects. Split, it makes excellent boards, durable for years. Some of the stems were from 50 to 60 feet high and of great girth.*

September 4th.—Just as we had made arrangements to start without him, a party of eleven Indians arrived with a letter from McCLINTOCK; and he himself joined us at Warrapoeka about 4 p.m., with a party of about 30 Indians. We remained where we were that night, determining to start as early as possible the next morning.

After dinner we were entertained by a dance got up for the occasion, the music being produced with a fiddle, a frying-pan and a shaak-shaak, or gourd in which were

* The prickly bamboo here alluded to is curiously and by no means widely distributed in the colony, and is very inadequately known. Even to the unscientific eye, it is easily distinguishable from the common bamboo of the sugar-estates and the coast, not only by its prickles, but by its habit of growth, rather singly than in clumps. It does, it is true, sometimes grow in clumps, but apparently only where it has been long established, and even then for some distance from the clumps stems growing singly will be found scattered. It does not occur, as far as I know, east of the Waini; but it is fairly common all along that river, from near the mouth upward, and on the Barama and on the Cuyooni, from about the point where the once much-used Indian path from the Barama comes out on that river; it seems to occur commonly also on the Cuyooni above that point; and it certainly occurs, though in a very local way, on the great savannah of the interior. Now there are many indications that, at one time, along this route, by the Waini (or by the parallel river to the west, the Barima), the Barama, and the Cuyooni there was a great migration of Indians on to this great savannah. And, this particular species of bamboo being highly valued by the Indians, who use its wood to make their arrow-points, I am inclined to think that it has been gradually carried and planted along this route by Indians; and that, wherever its native place may be, it is, like the common bamboo of the sugar-estates, probably not indigenous to British Guiana.—ED.

some seeds or pebbles. Dances and music were alike monotonous. The usual form was to advance four steps to the musician, the bare right foot sonorously beating the ground, and then to retire backward to the same time. This was repeated by parties of two or three, with their arms round each others necks, varied by an occasional gyration, first to the right then to the left, till the dancers were tired. This was continued till mid-night, before which we had all retired to our hammocks, to be lulled to sleep by the monotony of the music.

Before going to sleep, Mr. MCCLINTOCK mentioned to me some facts worth noting. He said the æta palm (*Mauritia flexuosa*) abounded in the swamps bordering the Barima and the Waini, and was one of the most useful of the palm tribe. It often saved the Indian from famine; the pith was used as starch or farina; the spire, or young unexpanded leaves at the apex of the plant yielded the fibre of which hammocks were made; the foot-stalks of the leaves were buoyant and strong, and were used as shafts for the spears or harpoons with which fish and game were struck, thus preventing their sinking when dead; the cabbage of the tree was the most delicate vegetable and salad; and the tree when tapped yielded 3 or 4 gallons of juice, from which two or three pounds of sugar could be obtained. He also mentioned that the 'black mora' abounded on the upper Barama, and was much more valuable as timber than the common mora, from which it is distinguishable by the absence of buttresses at the base of the trunk. Being asked by me as to the best arrangement for the safety of the money cannister, he replied 'I show the Indians what it contains and tell them they must take particular care of it.'

This is a fine trait in their character, and no creed or system of ethics could teach them a better morality.

September 5th.—To-day we joined the schooner, which was then at the mouth of the Barama, which river at its mouth is from 80 to 100 yards in width. In the evening we were towed for some distance up the Barama. The current of this river is stronger than that of the Waini, at the junction, and the water is darker; it is said to rise and fall about 20 feet during the rainy season.

September 6th.—This morning we left the schooner, on our upward course. Soon after starting we passed on the right hand the Waiwa Creek,* which seems about half as wide as the Barama. The trees, chiefly mora, on the banks were larger and finer than any we had hitherto seen; and the palms, flowers and climbing plants were beautifully interspersed and grouped, the various colours of the foliage being sometimes excessively beautiful and giving a rich autumnal colouring to the sylvan scene. The colour of the mora leaves was an especially striking and beautiful feature, leading one at first to suppose that the different colours are produced by different trees. On the same tree, however, may be seen young leaves of the most delicately pale green, fawn colour and pale red, gradually passing to the darkest shades of each as the leaves become older. The oldest trees are marked by a comparative paucity of leaves, and these are usually not of so dark a green as

* The Warraus, at any rate, know this large creek as the Hina, and I never found anyone who knew it by the name of Waiwa. As however, the different tribes very often have different names for creeks and places, it is quite possible that Waiwa is a true Indian name.—ED.

those of the younger trees, and by the branches being covered by epiphytes. There was an abundance of a prickly palm here, called 'yaruwa'.*

September 7th.—Nearly opposite where we camped last night was the first ledge of rocks, at the margin of the river; and from this point upward similar rocks, many of them stratified, apparently clayey slate, occurred at frequent intervals. The banks, too, continually increased in height. Occasionally, too, at the points where the river took some of its many abrupt turns, there were banks of muddy sand. Examining some of the slaty rocks, we found them when broken to be white and ferruginous in colour and to resemble lime stone; but when submitted to nitric acid no effervescence took place.

September 8th.—Passing the mouth of the Corie Creek, we were told that at the head of this there is a considerable savannah, by walking across which Kariakoo can be reached in about 6 hours. We occasionally saw trees or shrubs bearing very handsome clusters of rich red, or carmine-coloured, flowers, which I supposed might be *Brownea racemosa*.

September 9th.—About midday we reached the Waanamoo Creek, from a point up which there is said to be a path to the Cuyooni. It was the largest creek we had passed on the Barama. The current was strong; and the creek was so much impeded by fallen

* This prickly palm is a *Bactris* like, but certainly not identical with, a species very abundant in many similar localities throughout the country, specimens of which have been named by Professor TRAIL of Aberdeen *B. leptocarpa* NOV. SP. This Barama form is very abundant on that river and on the Barima, but I have not seen it elsewhere.—ED.

trees as to be impassable. We, therefore, gave up the idea of attempting this route to the Cuyooni, although much the shorter, and proceeded on our way to Kariakoo. Later in the day we saw a cut in the bush, about 12 feet above the present level of the river, through which in the rainy season one can pass by a passage a few yards in length, and thus save a circuit of nearly a mile. That evening we reached Kariakoo.*

September 10th.—This morning a number of Indians from the neighbouring settlements collected at our encampment, with whom we had various dealings for the purchase of cassava-bread, the hire of corials, *et cetera*. Most were Accawois. Their style of ornament was peculiar, some having pieces of reed through, and projecting 6 or 7 inches beyond, their ears, with red tassels in front, and another piece passing through the upper lip. Many of them were very handsome; and one, as he crossed the river standing upright, motionless as a statue, in a woodskin, which he caused to glide along by one graceful touch with his paddle, was a perfect model and study for an artist.

September 11th.—In the stream, on our upward course we saw a large log of red cedar, which had apparently floated down; the portion of its trunk seen was about 80 feet in length, with a girth of 11 feet 4 inches at about 20 feet from the base.

September 12th.—About 3 o'clock this afternoon we reached the fall at Dowocaima, beyond which we could not take our large corial. These so-called falls are a

* At this place Kariakoo, there are now three more or less, civilised settlements, two occupied by Germans, one by a coloured man. Ed.

series of rapids pouring in white and foaming streams through chasms formed by the larger rocks, or small islands, which are densely covered by trees of considerable size, though much smaller than those on the adjoining banks. We proceeded to an encampment at the foot of the rapids, on the right bank going up, being a well-raised sandy island at the mouth of a small creek. That evening we had a long consultation as to our future plans; and it was arranged that we should devote the next day to sorting and packing such articles as we intended to take on with us, leaving a depot of stores here, to await the return of ourselves or crew. After that a day would be required for dragging the three boats which we intended to take on with us, and probably another day for carrying up the luggage. It appeared that it would take us from 20 to 22 days to reach Tupuquen.

It is proper to note that we were all particularly pleased with the quiet methodical way in which Mr. McCLINTOCK conducted all our arrangements with the Indians; and we were satisfied that without his assistance our expedition must almost certainly have failed. It was also most pleasing to see the confidence reposed in him by the Indians, his name being sufficient to secure their services at any moment. Moreover, the good humour and amiable disposition of all our Indians particularly struck us; not a single quarrel, angry word or dissatisfied look has been heard or seen since they joined us.

September 13th.—The Indians were employed during the morning in erecting a hut, thatched with palm-leaves, in which to shelter the surplus stores to be left at this

place; they also made quakes in which to pack what we were to take with us.

September 14th.—By about noon the embarkation of our stores and luggage, the latter now reduced in quantity and packed in quakes for the overland journey to the head of the falls, was completed; and we crossed the river to the point where the path commences, on the left bank going up. While the goods were being carried past the rapids and the boats, which being lightened, were hauled up, without much difficulty, Sir WILLIAM HOLMES and I walked on to the point above the highest fall which had been selected for our camp, and examined the nearly dry course of a small stream, the bed of which was filled with coarse sand, chiefly quartz. It appeared to me that this sand was not the debris or detritus of any rocks in the neighbourhood, but the residuum of the soil through which the streamlet flows, the clay being washed away and the gritty particles left. We also examined each of the falls carefully, and met with several points from what they may be seen to great advantage, chiefly from rocks in the bed of the stream. The surface of these rocks was mostly black or dark brown, exceedingly smooth and shining.* Three of the falls, which may be seen from one point of view, are of considerable height, one being about 20 feet perpendicular, and the others about 15 and 10 feet respectively.

September 15th.—At half past nine this morning the boats were brought to the head of Dowocaima Rapids,

* Such rocks, their black and shining appearance being due to a deposit of oxide of manganese, are common in most of the rivers of Guiana, and are regarded with superstitious feelings by the Indians.—ED.

having been carried about half way and then relaunched, after which they were partly dragged, partly paddled over the remaining rapids. Leaving our camp about noon we soon passed a creek, on the right bank going up, called Massiwindooie, probably the same which caused SCHOMBURGK to name the neighbouring rapid Massawindooie. This rapid is small, but is rather difficult to get over, owing to the narrowness of the passage. Presently we arrived at a small creek, called Kamwatta,* on our left, from the mouth of which starts the path by which we were to walk across to the Cuyooni. It is to be remarked that each tribe adopts a path for its own special use, the Indians in their movements thus avoiding the chance of meeting those of any other tribe. About this time we began to observe that the continued wet weather which we had encountered had had an effect on the Indians, some of whom were suffering from severe colds; and this made us regret that we had not provided a blanket for each.

During the day MCCLINTOCK told us that he had learned in various conversations with the Indians that from a point two or three days further journey up the Barama a path could easily be made directly across the country to Tupuquen, which might save us 8 or 10 days' journey; that the path could be cleared for about \$20, provided we could get food enough for the Indians employed on the work; and that the only reason why such a direct path did not already exist was that the Indians here had no communication with any settlement in that direction. Although this may hereafter be an

* Kamwatta is the Indian name for the common bamboo.—ED.

important route to open up, we determined, as we had not sufficient food for the Indians and could not depend on getting cassava, to adhere to our original plan of crossing over to the Cuyooni from here.

September 16th.—This morning we prepared for our overland journey; but found that our Indians could not carry all the baggage on one trip. We had, therefore, to leave one or two behind, in charge of such things as were left to be sent back for in the course of the day. We started at 8.15 a.m., and after walking for an hour through the forest and over marsh and hilly ground, where quartz rock occasionally appeared, we reached a Carib settlement, recently abandoned, where we were obliged to halt for the day, to send back our Indians for the rest of the luggage. At midday they came with their second load, but there were still some things left behind. In the course of the day, some pieces of quartz with metallic particles adhering to them were found in the creek. This caused us to make further search, and it was amusing to see the eagerness of the Indians in watching and assisting us. Our find, however, proved to be only pyrites.

September 17th.—Two hours after starting from our encampment this morning we arrived at a Carib settlement called Adawyne. The path was much worse and more intricate than yesterday. We noticed considerable quantities of gravelly soil in which blocks of quartz were imbedded. In general the ground was undulating, and well adapted for the growth of coffee, cacao and most tropical products. In crossing a creek of considerable size also called Adawyne, we found it bridged by a large fallen mora-tree, over which, we were told by our

Indians, Schomburgk had passed when he crossed the path which we were now using on his way from Aunama to the Acarabisi Creek and the Cuyooni. We did not very clearly understand how the two paths should thus coincide, unless owing to the circumstance that an Indian will deviate several miles from the straight road to get a tree such as this to cross upon. Some parts of the path were very swampy and in the rainy season would be almost impassable.

At the settlement there was a considerable extent of cultivation, and some sugar-canes as well grown as on the best estates near the coast. An unusually large number of dogs—no less than 13—greeted us on our arrival; some were large and fine, apparently of the Spanish breed. Poultry and a few flowers showed a comparatively advanced stage of civilization.

We learned to-day, with no small satisfaction, that we might considerably shorten our journey by avoiding the Yuruari and proceeding by the Acarabisci to the Cuyooni, and thence by the Cooroomoo Creek to Toomeremo, where horses can be had to proceed to Tupuquen.

The course taken to-day, though along the only path, varied considerably from the proper direction; to-morrow we shall go nearly west, causing us almost to retrace our course of this morning.

Just before dark the last detachment of our Indians came in with the unwelcome intelligence that they were unable to bring on the remainder of the luggage, and that 8 or 10 hands must be sent in the morning to bring it forward. This might cause us to lose another entire day. It was also a source of great anxiety to us to find that a severe cough and

cold was spreading among our Indians, no less than 11 being now reported as on the sick list. This we attribute to the continuance of wet weather and the want of covering during the night, when the damp and cold and occasional heavy dews render a covering of the greatest importance. We believe that had we provided a blanket for each, much of this sickness might have been avoided.* It thus became a matter of absolute necessity to reduce our baggage to the smallest possible compass.

September 18th.—During last night the coughing among the Indians was more severe and incessant than ever; and Dr. BLAIR recommended that all who were ill should have their hammocks moved to one place, that he might be able to pay them more attention and observe the progress of the complaint. He seems to apprehend that, if neglected, inflammation of the lungs or pneumonia may ensue. It was also determined that some salem-poras which we had with us should be cut into sheets, to be used by the Indians during the night.

The remainder of our baggage was brought up by 11 a.m.; but, the Indians who brought it being unable to commence another day's journey, and many still remaining on the sick list, we determined to remain another day at this settlement, to rest our hands and reduce and repack our stores.

We bought from a Carib at this settlement, his pepper-pot, containing boiled cassava juice and peppers, in other words, fresh cassareep prepared in the

* An Indian, whether or not he is sufficiently civilised and unfortunate enough to wear clothes during the day, sleeps naked—generally with a fire under his hammock. When travelling in very wet weather it is of course difficult to keep this fire continuously alight.—ED.

way in which the Indians themselves use it, as a condiment with cassava bread or meat, and we found it to be one of the best sauces we had ever tasted, undoubtedly better than the concentrated cassareep which is generally used by all but Indians. The fresh cassava juice is boiled for about half an hour, peppers being added according to taste. Care is, however, taken to allow the juice to stand some hours before it is boiled, to allow all the starch to subside; otherwise the pepper-pot soon becomes sour.

September 19th.—During last night we had been frequently disturbed by outbreaks of coughing among the Indians. These, by a little observation, Dr. BLAIR soon detected to be in part got up for the occasion, a sort of malingering, to enable the lazy ones to avoid as far as possible the anticipated march with heavy loads in the morning. When Dr. BLAIR by imitating them showed that the sham was detected, their good-humoured burst of laughter disarmed censure and went far to restore them to our good opinion.

It was 9 o'clock before we could get all our Indians off; and even then five loads had to be left to be sent back for. Our course was in a south-westerly direction, toward the Acarabisci. The forest-path was better than yesterday's, being usually over undulating, and sometimes hilly, ground where magnificent trees of locust (*Hymenea Courbaril*) and other timber abounded. Occasionally the path was at the bottom of a hill and evidently covered by water in the rainy season. When we were there it was wonderfully dry. We crossed the Marawyne creek twice, and then came to the Aunama, which we also crossed two or three times. We were told that

this was the same track which SCHOMBURGK had used. About one o'clock we reached a settlement where we encamped, having, by the promise of six bits additional wages, induced some of the Indians to return for the things left behind.

At this settlement the Indians were wonderfully primitive, few of them having ever seen Georgetown, and some never before having seen salt-fish, usually esteemed by such people one of their greatest delicacies. When it was first given to these, they turned from it with disgust, saying it was stinking stuff.

September 20th.—Several of our Indians are still suffering from colds and coughs, but not so severely as before. The character of these people still impresses us most favourably. They are so quick, ready and obliging, and so ingenious in their modes of doing everything which they are required to put their hands to, that they put the more clumsy and bungling European, with all his advantages of education, knowledge and civilization, completely into the shade in all matters where bush-life and travelling are concerned. Their manners, too, are exceedingly pleasing; they are so gentle, modest and unobtrusive—and, in fact, most of them are by nature perfect gentlemen.

Some of our Indians, going out to 'poison a creek' for fish, mentioned that the most deadly fish-poison known to them is the wood of a tree called *dawahy* or *moraballi*, chips of which, if thrown into the water, kill the fish for a great distance down the stream.

Having to await the baggage from the rear, we were not able to begin our march till 12.45. Our course was still westward; and in about an hour we had crossed the

Aunama again, and came to that point where SCHOMBURGK thought it might be connected by a canal with the Acarabisci. After that we seemed to descend from the summit level which we had attained; and having again crossed and re-crossed the Aunama, we eventually encamped on both sides of it, after a journey of about 10 miles.

For its bearing on climate, it is worthy of note that, on arriving at our camp with our clothes saturated by rain and perspiration, we found immediate relief from chill and cold by simply taking off our clothes and adopting the Indian costume.

September 21st.—To-day we reached the settlement of Acarabisci, close to the source of the creek of the same name. At this season, this creek was almost dry; and, as far as we could judge, at no season could it be navigated even by the smallest woodskins. We were, therefore, at a loss to understand SCHOMBURGK'S remark about uniting the waters of the Aunama and the Acarabisci by canal. The head-man at the settlement, keeps his wood-skin on the Cuyooni, two days march off.

From here it was arranged to send off a messenger in advance to the Cuyooni, to engage the requisite boats. To prevent mistakes, an "Indian letter" was prepared, to be sent by the messenger. It consisted of a series of knots on a piece of cord, showing, among other things, for how many hands provision had to be made and after how many days the boats were to be ready for us.

September 22nd.—Having after some difficulty persuaded three men, by the temptation of additional pay, to go for the luggage left behind, the rest were set to make quakes, in which to carry the burima or cassava meal.

We were told that the sharp pebbles with which the cassava-graters are made rough are fastened into the wood by means of a vegetable glue called *wabba*, obtained from the fruit of a tree or shrub called *ducalli* (not *ducalliballi*). It must be a strong glue to stand the friction and constant moisture to which it is exposed, and might be useful if it could be collected and preserved. It is used by the Accawoi and Carib Indians only. The juice is applied without any preparation.

On the suggestion of Mr. McCLINTOCK we determined to send 12 or 15 Indians on to-morrow with the cassava bread to the next settlement, to return here in the afternoon, and that we should then all start on the following morning after seeing the whole of our luggage sent on, instead of leaving part of it to follow us as heretofore.

September 24th.—Even after remaining still all yesterday, it was not till 8.45 a.m. that we could get all our Indians under way with their burdens. There was a manifest reluctance to go, and some persuasion had to be used with several of them. Two were left behind, sick, to follow us to-morrow. After a march of 4 hours, we reached a deserted Indian settlement called Aranassi, near a creek of the same name, where we took up our quarters. On the way we saw a very large purple-heart tree (*Copaifera pubiflora*), which had been cut down, and had its bark taken off to make wood-skins. A large tree such as this must be a fine sight when falling; it cuts for itself a space like a long avenue, overpowering in its fall every tree of smaller dimensions, and allows a blaze of light to enter where formerly the mid-day sun could scarcely penetrate.

The Indians with the loads did not arrive till, some an

hour, some more than two hours after us, showing that the work of carrying begins to tell upon them. They are by no means a strong race nor well adapted for continuous exertion, although naturally active and capable of undergoing great fatigue in paddling for many hours consecutively, or in travelling if not heavily laden.

In the afternoon we learned that the path to the Cuyooni by the Acarabisci, by which we had intended to go, is much the longer, occupying two days, whilst by another path we may reach the Cuyooni in one day from here at the fall named by SCHOMBURGK Kenaima, which is about one day's journey below the Acarabisci. We therefore think of taking the latter path, sending a messenger to direct the corials engaged for our trip to meet us at the Kenaima fall.

The Indians amused themselves this afternoon, like a parcel of schoolboys, at a game of ball, with the most hilarious and uproarious mirth. The ball was of india-rubber; and the fun seemed to consist in keeping it rebounding by striking it down with the hand; whoever missed his stroke was made game of, and laughed at, most immoderately.

September 25th.—Having resolved to remain here to-day, we sent on 20 Indians at 7.30 a.m. with our baggage to Kenaima fall; but at 3 p.m. these same Indians returned with the unwelcome news that the journey to the Cuyooni could not be effected in less than two days, and that they had left their loads at a settlement about half-way.

September 26th.—We made every exertion to get off early this morning, but found more than usual reluctance on the part of our Indians to move, and several of them

absented themselves altogether or refused to go further. One left without getting, or asking for, any pay, although he had been with us for 10 days. However, about 8 a.m. we started; and after a very disagreeable walk through a swampy, stiff, yellow clay in 3 hours we reached a Carib settlement, where we rested. But, having ascertained that the Cuyooni was distant not more than 2 or 3 hours walk, we resolved to proceed, after giving our Indians a rest. After a pleasant walk, over a fine, dry, undulating country, covered densely as before with forest, we arrived at 2.20 suddenly and unexpectedly on the banks of the Cuyooni, which is here (a short distance below Kenaima Cataract) a beautiful and broad stream, with a fine, clear lake-like expanse, in the centre of which is an island. A glad shout expressed our delight at having thus ended our tedious march between the two rivers. We found that the Indians sent on before had pitched a very nice tent for us, on a height by the river-side. A number of Indians, Ackawoi, Spanish Arawaks and Maionkonges, came in corials, canoes and wood-skins to meet us, some having been engaged for our service, some being visitors from the opposite side of the river.

September 27th.—We agreed this morning to return by the Orinoco, and to send a messenger to the schooner to meet us at the mouth of the Barima. We also made a vain appeal to our *chef d'escadron* to give the order for a start; but so many difficulties were thrown in the way, and there was such an obvious intention to remain all day in the hammock, that we soon saw that all representations would prove ineffectual, and that we must make up our minds to lose another valuable day.

September 28th.—On taking an inventory of our stores, we found we had barely sufficient to carry us to Tupuquen, estimating the journey at from 12 to 14 days; and Mr. McCLINTOCK estimated it at 20 days.

We were off about 9.30 a. m. in six boats; and almost immediately we reached the first rapid. Here we saw a new feature of the Indians displayed to great advantage; and we much admired their dexterity in carrying our delicate wood-skis, with gunwales not more than 3 inches above the water, safely through the most intricate passages in the rapids.*

The higher we went, the more beautiful did the scenery become. Landing on a small island above Kenaima fall, from the upper end of this, one of the most magnificent views burst upon us. The river, dotted with islets and rocks, had expanded to at least a mile in width, and was shut in on all sides by a fringe of the most gorgeous woodland scenery, in all the glory of a bright tropical sun. Behind, on our left as we looked down the river, was seen the great rapid or fall called by the Indians Porro-eng. The sea-breeze was felt fresh and strong, and the buoyancy of the air was delightful. Sir WILLIAM HOLMES insisted on calling the place 'Fairy-land'.†

The river continued of great width above the falls.

* Mr. CAMPBELL does not state whether the boats were manned by the Indians brought from the Pomeroun or by the new hands engaged on the Cuyooni; but there must have been at least some of the latter in each boat, for the Indians of the Pomeroun, as of other rivers equally free from rapids, are by no means remarkably skillful among falls.—ED.

† Without throwing any doubt on the beauty of the scenery, it may be remarked that the delight and exhilaration felt on coming out after many days from under the dense unbroken shade of a tropical forest, into a widely open and sunlit space is worth feeling.—ED.

Occasional ledges of rock appeared; though on the whole, its course was very clear of such obstructions. The current was generally slow. Our night's camp was made about half a mile above the mouth of the Acara-bisci creek.

September 30th.—Early this morning we passed the mouth of a large creek, on our left hand, called Urawarawa, probably the same laid down in SCHOMBURGK'S map as Uruaraia. Above this the river was for many miles like a beautiful lake, its surface like a mirror, and not a single rock visible. We also passed a small creek called, by the Accawois, Wakenaam and, by the Caribs, Waka. About this part of the journey several ranges of hills were in sight. In the course of that afternoon we passed on our left the beginning of a path by which it is possible to walk to the Masserooni in 4 days.

October 1st.—The settlement at which we stayed last night, called Warraput, differs from all we have yet seen. It is close by the river, on a bank rising steeply to the height of 30 or 40 feet; the houses are all enclosed to the ground, and consequently very close and warm; some were circular, like those of the Macusi Indians. On making the most minute enquiry we could not find that any of the Indians of this settlement had visited the hills in the neighbourhood; they seem to entertain a superstitious dread of hills of any magnitude, believing that 'kenaimas' reside there.

About noon we reached the Coroomoo creek, said by SCHOMBURGK to be 20 miles above the Acarabisci. It is said that in the wet season Tupuquen can be reached in 3 days by this creek; but it was impassable when we saw it. During the day the sea-breeze was felt most

refreshingly ; and with a sail it would have helped us on very materially. It usually sets in as early as 8 or 9 a.m. on this river ; and from this circumstance, and the course of the stream being nearly east and west, and thus exposed all day to the sun, as well as on account of the high banks and rapid current, Dr. BLAIR thought that this river ought to be particularly healthy and free from the miasma to which most of the other rivers in the colony are subject.

October 2nd.—Many hills were still in sight. At one place the scene was especially beautiful. The river appeared to pass into a kind of gorge or defile, resembling the approach to Loch Katrine and the Trossachs, although the hills were by no means so high, apparently not exceeding 1,000 or 1,500 feet. Not a palm was to be seen and the bush-ropes were not numerous or noticeable ; so that the scenery was much more like that of Europe than of the tropics.

We camped on a curious sand-bank, laid out so symmetrically and regularly that it appeared artificial and seemed levelled on the sides and top by rule. On first arriving here, some Indians were found who, while they were making a new field, had temporarily located themselves by the river side. These, on seeing our boats approaching, fled, but returned with guns and bows and arrows in their hands. This was the first hostile feeling we had seen manifested by Indians. They were soon reconciled, and in the most friendly way gave up their own encampment to accommodate us.*

* The Indians on this river seem to have been much harassed by Venezuelans, and are always on the alert to avoid or repulse the latter. See *Timehri* Vol. 1. p. 130.—ED.

One noticeable feature of this, as of all the other rivers of the colony that I have seen, is the intense stillness and absence of all *appearance* of animal life. Scarcely a single bird, except in the morning and evening a few parrots passing to or from their feeding ground, is to be seen; and only a few notes, usually most unmusical, are to be heard. Insects are everywhere; but these give no character to the scene. For the gayer sorts, such as butterflies, are by no means numerous. The ants and their allies the wood-lice, or wood-ants, are omnipresent and exercise the most powerful influence in the destruction of all material which comes within their reach; for, from the crumbs which fall on the ground to the monarch of the forest when old or fallen, all is speedily reduced to a decayed mass, presently to mingle with the soil. During the day the monotonous but loud and shrill noise of the sun-beetle is almost the only insect note heard. This is fearfully suggestive of intense heat, being heard most frequently and loudly at Indian settlements, where not a tree is left to shade the ground. At sun-set the concert of razor-grinders, crickets and grasshoppers of all sorts, aided by multitudes of frogs, commence a din of innumerable sounds, which continues all night long. No mosquitoes, or only a few and of a small sort, are met with so high up the rivers. Bees, however, are tolerably plentiful, and one very peculiar kind was met with. One very small kind which we looked at too closely one day in the forest followed us for some distance and was only with difficulty got rid of from our hair. They sting very slightly; but the Indians say that they eat the hair!

October 3rd.—Early this morning we had to pass a

rapid—which we did with some difficulty. It is called Trumbang, or Tirumba according to Mr. McCLINTOCK, who says that it means ‘the tinkling as of metal’.

About noon we reached the Carib settlement of Warracaba.* An attempt was here made to dig for gold; the result being a black residuum, like oxide of manganese, with one minute gold-like particle.

October 4th.—We were told that in some dry seasons the river may be forded here. Soon after starting this morning we passed the Yacami Rapid, which was one of the most difficult we have yet encountered. Above that the river was one confused mass of islands and rocks and one continuous series of falls and rapids.

October 5th.—We now felt the atmosphere to be remarkably dry as contrasted with that of the lower part of the country through which we have passed. Clothes, wet at night, are here nearly dry in the morning; and our guns, formerly red with rust in the morning, are now found quite free from it, although sometimes exposed to heavy rain.

The banks here are high and sandy; and the trees are much smaller than, and apparently different in kind from those seen lower down. There was scarcely any mora, and the few bullet-trees were of no great size. There were certain trees which yielded a very adhesive, white, gummy juice, tasteless and inodorous, which as it dries becomes very elastic and can be drawn out in threads several yards long.

* Warracaba is an Indian (Carib?) name for the trumpet-bird (*Psophia crepitans*). Yacambi is the Arawak name for the same bird. It is a curious circumstance that Mr. CAMPBELL mentions the existence of a rapid in the immediate neighbourhood of this settlement, which he says is called Yacami.—Ed.

October 7th.—This morning we entered the Yuruan ; which is here not more than half the width of the Cuyooni, or about 200 yards ; and the banks, as are the trees on them, are here much lower than those of the main river ; but they become higher a short distance up. The current is strong, and rocks and islands are almost immediately met with. The water is dark in colour. Some of the rocks present a basaltic appearance, with needle-like points. Some 3 hours up the river becomes a good deal wider. Here it is sometimes crossed by clumps of guava bushes (*Psidium aqualicum* and *P. aromaticum*) and its banks are low ; from which I infer that it does not rise very much in height during the rainy season but, Nile-like, overflows the surrounding country. Six miles from the mouth of the Yuruan we came to the mouth of the Yuruari ; and hearing that there is no camping ground for some distance up, we were obliged to remain at the mouth for the night.

October 8th.—The Yuruari at its mouth is not more than 160 feet wide. A few hundred yards up some rocks appear above its sluggish and dirty-looking water ; and these seem to differ from those in the Cuyooni, appearing stratified and as if intersected by layers of quartz. The trees are mere scrub, and appear as if only a fringe to the stream, with a swamp or savannah behind. On the whole this river is singularly uninteresting at this part of its course.

Four or five hours up, we passed two granite boulders, each about 20 feet high, and each with a figure of a frog, about 3 feet in length, neatly sculptured upon it.

An hour later we came to a series of rapids, caused by the river pouring over most enormous beds and blocks of

granite, which much exceed in height, and are much more difficult of ascent, than any met with in the Cuyooni.

October 9th.—In ascending a rapid this morning Sir WILLIAM HOLMES' boat was upset and sank. We took the opportunity whilst such of his clothes as were saved were being dried to visit the savannah, which lay close by. It presented a curious sight to those who have never seen such a place before. Undulating and hilly ground stretched as far as the eye could see, with scrubby looking bushes and clumps of trees and æta palms (*Mauritia flexuosa*) scattered over it. The soil seems poor, hard and arid, with a scanty vegetation of tufts of coarse-looking grass about 15 or 18 inches high. Great blocks of granite, from 50 to 60 feet in length and breadth and about 20 feet in height, appeared in several places, all rounded and water-worn. Almost every small hill was covered to its summit by water-worn quartz gravel, of considerable size, intermixed with blocks of quartz from 1 to 2 feet high of various shades of white, pink and red. Cacti of large size and aloes were also seen. The soil was found to be mixed with black ashes, as if it had recently been burned, as, we were told, it constantly is, to keep the grass low and thus to guard against rattle-snakes.*

Proceeding again, we came in the afternoon to a greater fall than any that we had yet passed, the noise of which was heard an hour before we reached it. The river here presents a magnificent appearance, being broad, and

* This burning of the savannahs, which is practised by the Indians in all suitable places in Guiana is not fully explained. Many reasons have been given to me for the practice; the most probable being that the burning encourages a growth of young and tender grass which attracts deer and other game.—Ed.

pouring its torrent through gigantic masses of granite. Some little distance above this the trees almost entirely ceased on the right bank and the open savannah was visible from the river in several places.

October 10th.—Some Accawoi Indians, at whose settlement we stayed last night, told us that the Spaniards of the lower class at the diggings use threatening language about the English, to the effect that we had better leave them, the Spaniards, alone.

About an hour after starting this morning we passed a most extensive rapid; and here we saw a rock well-known to the Indians as the 'sun-rock' and named by them Wykoo, from certain sculptures upon it which they imagine to represent the sun. This rock faces due north and south, and on it there are several figures rudely sculptured. The centre and most perfect one resembles a figure which I think I have seen pictured as being on Indian, Egyptian and Mexican temples. Two other sculptures appear very distantly to resemble human figures. A small symbol to the right of these is somewhat like a dromedary; but it may be a beetle or anything else, it is so rudely done. The rock is granite, and so hard that I could only get some small, weathered specimens off it. On the wet side are also figures, but less perfect than the others.

By the middle of the afternoon we were passing through savannah on both sides of the river. Some of the trees here appeared to have been scorched, and were dead in consequence.

A large cactus about 20 feet high was occasionally seen. From a hill within half a mile of the river we had a delightful view. From west to north-east we saw a

high range of mountains, probably those bordering the Orinoco. The view was diversified by nearer hills and large savannahs as far as the eye could reach, woods bordering the creeks and rivers, and clumps of trees in all directions. There was a fine breeze; a thunder-storm was passing in the distance; and the setting sun illumined the whole. Altogether it was very pleasing.

Before long we passed the first cattle farm, with a house, and a pen capable of holding 800 head of cattle; and soon passed others; and cattle began to be visible on the savannah.

At night we stayed at a cattle farm called Massapiri, formerly belonging to Colonel HAMILTON, who had a very large grant here, including 8 or 10 cattle farms.

On the savannah here there were frequent coveys of quail; pigeons were abundant, and several other birds were seen which are not seen in Demerara. Rabbits* also were seen by their burrows, but we did not see these very near.

The house in which we slept was of clay, with a red-tiled roof. It had a verandah on each side, and two doors but no window, so that it was dark and close. The people had charge of 157 horses; and much cattle was on the savannah, of which they were catching and killing a few to make 'tasso' or dried beef. This tasso is the nastiest preparation of beef I ever met with; the smell of it, cooked or uncooked, nearly made me sick, and I think I could sooner learn to relish candle-grease than this nasty stuff, unless it were divested of its odour.

* These 'rabbits' may possibly have been armadillos, which live in some numbers on the savannahs and make their holes under the nests of the 'white ants' (termites).—ED.

The country between this place and the Cooroomoo creek is open savannah, over which cattle could easily be driven; and there is also a savannah on the opposite side of the same creek which extends for some distance and approaches the Cuyooni. It would not, therefore, be a very serious undertaking to make a road across this country by which cattle might be driven to Demerara; and the people here said they would much prefer to take cattle by such a road than over the mountains to Las Tablas.

Enquiring as to the price of cattle-farms, we were told that half of Colonel HAMILTON'S estates, of which this farm of Massapiri formed part, and the whole of which extended over a large tract of country and had several hundred horses and about 20,000 head of cattle, was sold for 50,000 pesos, and could now be purchased for about \$33,000. The average price of cattle, here is about 10 pesos or \$10 per head. The manager of these estates arrived before we left; and we found him intelligent, obliging and communicative. Wages, we were told, for a trustworthy cattle-minder, such as we found in charge of this farm, skilled in riding and using the lasso, are \$4 a month.

October 13th.—Travelling all yesterday through much the same country as on the day before, and continuing in the same way to-day, we arrived about noon at Tupuquen.

Our arrival soon attracted visitors; and among these was a character name WYSE, last from St. Vincent, and part proprietor of the *Mirror* newspaper, of mixed Yankee and Indian origin, who gave us a most graphic account of his labours at the 'diggings' for upwards of three weeks, the result of which was a single grain of gold; about

the size of a pin's head, from a hole which he dug 10 feet square and 14 feet deep. He said he knew what hard work was, and had worked hard at various trades, but that gold-digging was the hardest of all. He had had two or three hundred dollars, but was now about to leave without a farthing; a few, but very few, people had been more lucky.

We went up to the village, about a quarter of a mile off, and got quarters at the house of the alcade, one MOLERO, who is also an inn-keeper. This village was a wretched place; the houses were of the poorest sort; of wattle and mud, and seldom had more than one apartment. Till lately it had been inhabited by Indians alone, but these are now giving way to others. The situation is fine, overlooking an extensive green savannah with mountains on three sides. This savannah, we were told, extends far, and would greatly shorten the length of road which it would be necessary to cut to the Essequibo.

Donkeys are chiefly used for transport of every kind, almost all supplies being carried on these over the mountains from Bolivar or Las Tablas. Provisions, such as fruit, and sugar in cone-shaped loaves called papillones, are also brought from Tooporemo, about 27 miles distant.

In the evening we saw the "Gaceta de Guyana" of the 19th of September, which contained information about our alleged claims to the gold districts as part of British Guiana and stated very clearly the arguments on which the Venezuelans found their claim to the same territory. We were told that the lower classes here were inclined to stop us from proceeding, but that it had been explained to them that they were in error

about our intention, and that if they dared to interfere with us they would be put down by their own Government.

Caratal and the 'diggings' being on the opposite side of the river, and 6 or 7 miles distant, we resolved to postpone our journey thither till the next morning.

October 14th.—We could not complete our arrangements for leaving Tupuquen till late in the day, but moved across the river to the house of an Indian woman named GARCIA, whose son PEDRO JUAN GARCIA has been very lucky in discovering gold. In the afternoon, walking very slowly, we reached the diggings in about two hours and a half. The path is very good, up and down hill, and through the forest the whole way. The diggings are also in the depth of the forest, where about 70 or 80 huts thatched with palm leaves, have already appeared. Round these huts are the holes or barrancas of the diggers, usually square pits from 8 to 10 feet square and from 8 to 20 deep.

In passing we saw HAMILTON from Demerara; he was suffering from ill-health and was confined to his hammock. He said he was doing no business of any importance in the way of selling his venture, and had as yet made nothing by digging. He had had to pay heavy duties; many of his things had been broken on the way, and others had not arrived.

October 15th.—Having put up at the house of a Mr. GRAY, from Demerara, under his directions we this morning set all available hands to open a pit in what was pointed out as a good locality. The implements required were an axe or cutlass, to clear away trees and brushwood, a pick-axe, to cut through the roots and loosen the stiff soil; an instrument called a 'chickora', which is like

a large and long-handled socket-chisel, which is used to cut square and smooth the edges and sides of the pit; * a crow-bar, to move the many larger pieces of rock; a large hammer to break such masses of quartz as are supposed to contain gold; a cradle—here quite circular—in which to wash for gold; and a few coarse bags to carry the 'greja,' which is the gold-bearing soil and gravel, lying above the clay, to the stream where it is washed. From 2 to 8 men may be employed in digging a pit, according to its size. These pits are usually square or oblong, from 8 to 10 feet each way. Ours, there being many hands to work at it, was 16 feet by 10.

While the digging was in progress, I started, with a guide who possessed a minute and excellent knowledge of all the Caratal hills, to visit the falls of the Macápero, about four miles off. The guide pointed out the likely places for gold, usually near running or dry watercourses, which he said he had traced to their sources in the hills, among quartz rock such as usually contains gold. We found the fall to be from 30 to 40 feet high, the stream falling over a large and solid mass of very hard rock into a circular basin, said to be very deep. The whole country through which I passed was densely wooded; the soil was rich chocolate-coloured, yellowish loam, such as prevails at the diggings. No quartz was seen; and the guide stated that in many places where quartz abounded no gold was to be found, but that where stones containing iron were near, or mixed with, quartz, there gold would probably be found.

* 'The chickora,' writes Dr. BLAIR, 'is not peculiarly a mining implement. We saw one at Santa Maria, where, as on other cattle-farms, it is used chiefly in digging the trench along which the posts of the cattle-pen are planted.'—ED.

After this I devoted the greater part of the day to examining the pits at the diggings, and conversed with many of the diggers. Without a single exception, they had all suffered from fever or illness of some kind since their arrival. There were people from almost every country in Europe, besides natives of Venezuela, the West Indies, and British Guiana. All spoke of the work as very hard, a fact which was amply confirmed by our own observation; and nearly all seemed reduced in strength and pale from working in the woods; where the sun rarely reaches them. Most had walked from Las Tablas to the diggings, a journey of from 5 to 7 days, partly across arid and heated savannahs; and to this we attributed much of the illness from which they had suffered. Poor food had probably also contributed to the same result. The result of the information we got was that 'the diggings' on the whole have been a sad failure and that most of the adventurers, now supposed to number about 160 or 170, bitterly regret having left their homes for such an unprofitable pursuit. Some poor creatures were crawling about, too ill to work and unable to get away, having run into debt for the necessaries of life. On the other hand, a few had been fortunate; one, a Frenchman, was said to have left with \$2,000 worth of gold; and several were now finding from one to several ounces a day. The Spaniards show the greatest neatness and dexterity in the work; and these, with the Indians, are said to be the most fortunate. One Spaniard is now making so much that he can afford to pay a man at the rate of \$10 a week to dig for him, although but lately he was reduced to nearly his last peso,

The average quantity found per diem, at a rough guess, seemed not to exceed $\frac{1}{8}$ ounce for each digger, or about 30 to 40 ounces in all. The work is, however, very roughly and carelessly done, and it is said that much is lost in washing. The appearance of the country seems to indicate the existence of gold in many places besides that at present worked. The gold is said to be remarkably pure, and is sold in Trinidad at 22 dollars per ounce. As usual, a great deal of gambling goes on, and most of the gold finds its way into the hands of the gamblers or strangers who keep eating-houses and gambling tables. The price given here for gold is only about \$16, or something less, per ounce; thus offering a good speculation to any one with a capital of a few thousand dollars.

Many things here are extravagantly dear, especially medicine; a dose of senna or of jalap costs a shilling and quinine is fourpence a grain!

October 16th.—This morning I went down into a pit to examine the strata. Uppermost was a rich vegetable mould, usually chocolate-coloured, brown or yellowish; next was a stiffer sub-soil, which is also yellowish; next is the stratum called greja, in which the gold is found, of loose and friable gravel, almost always mixed with rounded pieces of quartz and stones in which, when broken, iron is apparent; below this is a greyish clay which is never penetrated by the diggers. Under large blocks of quartz embedded in the greja nuggets of pure gold are often found, sometimes of considerable size. The 'greja' after the larger stones have been removed is carried in bags to the water, to be washed in cradles or 'batelles.'

We found some specimens of quartz with what ap-

peared to be specks of platinum in it; and one of the diggers mentioned that he had found apparently the same metal.

We were disappointed at hearing that horses could not be procured under two days notice; and MR. McCLINTOCK and I crossed the river to Tupuquen to endeavour to get donkeys, if horses were unattainable; but we were given very little hope.

October 17th.—We were occupied during the morning in making arrangements not only for our own departure, but also for that of Mr. McCLINTOCK, who is to return by the Cuyooni, if possible by the Cooroomo and Acarabisi Creeks, in order that he may obtain as much information as he can about the nature of the ground thence to some point near the mouth of the Essequibo or the creeks falling into it, especially Groote Creek.* After we had taken farewell of him, he returned to Caratal, to remain there a few days longer if he should find sufficient encouragement to do so.

In the afternoon we examined the old convent of Tupuquen, which is now occupied by a German named

* The Indians under MR. McCLINTOCK reached the 'greja' or gold stratum on the 17th of October, and got some particles of gold from the first cradles; but the pit was half filled with water by a storm during the following night. Mr. McCLINTOCK remained at Caratal till the 20th; but the heavy rains continuing, and hardly one of his Indians being free from fever and ague, he then commenced his return journey to the Pomeroon. The Yuruari had risen much, and in 4 days the party were carried by the rapid current down what it had taken 8 days to ascend. The whole journey from Tupuquen to the Pomeroon occupied only 22 days, instead of the 45 days which the reverse journey had occupied. Amongst the Indians, said MR. McCLINTOCK, there was no loss of life.—ED.

SOMMERS as an eating-house, store, butchery, gambling den *et cet.* It is in a wretchedly dirty and dilapidated condition, but the remains of an old tessellated tile pavement may be seen in the verandah. The whole is merely a framework of wood and laths covered with mud, and has stood remarkably well, as it is now supposed to be from 70 to 100 years old. In its palmy days it can never have been anything remarkable, but it probably afforded the friars a comfortable retirement, in the midst of a beautiful country, with plenty of Indians as servants, or slaves, to minister to their wants and appetites. Rumour states that the friars held the large possessions attached to 32 missions about here as their absolute property, and that they used the Indians as bondsmen for every species of labour, and that they prevented the ingress of Spaniards and other strangers into the mission territory. All this was ended by the revolution. The priests, having sided with the Royalists, were hunted out of the country or massacred; and the Indians were for the most part scattered over the country, though a few remained in their old homes.

From the summit of the small hill south of Tupuquen, immediately above the burying-ground, we had a most beautiful view of the surrounding country, which presents on every side a grand savannah surrounded by the Caratal, Noria and other mountains. The whole seems as though it had once been the bed of a lake, which when it burst its boundary emptied itself by the Cuyooni. Hearing that two pedestrians had just arrived from Demerara we went in search of them to Mr. SOMMERS' *hotel*, where an indescribable scene of noise, bustle, confusion and grumbling proceeded from a numerous throng of

diggers and idlers. The pedestrians proved to be a Mr. EDGHILL and a nephew of Mr. PRESTON'S, who had left Demerara on the 10th of September, and had come by way of Bolivar and Las Tablas, walking from the latter place to Tupuquen. They told us that, owing to some informality in getting a proper manifest or bill of lading on leaving Bolivar in a launch for Las Tablas, nearly everything they had, including two donkeys, mining and digging tools *et cet.* had been taken from them; and they had come on with little more than the clothes on their backs. They looked weak and fatigued, and from their slight build and small size seemed singularly ill adapted for the hard labour of digging; in fact I should say it would kill them in a few days were they to attempt it. Under these circumstances, Dr. BLAIR thought it his duty to caution them, and to recommend their immediate return home.

By the way, the Caratal mountains are so named from the abundance of the carata palm in the woods.*

October 18th.—After many delays and difficulties, we succeeded in getting our horses, donkeys and guide, and started at 11 a.m. for Upata, which is estimated at 2, 3 or 4 days journey, according to circumstances. Owing to the rivers being flooded, we found that our journey would take 4 days. The distance, by the road which we were to follow, is estimated at 72 miles. On starting we took a north-westerly course across the savannah, toward the foot of the Caratal hills.

The scenery was singularly beautiful. From the top

* The Carata palm is *Mauritia aculeata*, a fan-leaved palm, resembling the æta palm (*mn. flexuosa*) but smaller, and with a much more slender stem beset with prickles. It occurs in British Guiana, but only on the rocky and higher savannahs.—ED.

of the first rising ground, looking back, Tupuquen, with its red-tiled cottages contrasting well with the rich green, looked pretty. And everywhere around the auriferous appearance continued the same, the mountains seeming from their shape and conical summits to be volcanic, and the whole plain being everywhere covered with quartz rock and pebbles in every stage of disintegration. Accident or patient search will, no doubt, in time disclose rich gold-fields throughout this region.

The characteristic plants of these savannahs are the tree or bush called 'chapperal'* which is usually very stunted, from the effects of burning, but at times is more luxuriant and bears a sweet smelling whitish flower, not unlike hawthorn, and the æta palms,† graceful groups of which are seen where are springs, rivulets or swamps.

Toward afternoon we reached a farm, near the banks of the small river Miamo, where a ferry-boat is kept, a comical-looking, flat-bottomed narrow boat, in which we crossed. The horses and donkeys were then made to swim across in pairs, led by a fine athletic Indian who swam across before them with the halters in his teeth.

As we travelled we were continually reminded of sheep by the blocks of white quartz scattered about on the hills, which at a distance might readily be mistaken for such. These same blocks also brought forcibly to our minds the description given by Sir WALTER RALEIGH of the white quartz rocks seen by him, perhaps on these very hills, and called by him '*el madre del oro.*' The total absence of real sheep, on pastures apparently so well adapted for them, was also remarkable.

* *Curatella americana*.—ED :

† *Mauritia flexuosa*.—ED :

The house at which we stopped that night at Guacipata, belonging to a Mr. MIRANDA, was of a better description than any which we had yet seen, being substantially built of clay, with the rooms ceiled and white washed.

October 19th.—This morning we examined the old mission buildings here. The situation is well chosen, on the top of one of the savannah hills, and commands an extensive and beautiful view on every side. The village, formerly occupied only by Indians but now by a mixed population, is composed of a number of neat clay cottages, with red-tiled or thatched roofs, and stands on a fine plateau in front of the mission. Some additional buildings have been put up since the monks were driven out, the materials having been chiefly obtained from the mission buildings, which were much more extensive than they now are. In one room may be seen the stocks used by the monks for punishing the Indians, with numerous holes worn smooth by the unfortunate sufferers, and the frame-work smeared with blood-stains said to have come from those who were flogged when in the stocks. A centre hole in the stocks, larger than those on either side, is said to have been used for placing the head in, as a higher degree of punishment. Another room was pointed out as that in which singing was taught; and here much of the old furniture still remains, such as benches, stands for goglets and jars of water *et cet.*, and the roof is lofty. In another room is a large frame on which were made hammocks, all these missions having been famed for the manufacture of these articles. Long passages traverse the buildings, and off these are numerous large and airy rooms all most substantially

built and well finished. The doors and other wood-work, being of the best and strongest materials, are in the most perfect preservation. The church is really a very handsome, large and lofty structure, about 160 feet long by 45 wide. The centre aisle has a fine arched roof supported on two rows of lofty pillars; and a smaller arched roof is on each of the side aisles. The roof has been coated with a pale pinkish cement, which is highly glazed with some substance not now known but which has been remarkably durable, the roof although now more than 90 years old, having still a beautiful glistening appearance as the sun-light falls upon it. The floor is tiled; and the walls, although made of clay, are very smooth and well-finished and look as well as the best plastered work. The entrance doors are large and lofty, and over them is a gallery where the choristers must have sat, some music-stands being still left. Outside the church is a small gallery overlooking the esplanade and village; and by the side of this are two large bells, hung on strong beams, and apparently still in use. We were told that the Indians still resort to the church to worship and burn a few candles.

On examining the walls of the mission, we were surprised at the simplicity with which the wattles of which they are composed are fastened together, by pieces of bush rope, which seem as fresh as when first put into position.

We were advised, and resolved, to proceed to Upata by way of Platanal, to avoid crossing the rivers lower down, where, in consequence of the rain, we might be detained several days. We started about 11 a. m., and about sun-set reached Platanal, so-named from the fact

that a single plantain-tree was found there when the land was first occupied as a farm. As we approached, two damsels took to their heels and fled, and, when pursued, set a number of dogs upon us, and drew their knives; but we soon allayed their fears and showed that we had no hostile intentions. The house was large and good, but the entertainment most wretched; nothing was to be had but rancid 'tasso' and cassava bread. Although a cattle-farm of 5 square leagues, with 10,000 head of cattle, 80 horses and 10 peons, no milk, fowls, eggs, butter, cheese or vegetables could be got.

October 20th.—About 8 this morning we started, and proceeded round the shoulder of the Sierra del Bacaron to Para-para, another large cattle-farm. We were much pleased to find a patch of cane cultivation in the hollow, before reaching the house; and at the farm we saw a very nice sugar-mill, with three perpendicular rollers, worked by two oxen, and two small taches very neatly put up and scrupulously clean. The furnace and copper-walls were very well built of brick, and plastered with lime; brick and lime having been brought, at very great expense, from Las Tablas. The sugar made is poured into a frame containing thirty moulds, in each of which the sugar, hardening, forms a loaf, or papillone, worth about ten cents. The loaves are taken out of the moulds after remaining about an hour to cool. The syrup is much boiled, to give it consistency, by which the grain is destroyed. Lime is seldom used, except in very damp weather. A new mill was being put up, the rollers of which were turned out of large and fine pieces of locust-wood.

Tobacco was also grown to a small extent, and was

cured in bales and made into cigars, which were sold at the rate of ten for a bit. Provisions and coffee were also grown for the use of the owner, who thus enjoyed many luxuries which all such settlers, if possessed of similar energy, might share.

The view from this place is one of the most beautiful that can be conceived, embracing a very wide extent of what appears to be the richest and greenest country, embosomed in woods, and stretching over height and hollow as far as the eye can see. Yet this country appears almost uninhabited, instead of affording one of the finest outlets which perhaps the world affords for the redundant population of Europe.

The climate although warm is not oppressive, and a refreshing breeze is seldom wanting. The rain is, no doubt, heavy, but owing to the nature of the soil and the excellence of the natural drainage the ground soon dries; and no miasma or fever need be dreaded.

Leaving Para-para, we proceeded by a farm called Santa Cruz, through a hilly country, and a more wooded savannah than we had yet passed, to a farm called Coomi, near a stream, of the same name, now easily forded, but sometimes impassable. This place was more wretched than any at which we had yet put up; there was literally nothing to be had but the detestable tasso. The people told us, by way of apology, that they did not use milk because it was unwholesome and produced feverish symptoms!

October 21st.—After two hours march from Coomi we reached a very nice farm called Tigre, where we again found cane cultivation, and a larger mill than at Para-para. There was also a small still for making rum.

On leaving Tigre, our way lay through a tolerably level savannah environed by mountains on every side. The height from the level of the savannah seemed to be from 1,000 to 1,500, or in some few instances, 2,000 feet. Toward afternoon we entered a ravine between these mountains, and commenced to ascend toward the old mission and puebla of Santa Maria. The path was in places very steep, and none but sure footed animals could mount it in safety. As we ascended we had most beautiful views of the savannah below and its surrounding mountains. The clear atmosphere, with the thinnest possible veil of vapour or haze over the hills, with the passing clouds, and the deep shadow of the wooded valleys, gave an Italian character to the landscape.

On reaching the summit of the pass, the ruins of the old mission were seen, on the top of a hill, commanding a magnificent view of the surrounding country. There were also two or three houses on adjoining heights. We proceeded to a farm about a quarter of a mile further on, also called Santa Maria, where we were most hospitably entertained for the night by a Spaniard and his wife.

October 22nd.—On one of the buildings belonging to the mission was marked in modern figures on the clay wall, 1657, which date, we have been informed, was about that when the missions were first founded. It is supposed that they were dismantled, and that the priests were finally driven away or massacred, soon after the ultimate success of the revolutionists at the battle of San Felice in 1813.

On one of the mountains to the south east there is, we were told, a small lake near the summit, which our host said he had seen but was afraid to approach, as the

ground shook as he advanced. This hill is called Guacamaio, and it was near it that the rebel BRASHE was routed by General SONTIJA on the 15th of June 1856, after which he fled and, being taken near Guacipita, was shot and speared.

We did not leave Santa Maria till about noon ; and in about an hour Upata was seen at the foot of a range about 7 or 8 miles distant. We reached it between 2 and 3 p. m., and got lodging at the house of a German goldsmith, blacksmith, butcher and cattle-farmer named DRAEGER. We had scarcely made this arrangement when a person came to ask for our passports, which had not yet arrived, being with our luggage on the donkeys. This led to a grand discussion as to our right to enter the country except by way of Bolivar. Various rumours were afloat about us, the general impression being that a large party were coming up the Cuyooni to claim the country and the diggings as British property ! It was also reported that Dr. BLAIR had been killed by the Indians. We also heard that a Mr. BRATT had arrived here, with instructions from Lieutenant Governor WALKER, but had already proceeded to Tupuquen. It was also said that Mr. SHANKS and another were now on their way up the Cuyooni.*

A Mr. PEDRO MARIA NUNES introduced himself to us as having been in Demerara and there married an English wife. He lives about a mile out of Upata, and

* These expeditions were actually sent ; and the reports of Messrs BRATT and SHANKS, which however contain but little valuable information, may be found in the printed minutes of the Court of Policy for October—December, 1857. Among these same minutes will also be found the report by Messrs. CAMPBELL and HOLMES.—Ed.

invited us to breakfast with him the next morning, which we agreed to do.

October 23rd.—The situation of this village, surrounded as it is on every side by hills, appeared to us confined and hot ; but we were told that there is naturally a good breeze, and that the temperature varies from 18 to 22 Reaumer, whilst at Bolivar it is at least 5 degrees higher. The houses are very neat, built in Spanish fashion, with outside gratings to the windows, white-washed clay walls, and red-tiled roofs. There is a church in the centre square. I observed but one house of two stories ; but this was very nicely situated and, as in Mexican villas, had a flat roof, where the inmates spend the evenings. There are a few good looking stores, and several houses are now being built. Altogether the place has a thriving appearance, caused probably by the traffic to and from the diggings.

As usual, innumerable delays prevented our getting away from Upata till 7 a. m., but we reached Signor NUNES' house in half an hour. We found his English wife to have been a Miss DAGG, daughter of JOHN DAGG of Essequibo.

All the hills in the neighbourhood, we were told, abounded in very rich iron ore, of which we were shown excellent samples. After breakfast we were taken to the hill* opposite the house, which is densely covered with wood, through which we made our way to the summit. We found that the whole hill, from base to summit, consists entirely of the richest iron ore. Some samples appeared almost pure metal ; and our informant estimated that these samples contained from 50 to 70 or even 90

* This hill is called Sierra San Juan, according to Dr. BLAIR.—ED.

per cent. of pure iron. He stated that he had traced similar rocks for more than 20 miles on each side of Upata. Near the top of the hill the rocks seemed to be particularly rich, the broken portions which lay about being like the refuse of iron castings in a foundry.

It was past 3 p.m. when we left Signor NUNES' house to proceed to Mayore, distant three and a half leagues from Upata. Moreover, having lost our way we did not reach our destination till long after dark.

October 24th.—Here at Mayore, as a somewhat noteworthy fact, it may be remarked that we got a good supply of milk.

Starting at 8 a.m. for Guacaima, our next stage, the country through which we passed was quite as hilly as before, and the road, or rather horse-track, was exceedingly rugged and bad. The country was much covered with timber of small size, and open savannah was seldom seen. Not a single house was passed by the way; but an entrance, something like an avenue, seemed to indicate a house in the neighbourhood. We reached Guacaima about 1 p.m., the distance travelled being called five and a half leagues.

October 25th.—We started this morning at half-past six in order to reach Las Tablas, said to be distant nine leagues, before dark. The road continued much the same as before. A series of wooded hills lay on either side as far as the eye could reach; and only one inhabited house was seen, at a distance. On the right, the road is for a short distance parallel with a mountain stream, with considerable rapids and falls, judging from the sound, for they are not visible through the trees. This stream was the Upata. About 10 a.m. we passed

close by the site of the former mission of San Felicé, situated on a hill below which the last battle for independence was fought, and the Spanish army routed and destroyed to a man. Here the savannah became more open and level, and continued so, with but slight exception, for the rest of the way.

About half-past eleven, the majestic Orinoco appeared in sight, barely visible through the rain-clouds which were floating over the savannah. The sound of a great water fall was also distinctly heard, coming as we afterwards ascertained from the falls of the Caroni, which are heard all the way to Las Tablas, from which they are distant, I should suppose, not less than six or eight miles. The view of the river gradually opened up, and was strikingly grand, looking like an inland sea, two or three miles broad.

Las Tablas, as approached from Upata, appears well situated, on a high bank overlooking the river; but only a few small houses and thatched roof as yet indicate what its future may be. One or two stores of a better class have lately been built near the river.

[Here ends Mr. CAMPBELL'S diary,—but Dr. BLAIR continues as follows:—ED.]

We found that the Alcade (of Las Tablas) had received an order from the Governor of Bolivar to compel us to proceed to Bolivar, there to be detained until he should return from Tupuquen. We positively refused to comply with any such order unless under personal violence; and Mr. MATHESON, the British Consul at Bolivar, who fortunately for us happened to arrive at Las Tablas on the same morning on which we arrived, telling the Alcade

that he would take on himself the responsibility of our departure, we left. We also agreed with a negro, a native of Trinidad, to carry us in a corial to Kariapo, the last settlement on the Orinoco.

October 26th.—We were to have left Las Tablas at 10 this morning, but there was another hitch with the Alcade, who refused the necessary permit to drop down the river. Mr. MATHESON had again to be called in, and it was 1 p.m. before we could get under way.

October 27th.—We did not reach this place (Barancas) until midnight. A Mr. BURNETT, who resides here and has a contract for the supply of cattle to the French Government in Cayenne, having offered us a passage to the Barima mouth in the cattle-ship 'Loyal,' we have paid off our canoe-master, and shall sail to-morrow morning.

October 28th.—We did not leave Barancas till 8.40 a.m.

October 30th.—We reached Kariapo at 10 yesterday evening. CAMPBELL was sick.

October 31st.—We left Kariapo at 8.30, and about 10.30 the pilot left the "Loyal." We, with our servants and luggage took passage in the pilot-boat, and started off for our own schooner (the *Pheasant*) which, according to agreement, lay since the 20th instant at the mouth of the Barima, about 5 miles from where we left the "Loyal." Last night CAMPBELL had a bad night, fever and disturbed brain. I left the "Loyal" perfectly well; but HOLMES had to be carefully hoisted down into the boat.

Up to the time we reached Barancas we had enjoyed perfect health; we forded the river and climbed the high

hills ; never a day did our steeds stand still ; fresh we rose up upon the morrow ; all our words and thoughts had scope ; we had health and we had hope—toil and travel, but no sorrow. Our attempted detention at Las Tablas, however, had annoyed us somewhat, and delayed our voyage down the river till noon ; and we did not arrive at Barancas till midnight, and there we were further detained. HOLMES could not resist sleep ; and he slept for five or six hours on the baggage in the clear moonlight. We did not sleep well that night (after arriving at Barancas) for we were in a walled house, to which our forest life had given us an aversion. We were tolerably well ; but after breakfast HOLMES became sick and took to his hammock. CAMPBELL and I strolled in the evening through the village to the cross-road that leads to Tobasco and Maturin. We passed most intolerable stinks of tasso and decaying flesh and slaughter-house refuse. We found also that the village is surrounded on all sides by lagoons which, though navigable by schooners in the rainy season, become dried up and covered with grass during the dry. They were now half dry. The sun during the day had been hot, close and oppressive to a degree we had never before felt, and we had to close the doors and windows of the house to keep out the heat. We had evidently been predisposed to disease by the previous day's hardships, and we were exactly in the place where the germs existed in abundance. All day yesterday HOLMES and CAMPBELL were very ill, but up to this morning I felt in good health, until we got into the pilot-boat. Then, the two hours' exposure to a parching sun, the slight motion of the sea and the immediate contact with my sick companions completely upset me. We had been so

confident of maintaining our health, after the severe trials endured before reaching Caratal, that I had given our medicine-chest to the Post-holder (Mr. McCLINTOCK) for the use of the Indians on their downward passage, and had retained only about 40 grains of quinine and an ounce of opium. The last of the quinine I gave away at Barancas.

When we reached our schooner we found all well; and we propose sailing this evening and hope to reach Georgetown in five days.

[Here ends Dr. BLAIR's diary. On November 1st, the schooner was off the mouth of the Waini. The invalids were then suffering much from want of proper food, the stores which they had left on the schooner having been inconsiderately consumed during their absence. There was hardly anything but salt pork and biscuit left. The next day the pilot-tender met them with stores. The next two days they were at sea, all the three travellers continuing very ill; and at 4 a.m. on Thursday the 5th of November they reached Georgetown. All three were then extremely prostrated; and Dr. BLAIR died the next day.—ED.]



Occasional Notes.

Etymology of the word 'Grail-stick'.—On page 204 of the first volume of *Timehri* is an allusion to the 'grail-sticks' which are used on the wood-cutting grants of this colony to drag the timber from the place where it has been felled to the nearest river or creek, for further transport by water; and there is an enquiry as to the etymology of this word. Mrs. HAMPDEN KING has kindly written to me on this subject as follows:—

"I have been trying to hunt up the parentage of 'grail-stick,' and I am inclined to think that its ancestry may be traced to the Dutchmen. It occurred to me that as the Dutch were the first woodcutters, they, in all probability would leave behind them the terms used in the craft. On looking into an old Dutch-English Dictionary in my husband's library, I find 'greel=horse-collar' Now the grail-sticks are described as 'yoking men in couples.' Considering the resemblance there is in the meaning of the two words, do you think it possible that *grail* was once *greel*?"

'Couvade'.—The subject of *couvade*, to which allusion was made in the last number of *Timehri*, is so curious and so interesting that no apology is necessary for the insertion, from time to time, as they occur, of further notes on the subject. Mr. ALEXANDER WINTER writes to me as follows:—

"I remember when settling with the Carib captain for his services with Governor BARKLY'S Expedition in Corentyn, he brought back the salt-fish, and asked to have it exchanged for some other article. Upon which, I asked him if he did not like salt-fish. He replied 'yes, he liked it very well, but could not eat it at that particular time because *his wife had belly!*' By the way, where does the word 'couvade' come from? You remember the allusion to the practice in *Hudibras*; but

as you may not have a copy of Hudibras with you in Pomeroun I enclose you the extract: I think there is also something in BOSWELL'S Life of Johnson bearing on the subject, if not of couvade, of the priority of the father's affinity to the child over the mother's, as being the principal agent in its procreation."

The passage from BUTLER'S Hudibras to which allusion is made above is from the 1st Canto of the third part.

" For tho' Chineses go to bed,
And lie-in in their ladies' stead,
And, for the pains they took before,
Are nursed and pamper'd to do more."

Note on same page.—" In some countries, after the wife has recovered from her lying-in, it has been the custom for the husband to go to bed and be treated with the same care and tenderness. See Apollonius Rodius II. 1013, and Valerius Flaccus v. 148. The history of mankind hath scarcely furnished anything more unaccountable than the prevalence of this custom. We meet with it in ancient and modern times, in the Old World and in the New, among nations who could never have had the least intercourse with each other. It is practised in China; and in Purchas's Pilgrims it is said to be practised among the Brazilians. At Haarlem a cambric cockade hung to the door shows that the woman of the house is brought to bed, and that her husband claims a protection from arrests during the six weeks of his wife's confinement." *Polnitz Memoirs. Vol. II., p. 396.*

On the same subject I may add the following extract from a letter which I recently received from a well-known Professor of Philosophy:—

" If ever you make out the couvade, I suspect you will find that its first origin was a real sympathy between husband and wife. I could tell you (if I had space) one or two very odd stories, where during pregnancy the husband, *at a distance*, was invariably affected by sickness—vomiting in one case. Such things are laughed at by the scientific, but if testimony goes for anything, (and perhaps it does not), they are well established."

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Ocean currents on the shores of Guiana.—Mr. ALEX-

ANDER WINTER, after his paper in the present number of *Timehri* on "Our Muddy Shores" was in print, sent me the following note:—

"Another sealed bottle has been washed ashore on the sand beach in Corentyn. It was thrown over from the ship *Pleione*, Captain Renaut, in Lat. 2° 00' N. Long. 29° 54' W. 15th February, 1883, and picked up 24th April, 1883.

Jonah-myths.—Among the incidents which occur, with remarkable similarity, in the folk-lore of many and remote peoples, the swallowing of one of the *dramatis personæ* by some big animal, followed by his reappearance, sound and unhurt, from inside the belly of the monster is one of the most universal and has given rise to much speculation. JONAH in the belly of the whale, HIAWATHA in the belly of the sturgeon Nahma, Brer Rabbit and Mr. FOX in the belly of the cow Bookay, the seven kids of the well-known story in the belly of the wolf, Red Ridinghood in the belly of the wolf, are a very few out of very many instances. One other instance, from Guiana, I may be allowed to repeat. In the Ooropocari Fall of the Essequibo River there lived an omar, or monstrous being, who used to feed on rotten wood, and who used to drag down under water many canoes, merely mistaking them for floating logs; but, all the same, the Indians in them were drowned. So, one day, an Ackawoi peaiman, having carefully wrapped up two pieces of the wood with which fire is rubbed, so that no water could make them damp, dived down into the midst of the fall and got into the belly of the omar. There he found large stores of rotten wood; and to this he set fire.

Then the omar, in great pains, rose to the surface, belched out the peaiman, and then died.

Now wherever, as in this case, an incident is found to recur in the folk-lore of different people it need not be assumed that this fact indicates intercommunication of the various people by whom such an incident is told, and that the various, more or less divergent, forms in which the incident recurs are merely various corruptions of the story of some one striking incident which happened before this inter-communication ceased ; for it is, in many, perhaps in all, cases, more likely that the incident as told by each people is founded on facts or fancies which have occurred to each of these people separately. For example ; that the folk-tales of most, or all, people tell of a world-flood, does not probably indicate that most, or all, people have retained in their traditions a more or less corrupted version of a real world-flood which at some time, previous to a general dispersion of the nations, overwhelmed the whole world as we now know it, but is much more probably due to the facts (1) that floods occur locally in all parts of the world, (2) that occasionally, probably in all parts of the world, one of these floods rises to a very unusual and memorable height, (3) that these floods, in proportion as they are greater or less, do more or less serious harm to the people of the flooded country, (4) that savages, or people in the stage of thought in which such traditions or folk-tales first arise, are apt to regard the little bit of the world known to them as the whole world. And, so it happens, that such people are apt to remember in their traditions some one of the great floods which affected their forefathers in their own small corner of the world.

But while it may be admitted that a wide, or universally, spread series of traditions of a world-flood, or of any other such actual natural phenomenon, may have originated in this way, it may yet be urged that the swallowing-myths, or as it may be convenient to call them, from the example which occurs in our own folk-lore, these 'Jonah myths' can not have originated in a similar way; for it is impossible to conceive any incident which can have occurred again and again to many different people on which these myths could be founded.* This difficulty is, I think, due to the fact that while such myths as those of a world-flood are founded on some actual fact—on some actual phenomenon—which has occurred again and again to many different people, other myths, and of this kind are these Jonah-myths, have arisen equally naturally from some equally universally spread *habit of thought*. The *facts* in the former case are easily discernible by us; the *fancies* in the latter case are, owing to their nature, less obvious.

The habit of thought, or fancy, which seems to have given rise to these Jonah-myths is this. It is extremely probable, and entirely natural, that every people has in some early stage of its mental development held, not only that each and every body, be it human or animal, be it animate or inanimate, is but the outer, visible form

* I am of course not ignorant of the explanation that the 'solar-mythologists' would give of Jonah-myths; but it is so utterly impossible to me, after a considerable and close personal intercourse with 'savages' to believe that people in their stage of thought could ever have held the highly elaborate and poetical conceptions which solar mythologists would attribute to them, that I can accept no such dicta of that school of mythologists.—ED.

of the being, which is the spirit within, but also that this spirit is not destroyed, or indeed affected, by the cutting asunder of the body or by its division in any form. For example, among innumerable similar instances occurring in Kaffir folk-lore, is one story which tells how, to gain a certain end, a woman plucked the hairs from her head and scattered them about in different directions, and how afterward the tufts of hair all spoke and answered in the voice and manner of the woman; and, again, here on the savannahs of British Guiana, there is a small bird which, because it is supposed to be possessed of a malicious spirit, the Indians kill whenever they can; and in so doing they take care that not one feather drops and floats away, but burn and destroy all, lest even a single feather should do as much mischief as the whole bird would have done.

And if this is the universal primitive habit of thought it is obvious that the mere fact of being eaten would not affect the spirit of any body, and that, for instance, if once a man that has been eaten can find a way out of the eater, if, for example, the latter is cut open, then the eaten one is free to come out, whole and uninjured and is as he was before.

Thus each of the widely spread Jonah-myths has separately and quite naturally arisen from one and the same very simple and most primitive savage belief.



Analysis of one year's work on a Sugar estate.—The Honourable WILLIAM RUSSELL has very kindly supplied the following very complete analysis of the work done at

Plantations *La Bonne Intention* and *Beterverwagting*
during the year 1882 :—

Acres in cane cultivation	657
Acres cut this year	657
Gallons Juice (180°) per acre	4,776 gals.
Dry Sugar per acre	4,392 lbs.
Sugar per acre in Molasses & Rum	2,630 lbs. total 7,022 lbs.
<hr/>	
Tons canes per acre	34'1 tons
Punts " " " "	11'7 "
" " L.B.I.	7,714
" " B.V.W.	565
	total 8,279 punts
<hr/>	
Tons Juice L.B.I.	14,949
" " B.V.W.	1,094
	total 16,043 tons
<hr/>	
" Canes L.B.I.	22,416
" " B.V.W.	1,640
	total 24,056 tons
<hr/>	
Per cent. Juice from Canes... ..	66'6
Punts Canes per clarifier 600 gls (180°)	1'4 punts
Clarifiers Juice each 600 gls. at 180°...	563'8
Juice at 180° Fahr. gallons L.B.I. ...3,138,115	
" " " " B.V.W. ... 245,215	total 3,383,330 gals.
<hr/>	
Gallons Juice per 2000 lbs. nett hhd...	2,185 gals.
Average Glucose in Juice	'64
" Density of Juice 8'5 B=Sp. G.	1,062
" Pol'zation of Juice at 80° Fahr.	94'1
Sugar in Juice mufac. into dark crystals	834,696 lbs.
" " " " yellow "	4,140,790 lbs.
" from L.B.I. canes	4,613,810 lbs.
" " B.V.W. " "	361,676
	total 4,975,486 lbs.
<hr/>	
" obtained, dark crystals	652,002 lbs.
" " yellow " "	2,444,320
<hr/>	
" " L.B.I.	2,885,835 lbs.
" " B.V.W.	210,487
	total 3,096,322 lbs.
<hr/>	
" per cent. dark crystals... ..	78'1 per cent yellow 59

Average Polarization of Juice at 80°	...	...	9'41
Gallons Molasses (14 lbs. per gal.) from Masecuite			
10'34 lbs. invert sugar per gal.	...	...	181,694 gals.
" " per 2000 lbs. sugar	...	...	117'3 "
" " Rum distilled (43'2 o.p.)	...	...	80,238 "
" " Molasses shipped	...	...	9,358 "
Cane Engine hours at work	...	...	1465'6 hrs.
Juice ground per hour	...	...	2308.4 gals.
2 copperwalls (487.25 □' h.s.) hours at work	...	...	2074 hrs.
Average gallons evaporated per □' h.s. per hour	...	...	13 gals.
Syrup from copperwalls at 170°	...	...	2,038,435 "
" " " sp. gravity at 80°	...	...	1083
No. I Vac. Pan (520 □' h.s.) hours at work	...	...	2145'2 hrs.
No. II " " (277 □' h.s.) " "	...	...	2164'5 "
Average gals. evaporated per □' h.s. per hour.	...	...	1'02 gals.
Cubic feet Masecuite at 90 lbs per cubic foot, or			
14'4 lbs. per gallon	...	...	62667'2 □'
Per cent. dark crystals Sugar from Masecuite	...	...	61'2
" yellow " " " "	...	...	53'4
" Molasses from d.c. 38'8 per cent. Molasses			
from yellow	...	...	46'6
2 Centrifugals, hours at work	...	...	1264'6 hrs.
Hhds. Sugar (2,000 lbs. net) cured Ψ hour...	...	...	1'2 hds.
Wash set up (1055'2)	...	...	1,340,000 gals.
Per cent. Rum obtained	...	...	6'01 gals.
Inverted Sugar used in making 1 gallon Rum	...	...	23'9 lbs.
Coal consumed Ψ 2,000 lbs. Sugar '9 ton. Total	...	...	1430'3 tons
" " Ψ 100 Rum '5 " "	...	...	377'8 "
" " Ψ Acre cul, drainage '6 " "	...	...	404'3 "

(Signed)

FOSTER MASSIAH.

New Plants from British Guiana.—In the February number of the 'Journal of Botany' Dr. MAXWELL T. MASTERS published notes on certain new and previously undescribed species of passion-flower. Two of these are from British Guiana, where they were collected by Mr. JENMAN. One of these two British Guiana species,

together with a second new species, from southern Brazil, have been formed into a new genus called *Mitostemma* (MASTERS) containing the two species *M. Glaziovii* and *M. Jenmanii*. Dr. MASTERS notes that, it is a singular circumstance that the only known representatives of an entirely new and distinct genus should have found their way into the herbarium about the same time and from two such widely separated districts as South Brazil and British Guiana respectively. The second new passion flower from this colony has been named *Passiflora deficiens* (MASTERS).

It is intended to publish descriptions of these two species, together with those of a very considerable number of other new plants recently discovered in British Guiana, in the next number of this Journal.

EVERARD F. IM THURN.



Report of the Meetings of the Society.

Meeting held January 11th.—The Hon. B. Howell Jones, Vice-President, in the chair,

There were 17 members present.

Elections.—*Members* : Charles Simon Davson ; David Hugh McGowan ; James Richard Mckenzie ; James Gray ; J. M. Dawson.

Associates : John W. Gallienne ; W. H. MacIntyre ; James W. McInroy ; H. Y. Delafons.

Treasurer's Account.—The Treasurer laid on the table a balance sheet for the year, which showed a balance in favour of the Society of \$3,321.62. Messrs. T. H. Glennie and L. M. Hill were requested, and consented, to audit the same.

The Amsterdam Exhibition.—The Secretary stated that he had received a letter from the hon. William Russell, dated 8th January, of which the following is an extract :—

“ Business calls me to Berbice this week, consequently I shall not be present at the monthly meeting of the Agricultural Society on Thursday. This I regret, as I wished to lay before the meeting an extract from a letter from Baron Siccama, in which he kindly offers his services in connection with any exhibits that may be forwarded from this colony to the Amsterdam Exhibition.

As there have been no arrangements made for space, etc.. by this colony, I am somewhat at a loss to know how private exhibits could be admitted ; no doubt Baron Siccama would use his influence to get such placed in the exhibition, and knowing this colony as that gentleman does, I need not point out the value of his services to any of my fellow colonists who may wish to send on exhibits. Any aid I can render in the matter shall be given with pleasure. Perhaps you will bring this before the meeting.”

The Chairman said that it was too late now for private individuals to send from here. They might ask Mr. Russell to thank Baron Siccama for offering his services. He could not but express his regret that the matter had not been before the Society before now.

Essay on the Sugar-cane Mill.—A paper was received from Mr. J. H. Mann, entitled "The Sugar cane Mill; its usage and capability."

The secretary said that it was a very long paper, and Mr. Mann had suggested in writing that instead of fatiguing the meeting by reading it, it might be desirable to take it as read and have it published in one or two newspapers. Acting on this suggestion, he had arranged with the proprietor of the *Argosy* to put it in type, and it would appear in that paper on Saturday, after which slips would be supplied to the other newspapers.

The Vice-president said he did not think anybody would want to hear the essay read now and that it would be better to see it in print.

Mr. Williams said that some of those now present came with the express wish to hear the paper read.

The Hon. H. Braud said he was one of those gentlemen who came with the intention of hearing the paper read, but as the Secretary had mentioned that it would be published in the *Argosy* on Saturday morning, it might lie over until next meeting and then be brought up for discussion.

The Curator of the Museum.—A letter was received from the Government Secretary acknowledging the receipt of a letter from the Secretary of the Society, in which it was intimated that the Society had selected, as

Curator of the Museum, Mr. E. H. Glaisher, B. A. of Trinity College, Cambridge.

The Microscope.—Rules for the use of the microscope, lately presented to the society by Mr. Alexander Reid, drawn up by Mr. G. H. Hawtayne, were submitted ; and it was agreed that the necessary bye-laws for the enforcement of these rules should be prepared and passed in the usual way.

Donations—

Pamphlets.

“On the Animism of the Indians of British Guiana,” by E. F. im Thurn.—From the Author.

“On some Stone Implements from British Guiana,” by E. F. im Thurn.—From the Author.

Newspaper.

“*The Barbados Agricultural Gazette*” (with Meteorological tables) of 1st December, 1882.—From His Honour J. Hampden King.

Engravings.

Illustrations to “St. Ronan’s Well.”—From R. W. Imlach.

The meeting then dispersed.

Mr. Mann’s paper was as follows :—

The Sugar-cane Mill, its Usage and Capability.

Before the reading of this paper, circumstances demand, and, I may add, fortune permits me to say a few words anent the article on the “Efficiency of Cane Mills” by Mr. Fryer, that appeared in the December number of the “Sugar Cane.”

The similarity of certain opinions and ideas, although expressed very differently in the two papers, is so striking that I might be accused of plagiarism. But as my paper was written before the arrival of the second mail in December, I am sure to escape such a charge, particularly as I had, in one portion, given Mr. Fryer the palm for originality ; so that, giving publicity to the following, I am encouraged in the belief, that the above coincidence will but strengthen the interest in both papers.

The feeding of a mill is a very important though neglected item in

connection with its capability and safety, and I intend to describe the actual working, so as to point out the defects in the present style of doing things, and what can be done to improve matters.

The canes are thrown into the carrier, on both sides, in such a manner as to make them lie, as nearly as possible, parallel with the carrier; this is of course, a great improvement over the old hand-feeding process, and works very well so long as the feed is regular. But there are many contingencies to make it otherwise; *first*, the laziness and stupidity of the throwers themselves, sometimes throwing quickly, and then standing up idle, or continuing to throw whilst the carrier, from some cause or other, is not moving; *second*, the changing of the cane punts,—this leaves a gap on the carrier, on the one side, where there are no canes, but which could be partly obviated by prolonging the carrier so as to have a spare punt on both sides. This irregular throwing causes the requirements of the mill to vary continually, alternating with a *light* and *heavy* feed; with too light a feed the backers should be hard at work, and, if not watched, they too often cause a “choke” by careless backing, that is, by turning back a mass of half-crushed canes, perhaps stopping the mill and engine, or at any rate necessitating a stoppage of the carrier, presenting a *third* contingency against regular feeding; again, we have a *fourth*, the choking of the mill from too heavy a feed; and all these are more or less dependent on, or consequent on, each other. There is a sort of rocking, of consequence, backwards and forwards, between the throwers and the work done by the mill; if the former be not constant the latter cannot be; all this results in short work done, in two ways, from the imperfect crushing and from the loss of time, inasmuch as the mill would be capable of a greater day's work were the feed regular, necessitating no delays; to say nothing of the danger the mill is subject to, on account of the continued overstraining.

One might infer from this, I blame the throwers; but I do not. I think it very hard to expect them to watch the movement of the carrier, and to keep on stopping the mechanical movement, into which they get when throwing canes; they do not, and cannot give the mill an excessive quantity at any one moment, so that there should be no occasion for stopping the carrier. They may however do rather more than usual when they see “big-wigs” about, whose presence inspires feelings of energy which unfortunately the engine cannot experience; but even then, I am of opinion, that the excess of power engines possess over their average development, should prevent any necessity for an intermittent

action of the carrier. And if the carrier does *not* stop, how is it possible for the poor fellows to put the canes on otherwise than regularly? A heap cannot possibly occur if there be continued advancement of the canes previously thrown, and I cannot see whence any cause for a choke or stoppage is to arise, provided that the number of throwers and the power of the engine are proportionate. So I argue, the remedy for all this evil is in keeping the carrier continuously in motion. If once a stoppage occurs, stop the throwers, empty the carrier and begin over again.

While changing a punt, you must either stop the carrier and all throwing of canes, or be content with poor crushing, the result of the mill receiving but a half-feed, taking care to prevent the commencement of the evils described above, by careful backing.

I can mention two other causes for irregular feeding, but of a totally different nature; one is the too often excessive speed of the cane carrier, which in most arrangements is equal to, or more than, that of the surface of the rollers, thus bringing up the canes quicker than the mill can take them, and causing them to heap over on to the top roller, unless the carrier is stopped; when this is the case, the regulation of the feed is wholly dependent on the poor judgment of the mill-bos'n in manipulating the carrier, instead of allowing the regular throwing of the canes to produce the regular feed required. The other cause for irregular feeding, is when the boiler power is insufficient, or when the pressure of steam has relaxed temporarily, which virtually means a reduction of the power of the engine, until it becomes incapable of coping with the work given it to do; the mill chokes and the carrier has to be stopped; the remedy for this latter is, never to attempt grinding unless the proper pressure of steam is available, it being better to wait for the steam, than to make shift with low steam; and for the former, reduce the speed of the cane carrier to about 20 per cent less than the rollers.

Next let us study the crushing of the canes, or rather how the mill takes its feed.

To the question, why have our mills three rollers, few would be able to give a ready answer, except it be because two will not do; when the next question would naturally follow, why will not two do? and what is the function of the front roller? If the front roller be screwed up to $\frac{1}{8}$ th of an inch, the canes will not go in, and we reason, the rollers lack a certain something to enable them, when screwed up, to take canes and

crush them at one operation ; this something is " power of grip," hence we have to introduce two operations, the first being a *feeder* to the second, it however need not do any crushing, as the mill could be conceived to work just as well, were the front and top rollers capable of gripping the canes, without crushing them. There is no inherent necessity for taking " two bites of a cherry," and I am inclined to think, the front roller, in heavy mills, does a very small percentage of the total work.

Now granted we ensure regular feeding, as far as possible, by keeping the carrier continuously in motion, so that the quantity of canes that reaches the mill is what the throwers handle, in any one moment, we shall not get good crushing if the mill " refuses" her feed ; and here we have an evil familiar to us all, the jerky movement of the rollers, the terrible racking of the whole machine, the starting of keys, the loosening of rollers and the like, and all because the canes, that are fed into the mill, will not pass out between the top and back rollers, allowing an accumulation of half crushed canes to take place, between the top roller and the trash turner, which getting more and more solid every moment, refuses to move forward, and is seldom released except by reversing the mill.

This refusing, may by some be assigned to various causes, the set of the rollers, set of the trash turner, a cane getting crosswise, or the smoothness of the rollers ; I have seen attempts to remedy this evil, by altering the position of the trash turner, but am of opinion, trash turners have often been wrongfully blamed, and the *sole* cause is the smoothness of the rollers ; I do not say that a trash turner could not be so badly set as to prevent a feed passing through, but that in all instances we have to resort to some method of roughing the rollers ; we make a murderous attack upon the roller, with a heavy jaggng tool, or hack away 10 to 20 per cent of its surface, by chipping heavy grooves for the purpose of enhancing the " power of grip" ; this however soon results in disappointment, the same having to be done over and over again, because the metal is soft and the roughing lasts a very short time.

Now we come to my strongest argument relative to the good working of a sugar mill. I consider we ought to blame the makers who have supplied rollers of inferior metal, and would recommend any one getting new rollers to have them made of the very best iron procurable, or even of steel ; for prime cost is of very little moment, in a matter of such vital importance. Rollers should not wear smooth and shiny, but,

if made of superior metal, will always remain rough, the grain of the iron standing out in relief all over the surface.

For those who care to accept my suggestions, and to follow them up with further experiments, I beg the perusal of the following, which is the result of practical experience, and embraces an invention which I publish in the hope it will be of some good to the sugar-making community.

Let the rollers (top and back at any rate) be of good hard iron, not necessarily brittle, and turned smooth, that is, without the usual tool marks, which in rollers of inferior metal, are simply a *farce*, as they last no time at all, and in rollers of superior metal, not necessary: they will then possess the principle essential to perfect crushing, viz., smooth surfaces, but to ensure perfect immunity from the refusing of canes, we must introduce the groove; which preferably shall be as follows:— $\frac{3}{8}$ of an inch wide by $\frac{1}{4}$ of an inch deep, semicircular at the bottom, and at a pitch of about 3 inches to $3\frac{1}{2}$ around the circumference of the roller. The chamfering of the trailing edge of the groove, as advocated by some, I deprecate most strongly, as being unnecessary and absolutely detracting from the power of grip; the grooves should be cut slightly on the spiral, and not parallel with the axis, so as to minimize the inequality of the surfaces of contact.

By this means, we have a mill possessing perfect immunity from the objectionable "refusing," and whose rollers, being hard, will out-live those of inferior metal, by not wearing smaller or getting hollow. These advantages are productive of the happy result of better crushing. But my invention, above referred to, goes a step further, and introduces an idea, which I believe to be novel as regards sugar mills, viz., by causing the periphery of the top roller, to travel somewhat quicker than that of the back roller, there will be a bruising pressure, which, together with such perfect "grip," will tear up the canes, at the time of maximum compression, and liberate the juice with greater freedom.

This can be effected without in any way altering the design of the mill, or disturbing existing arrangements, by merely substituting a new set of pinions, the top having one tooth less than the bottom ones, say, 18 teeth in the top, and 19 in the bottom, giving a "slip" on the canes of nearly $5\frac{1}{2}$ per cent.

The advantage of the hunting tooth is everywhere appreciated, and will be particularly so when applied to mill pinions. They will wear more evenly together, and must last longer, they are also indirectly strength-

ened, for inasmuch as there is a certain drag between the top and back rollers, through the crushed cane, by so much will the strain on the pinions be lessened.

All this has been put to practical test, there being more than one mill fitted in the way described, producing crushing superior to any other single crushing I have seen, and suggesting the idea, that to crush such megass a second time would be wholly unprofitable.

This brings us to a stage at which it may be "a *propos*" to say a word on double crushing. I do not believe in double crushing, nor in the arguments put forward in favour of maceration, the benefit derived from the latter, being, in my opinion, limited to the prevention of acidity, which might otherwise set in between the two mills¹

Here again, I do not mean to say all double crushing is unprofitable, but that we should be working to better advantage by paying attention to heavier *single*, rather than to *double* crushing. Circumstances may combine in such a way that double crushing is necessarily profitable; for instance, an estate having two small and light mills, neither of which can do heavy crushing, will do well to open up the first mill and put the additional power into the canes at a second operation. But if put into the same weight of canes at one operation, it would produce the same, or better result, by means of a larger engine and a stronger mill, possessing the improvements suggested; and even in the apparently most successful arrangements of maceration and double crushing, the question of commercial success must hinge upon the saccharine quality of the juice, from which I infer, there is a sort of neutral point in the polariscopic readings of the juice, above which, it may be profitable, but below, very much the reverse, particularly with the addition of steam and water; this natural point cannot, of course, be defined, but I consider the manager ought to be allowed to exercise his judgment, under all the varied conditions as to whether he should do double crushing or not.

There is an erroneous opinion amongst those who, I suppose, have not thought much about these matters, that the work a mill is set to do is a test of its capability; certain mills are spoken of as doing so much per cent, others that can only do so and so, whereas any mill *can* be made to do differently, by varying the conditions; its actual capability is limited only by the ultimate strength of the machine. By increasing the power expended on a given weight of canes we improve the crushing or, *vice versa*, the same can be effected by causing a lesser

weight of canes to absorb a given development of power. Hence, the quality of the crushing must vary, *directly* as the power, and *indirectly* as the weight of canes. Here then we have the backbone of the argument in favour of slow-speeded mills; an increase in the ratio of the gearing, decreases the speed of the mill, which if taking the same feed as before, that is, the same quantity per revolution, will produce superior crushing by means of the additional power available per ton of canes operated on; and I consequently advocate the adoption of the slow-speeded mill.

Another mistake a great many people make is in supposing the size of the mill to be a gauge of the work it can perform; just because one mill is larger than another it will not necessarily do more work or better crushing, as this depends upon the power put behind each: this *power* is the gauge of the work done, the *engine* is that which virtually does the work, the mill being merely the "medium", the instrument by which the power is put into the canes.

To illustrate my meaning more forcibly, I will use the following simile. It cannot be supposed the substitution of a larger screw propeller would increase the speed of a ship, without also putting more power into the propeller; so it is, that mills, although of different size, must do the same amount of work, under similar conditions; if driven by engines of the *same* size, some may be doing the better crushing, but they do less of it, since we cannot have quality and quantity at the same time.

Careful attention paid to the condition and working of a mill might decide between profit or loss; as it is quite within the limits of probability to be able to improve the expression (and, relatively, the out-put) from 60 to 66 per cent, or 10 per cent increase, representing of itself a fair profit upon the annual expenditure.

I will now proceed with a description of certain tests for ascertaining the comparative crushing power, under varied circumstances, of the same and different mills; I say "comparative," because it is not necessary to know the *actual* expression of juice, to judge of the work done; this I will show further on.

We have first, the elaborate, costly, and I fear unsatisfactory experiment of weighing a few tons of cane, and its components, megass and juice; but this, if correct, only tells us the percentage on the total weight of canes, and is valueless as a comparison, since it is evident that other canes, carrying more or less woody matter, would yield different percentages, under the same treatment; neither can we correctly compare

this percentage with the total amount of juice in the canes, (found by the diffusion process) ; because it is impossible to compare, on the same footing, results of processes so dissimilar as the mechanical and the diffusion.

If the test is to be made in this way, we should have a powerful hand-mill, capable of putting enormous power into sample canes, and so ascertain, what might fairly be considered the maximum possible expression by mechanical means. Let us take some imaginary results as given in the tabular form below :—

Actual expression.	Maximum possible.	Corrected percentage.
60 o/o	80 o/o	75 o/o
65	85	76½
65	80	81¼

From which we see, 65 out of 85 is only a trifle better than 68 out of 80, but that 65 out of 80, is more than 6 per cent better.

This I take it, would be a fair test, but one far too laborious for any practical use.

Next comes the practice of treating average samples of canes and megass, by the diffusion process, and drying, to discover the percentage of woody fibre &c. in each, from which a simple calculation will show the actual percentage of expression ; this, too, is of no use as a comparative test, because we are comparing the actual expression, with results no mechanical process can possibly attain to.

We see then how futile all tests are that attempt to discover the amount of juice expressed, and I argue, we are altogether wrong in looking upon this as a test of crushing ; we ought rather to say “ How dry is my megass ? ”

I consider two mills are doing equal crushing, when the megass from each carries the same percentage of moisture, independent of the juice obtained ; and to make a comparative test, we have merely to weigh a sample of megass, dry it, and weigh it again. The percentage of the latter on the former represents the quality of crushing. For instance :—

Canes	Juice	Megass	=	Dry	+	water	Comparative crushing.
100	70 o/o	30 o/o	=	20	+	10	66⅔ per cent
”	70	30	=	15	+	15	50 <i>a</i>
”	70	30	=	10	+	20	33½
”	60	40	=	20	+	20	50 <i>b</i>
”	60	40	=	15	+	25	37½
”	60	40	=	10	+	30	25

Here we see the two samples of megass, marked *a* and *b*, that lost half their weight on being dried, (representing 50 o/o comparative crushing), yielded different weights of juice, not because the crushing was any better in one case than in the other, but because the total quantity of juice was 85 o/o in one, and 80 o/o in the other; hence a yield of 60 out of 80, is as good crushing as 70 out of 85.

The usual method adopted for drying megass is, I believe, exposure to the sun, or to the radiation of heat from the outside of a boiler. Either of these is a long process, and I fear unsatisfactory, as it is not continuous, and suggests the probability of chemical action or decay taking place. I would recommend the sample be placed in a copper vessel, wholly enveloped in steam, at 50 or 60 lbs., inserted either in a boiler, or in a separate vessel, supplied from the steam main, the surrounding temperature of some 300° Fah. would effect comparatively rapid evaporation of the moisture from the megass, without, I trust, distilling over anything but water.

Another easy test that can be made without expense or trouble is by the use of the thermometer alone, (suggested to me by Mr. Fryer, who had already made some experiments); it involves the well known principle of physics, that an increment of temperature is a measure of the absorption of power. Thus, when under pressure, the canes part freely with the juice, which gets away, but the megass remains, and, by absorbing power, gets warmer than the juice, hence, the difference between the temperatures of the megass and the juice can be taken as a fair representation of the work done upon the megass, that is, the quality of the crushing.

Experiments in this way have shown that a difference of temperature of 7° Fah. is acquired with fair crushing.

9° or more.....very good

5° or less.....poor

I may add, in conclusion, a very good, and certainly the most simple method, for judging the quality of crushing, is perhaps the use of one's eyes. We need not weigh or measure any thing, for the appearance of the megass *alone* will tell us whether the mill might be doing better or not.

JAMES H. MANN.

Demerara, 29th December, 1882.

Meeting held 8th February.—The Honourable W. Russell, President, in the chair.

There were 8 members present.

Elections.—*Member* : J. Owen Alexander.

Associate : Thomas Morris.

Treasurer's Account.—The Secretary stated that the treasurer's account for the past half-year had been audited and found correct. A vote of thanks was passed to the treasurer.

The Microscope.—Mr. Hawtayne moved the following rules of which notice had been given at a previous meeting for the management of the Society's microscope:—

1. The microscope shall only be used by members and associates of the Society, and on the table provided for it, and it shall be kept in the rooms of the Society, and on no account shall it or any of its apparatus be removed therefrom.

2. When not in use, it shall be kept in its case, which shall be locked and the key retained by the Curator or person in charge thereof, to whom applications for the use of the microscope shall be made; such applications shall be registered and granted in the order in which they are made.

3. No member or associate shall have the exclusive use of the microscope for more than one hour, when it is required by other persons, unless he requires it for some particular purpose which he shall specify in writing when applying for its use, in which case such member or associate may have exclusive use of the instrument for a period not exceeding three hours.

4. The Curator or person in charge of the microscope, before delivering the instrument and its apparatus to, and on receiving it from any member or associate, shall examine the same and shall point out to such member or associate any damage or loss which the microscope or its apparatus may have suffered while in the charge of such member or associate, and shall forthwith report the same to the Managing Director for the month.

5. Any member or associate who shall be declared by a majority of the Managing Directors to be responsible for such damage or loss shall

be by them required to make good the same ; and in case of refusal or neglect to comply with such requisition, the name of such member or associate shall be struck off the roll of members of the Society.

6. The brasswork and stand of the instrument, and also when necessary, the apparatus should be dried with soft leather, before the same are put away after use ; and it is recommended, that great care should be observed in cleaning the lenses, which should always be done with soft silk.

The rules were accepted unanimously.

The Curator of the Museum.—The Secretary mentioned that the following letter had been received from Mr. Walker, dated January 16th, respecting Mr. Glaisher—the gentleman appointed as Curator of the Museum :—

I have the pleasure to acknowledge your letters of the 24th and 25th ultimo, with accompanying documents, from which I learn with great satisfaction, that the Directors have almost unanimously decided upon offering the Curatorship of the Museum to Mr. Ernest H. Glaisher. In accordance with the terms of the Extract Minute of their proceedings on the 11th of December, I have made the necessary communication to Mr. Glaisher, and I now forward his acceptance of office upon the conditions named.

Mr. Glaisher has been sedulously engaged ever since I forwarded his application, in studying the various special branches of knowledge indicated as desirable by Sir Joseph Hooker ; and it will be perceived from his letter, that he is still so employed and will persevere until his departure for the colony. I feel very sanguine that the Directors will have no reason to regret their decision in this matter. I have also intimated to Mr. Mellor the reasons which influenced them in declining to avail themselves of his services.

I observe, in the Report of the proceeding of the anniversary meeting of the Society, that on the motion of the President and Vice-President, the best thanks of the Society were awarded to me for my services as Director resident in London, during the past year, and I shall deem it a favour if you will kindly become the medium of conveying to the Society my grateful thanks for the honour thus conferred upon me.

Anniversary of the Society.—The secretary said that the 18th March would be the anniversary of the Society,

and enquired what would be done in respect to it? The President, Mr. Hawtayne, Mr. Imlach, and Mr. Garnett were appointed a Committee to arrange matters.

Mr. Mann's Paper on the Sugar-mill.—The Hon. W. Russell referring to the paper by Mr. Mann on the Sugar Mill, said no subject could be of greater interest to the members than that of the expression of cane juice from the canes, and he wished Mr. Mann were present to discuss the subject; although the paper had been read and remarked upon it would be better if he were present to take part in the discussion on all points. He had gone through the paper very carefully, and would like to take objection to one or two things, he having had some practical experience; it would, however, be a waste of time to discuss the matter during Mr. Mann's absence. He moved that the paper be discussed at the next meeting, and Mr. Mann be requested to be present.

The motion was adopted, and there being no further business the meeting rose.

Meeting held March 8th.—The Honourable W. Russell, President, in the Chair.

There were 9 Members present.

Elections;—*Members*: The Hon'ble E. F. Villiers; James Smith; T. F. A. Williams.

Associate: Noel Menzies.

Nepaul Pepper Seed.—The following letter was read:—

Government Botanist's Office,
Georgetown, 28th February, 1883.

My dear Sir,—I herewith send you a parcel of Nepaul pepper seed and a note from Mr. Tinne to Mr. Russell, which will explain the transac.

tion to you. The estates in Mr. Russell's charge have been supplied, as have also the Botanic Gardens.

(Sgd). G. S. JENMAN.

W. H. Campbell, Esq.

And, in reference to the same matter, the following memorandum from Mr. J. E. Tinne was also read:—

16th January, 1883.

The Hon. W. Russell,

Please apportion between Jenman and the estates a few of the Nepaul pepper seed I have sent you per the *Benhope*, and let the Royal Agricultural Society have the balance. Prestoe, in the Trinidad, and the Jamaica Gardens, might have a few pods. It makes the most fragrant yellow cayenne known.

The seeds referred to were placed at the disposal of members; and a vote of thanks was passed to Mr. Tinne.

Potato Cultivation in British Guiana.—The President exhibited a few potatoes grown by Mrs. Crossley at *Pln. Canefield* in Berbice, as proof that the potato could be grown in the colony.

He further stated that he had never before seen so good a sample, of colonial growth. The subject was of some importance, as one of the many to which small owners might turn their attention. He had not had an opportunity to take lessons from Mrs. Crossley, in potatoe planting, but the next time he was in Berbice he would call on that lady, and he would reduce the result of his observations to writing for the use of those desirous to try the experiment of growing English potatoes here. He thought that Mrs. Crossley deserved very great credit, and that the thanks of the Society should be transmitted to her.

The Secretary said the only occasion on which English potatoes, grown in the colony were before the Society

was, he believed, at the only celebration of the anniversary of this Society they ever had, at which Mr. Peter Rose produced English potatoes grown in his own garden, but they were not so good as these; they were greenish and looked waxy. That was many years ago, and if the effort had been continued it might have been found that English potatoes would succeed here.

A vote of thanks was accordingly passed to Mrs. Crossley.

Mr. Mann's paper on Sugar-Mills.—The following letter from Mr. Mann, was read:—

Vergenoegen, 6th March, 1883.

W. H. CAMPBELL, Esq.,
Secretary, Royal Agricultural and
Commercial Society.

Dear Sir,—Your favour of the 12th ult. came duly to hand, intimating that my presence at the next meeting is requested, so that I may take part in the discussion on my paper "The Sugar Cane Mill." I have now to acknowledge the honour that is done me, and to express my regret at not being able to attend, on account of sickness which keeps me a prisoner in the house.

(Sgd.) JAMES H. MANN.

The Chairman said he was sure they all regretted the cause of Mr. Mann's inability to be present, to discuss the very important paper which he had been good enough to write and lay before the Society for the purpose of discussion. He (the Chairman) was prepared to go into the matter fully with Mr. Mann, and he had brought a small crushing mill used for laboratory purposes, and scales, for weighing the matter in a practical way before the members of the Society: also notes he had drawn out to refresh his memory. He was ready to read these notes now, and to have them printed, as it might induce Mr. Mann to write another paper on the subject. He (Mr.

Russell) knew that Mr. Mann was taking very great interest in the matter, and he thought that when a gentleman took the trouble to compile such a paper as Mr. Mann had done, he ought to be encouraged to go on with the subject, and if the paper were wrong in any part he (Mr. Russell) was sure that the writer would wish to have it pointed out.

The small mill having been brought beside the table and several pieces of cane having been put through it, Mr. Russell proceeded to read his notes, which were as follows :—

The Feeding of Mills.

There is much sound criticism on this head, and there is no doubt much room for improvement. Planters who have given the question much consideration have come to the conclusion that a man's power is almost the exact coefficient necessary to throw canes for a hhd. of sugar. This point settled, the mill is set so as to pass the quantity of canes necessary to make the given day's work, and instead of the front roll being deemed as of little importance, it is the set of this which is a safety-valve, and prevents such a feed passing to the back roller as would cause a fracture. My own experience is that where the bulk of the work is done with the front roller the expression of juice is the best. As when the megass passes the turner it is denuded of such a large quantity of juice as to reduce the absorption into the megass, after it has passed the final tube between the front and back roller. This absorption is always found more where large mills are at work than with smaller mills, because of the necessity to open the front rollers in large mills to enable a large feed to be passed through. The best single crushing that I have come across was at *Le Resouvenir*, where my friend Mr. Cornish set the front roll to $\frac{3}{8}$ of an inch, and ran out his engine so as to raise the speed of the mill to something like 25 feet surface per minute. Thus he ran through a thin fuel, and reduced the strain on his engine to a minimum.

The small mill before you has only two rollers, and has the rubbing action described by Mr. Mann in the proportion two to one. I have made some very important investigations with that machine, and determined that with single canes, and by a man's power at the crank, percentages

have been obtained as per accompanying table according to the woody fibre in the cane up to 68 per cent. In making these investigations it is necessary to be provided with accurate means of weighing the canes operated upon. The set on the table were procured for me by my friend Mr. Williams, and are admirably suited for the purpose. It is when one is brought face to face with the quantitative analysis of certain products, that one discovers errors made by theorists who write without making such experiments. Taking an example from Mr. Mann's table giving percentages of crushing under various conditions of the sugar cane, we have :—

Cane.	Juice.	Megass.	Dry	Percentage.
100	70	30	10	= 33½

Now, 30 pounds megass from Mill.....
 10 Dry

—
 20 must have been got rid of as vapour (water) so that this water must have left a proportionate quantity of Sugar in the megass to what was contained in the original cane juice. say 16 per cent.

Therefore we have $84 :: 20 :: 16 \times 3.81$. The wet megass must be composed of :—

Moisture.....	20
Sugar	3.81
Wood	6.19
	———— 30

which would reduce the fibre in the cane to the same proportion as that found in the beet. It is evident that Mr. Mann has never worked out a quantitative analysis of megass, and this may account for his not seeing the advantage of what is known as double crushing and maceration, for it is self-evident that for every 20 lbs. of moisture carried away in the megass there are combined with it 3.81 lbs. of sugar. Surely the difference in some shape ought to be applied to reduce this loss. I lay over a table compiled from analysis of megass.

I am quite at one with Mr. Mann in the opinion that more care ought to be taken in feeding mills : a moderate steady feed always gives the best results, both in the quality of crushing and in quantity of work, and I consider those who have extended their cane carriers to admit 4 cane punts—two a side—have made a step in the right direction.

These are a few points on which I somewhat differ from Mr. Mann. A small mill may give such good results as to put dry double crushing out

of the question, but in my opinion the larger the mill the more necessity arises for double crushing.

Mr. Russell, continuing, said these were briefly the remarks he had to make upon Mr. Mann's paper, and the results as worked out by him (Mr. Russell) by actual observation of the crushing of canes by means of a machine like that (pointing to the small crushing machine in the room). This was a question of the first magnitude to planters. Mr. Fryer had written a good deal about it, and had fallen into several errors; others too had written a great deal since, and they had also occasionally fallen into errors. He confessed that he, also, when making experiments, used to make grievous errors; one of these was always estimating the sugar contained in the cane in value as sugar, whereas sugar in the cane should be valued as cane juice. The whole cost of manufacturing the sugar had to be considered. In crushing canes, it was not that they lost so much in the value of sugar, but so much cane juice. In an admirable essay by Mr. Blake, Skeldon, on trenches, he also fell into a similar error. He calculated on the land producing so much sugar, valuing that sugar as sugar; he forgot that it was only canes, which he had to get manufactured, and there was all the expense of transportation, which makes a very great difference. He had read in one of the local newspapers articles with regard to the waste of molasses, but it must be remembered that these were very low molasses, and produced only a very small quantity of sugar. They had all their idiosyncrasies, and were very liable to fall into error when making calculations with regard to the hobby they were at just now. Again, in some of the earlier publications of this Society,

on the manufacture of sugar cane, he found many errors in the calculations, and these errors had often been reproduced. He trusted that some other member of the Society would be able to give them the result of experience. It might be remembered that Dr. Filmer, who gave this question an immense deal of attention, wrote a great many papers on the question of crushing cane, and he then expressed an opinion that it was not the size of a mill that meant good crushing. Of course, he need not tell them that in deciding the percentage of sugar from the canes, they had to be most particular in crushing, so that juice and refuse megass may be actually the same weight as the canes, minus the moisture. The table he had now tried to complete was drawn out from the results of actual experience from observation. He had no doubt that the time would come when they would be thoroughly acquainted with all the details for the more economical crushing of a cane.

Mr. Williams hoped to have heard some gentleman criticise Mr. Mann's paper, with respect to the working of the mill.

Mr. Stokes having enquired as to certain grating sounds sometimes caused by the mill ; Mr. Russell explained that these were caused by one of the rollers not properly performing its work ; and he added that great care ought to be taken in feeding the mills.

Mr. Campbell having asked whether Mr. Russell's note should be published, Mr. Russell replied in the affirmative. It was to invite criticism, and it was, he thought, one of the most important things to planters. Although they pride themselves on their knowledge they had yet a lot to learn. Mr. Mann would

in the meantime read the discussion that had taken place and that would all the better enable him to discuss the matter. This was the most important subject of all to the planters, and was most fertile of suggestions to any one who would take the trouble to go into the subject. The longer he lived, the more ignorant did he find himself in everything with regard to the treatment of cane juice; they were simply in their infancy. It was advisable to use the scale and weights in crushing canes.

The Curator of the Museum.—Mr. Campbell stated that he had been advised that Mr. Ernest Glaisher, the newly appointed curator of the Museum, would leave England by the mail of the 2nd instant. He would, therefore, probably be able to assume his duties about the 22nd instant.

The meeting then terminated.

Meeting held 12th April.—Mr. G. L. Davson, in the absence of the President, in the chair.

There were 10 members present.

Elections.—*Members:* W. Bovell Jones; M. Shannon, M. D; Scott Herriot, W. Davis M. D.

Associates: G. Corronel: John Wood Davis: Alfred Augustus D'Andrade; C. A. Cunha; R. Maclean.

Treasurer's Account.—The financial statement for the quarter ending 31st March, showing a balance of \$1,349 90 to the good, was laid on the table.

Timehri—The concluding part of the first volume of *Timehri*, the Society's Journal, together with the follow-

ing letter from Mr. im Thurn, the editor was formally presented to the Society :—

Pomeroon, 23rd January, 1883.

To W. H. CAMPBELL, Esq.

Hon. Sec. of the Royal Agricultural and Commercial Society of British Guiana.

Sir,—Accompanying this you will receive a copy of the 2nd Part of *Timehri* immediately on its publication. Will you be good enough to lay the same before the Society at its next meeting. I have given instructions that a second copy should be delivered at once to the Librarian, for immediate use in the rooms of the Society.

I regret the unavoidable delay in the publication of this part ; and I trust that so long delay may not occur again.

I have the honour Sir, to be,

Your obedient Servant,

EVERARD F. im THURN.

Mr. Tinne proposed a vote of thanks to Mr. im Thurn, for the way in which he had superintended the second part of *Timehri*. He thought those who read the part would find that it was in no way inferior to its predecessor ; and he only hoped that Mr. im Thurn would be able to continue his duties as editor.

Sugar-maize Seeds.—Mr. J. E. Tinne presented packages of sugar sorghum (Minnesota, Early Amber), and three kinds of sugar maize, viz, Rosslyn's Hybrid, Howell's Evergreen, and Egyptian.

The thanks of the Society were accorded to Mr. Tinne.

Mr. Mann's paper on Sugar Mills.—The Secretary said he had received from Mr. James H. Mann a further communication on the Sugar Cane Mill, and he stated in an accompanying letter that he was sorry that owing to continued ill-health he would be unable to attend the meeting. It was agreed to take it as read at this meeting, to publish it, and to discuss it at the next meeting.

Donation.—The Secretary read the following letter from Mr. Edmund Field, a former President of the Society :—

W. H. Campbell, Esq.,
Secretary, R. A. and C. Society,
Demerara.

Dear Sir,—I am sending by the Demerara and Berbice Steam-ship Company's vessel the *Laura*, a set of five engravings from the painting by Frith, R. A., as a present to the R. A. and C. Society, which, I trust the President and Directors of the Society will do me the favour of accepting.

EDMUND FIELD.

Description of the Pictures.

A RACE FOR WEALTH.

I. The Spider and the Flies

(Ante-room of the great financier and projector's office.)

II. The Spider at Home.

(The time is the "mauvais quart d'heure" before dinner.)

III. Victims.

(The bubble has burst. The blow has fallen !)

IV. Judgment.

V. Retribution.

It was moved by the Chairman and carried by acclamation that the best thanks of the Society be given to Mr. Field for his valuable gift.

The meeting then terminated.

Mr. Mann's second paper on the sugar-cane mill, referred to above, was as follows:—

In continuation of the discussion on the above subject, I beg to submit the following communication :

Mr. Russell in his paper read at the last meeting pays me a very poor compliment in supposing that I fancy there is such a thing as a sugar cane carrying as little percentage of fibre as the beet, and I am sure it does not require experiments in quantitative analysis to teach one as much as this. I am the more surprised he should have criticised my figures in the way he has done, because he ought to have known, that

these, being all *round* numbers, were *not* actual examples of expression, but mere illustrations of the proposed method of reckoning percentages. I gave a mean and two extreme examples in each case; and had he taken the other extreme he would have found another mare's nest in the fibre being excessive.

Neither do I fail to see the advantage of maceration and double crushing, when under such circumstances; and if I repeat my opinion on this subject it is simply this "we should be working to better advantage by paying attention to heavier *single* rather than to *double* crushing &c."

The other subjects under discussion are mere matters of opinion and I may criticise Mr. Russell's remarks pretty minutely.

The number of throwers, as he says, does bear approximately a co-efficient ratio to the hhd. sugar made in given time; but this can only be true when the quality of the crushing is a co-efficient also, for in the "good old days" of inferior crushing *more* men must have been required than now, there being *less* juice extracted from the canes thrown.

"The mill is set so as to pass the quantity of canes necessary to "make a given day's work" surely this is misleading, as it gives one the idea, a mill can do anything one chooses, whereas the power available remains constant; and although by increasing the feed, and necessarily the set, we can increase number of gallons expressed in a given time, yet this is achieved only at the expense of the quality of crushing and so upsets the idea of a "man's power being a coefficient necessary to throw canes for a hhd. sugar."

To decide the day's work first, is, I think, getting hold of the wrong end of the stick; we ought to decide what the quality of crushing shall be and then get as much out of the engine as possible. On some estates where the cultivation has been increased beyond the capacity of the machinery, it may be advisable to work the other way and sacrifice quality of crushing; but it is not the machine which must be blamed for its poor crushing; but rather the proprietor, for growing more canes than the mill can take during the most favourable seasons.

Then again, if by setting up the front roller it is to be looked upon as a kind of "safety valve," I would consider the mill not worth having and will go so far as to say mills should not and (of modern type) do not break under the strain due to a feed of canes alone.

Many of you no doubt think you have seen accidents of this sort, but

who can say positively when a mill tumbles to pieces with nothing but canes in her at the time, that nothing *but* canes had ever passed through her before? I am afraid a good deal more foreign matter does pass through our mills than we have any idea of; pieces of iron, accidentally or otherwise, often get into the mill and many small things (such as cane-carrier nuts and the like) more often pass out unobserved but not without sowing the seeds of subsequent trouble by starting some minute fracture which, under continued strain, increases and finally shows itself in a complete breakdown.

If one considers the enormous difference in the quality of the strains when a mill crushes canes or iron, the awful rapidity in the increase of the strain (and that local in its effect) when the square edge of a piece of iron suddenly enters the grip of a mill, and remembers also the fact that mills even under such trying ordeals do not always fail, it will not be hard to concede to me the supposition that mills never do break with an excessive feed alone, and that the effect of such can only be the stoppage of the whole machine.

Mr. Russell considers that for the best results the front roller should be made to do a considerable portion of the work, and in support of this quotes the best single crushing he has seen where the front roller is said to have been screwed up, (to the same proportionate extent perhaps) to produce the superior crushing spoken of with a thinner feed than usual!

If the back roller was originally what is called "metal to metal," it could not of course be screwed up any more, but this will not alter my argument; for since the heavier the strain the more the mill yields, so the actual opening when passing the light feed must be less than with the heavy, and I look upon this mill as one in which the sets of the front and back rollers probably bear the same ratio to each other as they did before, and consider the additional power available (due to the increased speed of engine) produced the extra quality of work and *not* the change in the position of the front roller only.

If we do not take into account the power absorbed by a given weight of canes, arguments about the set of rollers and depth of feed must go for nothing. We can do what we will to the mill and alter the feed, but if the power absorbed be not different we cannot expect any different result.

The argument, again, about extracting more juice by screwing up the front roller and so preventing the likelihood of re-absorption is, I think,

fallacious; in the first place a great portion of the juice is supposed to escape on the back roller side of the trash turner; and presuming the space below the top roller is at all times pretty full of juice, from the fact of its finding its way down the inside of each headstock as well as over the top of the front roller, the opportunity for reabsorption is practically the same whatever be the set of the front. I might here point out what is a decided defect in the construction of our mills; there is no escape for the juice along the front edge of the trash turner; the space between it and the back roller can be of little use either, since it is always covered by the passing megass, therefore the juice must try to escape at the ends of the trash turner, where it is also impeded by the side blocks. If then it cannot find sufficient exit it will find the space between the top roller and the trash turner and, by accumulation, rise until it flows freely over the front roller. It has however the same tendency to flow over the back roller; there being a hydrostatic pressure upwards at the point where the canes are under maximum compression, the juice naturally avails itself of every opportunity to pass through any gaps or space there may be, and so come in contact with megass just relieved from pressure and ready to reabsorb any quantity of juice; the obvious remedy is to keep the back roller somewhat higher than the front, so that the juice finding free exit over the latter shall not have the tendency to rise into the megass. I believe, moreover, that a mill so constructed would show a marked improvement in the percentage of expression.

In the case of a large mill having its rollers set in the same proportion as those of a small mill, but wider, there can be no difference in the treatment of the canes, provided the depth of feed in each be also proportionate to their sets; so, I cannot see why a big mill should not do the same quantity of work as a small one. The real reason why large mills do not do so well as some small ones is, that too much is expected of them; or rather the mills being in size more than their engines, the power available per ton of canes is less in the large than in the small mills. Any one can verify this by making a few calculations from mills under his own observation, if the power available be divided by the work expected of the mill, i.e., due to her size, we shall get a figure representing the comparative crushing power of each. In other

words divide the area of the piston by the size of the mill. Here are three examples :

	CYL.	MILL.	CRUSHING-ROOM.
Hoff van Aurich.....	20½"	26" × 54"	Area 20½ $\frac{26 \times 54}{2} = .235$
Anna Regina.....	24"	32" × 66"	Area 24 $\frac{32 \times 66}{2} = .214$
Bel Air.....	30'	48" × 84"	Area 30 $\frac{48 \times 84}{2} = .175$

It thus appears that there is less proportionate power in the larger arrangements.

It is assumed for simplicity of calculation that the conditions as to piston speed, steam pressure &c., are the same in all ; results can of course be altered by varying these conditions, but when mills are fed in proportion to their size, differences in the quality of work done will always be apparent as exemplified by the above figures.

At the same meeting the trash turner was spoken of, and some one asked the cause of such terrible jerking and noise that sometimes takes place ; in my paper under discussion I stated my opinion pretty plainly that trash turners were often wrongly blamed, and that the cause of the jerking was the refusing of canes, due to smoothness of the rollers and insufficient grip. I will now enlarge upon this subject by giving further arguments in support of my reasonings.

If the cause be the position of the trash turner, why does not the jerking go on continuously until the trash turner be moved ? And as the jerking only occurs at intervals, I say the trash turner is not *the* fault, although I admit the possibility of a badly set trash turner ; the same negative argument applied to the grip of the rollers will not prove the latter not to be at fault because the grip is more perfect in some position of the rollers than in others, it being impossible to ensure uniformity in the roughing all over. It is the fact of the rollers being smoother at some places than others, combined with the varying thickness of the feed that causes the grip between the back and top rollers to fail occasionally, when the rollers, as it were, continue to nibble at the canes until a rougher portion of the roller comes round and a hold is again effected.

The noise is no doubt occasioned by two circumstances ; this nibbling

which is a very heavy process, for the canes after nearly getting under maximum compression slip back with a jerk, and then there is the consequent accumulation of half crushed canes between the trash turner and the top rollers.

When watching a large mill when she was giving trouble by refusing canes I noticed that when the jerking and noise lasted but a second or so the continuity in the wad of megass was not apparently broken, but when it continued for some appreciable time the mill passed out no megass at all. One end of the rollers would take up the grip then the other, passing out its megass at different points at different times. The ear could also detect the direction from whence the noise proceeded, whether from this end or that, according to where the rollers were refusing. This, to my mind, clearly proves where the fault exists, and I cannot believe a small change in the position of the trash turner can effect improvements with which it is so often credited. When a manager insists upon having his trash turner re-set he usually utilizes the time by jaggng the rollers and then says the trash turner has improved the working of the mill!

Here is another negative proof that the set of a trash turner is of little moment and that there is no real proportion between the set and the depth of feed (within certain absurd limits of course)—take a mill, in which, according to experts on trash turners, the set is correctly proportioned to the ordinary feed, what becomes of this proportion when the feed varies? Why does not the mill refuse and jerk with a lighter or with a heavier feed when this proportion is so entirely different? and yet we have mills that continue to work smoothly whatever be the feed.

It may be as well to state that I use the word "set" as a technical term applied to the trash turner, meaning the distance between it and the top roller, and not the position generally. When the trash turner is re-set you raise or lower it and do not assign a new position for it relative to the front roller, its absolute proximity to the latter being a necessary condition as much as screwing up the piston rings before turning on steam.

Mr. Russell is reported to have said that the jerking and noise was when the trash got crimped up on the trash turner, and that raising the latter would obviate the evil. Now, after what had been written I fancy some of you will agree with me (1) that Mr. Russell has got hold of the *effect* not the *cause*. The megass gets crimped up because the rollers

refuse to remove it, and (2) that removing the trash turner cannot supply the deficiency in the power of grip between the rollers.

This brings me to the end of a second paper on this interesting subject, and I crave the indulgence of my readers to repeat some of my opinions in a concise form; insufficiency of grip is the cause of nearly all the troubles in connection with the working of a sugar mill—rollers possessing roughness, in one form or another, sufficient for the grip, are absolutely necessary to ensure uniformity in the crushing;—rollers of inferior metal must have their grip maintained in, what might be called, an artificial manner by continued labour bestowed upon them on the estates—and this rough process is no longer necessary when once the rollers are made of superior metal with grooves cut in them having right-angled edges.

JAMES H. MANN.

Demerara, 2nd April, 1883.

Meeting held 10th May.—The Honourable W. Russell, President, in the chair.

There were 11 members present.

Election.—*Member:* Jacob Conrad

Associate: W. Palmer Samborne.

Representation of British Guiana at the Calcutta Exhibition.—The Secretary read a letter from the hon. B. Howell Jones, intimating that he had been appointed a member of a Committee of Court of Policy to consider whether this colony should be represented at the Calcutta Exhibition, and enclosing several documents. Mr. Jones further stated in his letter that the Committee would be glad to confer with a Committee of members of the Agricultural Society with regard to the matter. Mr. Campbell said the other documents were letters from Mr. Barr to the Government Secretary, stating that Mr. Hogg thought it was desirable that the colony should be represented, and the official documents of

the Exhibition, giving all information. The Society was generally asked to take matters of this sort up by the Government, and a committee was then appointed of the members of this Society to undertake the arrangements and to administer any funds that might be contributed for the purpose; but at present the Society had no funds for that purpose. He had had no further communication in the matter than Mr. Jones's letter stating that a committee had been appointed by the Court of Policy.

The Chairman thought that the documents ought to have been accompanied by some letter from the Government.

Mr. Jones said he had been appointed along with the hon. Robert Mitchell and Hugh Sproston, on a Committee of the Court of Policy, to confer with the Royal Agricultural Society, as to whether British Guiana should be represented at the Exhibition. He had liberty to bring the documents before the Society, and he did not think there was any necessity for further formalities.

The Chairman believed that there were very few in this colony who thought it should not be represented at the Calcutta Exhibition; but, as the Secretary had stated, they had no funds for that purpose, and without assistance from the Government they could do nothing.

The Chairman suggested that Messrs. J. E. Tinne, Luke M. Hill, and the Rev. T. J. Moulder form a committee to confer with the committee of the Court of Policy and should report to the Society at its next meeting.

Mr. Campbell, on behalf of Mr. Glaisher, intimated that that gentleman's services would be available to prepare and forward articles to the Exhibition.

Colonial India Rubber.—The Secretary submitted a

letter from Mr. G. S. Jenman on certain samples of the India-Rubber (vulcanised) produced by the hatie (*Hevea Spruceana*) and cumakaballi (tepong) trees of this colony.

On the suggestion of the Chairman, it was agreed that it should be published. He thought it was always desirable to have these things published, as it afforded members an opportunity of going into details in technical questions.

Thanks were voted to Mr. Jenman for his communication.

Authority of the Secretary to print Communications.—Mr. Luke M. Hill suggested that the Secretary should have authority to print such papers, as this of Mr. Jenman's as soon as he received them. As they were at present brought before the Society, they were generally ordered to be printed; after which they did not generally come up for discussion for about two months.

The Chairman said that was a very good suggestion. Some discretionary power should, however, be given to the Secretary, as he might be flooded with papers; it might become an advertising medium.

A committee consisting of the President, the Vice-president, and the Secretary, was empowered to print papers.

Sorghum and Maize.—It was agreed to send portions of the seeds of sorghum and maize presented by Mr. Tinne to the Society at its previous meeting to Mr. Blake of Pln. *Skeldon* and Mr. Luard of Pln. *Peter's Hall*, with a request that the seeds should be planted and a report on the results be submitted.

The Curator's Report.—It was ordered that the report

by Mr. Glaisher, the new Curator of the Museum, should be printed and brought forward at the next meeting ; also that it should be carefully considered by the Committee of Correspondence.

Local Cocoa-nut fibre and Palm-oil.—The Hon'ble B. Howell Jones submitted samples of cocoanut fibre dressed at Mr. Smith's factory at Mahaicony. This was one of the small industries of the colony, and one in which he (Mr. Jones) was rather interested. The first sample was the ordinary fibre used for the ordinary purposes, and the second was for brush making. These were not exhibition samples. He also wished to submit a bottle of what was known as palm-nut oil, obtained from the *Courie** palm. He had obtained it from a black man in the Berbice River District, who used it for culinary purposes, but it might perhaps be of value as an article of commerce. He might mention that this was the palm-nut oil mentioned in a report by Mr. Jenman ; if there was anything valuable in it, it could be procured in large quantities for export if desired, the palm being very abundant.

The Chairman said that no doubt the specimens were very interesting. He was aware that Mr. Smith had imported some very fine machinery for making cocoanut oil and dressing the fibre, and he thought Mr. Smith deserved great credit indeed, for that advance in what might be called one of our small industries. He had not the slightest doubt that it would pay. Formerly, when cocoanuts cost \$20 or \$24 per thousand, it did not pay

* The *Courie* palm is probably the African oil-palm (*Elæis Guinensis*) which has become naturalized in many parts of the colony ; or, it is perhaps more probably the Kokerite (*Maximiliana regia*).—ED.

to make cocoanut oil, but it was different now, when they only cost \$12 per thousand.

It was suggested and ordered that the palm oil be forwarded to Mr. Francis, with a request to that gentleman to report on it.

Mr. Mann's Paper on the Sugar-mill.—The Chairman said he had read Mr. Mann's paper, but had not had time to give it much consideration. Mr. Mann had found fault with his (the chairman's) estimate that co-efficient man power was equal to a given quantity of sugar per day. He (the chairman) said that it was the assumption of many of the planters that it required a man to make a hogshead of sugar per day. He could only say that if Mr. Mann had served his apprenticeship under such planters as Mr. McLaren and Mr. James Stuart, he would have been told that he had to make a certain quantity of sugar a week; and he would then have to make his mill do the best he could. At the same time, he thought Mr. Mann deserved the thanks of the Society for the way in which he had come forward and given his opinion on this matter.

Donations.—Lithographic fac-similes of the execution warrants of Charles I and Mary Queen of Scots were submitted, and the donor (Mr. B. S. Bayley) was awarded the thanks of the Society.

The meeting then terminated.

Mr. Jenman's letter on India-Rubber, to which reference is made above, is at follows:—

Georgetown, 27th April, 1883.

My dear Sir,—I enclose herewith, for the Museum of the Royal Agricultural and Commercial Society, samples (vulcanised) of india-

rubber, produced respectively by the hatie and cumakaballi of this colony. The raw rubber from which these samples were manufactured I collected on the Pomeroon River, and sent to Kew to be tested a few months ago; which resulted (with other correspondence) in the following report, communicated through the Secretary of State for the colonies and published in the *Official Gazette* of the 18th instant:—

“The India Rubber made on the Pomeroon River, British Guiana, from the *Hevea Spruceana* contains caoutchouc but is impregnated with other principles which destroy its properties for any manufacturing purposes involving the process of vulcanizing. Since most of the species of *Hevea* have been described as yielding good India-rubber, including the *Hevea Spruceana* growing several miles north of the Amazon, it would be important to determine whether in this case the deteriorating principles are foreign [^p belonging] to the tree, or whether they arise from injudicious incision. The rubber smells very strongly of the oily matter which goes off in the smoke from the burning of the nuts of the Uracappi palm, which also has the effect of softening and rendering the rubber dark.”

“The loss on washing and drying is 11·75 o/o. The soft and sticky character would appear to be due to a volatile, or perhaps easily carbonised substance. When mixed with sulphur and submitted to the vulcanizing process, it vulcanizes, but becomes spongy. The caoutchouc vulcanizes so completely, that it would be worth while to try whether, by any chemical treatment, its sponginess can be prevented. Such treatment, however, prevents its being used extensively.”

“The (cumakaballi) India-rubber on washing and drying yields a loss of 14·96 o/o, and when mixed with the suitable proportion of sulphur, vulcanizes perfectly. Its firmness and freedom from stickiness are in favour of its manipulation”

The passage in the report,—“it would be important to determine whether in this case the deteriorating principles are *foreign* to the tree, or whether they arise from *injudicious incision*,” is not very clear in its meaning. Injudicious incision, so far as it affected the character of the milk, would be “foreign” to the tree; but I do not see how any method of tapping could be injudicious in this sense. In collecting this rubber, the incisions were made with a cutlass; and an axe or this instrument must necessarily be used in the operation. It is true the juice was dried in the smoke of burning palm nuts, but this system is very largely practised in coagulating Para india-rubber. It hastens

the process, but is not essential, and need not be pursued if disadvantage pertains to it.

It is disappointing, however, that as *Hevea Spruceana* is so abundant in the colony, and such a near ally botanically of the valuable *Hevea brasiliensis*, its rubber should be, apparently, of such inferior quality. I say, apparently advisedly, for I think this cannot be regarded as determined till the nature of the deleterious principle, which prevents its perfect induration when vulcanized, is ascertained, and whether it was accidental in this sample or is inherent in the juice of this species of *Hevea*. It is possible, too, that if the sponginess cannot be prevented in its manufacture, considering the multiplicity of the applications which are being found for india-rubber, certain uses may be discovered for which this character will specially recommend it; which seems not improbable, for it is certainly a very peculiar and characteristic substance.

As I anticipated in my report of the discovery of the cumakaballi, its rubber has proved to be an excellent material; and considering the great size of the tree, its thickness of bark and prolificness in milk, the price (2/3—2/6 per lb.) it is estimated as worth in the market is very satisfactory and encouraging; and I have no doubt that in the future both the tree and the rubber which it yields will be in considerable demand. I hope in the interval, steps may be taken to prevent collectors from felling and destroying a tree so valuable, and of so much interest for its grand proportions as a woodland feature, and thus ensure its abundant perpetuity in the colony.

Very faithfully yours,

G. S. JENMAN.

W. H. CAMPBELL, Esq.,

Secretary, Royal Agricultural and Commercial Society.

Mr. Glaisher's Report on the present state and prospects of the Museum, to which reference is made above, is as follows:—

Report of Curator of British Guiana Museum.

To the Directors of the Royal Agricultural and Commercial Society.

Sirs,—I beg to submit to you the following Report on the British Guiana Museum as I found it, on commencing my duties as Curator.

I have also added my views on the work which I think it would be desirable to do in connection with my office.

The arrangement of the Museum as it now stands, with some slight modification, is very suitable. It is divided into two portions, one of which is devoted to showing the Natural History and Products of this colony, the other to extra-colonial exhibits. There are two objects to be obtained, 1st: to have a collection which will be instructive to our Colonial Population, and 2nd: one which will illustrate the Natural History and Products of this Colony, and therefore be of special interest to visitors to this country, who from a cursory inspection of the Museum will be able to obtain a good idea of our Colonial Fauna and products. To meet these two views it is desirable that both the Colonial and Foreign departments be kept up; but as the economising of space is a matter of the greatest importance, I venture to urge, as suggested by my predecessor, that in the Natural History Collection only types be exhibited, a more complete collection of skins being kept in properly constructed drawers. This, it seems, would very fairly meet the exigencies of the case, a glance would give a general idea of the classes of animals etc. to be met with in this colony; and if further information was desired, the larger and more complete collection preserved in drawers could be consulted.

The present arrangements of the birds and mammals in the cases is not so satisfactory as it might be. The specimens are placed on three flat shelves, one above the other; the result of this is, that those which are placed on the lower shelf, situated only an inch or so from the floor, are almost hidden from view, with the exception of a few close to the glass; the specimens on the top shelf are scarcely in a better position. To remedy this I propose to erect an inclined stage of shelves such as is used to display the birds in the British Museum; the cost of each of these stages would be \$20, and I feel sure that the great advantage to be derived from such an arrangement would well compensate for the comparatively small outlay required.

The fish of the Colony are not well represented. Out of 600 species known to exist in our rivers only about 50 are in the Museum. A complete collection preserved in spirits would be of great value, and I hope to be able to add largely to the present stock of specimens, by collecting myself from time to time, and by contributions from various sources.

There are several small cases of plaster casts of fishes which are very creditably executed, and which to the ordinary visitor are of much more

interest than specimens preserved in spirits; it would be well to obtain more of these casts, if they could be procured at something like a reasonable cost.

One of the greatest difficulties to be overcome is the setting up and mounting of specimens; the work done by colonial stuffers is very expensive, and, as is only too painfully shown by a glance round the Museum, thoroughly bad and unnatural. One solution of the difficulty suggests itself to me, that is, to make arrangements with a London taxidermist to mount and set up at a fixed and reasonable rate any specimens which may be sent to him; the benefit that would accrue to the Museum would be great and in the end it would be found no more expensive than having the work done by the indifferent stuffers here.

The Museum possesses two good collections, both of which are very complete, I refer to the very fine Mineralogical and Geological collection presented by Mr. Barrington Brown and the case of local Ethnological specimens presented by Mr. im Thurn. It is matter for congratulation that we possess them. There is also a very fair collection of shells which fully deserves to be placed in a separate cabinet.

A Catalogue should as speedily as possible be issued. My predecessor did a great portion of this work, and I propose to finish it as rapidly as I can. To get a thoroughly complete Catalogue would take a long time, as some of the specimens would have to be referred to specialists at home in order to settle their respective species. I therefore recommend, as has been previously proposed, that a first, though somewhat imperfect edition of the Catalogue, be quickly and cheaply printed, and afterwards, when all the doubtful species have been named, that an amended edition be issued.

The British Museum authorities keep a list of institutions in England and the Colonies to which they give their spare Zoological specimens. It would be desirable that this Museum should be added to that list, and I have little doubt if the Society showed a disposition to help the British Museum by presenting to it some of the duplicate specimens which are not required, Dr. Gunther, the head of the Biological Department would bring the matter before the Trustees, and the British Guiana Museum would be added to that list. This Museum would not only benefit by receiving specimens from time to time, but would also obtain the British Museum publications which are of considerable value.

There is an important work which it would be desirable to commence

as soon as possible, viz :—the establishing of Meteorological Stations over the Colony. There are already instances of colonies situated within the Tropics recognising the importance of this work. Ceylon has a Meteorological organization consisting of 26 stations, which send in monthly and weekly returns. Mauritius has a Meteorological and Magnetical Observatory supported by the Colony; at Hong Kong Meteorological observations are made in connection with its Astronomical Observatory, and there are several other stations over our Indian Empire. From the position of this colony, situated on the mainland of South America within 5 or 6 degrees of the equator, observations taken here would be of considerable importance. Apart from the mere scientific value that these records would have, considerable advantage would doubtless be obtained by combining their results with the health statistics of the Colony. I know also that the results of observations taken here would be valued and gladly received by scientific men in Europe.

The system that I should propose would be as follows: To establish three first class stations where Atmospheric Pressure, Temperature, Humidity, Rainfall and Radiation are observed; and in addition to these to obtain as many temperature and rainfall stations as I can procure. I am willing to undertake the labour of reducing and preparing the results from the returns sent in, and to generally superintend the whole organization. The outlay would be small; it certainly would not exceed £30.

Other useful scientific work could with great advantage be carried on in connection with my office. At some future time, it would be probably worth while to erect a small Transit instrument in order to obtain the absolute time of the colony. It would also be an advantage to have a Seismometer for registering Earthquake shocks; for no doubt some shocks pass unnoticed, and it is impossible to give any useful scientific information about the shocks which are perceived without having such an instrument. These instruments would not cost a very large amount, and might be added to the Museum appliances when I have better assistance than I have at present at my command.

I have the honor to be, Sirs,

Your obedient Servant,

ERNEST H. GLAISHER,

Curator.

British Guiana Museum,

May 9th 1883.

Meeting held 14th June.—The Honorable W. Russell, President, in the chair.

There were 14 members present.

Elections.—*Members*: R. B. O. Butts; W. A. Grant; Allen C. Stewart; William Charles Easten Griffith.

Associates: Howard T. King; Colin Simson Smith; R. T. Wright; Frank Gill; James Brown.

The Calcutta Exhibition.—The following letter from the Government Secretary was read.

Government-Secretary's Office,
Georgetown, Demerara,
1st June, 1883.

Sir,—I have the honor by direction of the Governor to acquaint you, for the information of the Agricultural and Commercial Society, that it has been decided that British Guiana shall be represented at the International Exhibition to be held at Calcutta in December.

2. The Governor proposes to appoint Mr. Henry Kirke, M.A., acting Emigration Agent for this colony at Calcutta, to be the Commissioner at the Exhibition for British Guiana, and as the Governor has been given to understand that the Royal Agricultural and Commercial Society will undertake upon this occasion, as on former similar occasions, the management of affairs in connection with the Exhibition, I am to state that it will afford His Excellency much satisfaction if the Society will do so, and will appoint a committee for the purpose accordingly. The Governor and Court of Policy have placed an item of two thousand dollars on the supplementary estimates to defray the expenses connected with the exhibition.

W. H. Campbell, Esq.,

Secretary to the Royal Agricultural and Commercial Society.

The Chairman proposed, and it was agreed, that the matter be referred to the Committee of Correspondence. He need hardly impress upon the members of the Society the desirability of putting in an appearance at the exhibition at Calcutta. He urged upon the members of the Society to do everything in their power to forward

exhibits to Calcutta, so as to bring the colony and its mode of tilling the land, vividly before the people of Calcutta.

Mr. Tinne, in reference to a question as to whether the exhibits would go by next coolie ship, said he thought it would be very undesirable to send the exhibits by a coolie ship, after the long passage of 180 days of the *Bayard*. He thought it would be far better to send them to London by the "Direct Line" steamer and then tranship them to a steamer going to Calcutta; the exhibits would thus be transferred to Calcutta in forty-five days, including transhipment.

The Curator's Report.—This report which had been laid before the Society at the previous meeting and had since been printed and circulated, was also referred to the Committee of Correspondence, to take action on the same.

Surinam Gold.—Mr. G. L. Davson, on behalf of Mr. Hugh A. Greene, exhibited a nugget of gold from Surinam, valued at \$1100. The Chairman, commenting on this excellent find from Dutch Guiana, remarked that it was about equal in value to about eleven hogsheads of sugar; he added that he was informed that the Company who had discovered this nugget had spent three or four thousand pounds before getting any return, but that a good deposit had now been struck. It was stated by a gentleman present that the Company was now making a very high per-centage on their outlay.

Mr. Jenman's Report on India-rubber.—In the absence of Mr. Jenman, in consequence of ill-health, this subject was postponed to the next meeting.

"The Tropical Agriculturist."—On the suggestion

of the Secretary. it was ordered that this journal, published in Ceylon, should be taken in by the Society.

The Hour of Meeting.—On the suggestion of the Secretary, it was ordered that the meetings of the Society should in future be held at 3.30 p.m., instead of 4 p.m., on the second Thursday in each month.

The Mahaicony Oil and Fibre Works.—A paper was read by the Honourable B. Howell Jones on the cocoanut oil and fibre works recently established by Mr. Smith at Mahaicony. Before doing so, he stated that his paper did not give full details, such as the cost of making the articles, because the whole factory was not at present working, and it would be misleading to attempt it. It was simply the account of a visit to the factory.*

The Chairman said he followed Mr. Jones's paper with very great interest, because twenty years ago, in the Island of Wakenaam, an exactly similar factory was started. In those days cocoanuts fetched very high prices—\$22 to \$24 per thousand; and at that time the production of oil from cocoanuts did not pay. There was a considerable loss of money. Mr. Smith was fortunate now in obtaining the cocoanuts; he (the Chairman) believed they could be procured at \$10 to \$12 a thousand. The difference between \$10 to \$12 and \$22 to \$24, which was formerly paid for the cocoa-nuts would allow a large margin for profit on what they might call one of the smaller industries of the colony, and he had little doubt that Mr. Smith had struck upon a very profitable means of disposing of his cocoanuts. He (the Chairman)

* This paper, having come to hand too late for insertion in the present number, will appear in the next.—ED.

believed that there was a much larger quantity of cocoanut oil produced in this colony than probably members were aware of. The coolies were in the habit of making oil in their own rude way in India, and after serving their time on the estate, a great many of them take to manufacturing oil here. He was told that at the present time the coolies who manufacture oil were prepared to pay even a higher price for cocoanuts than was got before the starting of this manufactory. He merely mentioned this to show that the coolies after serving their time on the estates had an opportunity of doing something else than merely working in the field. He quite agreed that it was to the introduction of these people, who came here with a knowledge of what are known as the smaller industries in their own country, that they must look for the successful carrying out of the same line in this colony. He thought the members of the Society were very much indebted to Mr. Jones for the excellent paper which he had read, and he moved that it should appear in the Society's Journal. In the meantime he begged to move that the thanks of the meeting be awarded to Mr. Jones.

The motion was carried with acclamation.

A member mentioned that as soon as Mr. Smith started his manufactory, cocoanuts had gone up \$2; Mr. Smith was giving \$13 per thousand.

Mr. Jones said that this industry was jealously guarded. In London there were five factories, all in the hands of Jews, and when Mr. Smith was in London he was refused admission to witness any of these factories. He thought that the oil extracted here could compete with that from factories which had to pay freight on the cocoanuts.

Donations.—The Secretary said the following publications had been presented to the Society:—

By the Smithsonian Institution—"Report of the Commissioner of Agriculture for 1880-81-82;" "List of Foreign correspondents of the Smithsonian Institution;" "Scientific proceedings of the Ohio Mechanics' Institute;" "Additions and corrections of the list of Foreign Correspondents to January 1883;"

By Captain Sparks, "Monthly Weather Review of the United States from January to November, 1882."

The President, after alluding to the excellence and completeness of the United States Agricultural Reports, expressed a wish and a hope that a statistical department might be established in this colony.

The meeting then terminated.





“ T I M E H R I , ”

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[PART II.]

Edited by

E. F. IM THURN, M.A.

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REPORT OF SOCIETY'S MEETINGS, from July to December, 1883, including papers, by Luke M. Hill on *'A Wasted Water Power'*; by the Hon. W. Russell and Thomas Shields on *'Sugar Cane Mills'*.

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Between the Pomeroon and the Orinoco.

By the Editor.



LESS known than any other part of British Guiana, less known by far than the district more remote from civilization, in point of mileage, which lies on the borders of the Brazils, is the district between the Pomeroon river and the Orinoco. The SCHOMBURGK brothers, who travelled in, and have written most of, the interior of British Guiana, went but little into this district; and, examining only the lower courses of its rivers, they described it far more briefly and less satisfactorily than any other part. And such information of it as they did publish is more or less unknown, being partly buried in a large, somewhat scarce, and expensive book in a foreign language, being partly removed from easy access in the early volumes of the Geographical Society's publications. And of those who have more recently travelled in, and written of, Guiana the most important, Mr. BARRINGTON BROWN, paid a yet briefer and more hurried visit than that of the SCHOMBURGKS to the district in question; and he has described it in correspondingly brief fashion in the technical and little read official report which he wrote in conjunction with his sometime colleague, the late Mr. JAMES SAWKINS, and has not even noticed it in his more widely circulated and popular 'Canoe and Camp Life in British Guiana.' Yet this district is of interest, partly because it is chiefly as regards it, claimed by both the British and the Venezuelan Governments, that a movement has from time to time during the last

forty years been afoot, and is now once more afoot, to settle definitely the ownership; and partly because, in all human probability, this district, and this alone, is exactly in a natural state, is exactly as once was the now inhabited coast-land between the Essequibo and the Corentyn before the Dutch drained this, and cultivated it, and altered it, in most wonderful manner, to the condition, more or less, in which we now know it.

Looking at the desolate coast-land between the Pome-
 roon and the Orinoco, and trying to realise that as this
 is so the whole coast of Guiana once was, one cannot
 help wondering at the glowing description of the country
 given by Sir WALTER RALEIGH and other early visitors,
 one cannot help wondering at the courage and energy
 of those early Dutch colonists who made their homes in
 such desolate wastes. But this feeling of wonder, if not
 altogether removed, is certainly much lessened when
 one recalls the facts that RALEIGH not only saw such
 desolate coast-regions as these but that he also pene-
 trated up the rivers into the higher and more beautiful
 country; and that it was up the rivers, on those same
 higher lands, that the earlier colonists first settled, and
 that it was only at a later time, when they were firmly
 established, that, recognizing the superior fertility of the
 coast-lands, ugly as these were, and remembering what
 their ancestors had done in the swamps, in some respects
 not dissimilar, of the Netherlands, they found courage
 to make dams to ward off the sea and made their homes
 where but just before were uninhabitable swamps. 7

Before proceeding further it may be as well roughly
 to define the district to be described. The northernmost
 of the fairly well-known and settled rivers of Guiana

is the Pomeroon. This river may therefore be regarded as the southern boundary of the district to be described. Coasting in a north-westerly direction from the mouth of the Pomeroon, one passes successively the mouths of the Morooka, the Waini and the Barima and comes at last to the mouth of the Amakooroo, a river which discharges itself into one of the mouths of the Orinoco, opposite to the island of Congrèvo, on which now live the Venezuelan pilots who convey all vessels which pass up that channel of the Orinoco to the city of Bolivar. The boundary of British Guiana in this direction has never been settled; and much of the land, in accordance with a temporary agreement between the British and Venezuelan governments, is regarded as neutral. But in most maps, at any rate in most English maps, the Amakooroo is treated as the northernmost boundary of British Guiana; and it will, therefore, serve also as the northernmost boundary of our district. Taking the Amakooroo and the Pomeroon as the northern and southern boundaries, it is still necessary to find a boundary on the west. But to do this is very difficult, the country in that direction being hardly known. Yet without here assuming anything definite as to the actual boundary of British Guiana, we may, to fix a boundary for the district to be described, follow the line as laid down by Sir ROBERT SCHOMBURGK and the English map-makers up the course of the Amakooroo and from the point at which it leaves that river to the first falls on the Barima. From there, leaving SCHOMBURGK'S boundary, we must take a straight line to the first falls on the Waini, and from these again a straight line to the head of the Pomeroon, (which has, however, never been visited).

The first physical feature to be noted in this district is that it is somewhat distinctly marked out by nature into two tracts, parallel to each other and to the sea. Of these, the one nearer the coast, of which the land hardly rises anywhere, and then only for a few feet, above the level of the sea, is really rather swamp than land, and is covered, in the neighbourhood of the innumerable rivers and creeks, by a dense growth of mangroves (*Rhizophora mangale*), varied in the neighbourhood of the sea by a few courida trees (*Avicennia nitida*), and everywhere else by a rank mud-loving vegetation consisting chiefly of two kinds of palms, the troolie (*Manicaria saccifera*) and the manicole (*Euterpe edulis*). One may pass day after day along the rivers and creeks of this tract seeing perhaps no human being, or perhaps passing at most one or two canoes with an Indian or two in each. Hidden up some of the smaller creeks there are a few square yards of higher ground, on which perhaps a few Warrau Indians live; but there is little to draw these people from their secluded haunts out on to the main river, except occasionally when they pass down to the fishing grounds at the mouths of the rivers to catch maracots (*Pacu* sp?) or crabs. Elsewhere all is pure swamp; and there is no place on which to stand unless on the many and entangled, over-ground, or rather over-water, roots of the mangroves and other trees. Nowhere but in a few far-scattered mud-holes at the heads of the creeks is any water not at least brackish to be found; and such water as is in these is foul, to sight and taste, with mud. And the water of the rivers themselves is thick and clammy with exudations from the mangrove-roots, and the air is

heavy and sickening owing to the smell of the same, so suggestive of decay. It is, in short, a desolate place hardly fitted for any living thing but musquitoes.

This tract, varying much in breadth, extends on an average for from 30 to 40 miles from the coast.

Beyond that lies the second tract. Here the land is everywhere raised a few feet above the level of the sea, and not unfrequently, especially further inland, it rises in detached hills of from 30 to 40 or even 60 feet in height. Just as the mangrove is the characteristic plant—the physiognomic plant, HUMBOLDT would have called it—of the first tract, so mora (*Mora excelsa*), of the most magnificent dimensions, far exceeding in grandeur and beauty the mora of other parts of the colony, magnificent as is this tree everywhere, is the characteristic plant of this tract.

Here and there, at the heads of some of the smaller creeks, and on either side of the Morooka river, are open savannahs of greater or less, but often of considerable, size. These so-called 'wet-savannahs', must not be confused with the savannahs or downs—of considerable elevation, undulating, and covered for the most part with comparatively short grass,—in the interior, between the upper part of the Essequibo, the Roopoonooni, the Takootoo and the upper part of the Cuyooni. These wet-savannahs are marshes, the drainage of which forms many of the creeks and smaller rivers; and they were probably once lakes which have now been silted up.

Geologically the two tracts consist, the mangrove tract of alluvion in which, in one or two places granite boulders crop up, and the mora tract of granite, gneiss and syenite.

The whole district is intersected by a most unusually intricate system of rivers. Of these the main rivers, those which flow directly into the Atlantic, are the Pomeroon with the Morooka, which two rivers now discharge through a common mouth, though, the land about this mouth having been much washed away, it is probable that at no very distant period the Morooka was but a tributary of the Pomeroon, the Waini, the Barima and the Amakooroo. The general courses of all these, without exception, is in a north-easterly direction toward the ocean. It might seem, glancing at the map, that they belong to the water-system of the Orinoco, so distinctly do they all, before discharging into the sea, turn toward the huge delta at the mouth of that river; but it is more probable that they once all ran more directly into the ocean, at points considerably lower down on the coast of Guiana than their present mouths, but that the powerful currents which pass from the mouth of the Amazon up on to the coast of Guiana have gradually deposited banks of mud across their mouths and have thus driven them to seek outlets further and further north.

In default of exact measurements, it is difficult to give any idea of the relative sizes of these rivers. The Pomeroon at its mouth may be some 1000 or 1200 yards wide; the Morooka is but about 30 yards; the Waini and the Barima are several miles wide; and the Amakooroo some 200 or 300 yards.

All of these narrow but gradually and at points, roughly speaking, at a distance from the sea proportionate to the mouth of each.

Beside these main rivers there are many tributaries, most of which are small, and indeed hardly noteworthy,

but of which a few are of considerable size, sometimes, at the point of junction, even as wide as the main river. The larger tributaries of the Waini are, on the left bank, at about 50 miles from the sea, the Barama, which is even a more considerable river than the Waini above the point at which the two join, and on the right bank the Barimanni. On the Barima the two chief tributaries, both on the right bank, close to each other, and not more than from 40 to 50 miles from the sea, are the Arooka (which is marked but not named on SCHOMBURGK'S map) and the Kaitooma. As in the case of the main rivers, each of these large tributaries has smaller tributaries of its own; and most of these smaller tributary creeks rise, either in savannah, or more often run down from small hills, on which, hidden away in the forest, reside the few Indian inhabitants of the district.

All the main rivers rise on the Atlantic side of the Sierra Imataka range of mountains, which runs, roughly speaking, parallel to, and at no great distance from, the ocean. Their courses are therefore short, and singularly similar. All, with the exception of the Morooka, which seems simply to consist of the drainage of certain marshy savannahs, and with the possible exception of the Pomeroon, for this possibly though not probably, also takes its rise in a savannah, run down from the actual slopes of the Sierra Imataka. The upper courses of all, again with the exception of the Morooka and possibly of the Pomeroon, are obstructed by one or more 'falls' or rather cataracts, of greater or less magnitude, caused by the cropping up of the one or more belts of granite which run across the country at right angles to, and cutting, the courses of the rivers.

'As the crow flies' the 'first fall' on each of the rivers is about the same distance, probably about fifty miles, from the sea; but, as the courses of the rivers wind much and in very varying degree, the traveller in passing from the sea up to these various 'first falls' has to travel very various distances.

The cataracts themselves seem, allowing for difference in size, all to be of very much the same character and very similar to most of the many cataracts of about equal dimensions throughout Guiana. A description of one, that of the Waini, will therefore suffice.

The so-called fall is in reality a broad and low, but wide and long, cataract, some 100 yards wide, in which no great body of water is spread over a wide field of much-broken gneiss rock. It occupies an oval space, itself clear of, but surrounded by, trees, which spring from and among other rocks of the same character as those over which the water flows. These rocks, which surround the fall and cover the ground so densely that only tiny patches of white sand are left exposed here and there, are very thickly carpeted with mosses and selaginellas, and with a beautiful earth-creeping little plant with large pink, gentian-like flowers (*Sipanea* near *acinifolia*), amongst which, as also in the cranies of the rocks and of the tree-roots, nestle many tufts of a lovely but very minute pink orchid; and much-dwarfed clumps of an elsewhere tall-growing, white-flowered, sweet scented *Anthurium* rise wherever there is a small level patch of sand. And the trees which grow nearest the fall, among these rocks are, root, branch and trunk, so dwarfed and gnarled and twisted and moss-covered, so hung with long feathery streamers

of moss and of moss-like fern that it is difficult at first sight to tell wood from stone, root from branch.

So far there is nothing peculiar about the rivers of this district. The one remarkable feature about them, with which we have now to deal, is the extraordinary system of, apparently, natural canals, or to use the expressive colonial phrase 'water-paths', between them. For instance, there is a complete inland water-way from the Pomeroon to the Amakooroo, and from there on into the Orinoco; and it may be as well, in order to give some idea of these water-ways in general, to describe somewhat minutely this particular line of water-path.

Hidden among the dense mangroves on the northern bank of the Pomeroon, at about four miles from the mouth of the river, is the mouth of the Wakapoa creek, which even there, and at high water, is hardly more than from ten to fifteen yards wide. Passing up this creek for about two hours, under trees which meet overhead, one suddenly enters the savannah, covered by tall, rank grass and sedges, the roots of which are at all times in swamp, and the tops of which in the very height of the rainy season hardly rise above the wide-spreading lake which then occupies what is at other seasons savannah. Round about, in the far distance, the forest, now retreating to form one of many bays, now advancing in one of many jutting points on to the savannah, and many belts and clumps and single trees of æta palms (*Mauritia flexuosa*) are seen. Whatever the season, the winding bed of the creek is always distinguishable, marked, even when the whole savannah is water-covered, by the absence of grass along its course, caused by the swifter flow of the current and the

frequent passage of canoes, and by long broad bands of water-lilies. Following the course of the creek for about half an hour from the point at which it first enters the savannah, a point is reached, close to the Protestant mission of Kokerite, at which two nearly equal streams join to form the creek up which one has travelled. The branch coming from the left is still the Wakapoa; that from the right is Correia creek. Up the latter lies the way. For another hour one crosses the savannah, along the course of the Correia, which winds much, now into the bays of the surrounding forest-wall, now between two projecting, nearly-meeting points of forest, and from time to time past island-like groups of trees in that sea of grass. These tree-islands are really small patches of higher ground, and are in almost all cases inhabited by Indians. At last, on the right hand as one ascends the Correia, a narrow water-path diverges from the main stream. This is the actual 'water-path,' or 'itaboo' as it is locally called, which is certainly not itself a creek or stream but serves to connect the Correia with the Manawarin creek, which latter is a large tributary of the Moorooka. These water-paths, though apparently natural, are in all probability artificial; but it will be better for the present to defer discussion as to their nature. Passing along this itaboo, for perhaps an hour and a half, across the open savannah, it then suddenly passes, still through purely swampy ground, into the deep shade of a dense but low jungle, chiefly composed of thickets of a prickly palm (*Bactris leptocarpa*, Trail); and after winding through this for another hour, the itaboo suddenly passes, between three or four forest trees of larger growth, out

on to the comparatively broad Manawarin creek or river. The way now lies down this, for some two hours, till the Manawarin runs into the Morooka, at about eight miles from the sea. Turning up the Morooka, one passes in less than ten minutes the protestant mission of Warramoori, on the left hand ; and two hours later, the Morooka all the while running occasionally through savannah, occasionally through large clumps of fair sized forest, one passes, on the right bank, the Roman Catholic mission of Santa Rosa.

The scenery of the Morooka, though this river runs chiefly through savannah, is somewhat peculiar and remarkably pretty. The grass being more even and less coarse than usual, the trees being very beautifully grouped, many hills rising from the savannah and these having been taken possession of by a peculiar race of Indians, called from their history 'Spanish-Arawaks,' who, much more civilized than the pure Indians, have cleared the ground and planted many fruit trees and many clumps of that most beautiful of all tropical plants, the bamboo, and have built fine large houses in such prominent and well-chosen positions that one is inclined to think they chose with a view to picturesque effect and view ; for all these reasons the land on either side of the Morooka looks more like a stretch of English water-meadow before hay-harvest than like the ordinary coarse-grassed and muddy 'wet savannahs' of the country. In passing along the river it is not difficult to imagine oneself floating, in early June, along the Thames between Oxford and Henley. Once the resemblance is even to a particular place. There is a place on the Thames, just above Shiplake Lock, where a low tree-clad hill rising

somewhat abruptly amid long stretches of rich water-meadow, yellow in June with butter-cups and red with sorrel and white with ox-eye daisies, is crowned by a barn and some picturesque farm-buildings half-seen among a few huge elms standing singly. And on the Morooka there is a place very like this, where a picturesque Spanish Arawak house but half seen among the single forest trees, which the house builder has left in clearing the forest, stands high on a hill which rises from a long stretch of level savannah, the waving grass of which is brightened by countless flowers of a beautiful white lily (*Hymenocallis guianensis*).

But about an hour above Santa Rosa, a narrow itaboo, along which is the way, passes off from the Morooka to the left. After entering this itaboo no settlements are visible along it, though in one or two places a well-trodden narrow path starting from the water side indicates that some family of Warrau Indians lives in a house hidden away in some neighbouring coppice. But even such places as these are only 'one one,' as the negroes say, along this itaboo.

For two hours the itaboo winds in the most provoking and apparently aimless manner, just as does an Indian foot-path, here and there across the open savannah, through, often at the side of, or between considerable coppices, till at last entering one of these coppices it passes almost at once into the small river Kamwatta, close to the source of the river, which is here not more than four or five yards wide and runs, not between dry banks, but between heaps of mud only held together by the roots of palms and of innumerable small trees, the branches of which, overhanging and intertwining, make one long

tunnel of the river everywhere but where, the forest receding somewhat, the river widens into a series of ponds, so thickly strewn with the flowers and leaves of water-lilies as completely to hide the water except along the one streak where passing canoes keep clear the path.

There is an exquisite beauty about the place, and there is a terrible dreariness. For many miles there is no house, nor even so much as a yard of dry ground on which a house might be. Pull up one of the water-lilies, and its roots come up laden and dripping with the thick slimy mud ; the very water is thick with mud ; peep under the spreading heads of the bushes, in among the moss and orchid covered tree trunks and palm stems, and nothing is visible as far as the eye can see in that dim light but mud heaps and mud holes and innumerable twisted tree-roots and tree-trunks all mud-painted by many previous high tides. Here and there, a temporary roof of a few palm leaves marks where some passing traveller, stopping just long enough to sleep or cook, has used the tree roots as an uneven floor, or, failing even these, has overlaid the mud with a faggot of palm leaves, to obtain foot hold. One gladly hurries first along the Kamwatta for a few miles till it runs into the rather broader and more open Bara-bara, and then along that until it, in its turn, runs into the yet more pleasant Biara, between beautiful and dense banks of graceful manicole palms (*Euterpe edulis*). But the ground on either side is still pure swamp.

The Biara is a tributary of the Barimanni, which itself is a very considerable river ; and this latter, again, runs into the main river, the Waini at about fifty miles from its mouth. The water-way from the Pomeroon to the

Orinoco follows the courses of the rivers just mentioned. But on reaching the point at which the Barimanni runs into the Waini, the traveller has to choose between two ways by which he may make his further journeys. He may either pass up the Waini until he reaches its tributary, the Moraybo ; or he may pass down the Waini till, when the sea is in sight, he comes to the Morawhanna.

If he takes the former course, on reaching the Moraybo, an inconsiderable river not more than some 30 yards wide at its mouth, his way lies up this for a short distance to a point where two branches meet. From here it is somewhat difficult to explain the passage, owing to the fact that, comparatively inaccurate as is the existing map of this district generally, it is absolutely inaccurate in its representation of the connecting passage between the Waini and the Barima. On the other hand, for that very reason, and as a guide to future travellers by that way, it is desirable to describe the real route, as nearly as may be.

At the point where the Moraybo, as one ascends it, first branches, the left hand branch is, according to the Indians of the district, the Moraybo proper ; the right hand branch, along which the way to the Barima lies, is the Sowareeko. Travelling along this, having passed a small creek coming in on the right hand, which being uninhabited and never penetrated is said to have no name, and also another small called Hobima—which name in Warrau is said to mean 'tiger-water'—one comes in about an hour to a point where the river again divides, the two parts being of about equal size. The branch coming from the right is called the Saoreena ; for the branch from the left, along which lies the way, I

could learn no name. Again three quarters of an hour further on, the river divides, the large branch from the right being the Beesi-besani, the small creek from the left, along which lies the path, being the Seba-seba. And in another half hour the entrance to the actual itaboo, or connecting water-path, is reached, on the right bank.

This itaboo is very small and very much blocked by fallen trees; for the savannah through which it flows is not open and grass-covered but is occupied by a jungle of tall bushes and low trees. It connects the Seba-seba with the Entagga river. After entering the latter, passing down its course, one reaches the main river, the Barima, in about an hour.

A comparison of the passage between the Moraybo and the Barima as above described from actual experience with the same passage as laid down in the map, serves to show the inaccuracy of the latter. But though the difference is certainly partly due to error on the part of the map-maker, it is possible that it has also in part arisen from the facts that there may be more than one water-way between the two rivers, and that, as is certainly more noticeable in this part of Guiana than in any other, each tribe often has its own name for each creek, so that though none of the connecting streams as above named are to be found on the map, it is possible that some of these are really the same streams as those indicated, under different names, on the map.

If, on the other hand, the traveller, instead of passing from the Waini to the Barima by this Moraybo itaboo, decides to go by the Morawhanna, on leaving the mouth of the Barimanni he will turn, not up, but down the Waini, and will travel along the ever widening course of

that river till he comes within sight of the sea. Here, on his left, he will find the mouth of the Morawhanna, an itaboo which, on account of its great size, requires special mention. It connects the Waini, at a point close to its mouth, with the Barima at a point some forty miles from the mouth of that river. Perhaps the Morawhanna should not in strictness be called an itaboo, as will presently be explained, in that it is certainly of natural, not of artificial, formation. It is also of considerable greater size than any of the other water-ways, and is of different character. As regards size, its entrance from the Waini is about 100 feet wide; and its average width from end to end is probably about 80 feet, though it broadens out every now and then into a series of lake-like ponds. Unlike the other water-ways, it is not a series of connected creeks, but is a single, natural canal, perhaps ten miles in length, between the Waini and the Barima. The depth seems, on the average, about 15 feet; and it is hardly at all obstructed by fallen trees, stumps or sand-banks. There is no reason why, if it is ever necessary, it should not be traversed by craft of considerable size. It takes its tide, which runs through it very strongly, from the Waini, not from the Barima. Lastly, the scenery along its course is very different from that of ordinary itaboos, or even from that of most rivers. For, for some not very obvious reason, the low trees and very numerous palms, principally troolie and manicole, which everywhere clothe its bank are here grouped in very unusually beautiful fashion. The great broad leaves of the troolie, sheltered and yet not crowded by the encircling trees, rise untorn by the wind and stand in splendid relief. And the almost circular ponds into which

the channel now and again expands, their still water broken perhaps by a single picturesque tree rising from the surface, seem as though arranged by some skilful gardener.

But whether the traveller pass from the Waini to the Barima by the Morawhanna or by the Maraybo, on reaching the Barima he has again to decide between alternative ways by which he may make his further journey.

Between, and roughly speaking parallel to the courses of, the Barima and the Orinoco lie, to mention them in their order from the Barima to the Orinoco, the rivers Kaitooma and Arooka, which are tributaries of the Barima, and the Amakooro. All of these, as are also the Barima and Orinoco themselves, are inter-connected by one or more itaboos, such as have already been described.

For instance, the Annabeesi creek, a tributary of the Barima, has an itaboo which connects that main river with the upper waters of its tributary the Kaitooma; the Kaitooma, again, has a tributary stream called the Quara, or Cooshi, from which there is an itaboo into the Mahokobunna, which is a tributary of the Arooka; and the Arooka in its turn is connected by its tributary the Aroan with the Amakooroo, though in dry weather boats have to be dragged for a few yards overland between the two. Again, the Amakooroo is connected, by the Cuyueeni, the Waiakakooro, the Bassana and the Aratoori, with the Orinoco.

But the simplest way of reaching the Amakooroo from the point on the Barima which is first reached in using the itaboo by the Moraybo between the Waini and

the Barima is by following down the course of the latter river to its mouth ; and from there it is not more than four, or at most five, miles by sea round to the mouth of the Amakooroo. And in the same way, instead of using one of the itaboos, of which there appear to be several, though these are little known, between the Amakooroo and the Orinoco, there is little danger or difficulty in coasting round by sea from the one river to the other. In either way, the water communication between the Pomeroun and the Orinoco is completed.

Probably when the district is better known many other itaboos will be found. But enough has already been said to indicate the very remarkable and intricate net-work of water-paths throughout this district.

Something must still be said here as to the real nature of these itaboos. The word itself, "itaboo," is almost certainly Indian ; but whether it be Warrau or Arawak or Carib it is difficult to discover. It seems now to be used broadly for any water-way which connects either one main river with another or two points on one and the same main river ; but its original meaning is probably considerably less wide. In its broader sense it is used of at least three slightly different sorts of water-way.

One form is where a small side-stream leaves a large main river to re-enter it at some lower point. Of this kind, very curiously and most conveniently, there are many on the upper Essequibo, so situated that each of them affords an alternative way past, and by which may be avoided, some dangerous cataract on the main river, leaving the river above the fall to re-enter below. For instance, there is such an one, of perhaps

two miles in length though but a few feet in width, down the rushing waters of which, swiftly as these flow, boats may in comparative safety pass by and avoid the big cataracts of Etannime; for in the itaboo the too rapid passage of the boat may be checked at the will of its crew, as they catch and cling for the necessary moments to the tree-branches which everywhere overhang and inter-arch at no great height. Again, on the same river, the Essequibo, there is another so-called itaboo, of considerably greater length and widening out here and there into great pond-like reaches, which does not avoid any fall. This leaves the main river a mile or two below the point at which it is joined by the Roopoonooni.

Another form is merely a natural canal, not between two creeks of adjacent rivers, but between the two main rivers themselves. And of this the best example is the Morawhanna above described.

The third form is where a water-path *almost certainly artificial* connects the upper courses of two small creeks or rivers. Of this kind are the water-paths already described, between the Correia creek and the Manawarin, and between two side streams of the Moraybo and the Barima respectively. These occur always where the upper courses of the two connected streams start from points not far apart on one and the same 'wet savannah' or, more rarely, in some forested swamp. In such places there is at all seasons of the year a more or less moist and muddy surface; and during the wet season a good deal of water overlies the mud. Through this mud or shallow water it is easy to move a canoe or light-boat, either pushing it with poles or dragging it, from one

stream to the other ; and in course of time, one canoe after another having been thus pushed or dragged along the same path, an artificial channel is formed, along which water flows at all seasons. Thus an artificial itaboo is created between the two streams. The process by which this happens may be readily seen on the upper part of Morooka river, where its stream winds much and widely through moist, grass-covered savannah ; and here in many places, passing boats are dragged over such land as is there for short distances, from point to point, so as to cut off a long bend of the river. These short-cuts, half-formed itaboos on a small scale, are already very clearly and definitely marked on the savannah by their very much shorter grass and the smoother surface of the ground ; but, though in time water will flow constantly through these, at present it is only at times when there is a considerable amount of water over the savannah that boats can float along them.

It is to these artificial water-paths that the name 'itaboo,' it seems to me, more properly belongs.

The vegetation of the district, to which we must next turn, has already been described as regards its general characters in distinguishing the parallel tracts, of mangrove and mora, which occupy the whole district. But while the mangrove and the mora, respectively, are by far the most abundant plants in these two tracts, other plants are of course intermingled with these, especially in the mora tract. And as these additional plants differ in some degree from those general throughout the colony, they claim a few words of notice.

Next to the mangrove and mora, the most abundant vegetation is supplied by palms of various species. Of

these the manicole palm (*Euterpe edulis*) is the most prominent, growing as it does in a profusion greater even than in other parts of British Guiana. It is abundant in the mangrove tract, and is present, though in less abundance, in the mora tract; but it is just where the one of these tracts passes into the other that it flourishes most. On either side of the Biara river, for instance, which runs just where the two tracts meet, it occurs in surprising numbers. Indeed, the dense "bush" there consists almost entirely of enormous numbers of manicoles, varied only by a good many bushes, or rather small trees of 'wild chocolate' (*Pachira aquatica*), of unusually large size, and a few trees of a kind (*Spathelia* sp?) of which more will be said presently.

But if manicole is unusually abundant in the district, another palm, common elsewhere throughout the colony, is here remarkable for its great scarcity. Throughout the district there are but very few kokerite palms (*Maximiliana regia*); and those which do occur are of remarkably stunted growth. Nowhere in this district does one see the noble column-like trunk, the grandly curved capital of huge down-hanging spathes and flowers and fruits, and the noble crown of vast plumed fronds which distinguish the kokerites of other districts. Here, where this palm occurs at all, its dwarfed leaves rise to no great height, it is almost without stem and has its few miserable bunches of flowers and fruit almost buried in the mud.

Yet another palm requires notice here. This is the troolie (*Manicaria saccifera*), which occupies so much of the swamp lands of the Pomeroon and Barima but is, curiously enough, rare, or at least very locally

distributed, in the intermediate, though apparently equally suitable parts. For instance, on the Waini, at least on those parts of its banks immediately above the junction of the Barimanni, the troolie does not occur at all. But on entering the Moraybo, a tributary it will be remembered of the Waini, close, but on the opposite side to, the Barama, the troolie region is again at once entered; and from there right through to the Barima, and down that river, it is once more abundant. The leaves of this palm being used by the Indians of this district almost exclusively for thatching their houses, those of them who live away from the troolie-swamps have to travel far and to carry home the leaves with much labour.

A few booba-palms (*Iriartea exorrhiza*) are scattered along the upper reaches of the rivers; but apparently nowhere within this district does this palm form the chief vegetation of special tracts of swamp, as is the case in the Corentyn district. The only other palm claiming special notice is a small *Bactris* (like, but not identical with, *B. leptocarpa* of Professor Trail), called by the Warraus of this district *yarooa*, which occurs in very great abundance on the lower part of the Barama, from its mouth for some distance upward, and occurs scantily in one or two spots on the upper Waini.

Along the upper reaches of these rivers two flowering trees form a special and very noticeable feature. One of these is the beautiful *Brownea racemosa*, the 'rose of the tropics' as RICHARD SCHOMBURGK characteristically, but somewhat inaptly, called it. It occurs scantily on the Pomeroon, but apparently nowhere in Guiana south of that. But on the Waini, the Barama, the Barima and their tributaries this tree, for it there attains the

dimensions of a small tree, constitutes the bulk of the lower growth under the moras. Though it appears not to flower abundantly, its few but very large bunches of blossoms are of such intensely brilliant crimson colour as to attract the eye from afar. Equally attractive are the enormous magnolia-like flowers of a *Gustavia*, which is very abundant on these rivers.

One other tree, though occurring throughout Guiana, is nowhere so abundant as here. This is a species of *Spathelia*, which makes a great show among the moras by the river banks. In a young state its single upright stem and palm-like crown of grandly cut, dark-green leaves make it look like a young booba-palm; but as it grows older, it branches scantily, and forms a wide-spreading head of a few finely grouped leaf-clusters, in the midst of each of which is set, in the flowering season, a huge plume of countless white flowers.

Of the prickly bamboo which seems to belong, as regards Guiana, almost exclusively to this district, I have written already in an earlier number of *Timehri*.*

Orchids, as might be expected from the damp character of the district, are unusually abundant; but these are not very different from those of other parts of Guiana. Probably because the district has been less visited and less despoiled than many others, several orchids, however, which were apparently once abundant throughout the colony but are now rare elsewhere, are here abundant. As an example of this kind, may be mentioned *Oncidium Lanceanum*, which, common as it is in quasi-cultivation in the gardens of the coast, is now

* See p. 111, *ante*.

rarely to be seen in a wild state, except in this district, in which it is fairly abundant.

One very beautiful little yellow orchid (*Oncidium iridifolium*), occurring sparingly and in very small clumps on the Pomeroon, grows wonderfully abundantly and in very much larger clumps on the Barima. The plant is fan-shaped, like a tiny iris plant, generally not more than an inch high and as much across, from which rises, well above the leaves, a delicate stem, on which unfold, one at a time, many yellow flowers. Generally, each plant consists of one, or at most two, fan-like tufts of leaves; but on the Barima plants are to be found composed of a dozen or more tufts, but so small that one can hold the whole clump, root and leaves, in the hollow of both hands; and yet there may be on it, besides buds, from thirty to forty open flowers each an inch long and three quarters of an inch across, of brilliant yellow, and like, but of more brilliant tint than, single florets of *Oncidium altissimum*.

Another peculiar, and somewhat puzzling, orchid occurs in this district, resembling in the general habit of plant and leaf (though these latter are broader and of a darker shade) *Burlingtonia candida*, but with a pendent wreath of greenish white flowers, like a long, down-hanging spike of mignonette, rather the wild English mignonette than the sweet kind of gardens.

A beautiful pure yellow (lemon coloured) variety of *Gongora* is also noteworthy; a violet flowered *Sobralia* grows, though sparingly, on some of the tree trunks; and in the shady creeks, the lovely *Stanhopea grandiflora* hangs down many of its great white delicate flowers.

On the whole, it may safely be affirmed that while the

vegetation of this district resembles in the main that of the rest of Guiana, yet it has certain well-marked and note-worthy features.

The animal life of the district is less peculiar. The one bird to be noted as peculiar, as regards Guiana, to this district is the great horned-screamer (*Palamedia cornuta*), the *kamoko* of the Indians, a huge black powis-like bird with very formidable spurs on wings and legs. It lives, breeds and feeds among the long grass of the open patches; and it becomes more and more abundant the nearer one approaches the Orinoco. Another marked feature in this district is the very great abundance of the blue and yellow macaw, (*Ara ararauna*) the *abouen-neh* of the Warraus, which is to be seen in parties of two, three or even more, on at least one tree in almost every one of the innumerable bends of the river.

Game, both four-footed and feathered, is unusually abundant—doubtless on account of the sparse population. Fish, too, is very abundant. One much sought after species, locally called *maracot*, seems to be peculiar to the mouths of the rivers of this district. It belongs to the genus *Pacu*, but is certainly not of the same species as the *Pacu* shot in large numbers in the Essequibo and Masserooni.

But of living things the most numerous in the district are certainly mosquitoes, which swarm inside the mouths of most of the rivers in such vast numbers as can only be realised by experience. Yet these insects are curiously distributed. Within the mouth of the Pomeroon, and that of the Waini at many seasons of the year, they blacken the air; and it is no exaggeration to say that they there

make night noisy with their roar. At the mouth of the Barima they are less abundant; and within the Amakooroo they do not seem to occur at all. It would almost appear as though the head-quarters of these insects were at the mouth of the Pomeroun, and that they become less and less abundant further and further from that point. But, on the other hand, within the mouth of the Orinoco itself they again become enormously abundant. It must be added that the upper courses of all these rivers, and this is especially true of the Pomeroun, are free from these blood-suckers.

The population of the whole district is very scanty, and is very scattered. Most of the inhabitants are Red-men—True Caribs chiefly on the Barama and upper Barima, Ackawoi on the Morooka and upper Waini, Arawaks on the Morooka, and many Warraus everywhere at the mouths of the rivers. On the Morooka there are two missions—Warramoori, belonging to the church of England, Santa Rosa belonging to the Roman Catholics; and these serve as centres, bringing the scattered population together and making it thicker on that river than elsewhere.] The members of the Warramoori mission are the scattered pure-bred Indians of the above mentioned tribes, who live elsewhere but have houses at the mission to which they resort from time to time and especially on Sundays. The members of the Santa Rosa mission, on the other hand, form a curious and isolated group of people, locally called 'Spanish Arawaks.' These are half-breeds, between Spaniards and Arawaks, who fled southward from the Orinoco to escape the evils of the final war of Venezuelan independence, and, settling on the Morooka, took shelter, as they supposed, under English rule. In phy-

sique they show trace of both their parent races ; they speak, more or less impurely, both languages ; they pay decidedly much more attention to cleanliness, and do far more to make their homes pleasant, as for instance by cultivating fruit trees and even flowers, than do pure Indians ; and they almost invariably in all ways keep themselves aloof from the pure Indians. On the Waini, at Quobanna, is a third mission, recently established, in connection with that at Warramoori ; but this, as is the parent mission, is chiefly a centre to which the pure Indians from the surrounding districts occasionally and for very brief times resort. All the pure Indians of the district, whether they occasionally attend missions or not, live, not on the main rivers, but far up the most retired creeks ; and consequently they are but very seldom seen by the traveller, unless purposely sought. —

Except these Indian missions, there are but few centres of population. Just within the mouth of the Amakooroo there are some half dozen settlements, occupied chiefly by coloured men and Portuguese, who have passed from the English side and settled there, and by a very few Venezuelans. Again, on the Morawhanna settlers of the same class as those on the Amakooroo are now beginning to gather ; and at a point far up the Barama a few other settlements of the same character have recently been formed. There are also two or three more such settlements scattered singly throughout the district. These are all the regular inhabitants of the district.

But during the fishing season considerable numbers of people from the Pomeroon and the Orinoco gather at the mouths of the Barima and Waini to catch and salt

fish. And there are also some half-dozen regular traders, black people or coloured, who almost constantly move about in their boats, or 'floating shops,' carrying cheap European goods to the Indians and obtaining in return such produce as these people have to give.

And this brings up the subject of the products of the district. At present these are extremely few and unimportant. Chief of those actually obtained is perhaps balata, the milk of the bullet-tree (*Mimusops balata*), which till recently was abundantly and widely scattered throughout the mora tract; but, owing to this same search for balata and the wasteful method in which it has been carried on, the tree is now not far from being exterminated. Almost every Indian collects bullet tree milk, and in doing so unfortunately chops down the trees. Considerable quantities of locust gum are also collected by the Indians; but as is the case with this substance elsewhere in the colony, the supply, by its very nature, is limited, and it must before long be virtually exhausted, even under the very dilatory and inefficient system of collection followed by the Indians. By the Indians a few yams are grown for purposes of barter, and a few fowls and parrots reared; and a very large quantity of fish is caught, cured and, with the corresponding amount of fish-glue, bartered. And, considering the small amount of land under such cultivation, large quantities of yams, corn, and even cacao are produced by the few coloured and Portuguese residents; this produce finding its way in about equal proportions into the English colony and into Venezuela. A very little timber, chiefly red cedar, is also cut by these people. This fairly exhausts the list of produce at present obtained from the district.

As to produce which might be obtained, the land is very rich, and, under proper cultivation and with the necessary heavy outlay on drainage, might undoubtedly be made as fruitful as the similar lands along that part of the coast which lies between the Essequibo and the Corentyn; and the uplands of the district seem especially suited for the cultivation of coffee and cacao. Timber is abundant and fine; the mora, especially on the upper parts of the rivers, is far finer than any to be found elsewhere in the colony. And up the Barima and Amakooroo red cedar is very abundant and fine. Nor would there be much difficulty in getting this timber, when once cut, to market; for the rivers are large and fine and afford an unsurpassed system of water carriage. Lastly—and according to some this is the most important fact about the district—it may be taken almost for granted that gold will, for good or evil, one day be found there.



Health in the Colony.

By J. E. Tinne.



NO question can be of such burning importance to the colony as its public health; and yet none here presents such glaring anomalies at the outset, or offers more opportunities to a reformer, than the conditions under which it at present exists.

The late epidemic of yellow fever, the still more recent quarantine of the *Sheila* from fear of cholera, the alarming increase of leprosy, and the general sanitary state of our community now, as compared with former years, present serious points of reflection.

It strikes one as strange that a country should have such large and apparently unlimited powers of excluding disease from outside as we now possess, and yet be so regardless of the fact that disease is never purposely brought here by those who visit us. For instance, we introduce to this country annually some four thousand immigrants from a city where Asiatic cholera is endemic, besides the number of visitors to our shores from other parts and yet we have no existing quarantine accommodation for either East Indian coolie or mail passenger, such as even Trinidad or Surinam can boast of. At a cost of from £6,000 to £8,000 we could purchase an old iron steamer or ship, dismantle her, and place a double deck upon her, making a floating hospital to hold a thousand people if required.

Whilst, however, we have the means of placing a cordon around us that nothing but brute force could break,

we are compelled by English medical opinion, enunciated by at least some who have never seen a case of leprosy, and in opposition to the voice of almost every other civilized country, to allow that foul and deadly contagion to spread rapidly within our camp and beyond our own control. If, by the sense of modern public opinion at home, local option in matters of drink has been recognized, can any refuse us, living in the midst of this dreadful disease, the power to isolate its victims and save the rest of the country? Is it the enormity of the task in India that appals those who inwardly confess to the truth of the increasing evil, and urges them to withhold from us liberty to take the steps necessary for our own protection, because they would have to follow our example at a heavier cost? In the Sandwich Islands, if a member of the royal family itself, or one of the highest nobility, becomes infected,—without a word or murmur against what he recognizes as for the public good, he bids adieu to his relatives in this world and retires for the remainder of his life time to the leper island of Niolo Rai. What savages of yesterday have learnt as a bitter experience to be a necessity? what our neighbours, the Dutch, consider a proper precaution at our very door, is to be forbidden us, (who are almost omnipotent as regards excluding disease from without) because it has already landed and made its home here. Debates in the Court of Policy, a letter to the newspapers, may awaken a passing interest in the matter at the moment; but it is for those who have known its unhappy victims here and who live in its proximity, persistently to agitate for a better state of things and a sufficient control against the evil.

Generally, the colony would seem of late years to have

made some pigmy strides in the path of sanitary reform. Public baths, such as even the railing off the space between the two groynes where the Militia Band plays at the sea wall, to keep out sharks, would afford at a very trifling expense, seem to have gone out of recollection, although in 1879 the money was voted for their erection. One sees a few washing sheds, with Lamaha water laid on, over some city trenches; but where overcrowding, defective sewage management (save in one experimental district), the rapid growth of tropical vegetation, the equally quick alternation of heat and rain, the indolence and improvidence due to climate and conducive to filth and consequent sickness, exist there appears to be still a wide field indeed for philanthropists to work in. That an ample supply of pure tank water in time of drought has as yet been secured only upon sugar-estates affords a theme in itself.

Temperance also, as distinct from teetotalism or good templarism, has lessons to teach here which are no less valuable; and whilst it may reasonably be doubted whether total abstinence from stimulants is to be the rule for all, it is undoubtedly true that more to do, whether in work or recreation, and less to drink would be of benefit to the bulk of the community. From this point of view it seems right that, whether one partakes in the different means of occupying one's leisure or not, every one should support more actively than they do, the boating, cricket, rifle shooting, athletics, lawn tennis and other amusements; and steps should be taken to facilitate the modes of access to pleasure-resorts, such as the new Botanic Gardens, the many beautiful lakes and creeks behind our estates, even the Kaieteur

itself, from which at present the general public are practically excluded by the want of very inexpensive aids to travel, such as benches at stated points, ferries and tramways, at a minimum of cost and a maximum of convenience. Lastly, it must not be forgotten that for many years the colony has had to work for its bare existence and could spare no time for those diversions which make life in the Tropics as palatable as at home.



A Visit to the Oil and Fibre Works at Pln. "Fortitude."

By the Hon. B. Howell Jones.



MY curiosity was aroused by the samples of coconut fibre which were given to me by Mr. MUSTARD and which I had the honour of laying on the table at a meeting of this Society, on 10th May, 1883. I therefore determined to take the first opportunity of visiting the estate on which these were made. Consequently, on the 17th of May I found myself wending my way, accompanied by Mr. MUSTARD, towards Mahaicony, in which district Plantation *Fortitude* is situated. No sooner had we arrived on the creek road, which has recently been put in order, than I found I was indeed in the land of cocoanuts. Sugar was nowhere, and King Coconut reigned in his stead. Wherever one looked, cocoanuts in all stages of growth surrounded the observer. And a pretty sight it is to see the long avenues of palm trees casting a refreshing and inviting shade from the heat and glare of the tropical sun. Our first resting place was at Pln. *Sophia's Hope*, the residence of Mr. BARLOW, where we were most hospitably entertained at breakfast. Mr. BARLOW is indeed a splendid specimen of a colonist. Forced on account of ill health to leave the hills and dales of beautiful Devon, he joined his brother, who was already a planter out here, and for over fifty years has made this the land of his adoption; and during the last thirty-five years has never left its shores; over eighty years old, hale and

hearty, a living denial of the unhealthiness of the colony ; and surely if our Honoured President merits the title of " Sugar King," Mr. BARLOW may rightly be called " King Cocanut." But I am digressing from my subject. After breakfast and a chat on nuts and things pertaining, we started for Plantation *Fortitude*, arriving at which we were kindly received by Mr. SMITH, the owner, who immediately proposed visiting the works.

No sooner had we entered the yard than we saw piles of nuts ; and it is not until a tyro, like myself, sees masses of nuts together like this, that he understands what a vast difference there is in nuts. Here we saw large, bright, reddish-brown, even-sized looking nuts which we were told came from such an estate, others dirty, brown, undersized, and shrivelled, showing care had not been taken with the estate on which they grew, tell-tales of dirty trees or drainage unattended to ; but Mr. SMITH makes use of them to keep his machinery employed, and all is grist that comes to his mill at present. As you enter the machine shed, you soon discover that the manufactory is divided into two distinct operations, the Oil Department, and the Fibre, the motive power for both being a 14 horse power Robey Patent Engine, this being stationary, and placed under the boiler, working with a pressure of 60 lbs. the square inch.

The nuts are first divested of their fibrous covering, by manual labour, in the yard, 60 cts. per 1000 being the price paid for this work, which consists simply of splitting the husk on the sharp edge of a hoe fixed in the ground, no better method at present being discovered. The husks are then sent to the fibre department and the hard nut, the fortune of which we intend first to fol-

low, being broken up by a hammer, is then placed on long trays mounted on wheels, running in and out of a shed, so as to avoid danger of getting wet, should a shower of rain fall, whilst the sun's action is shrivelling the kernel, allowing it to come away easily from the hard shell. This is soon accomplished and children are employed in separating one from the other. The kernels, which at this stage are called Copra, are sent away to the store room, and the shells to be burnt to raise steam in the boiler. The copra is then placed under the crushing mill, worked from a shaft driven by a pulley, on the fly-wheel shaft of the engine, as indeed are all the machines in this department. The crushing mill consists of two large mill-stone wheels revolving round a large iron saucer or pan and also round their own centres; it is to all appearance like a large mortar mixer, so commonly seen in England, only in that case the saucer moves round, whilst in this the saucer is stationary and the stones revolve. The outer edges of these stones are set in such a way that each one delivers to the other the mass it has just crushed; in this way the whole is reduced to a fine powder. A door at the bottom of the saucer is now opened, a scraper, revolving with the stones, gathers the materials together and pushes it through the opening into a shallow tray ready to receive it. It is now to all appearance like damp brown sawdust and is ready for placing in the steam-kettle, which has a stirrer revolving inside which keeps the mass moving until the temperature is raised to 120° F. A sliding door is then opened, and the mass, which has assumed an oily appearance is run into coarse cloth bags; these are put between wooden envelopes lined with tin, and placed on the iron trays of the hydraulic press. The

hydraulic pumps working in oil, which are self-acting, are then set to work, the first and biggest pump quickly raising the pressure, which when it rises to a certain point is taken up by the smaller pump until a pressure of $1\frac{3}{4}$ tons to the square inch is reached. Long before this point is arrived at, the oil is seen bursting out from the bags, flowing from tray to tray, until it finally falls into a tank, from which it is pumped into the oil store. This consists of a receiving tank, a settling tank, and the pure oil, or shipping tank, arrangements being made for drawing from one to the other.

We now return to the hydraulic press from which the pressure has been taken off and the envelopes removed; the bags are now perfectly flat, and it is with difficulty they are taken off from the hard cake formed inside. This is now like oil-cake made from linseed, but is lighter, in colour. Sometimes these cakes are again broken up under the mill and are squeezed a second time, or are mixed with the copra to prevent the mass under the stones from becoming too oily, and after the second pressure the cakes are fit for food. The broken cakes are ground up into powder and form a fine food for poultry, most of it being sold on the spot at 72 cts. per 100 lbs., or is used for mixing with fresh copra; in this way little or nothing is wasted.

One action of the pair of presses will crush the copra from 400 nuts and yield per day 130 to 140 gallons of oil, and the filter bags used will work up 100,000 nuts before wearing out.

We then turned our attention to the husks, which are first placed in a crushing mill, worked by a belt from the fly-wheel, as are all the machines in this portion of the

factory, and which consists of two deeply grooved rollers which flatten out and break up the outer silicate covering. They are then placed on trucks and wheeled to the ponds placed at the side of the tramway, where they remain soaking in water for at least a week, but generally for a much longer period, until the outer cuticle has to some extent rotted and become soft. They are then taken back to the factory and the process of extracting the fibre by the teasing machines commences.

The husk, being held in the hand, passes between two small rollers about $1\frac{1}{2}$ inches in diameter, close to which a large wheel, with its periphery covered with small teeth, revolves with great speed, which, as soon as the husk touches it, tears the refuse from the fibre and in a few seconds leaves the fibres still somewhat dirty but separated from each other. Then it is withdrawn and the portion of the husk previously held in the hand is submitted to the same process, leaving a bunch of comparatively clean fibres. The refuse from these machines goes to make what is known as "No. 2 mat fibre." The fibre just acted upon, which I have stated is only comparatively clean, is again submitted to a second process in another teasing machine kept clean for this purpose, the result being a clean sample. The refuse from this second operation goes to form what is called "No. 1 mat fibre." Mr. SMITH has three of these teasing machines at work; but he finds they are not sufficient for his wants, and he has three more, on their way from England.

The fibre is tied up into small bundles, a number of these being placed together and placed under an hydraulic press forming a bale 2 feet x 2 feet x 3 feet weighing

about 200 lbs. The refuse from the teasing machine is again passed into a cleaning machine, consisting of a wire cylinder about 8 feet long, slowly revolving in the opposite direction to a shaft inside carrying teeth which shake out the dust from the fibres, carrying it at the same time forward and discharging it clean at the other end. This machine is most simple and effective. Of course the 1st and 2nd mat fibres are passed through separately and are packed by themselves, in bales similar in size to the brush fibre, but only weighing 120 to 130 lbs. But before packing, all the fibres are exposed to the sun, for drying, and are exposed on wheeled trays running on a tramway similar to those used for drying the copra.

Thus every portion of the cocoanut is disposed of, and is marketable with the exception of the refuse from the mat fibre cleaning machine, no use having been found for this, except for nurserymen at home, who place it as a top dressing to bedding plants and on the pots in greenhouses, and I have no doubt our Government Botanist will be able to take some of this for the Botanic Gardens, and perhaps tell us if it would be suitable as a manure in cane cultivation.

After inspecting the works we walked through the cocal. This consisted, a few years ago, of some hundred trees, but Mr. SMITH with his energy has now 7000 trees in full bearing, all kept clean and in good order. He states his average crop is 700,000 nuts, at which Mr. MUSTARD expressed some surprise, as he considered it high. Here and there we saw signs of the inexplicable cocoanut disease, not to be confounded with the tatak of the beetle, and on talking over the matter, both Mr. SMITH and Mr. MUSTARD were of opinion that it

results from the planting of green nuts, which grow much more rapidly than ripe ones, and that after bearing one or two crops they seem to get exhausted and die away. This opinion is to some extent borne out by the fact that in the older walks, such as that behind Mr. BARLOW'S house, the trees have never suffered. I mention this, as anything that can throw light on this strange disease or lead to a clue to the mystery must be useful to those interested in this cultivation.

In this paper I have not touched on the number of persons employed on the works or the rate of wages paid, as it must be remembered the works are only in their infancy, the full power of the factory undeveloped, and the hands unskilled in the use of the machines. Under these circumstances any minute detail of this description would be unfair to Mr. SMITH and misleading to the members of the Society; but I hope I have shewn what anyone with energy and push, coupled with brains such as Mr. SMITH possesses, can accomplish in establishing what are now termed "small industries," and I am sure all members of the Society will wish Mr. SMITH all success in his venture and that it may be the forerunner of similar establishments in the colony.

There is one thing which struck me on my visit to Mahaicony which I do not think it is out of place to mention here, this is the answer received to my question "Who are your labourers?"—"Oh, Coolies; nothing but Coolies";—a warning, to those who advocate small industries, that if their theories are to be successful they must look to immigration for assistance; a rebuke, to those who are constantly grudging the revenue supplying $\frac{1}{3}$ the present cost; and a strong point in favour of those who

know that without immigration the colony would not be what it is, and that as its success at present and in the past must be attributed to immigration so in the future will this have to be continued, if we wish to see that prosperity maintained and small industries progress and flourish.



Notes on West Indian Stone Implements.
(*Illustrated.*)

By the Editor.

No. 2.



IN the former note on this subject* the last specimen described and figured [Plates 3 and 4,] was a curious stone mill or mortar, or, as I rather suppose it to be, a bench, from Mr. E. L. ATKINSON'S collection. Since that was written, the owner of that implement has called my attention in a letter to certain hypotheses, one of which is somewhat wild, which have been held as to such stones. "I did form some opinion," he writes, 'as to what use the 'cocked hat' had been put . . . I thought it had been used rather to make fire with, as the inner groove seemed to be for the purpose of rubbing, or as a mill; but I have read of others perfectly flat. I also saw in an American catalogue that they were supposed to represent the island of Cuba, as all they had had come from that island, and in the distance it (Cuba) had the appearance of one of those stones; but I think the fact of one coming from another island (i. e. St. Vincent) so far away from Cuba knocks that on the head. Mr. OBER, who was sent to the West Indies by the Smithsonian Institute, picked up a very curious little imitation of a turtle in Balliceaux, a small island near St. Vincent where the Caribs were imprisoned after the last war. An engraving of it may be seen in

*See *Timehri*, vol. 1. p. 257.

his book "Camps in the Caribbees," where he also gives extracts from various authors about these images. It might be inferred that the turtle was one of the deities of the Caribs of St. Vincent. I think the head on one end of my stone represents that of a turtle and the other that of some fish. The stone may have been used as an idol, and the hollow part made to cause it to fit firmer on its pedestal." As regards the strange suggestion that the stones are representations of the island of Cuba it is probably not necessary to write. As regards the other theory, based partly on Mr. OBER'S remarks, that these stone benches were idols, I may add that in reviewing Mr. OBER'S book, at the time of its appearance, in an English literary journal, I remarked that 'the wooden object, representing a tortoise, figured on p. 223 as an image of a *semi*, an inferior sort of deity said to have been worshipped by the old Caribs, is in reality, as Mr. OBER himself seems half to suspect, part of an Indian bench or stool. The Indians are still in the habit of making stools roughly resembling such animals as alligators, tortoises and frogs; and the '*semi*' figured is the head-piece of one of these stools. To Mr. OBER'S information that the eyes 'are carefully carved hollows, as if for the reception of some foreign substance' I may add that the substance now usually inserted to represent the eye is a bright-coloured seed.' In short, while agreeing with Mr. OBER that his turtle was part of one of these bench-like articles, I cannot agree either with him or with Mr. ATKINSON that there is any probability of such articles having been regarded as idols. The further suggestion of the latter gentleman that the hollow part of the stone may have been

intended to fit on to the top of a pedestal is, I think, negatived by the fact that in the great majority of examples the hollowed surface is obviously intended to be uppermost, the opposite surface being flat, not pointed as is Mr. ATKINSON'S peculiar example, and very certainly intended to rest on the ground. It may be as well to add that I gather from Mr. OBER'S book that in the Report of the Smithsonian Institute for 1876 there is an elaborate article describing, amongst other things, several of these 'stools', from Porto Rico; but this article I have never been fortunate enough to see.

Those notes being as it were jottings of such information as comes to hand from time to time, I may here insert another interesting extract from a letter of Mr. ATKINSON'S, concerning the same island of Balliceaux above-referred to. He writes 'that the Caribs had a burial ground in the island of Balliceaux. I have only heard of it, having only once been there. The gentleman who told me said he had often seen the skulls, each one packed in a little urn, and very close to the surface of the ground. I cannot say if there are any there now. Balliceaux is about eight miles from St. Vincent; and from it to Grenada there is a string of small rocks and islands. I have specimens (of stone implements) and have heard of many more that have been picked up on these rocks and islands, upon which Caribs were never known to live; and, in fact, on some they would not have been able to, from their small size. On one of these islands (Mustique) I picked up some very curiously shaped pieces of shell, seemingly made, or rather shaped, by hand; but the people on the island told me they were pieces of conch shell broken of and smoothed by the sea. I have reason

now to believe that they were Carib implements similar to the St. Lucia (?) and Barbados specimens. . . . My 'gouge'* and a very sharp 'knife' of greenstone also came from Mustique. But Caribs could hardly have lived there, as there is no water.'

It is very much to be wished that further information may be obtained of this supposed Carib burial place and of the other Indian relics of these islands.

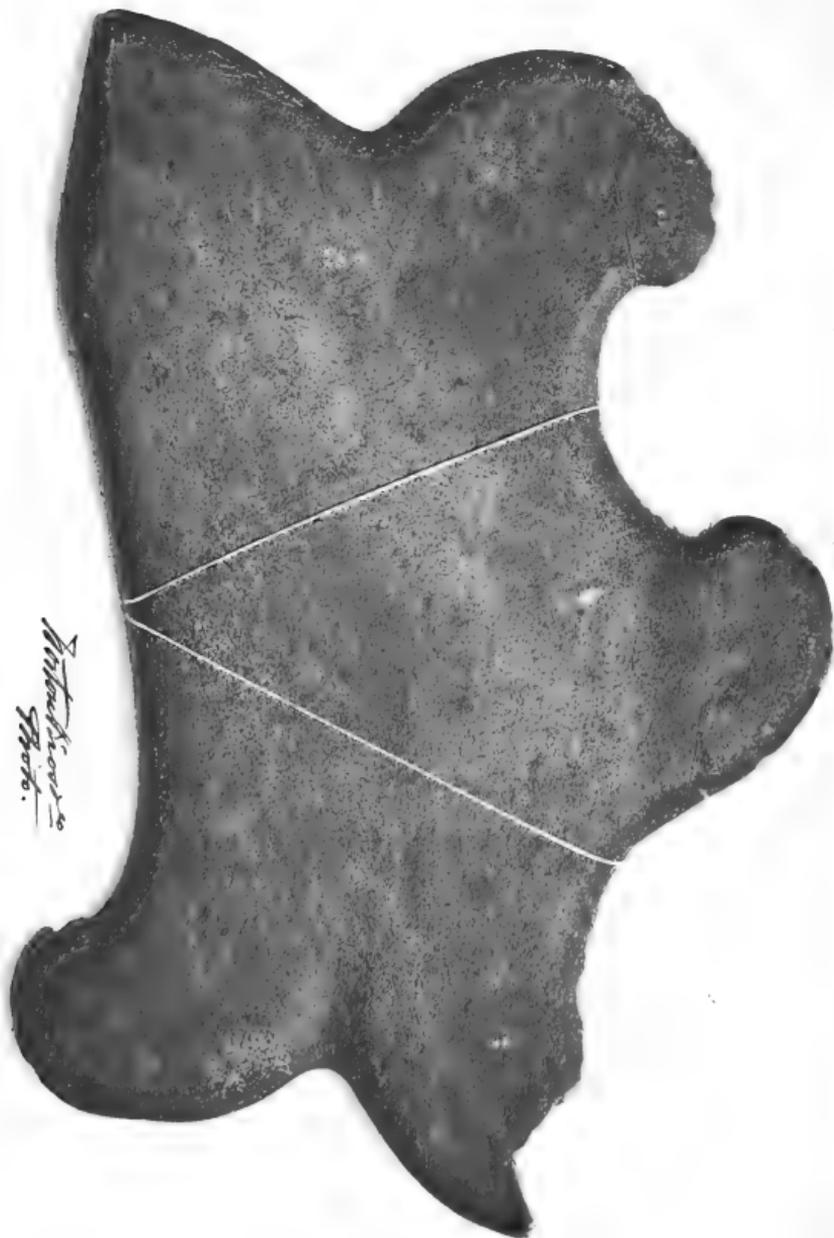
As regards the skulls packed in urns I may mention that some years ago Dr. WALLEEN, a Venezuelan, and formerly in the army of that country but since resident in Georgetown, in the course of a very interesting letter on shell mounds and other similar subjects which he sent me, mentioned his possession of an earthen cup of baked clay, the shape of a human skull, which was found, together with some other relics of Indians, in some loose mould near the village of Serro on the coast of the Gulph of Paria. As it is just possible that this skull-shaped cup may bear some relation to the skull-urns of Balliceaux, Dr. WALLEEN'S statement is worth mentioning.

The implements which I am able to figure on this occasion are all from the collection of M. ROUSSELET of St. Lucia; and they were, I believe, all found on that island. M. ROUSSELET was good enough to send them to the British Guiana Exhibition held in Georgetown in 1882.

By far the most remarkable of these implements is that figured on Plate 5. It is of very considerable size; its greatest length is thirteen inches, and its greatest height

* This 'gouge' is the very beautiful little implement figured (No. 7) on Plate II, See *Timehri* vol. 1. p. 265.

Plate 5.



*W. B. Smith
Photo.*

(from top to bottom as it stands on the plate) is seven and a half inches. Unfortunately, I failed to note its greatest thickness ; but this must be at least an inch and a half. Nor did I note its weight.

It will at once be obvious that its manufacture must have involved great labour. Its chief and great value to us then rests on the rather paradoxical fact that, notwithstanding this great effort involved in its manufacture, it is almost, if not quite, impossible to suppose that it can even have been of any practical use to its makers and first owners. I have already pointed out that, in accordance with an Indian habit of which strong traces may yet be observed in the surviving members of the race, Indians, and of these especially the Caribs, seem to have been in the habit of very elaborately fashioning and ornamenting certain hatchets and other implements *of the types which they ordinarily used*, and of keeping these glorified examples not for use but for ornament. Possibly these were made as examples of what they could do ; possibly, though not used practically, these had certain ceremonial uses. Perhaps the very remarkable stone here figured belongs to this class of ornamental or ceremonial, as distinguished from practical, implements. But if so, it differs from almost all others known to me in that at first sight it appears to be, not a glorified hatchet, or any kind of implement ordinarily used, but is apparently of a purely imaginative form. On the other hand, it is quite possible that this stone may have been made and used as a sort of 'banner-stone,' as an emblem or ensign, to be carried perhaps with war-parties, perhaps in ceremonial dances or feasts ; and in that case it may be of a form tradi-

tionally proper for such purposes, and may even be the conventionalized figure of some common object, just as for instance the conventional 'fleur-de-lis' represents, or misrepresents, some flower, probably the common iris.

As regards these 'banner-stones' some information may be gathered from the catalogue of General PITT-RIVERS' instructive collection as exhibited a few years ago at the Bethnal Green Museum, which collection, by the way, has recently been given to the University of Oxford. In this catalogue it is pointed out that axes in their earliest and simplest forms were probably used merely as tools ; at a later period they were used also as weapons ; and at a still later period a further use was found for them, as ceremonial emblems. And when used in this latter way the blade, and often the handle, were sometimes modified and ornamented to such a degree that the whole was hardly to be recognised as a weapon. General PITT-RIVERS writes* :—

Thus, modified and scarcely to be recognized as the semblance of a weapon, it may be regarded as the last vestige of the war axe. The axe, like the spear, was in ancient times used to mark a boundary. Of this we have an instance in the charter of Canute to Christ Church, Canterbury,.....granting the harbour of Sandwich and the dues thereof on either side as far as a man standing on a ship at flood tide could cast a taper axe. This custom of throwing an axe to mark a boundary has survived in some parts of England to our own time. The axe bound up in the fasces and carried by the Lictors before the Roman Consuls and others affords another example of the use of this implement for state ceremonial purposes. In the consular coins it is represented crowned as a badge of office. In ancient Egypt it passed into

* Catalogue of Anthropological Collection lent by Colonel LANE-FOX (afterward General PITT-RIVERS) to the Bethnal Green Branch of the South Kensington Museum. p. 142.

the reign of mythology and became the symbol of the Deity, and from thence into the hieroglyphs inscribed upon the ancient monuments, in which it stands for the word God.

So far I have been condensing from the PITT-RIVERS catalogue a brief account of the transition of the simple axe, a practical tool, into the highly ornamented weapon, useless but as an emblem. But it must be added that in the instances given above the transition was accomplished only in a long period of time ; it began probably when stone was the only material of which axes were made but was not fulfilled until the much later stage when civilization had long ago brought about the use of iron as a more suitable material for these weapons. But if the suggestion that some of the very elaborate and apparently useless stone implements found in the West Indies were in reality axes elaborated into 'banner-stones,' or mere ceremonial emblems, could be proved it would follow that the modification of the practical axe into the useless emblem was, at least occasionally, accomplished much more rapidly than is indicated in the above-mentioned catalogue, and within the duration of that stage of civilization when stone remained practically the only material of which implements were made.

In any case this stone is a remarkable example of the extreme and, I believe, almost peculiar, elaborateness of certain West Indian, or as they are commonly, though on perhaps somewhat insufficient evidence, called Carib, stone implements. Viewed in this light, side by side with this implement may be placed the stone (or sometimes wooden) benches or mortars already described. And yet other examples to be placed in this class are to be found in the very remarkable 'stone-collars' which have

been found in St. Domingo, Porto Rico and St. Thomas.

These stone collars are so rare that I may not be fortunate enough to be able to figure an example in this series, more especially as none have occurred, I believe, in the Lesser Antilles or in Guiana, from which places I have as yet been obliged to draw most of my examples. But as no general notice of West Indian stone implements would be complete without some account of these collars, I reproduce the following descriptive note from Mr. STEVENS' catalogue of the BLACKMORE Museum, in which is included an example of these collars, which was procured by Sir ROBERT SCHOMBURGK in St. Domingo.*

No. 8 is a sculptured stone collar. It is of an oval form, measuring ten inches and a half in its lesser, and fifteen inches and three quarters in its greater, diameter.

An elliptical stone collar was exhibited to the Society of Antiquaries, January 21st, 1869, by Mr. Josiah Cato, who made the following observations upon these objects:—

The ancient stone ring which I have the honour of exhibiting to the Society of Antiquaries this evening is an object of extreme rarity in English collections, and of quite unknown use. It was brought to this country in December, 1865, by my friend, Mr. E. B. Webb, from the island of Porto Rico, where it was found. It is formed from a boulder of light coloured volcanic stone, is seventeen inches and a half in its greater, and fourteen inches and a quarter in its lesser, diameter. The elliptical perforation has a major axis of twelve inches and one-eighth, and a minor axis of eight inches and a quarter. The weight is twenty five and a half pounds (avoirdupois). Externally, the ring has two distinct ornaments; one, at the end of the ellipse and the thickest part of the ring, is *chevronnée*, with nine incised chevrons. The other, on the side of the ellipse, may perhaps be intended to represent the ends of a loop which have been laid together and bound with a ligature.

* Guide to the Blackmore Museum, Salisbury, by EDWARD T. STEVENS. p. 70.

This second ornament appears on other specimens found in the same island, but the chevrons are replaced by other designs. I am not aware that the human figure is any case represented. The example before the Society was exhumed from a considerable depth from the surface, near the top, but on the southern side of, the *sierra*, or range of hills, which runs from east to west nearly throughout the length of the island. It is supposed to be the only specimen from this southern slope; but Mr. Webb saw several which had been found on the northern, anciently the more populous, side of the island. They included about five entire rings, and fragments of about as many others. They were all in the possession of one person, who would not part with them, and were all which were then known to have been found in the island; but Mr. Franks has kindly pointed out to me that a similar ring is engraved in the 'Mémoires de la Société Royale des Antiquaires du Nord,' in a report by C. C. Rafn on the 'Cabinet d'Antiquités Américaines à Copenhague, 1858,' and that it is said to be from the island of Porto Rico.

A similar ring, but of lighter proportions and more finished workmanship, is in the magnificent collection formed by the late Mr. Christy. It is from the island of St. Thomas, and may have been obtained by Mr. Christy, in exchange, from the Copenhagen Museum. Its internal diameters are thirteen, and eight and a half inches.

The only other specimen known to be in this country belonged to the late Sir Robert Schomburgk. It was sold on the 1st December, 1865, by auction at Steven's; and is now in the Museum formed by Mr. Blackmore, at Salisbury. Its internal dimensions are twelve and a half and eight and a quarter inches.

Dr. Wilson, in his "Prehistoric Annals of Scotland" (Vol. I. p. 222), engraves two stone collars, which are somewhat like the specimens in the Blackmore and Christy collections, and are said to have been found near the parallel roads of Glenroy. Judging only from the engraving, they are, however, very much more likely to have come from the Caribbean islands.

With regard to the probable use or purpose of these rings I can give no information, but I shall be very much obliged for any suggestion, or for hints as to any works likely to contain such an account of the customs of the natives at the time of the Spanish invasion as may afford a clue to the mystery. Such elaborate pieces of work in hard stone could not have been intended to serve either a temporary or a

trifling purpose. They are all far too heavy for ordinary use, but yet not heavy enough to kill, or even torture the wearer, if we regard them as collars of punishment.

It is doubtful whether in any other part of the world a people as primitive as the inhabitants of the West Indies who carved these stones presumably were have produced such elaborate carved work in this same stubborn material as these stone benches, stone collars and the implement here figured.

Turning now to Plate 6, No. 1, on this is another example of the winged type of hatchet, which may be compared with No. 2 on Plate 1 (see *Timehri*, Vol. 1 p. 264), from which, however, it differs in that the wings of this are simple, not as in that, double. The present example differs from No. 3, also on Plate 1 in that it wants the perforation of that example. No. 2 on the present plate [Plate 6] is also of the winged type, but is especially noteworthy in that it shows very clearly that it was bound, at the neck, on to its handle, and was therefore not used, as many of these so-called stone 'hatchets' almost certainly were, without a handle, as a wedge with which wood was split. The present example is also a good illustration of the way in which these wings were of service in strengthening the binding of the stone on to its handle.

Nos. 4, 5, 6 & 7 are all alike of a round-bladed type, in which the blade is almost completely circular and the handle, or upper end, is also often in the form of an almost complete, but smaller circle. This type occurs in remarkable abundance in St. Lucia and in St. Vincent, but is apparently not nearly so frequent elsewhere.

Of other examples from M. ROUSSELET'S collection

Plate 6. V



I have figures which I hope to be able to produce on some future occasion. But the next of these notes it is proposed to devote to a splendid series of implements most generously placed at my disposal by Sir THOMAS GRAHAM BRIGGS, Bart, of Barbados.



The River Berbice and its Tributaries.

By Alexander Winter.



THE Berbice, next to the Essequibo and Corentyn, is the finest river in British Guiana. It rises in Lat. $3^{\circ} 14'$ N. a little to the south of King WILLIAM THE FOURTH'S cataract on the Essequibo, from which it is distant about ten miles, and empties itself into the Atlantic Ocean in Lat. $6^{\circ} 20'$ N. after a somewhat winding course of three hundred miles, of which more than half is navigable for ships of considerable size. The first barrier of rocks, to impede navigation, does not occur for a distance of 175 miles from the mouth, consequently ships can go a longer distance up this river than up the larger rivers Corentyn and Essequibo.

It forms the drainage of a very wide extent of country lying between the rivers Corentyn and Demerary. The former of these rivers has no important tributary on its left bank, above the Mapenna, so that the drainage of the eastern portion of the colony finds its way to the sea by the Berbice, being brought in by the large tributaries the Icoorowa, Canje and Wikky. To the westward of Berbice, the alluvial portion of the land is drained directly into the sea by the rivers Abary, Mahaicony, and Mahaica ; but the upper district, beyond the sources of these three rivers, has to be drained by the Berbice, as the watershed between this river and the Demerary is within a few miles of the right bank of the latter river, and the drainage is brought in to the

Berbice by the Virogne and the Etoony, both considerable rivers, and higher up, by the Eberoabo and the Youacoury.

The Berbice, in common with all the rivers of Guiana, has a bar across its mouth, or rather a mud flat, on which, at low water during spring tides, there is not more than five feet of water; but at high water there is some fifteen feet. In the sea reaches of the river, there are also shallows for about 25 miles up, which though impeding the navigation of large vessels at low tide, yet have a beneficial effect in keeping back the run of fresh water from the interior, so that the river is always navigable.

The Berbice at its mouth is about two miles wide, and is divided into two channels by Crab island. It has often been suggested to close up the lee channel and so cause all the water to go out at one channel, which would probably have the effect of deepening the water on the bar. This might be brought about gradually, by running a groyne out from the west bank towards Crab island and a similar one from the island towards the shore. This would cause the lee channel to silt up, and also prove a protection to the west coast, which at present is being rapidly washed away.

Nearly opposite Crab island, on the east bank the river Canje (pronounced Canye) falls in. This is a very important tributary, having a course of over a hundred miles, and receiving at eighty miles from its mouth, a considerable addition in the water brought in by the Icoorowa from the eastward, being the drainage of a large tract of country lying between the Canje and the Corentyn. At the head of the Icoorowa, is a fine lake,

called the "Broadwater", of several miles extent, with white sandy margin, and some small islands in it. It is from the banks of the Icoorowa that the principal supply of bullet-tree timber comes, and it is of a very excellent description.

In the upper district of Canje, or as it is called in the Dutch maps "Canje boven", were several estates in cultivation, traces of which still remain, particularly of the cocoa plantations where cocoa trees have survived and grown into forest trees.

The Canje is much impeded in parts by so-called "floating islands", which in some places, stretch right across from bank to bank, presenting an unbroken surface of green entirely covering the water and giving it the appearance rather of a green lawn than a river. Lower down towards the end of the creek this vegetation is broken into detached masses and carried down by the current into the Berbice river, where these drift up and down with the tide and are eventually carried out to sea. These floating islands are generally called "mis-souri grass", but they are composed of three distinct plants. Missouri grass (*Panicum*), a kind of floating buckwheat (*Polygonum*), and a *Pontederia* with pretty hyacinth-like pale flower. The Berbice river is remarkably free from these floating masses, except high up, above the cataracts, where they are found, composed of the same three plants.

Opposite Crab island, on the east bank of the river, is the site of Fort St. Andrew, where the military were stationed till 1828 or 1829, when the troops were removed to the new barracks which had been built at the junction of the Canje with the Berbice and called Fort Canje.

Fort St. Andrew was then dismantled and the buildings sold. A little below Fort St. Andrew was the "one-gun battery", at the mouth of the East Coast Canal, and immediately opposite on the West Bank was the York Redoubt, the site of which has been covered by the sea.

The extensive buildings of Fort Canje were built by the home government under the direction of the officers of the Royal Engineers ; and to furnish plank for them a powerful steam saw mill was established on the banks of the Canje, and large quantities of bullet tree timber were sawn up there. The person in charge of this saw mill was a Mr. WILLIAM FRY, who also had a boat building establishment of his own, a little higher up the creek. He had a steam engine and saw mill, and carried on a very profitable trade. When emancipation took place and the negroes began to leave the estates and wander about, Mr. FRY employed many of them in planting canes, and applied his steam engine to a mill to grind canes ; and so a small sugar estate was established. This employment of the emancipated negroes gave great offence to their former masters, the proprietors of the estates in Canje ; but the Governor, Sir JAMES CARMICHAEL SMYTH, was pleased with the idea of this new sugar estate started on the free system, and supported Mr. FRY in his undertaking, by giving him the occupancy of the government land lying between the two saw mills. In gratitude to this Governor, the place was called "Smythfield" ; which name it still retains.

About a mile above the mouth of the Canje is the town of New Amsterdam, on the banks of the Berbice, built on a peninsula, surrounded on two sides by the river and on a third, by the creek. The town of "New Amster-

dam" was built as the capital of the colony when the old town of the same name, near Fort Nassau, about 60 miles up the river, was given up and the alluvial lands of the lower district began to be cultivated. The Dutch originally settled in the upper district, not so much, as has been said, for security from pirates and buccaneers, as because, with the few labourers they had, the higher lands, having natural drainage, suited them best; when the supply of labour increased, they could afford to empolder the heavy clay lands of the alluvial district, which, when once drained and put in cultivation, were far more profitable.

The exact date of the commencement of the town of New Amsterdam does not appear; but we learn from Dr. PINCKARD'S amusing "Notes on the West Indies", that the town, at the time of his visit in 1796, was the residence of the Governor, (VAN BATENBURG), though there were few other houses. This is his description of the place, "The town is yet in embryo. The whole scenery at New Amsterdam, as well as at Fort William Frederick (Demerary) betrays the infant state of the colony. The dreariness of the land, just robbed of its thick woods—the nakedness that prevails around the government house—the want of roads and paths—the wild savannah—the heavy forests: in short all that meets the eye conveys the idea of a country just emerging from its original wildness, into cultivation."

Berbice has suffered much socially from the transfer of the seat of government to Demerary, and by the system of centralisation which has followed this, as well as from the removal of the troops and from the cessation of the coffee cultivation; yet the town of New Amsterdam has

gone on increasing in size and number of inhabitants. The population by the census of 1881 was 8,386 and the amount of shipping that cleared at the Port last year was 26,685 tons.

The river opposite the town is broad but shallow. On the west bank was formerly a continuous line of estates for some fifteen miles up. Now, excepting plantation *Blairmont*, there is not a single estate in cultivation on that side of the river. On the town side about two miles up is a fine sugar estate called *Providence*. This is the only sugar estate in the county that remains in the possession of the same family that owned it at the time of emancipation in 1834.

About three miles further, at Plantation *Bellevue* (happily so named), the river takes a bend and a fine reach opens up, giving a somewhat lake-like character to the scenery. This reach is called in the Dutch grants, the "Groote marri-paam," meaning probably the great estuary, or sea reach.

Near the upper end of the Groote marri-paam on the east bank, is Plantation *Highbury*, a fine sugar estate that once belonged to the "Berbice Association." The Berbice Association occupied in this colony very much the same position as the East India Company did in Hindoostan. Although owing allegiance to the Sovereignty of the States General in Holland, the members of the association were the virtual proprietors of all the country, and had the government of it. They sold out lots of land to private individuals who were willing to cultivate them and establish estates. These lots or grants were all carefully measured by land surveyors, and diagrams of them were deposited in the Registrar's

Office, where they are still to be seen ; but the association retained certain portions themselves and established what were called "model estates." These were not measured off, and no boundaries fixed, as all the ungranted land belonged to the association.

These estates are valled "Society's ground," or "Society's Plantations" in the Dutch charts of the colony ; and in DOWNER'S map of Berbice they are marked as "Colony Estates." At the time of the capture of the colony by the English, there were four of these estates in cultivation in the hands of the association ; and it was specially agreed that they should be treated as private and not as government property. In the Act of Capitulation of the Colony of Berbice in September 1803, it was stipulated in Article 2 that "The Plantations, "Lands, Manufactories, Workshops, Slaves, Effects and "Possessions of the Berbice Association of whatever "nature shall be considered as Private Property in the "same manner as is agreed to by the Capitulation with "General Whyte in May, 1796."

The estates reserved to the association under this article were Dageraad, St. Jan, Dankbaurheid and Sandvoort. The association carried on the cultivation of these estates until the year 1818, when they sold them to English proprietors.

From the earliest days of the occupation of Guiana by the Dutch, there had been some English settlers, but these were much increased in number after 1814, in which year the colonies of Demerary, Essequibo and Berbice were finally ceded to Great Britain by the Government of the Netherlands. Soon after many estates were bought by the merchants of London, Liverpool, Bristol

and Glasgow ; and in 1818 estates in Berbice seem to have attracted the attention of British capitalists to a considerable extent, and the Dutch Berbice Association availed themselves of it to dispose of their estates. The purchasers were Messrs. D. C. CAMERON, HENRY DAVIDSON, and ÆNEAS BARKLY. The directors of the association were represented on this occasion by their attorney, Mr. THOMSON HANKEY of Mincing Lane, whose power of attorney is recorded in the Registrar's Office of Berbice.*

The following is the entry in the Highbury books of this purchase :—

“ The Colony Estates, November 1818.

“ Plantation Account Proper Dr.

“ To Thomson Hankey, 99.

“ For the purchase of the following Plantations from

“ him in August last, viz., Pln. Sandvoort, Pln.

“ Dankbaarheid, and Dageraad with all and every

“ thing to the same belonging together, with 682

“ slaves, names and particulars as per Inventory

“ filed—£66,000 @ f12. f792,000

“ Thomson Hankey, 99, Dr.

“ To Davidsons, Barkly & Co.

“ For this sum paid him on signing of contract for

“ part payment of purchase of said estates—

“ £22,000 @ f12 f264,000

The partners in this purchase divided their interest in it thus : Mr. D. C. CAMERON, joined by his friend Mr. JOHN CAMERON (*Glenevis*), took *Sandvoort*, which was a large coffee estate in Canje. This they divided in two, and made one half of it a sugar estate, which they called

* NOTE.—A carefully compiled index to the records of this office has been lately made. It was commenced by the late Registrar, Mr. A. B. STEWART, and completed by the gentlemen now in charge, Mr. O'MEARA and Mr. JAMES WALLS.

Lochaber, after the head quarters of the CAMERONS in Scotland. The remaining three estates were retained by the other two partners: *St. Jan* and *Dankbaarheid* were united and called *Highbury* after Mr. BARKLY'S place Highbury Grove, near London; *Dageraad* was continued in cultivation for some time, but eventually was made over to government as an asylum for lepers.

Both *Dageraad* and *Highbury* were worked by water power. The water from the river was admitted by a large brick sluice some six or eight feet wide, which was shut at high water, to retain the water till half ebb-tide, when it was loosed out at a narrow sluice about two feet wide, thus forming a mill-race in which the wheel worked which drove the cane mill. One inconvenience of this system was that the machinery could only be worked when the tide suited, whether by day or night.

Highbury was the first estate in Berbice that employed coolies from India. It soon became evident that the negroes after emancipation would not work as they had before, and that if British Guiana were to continue a sugar-producing colony, additional labourers must be introduced from elsewhere.

So Messrs. DAVIDSONS, BARKLY & CO. joined by Mr. MOSS, of Liverpool, and some others, sent to India for some of the surplus population of that teeming country; and in 1838 the ship *Whitby* arrived from Calcutta with the first lot of coolies! They were a very fine set of people and did remarkably well at *Highbury*; and at the end of their indenture they returned to India carrying large sums of money with them. Thus was commenced that system of Indian immigration which has saved this colony from abandonment and bids fair to establish a

labour supply on such a footing as will ensure to the present sugar estates something like an adequate return for the enormous amount of capital, skill and energy that has been expended on them. Capital has followed the supply of labour, and science is following capital. But success is only now setting in, after an arduous struggle of over forty years, during which most of the proprietors of former days have disappeared.

By the disposal of their estates the "Berbice Association" ceased to have any interest in the colony, which soon became thoroughly British. A few coffee estates remained in the hands of merchants in Holland up to the time of emancipation; but for some years past, not a single estate in Berbice has been owned by a Dutchman, and the time seems to have arrived for revising the system of Dutch laws guaranteed to the former owners of the colony by the Articles of Capitulation. It surely is unreasonable that Englishmen in a British colony, living under the reign of a limited monarch, should be tied down to a foreign law of inheritance forced on them eighty years ago by a Dutch Republic which no longer exists.

Towards the head of Groote marri-paam the river has a winding course of some ten miles, and here the water is deep. Here there were once ten or twelve coffee estates and two sugar estates, all now out of cultivation. One of the former, plantation *Bestendighied*, belonged to an enterprising Dutch planter named TIMMERS, who, at the time of emancipation, thinking as many did then, that the colony was about to enter on a course of prosperity under a happier system, extended his operations at *Bestendighied* by adding a saw-mill to his coffee machinery, and getting out a steam engine to work the

whole. The river Abary flows parallel to the Berbice, at no great distance from its left bank. Mr. TIMMERS connected his estate with the Abary by extending his middle-walk canal a couple of miles through the savannah into the Abary. At this point the whole country is an extensive swamp with a foot or two of water over the surface, but a few miles higher up the land rises, and there is a high reef on which is a forest of bullet-trees; and Mr. TIMMERS proposed cutting timber there, with the assistance of some Warrau Indians who were then living on the spot, and bringing it down the Abary, and up his canal to the *Bestendighied* buildings, where it would be sawn into plank by his newly erected steam engine, which would thus be kept usefully employed when there was no coffee crop going on. It was a well conceived plan and for sometime things looked promising, but, alas! the want of labour, which in this colony generally defeats every project, caused it to fail. Coffee cultivation ceased to be profitable because the laborers would not pick the crop, hard times set in, and poor "Polyglot Timmers" had to pass through the insolvent's court!*

A few miles above *Bestendighied* the river makes a bold turn to the eastward, and consequently vessels sailing up meet the wind right a head, and instead of running before the wind, they have to beat against it, and their progress is much retarded; hence this turn in the river has got the name of "Humbug Point." Beyond this, a fine stretch opens up, running nearly due south for about eight miles. This is called in the Dutch grants the

* This soubriquet he got from his habit of jumbling up so many languages in his talk, Dutch, English, French and Creole Dutch.

“ Klein marri-paam,” or little sea reach. There was once an unbroken line of coffee estates along this on the east bank. There are now only two estates in cultivation, both in sugar. These are plantations *Mara* and *Ma Retraite*, now the property of the Colonial Company, but formerly owned by Messrs. GEORGE and JAMES LAING, the leading merchants of Berbice, and the most enterprising and energetic of our colonists. Emancipation took place in August 1834. This was followed by the apprenticeship system, during which the negroes were still under some control, and had to continue on their estates and work certain regulated hours a day, for which they received money wages. This was intended to accustom the newly emancipated to habits of steady industry and to prepare them for unlimited freedom. Estates thrived under the system; the seasons happened to be good, and the price of sugar ran up very high. This gave a great impulse to speculation, the Dutch sold out their coffee estates to the more enterprising English who put them in sugar. The Messrs. LAING bought plantation *Mara*, which was then in coffee, put it in canes, and established a fine sugar estate. The apprenticeship system according to the emancipation act was to continue six years, but four only had elapsed when it was prematurely terminated, and the negroes made entirely free, and left to their own devices. From this time the planters' troubles commenced in earnest; prices fell, labour was scarce and only to be had at a high rate. Hard indeed was the struggle; and many had to succumb. The Messrs. LAING suffered severely, for they had embarked largely, having besides *Mara*, become interested in *Ma Retraite*, *Friends*, *Enfield*, *Smythfield* and *Albion*.

Mr. JAMES LAING published a touching memorial on the subject, * addressed to Lord GREY, showing that though starting under the most favorable auspices, the investments of himself and partner had resulted in a loss of £197,000 sterling, incurred from the 1st August 1836 to 31st December 1847. He winds up his indignant protest in these words, "In such case no choice will be left to the memorialist than to abandon the cultivation of his estates, and submit to their realisation at whatever sacrifice, in behalf of his creditors. But, he will deem it only due to himself, and to his family, and creditors to appeal to the justice of Parliament and the people of England for redress and compensation for losses which have been altogether occasioned by the Legislation and acts of the British Government."

It was probably such cases as this, and there were many of them, that at last startled the Colonial Office into believing the truth of the reports of the state of the West Indies, and of the necessity of at once coming to their relief by sanctioning the importation of laborers from the East, as otherwise the cultivation of sugar would cease, the educated classes would abandon the colonies, and the manumission of the negroes prove a dead failure. Earl GREY tells us as much in his book "The Colonial Policy of Lord JOHN RUSSELL'S Government." He says (page 63.) :—

"This prosperity, and the welfare of all classes of the inhabitants of these colonies, depend upon their being

* A similar memorial was also sent in by the late R. M. JONES Esq., of Pln. *Houston*, Demerary.

A beautiful marble monument to the memory of Mr. GEORGE LAING has been erected in the Court House, New Amsterdam.

“ enabled to continue to advantage the cultivation of sugar, not merely because this branch of industry constitutes their chief source of wealth, but because, if it were to cease, there would no longer be any motive for the residence of the European inhabitants in a climate uncongenial to their constitution, while it is certain that they could not be withdrawn without giving an almost fatal check to the civilisation of the Negroes.”

Beyond *Mara* there is no estate in cultivation, and in passing up the river we leave sugar estates and their cares behind us. At the head of the Klein marri-paam, and commanding a view down this fine reach, is the site of the “Brand-waght,” literally, watch fire. This was a military outpost, of which there were several throughout the colony and always placed at an important bend of the river, or at the junction of a tributary, as at the mouth of the Virogne. PINCKARD mentions that he found one such fort, the garrison of which consisted of 30 old Dutch soldiers, all in a state of intoxication. It was to these inland posts that the colonists looked for protection from any insurrection, and it was one of the stipulations, in the surrender of the colony, that the captors should keep these posts garrisoned for the protection of the inhabitants. There is one in Canje in very good preservation, called Post Orototo, and another at the entrance of the Icoorowa, where until quite lately there was a twenty pounder gun which has been recently taken away by the unscrupulous master of a ship loading timber there. There is also a small redoubt at the mouth of Bartica creek with an embrasure for one gun.

From the Brand-waght the river (going upwards) turns abruptly towards the west; then after making a bold

sweep, returns to the east, thus forming a considerable peninsula. Across the isthmus thus formed, a canal was commenced called the "Brand-waght canal." This was one of the many "projected canals" we find in the old Dutch charts of the colony; but this was more than projected, it was cut half way, and estates laid out on its bank, when the colony changed owners and the canal was never finished.

Following the river along its bend to the westward we leave the sea reaches, and from this turn, the water is clear and deep, and seldom salt. At a bend to the south opposite the site of plantation *New Dageraad*, is a large sand-bank extending from the east bank more than half way across the river, and on this there is, at low tide, only a few feet of water. There is however a deep channel on the west side; but this sand-bank should have a beacon on it for the guidance of ships. This is the only sand-bank in the river for a hundred miles up. Near this is an "itabo" which is said to communicate with the river Abary.

Some creole settlers are to be met with here at the old estate *Hoorn*, and also further on at *Yacatta*. Their presence is betrayed by a few plantain trees showing through the bush.

It was at *Yacatta* that the late Mr. COSTENBADER lived, whose house was a convenient resting place for travellers passing up or down the river. It had a pleasing appearance, as the space between the house and the river was a green lawn of short grass, which was caused by the grazing of a few cattle on it. When the bush is cut down, it soon grows up again, unless there are cattle to graze upon the land, then a short grass or turf takes

its place, which gives a civilised look to the homestead. It is all bush again now. Mr. COSTENBÄDER was very successful in capturing manatees, which abound about here, and his house was full of harpoons, spears, and tackle for catching them.

The surface of the land all the way up above Yacatta is higher than the level of high water and there is natural drainage, but the soil is still alluvial.

There is an estate near this marked on the map *Mesopotamia*. It does not appear to have been in cultivation for a very long time. It is the last estate laid down in a curious old Dutch map, now in the library of the Royal Agricultural Society. Lower down than *Mesopotamia* there appears in this map no signs of a settlement of any description, no plantation, no town, nothing to show that the country had ever been visited by human beings, except at the mouth of the river, below Crab Island is marked "the new Brand-waght." Most likely this is what was afterwards called the one gun battery. Unfortunately there is no date to this map, nor the name of any publisher, only nine coats of arms, perhaps of the leading colonists of that day. It would have been interesting to know the date of this map, showing as it does that the occupancy of the country by the colonists at that period, was confined exclusively to the upper self-drained districts.*

* This map was probably made in 1720, when the Berbice Association was formed, for the purpose of extending the cultivation of the colony, and the coats of arms are those of the nine directors of that period. Their names are mentioned in Hartsinck (page 519) as being directors during the years 1720 to 1738. This company by paying the French captors of the colony the balance of the ransom money, became

Proceeding up the river we find both banks covered with a thick forest of trees, enlivened here and there by some flowering creepers, such as the various species of *Bignonia*, *Alamanda*, *Echites*, the gorgeous *cara-cara* or supple-jack (*Norantea guianensis*), and the curious *Marcgravia umbellata*. The graceful and picturesque manicole (*Euterpe edulis*) is frequent, also another palm with a larger leaf, probably the *loo* or the *tooroo*; and in one place there is a clump of tree ferns growing close to the edge of the water and attaining a height of fifteen or twenty feet. The view up some of the long reaches (or hooks as they are called) affords fine vistas, but on the whole the journey is monotonous, and the traveller looks impatiently for the first sight of the high land on the Bartica downs, where the open country commences. After passing Bamboo Creek, so called from some indigenous bamboos growing there, we come to the Bartica Creek, called in some maps Baracarabana Creek, a navigable stream of some size, and immediately beyond, the land rises, the bush ceases, and the open savannah is seen from the river.

The banks of the river here (on the east side) are steep, and steps have been cut in the hard clay to assist in ascending them; the highest point is twenty-five feet above the level of the water. On this spot a house has been lately erected, commanding a most extensive pros-

possessors of the whole country, and by importing additional labourers, were able to extend the cultivation by empoldering the alluvial land of the lower district. This map was evidently made for the guidance of the new association, and not published for sale. The seat of government was not changed to the coast for some seventy years after this, although Fort St. Andrew was established and garrisoned in 1746.

pect over the downs towards the north, east, and south, and as the open country extends all the way over to the Canje, there is generally a cool breeze blowing from the north-east. The grazing here is particularly good and the site is an admirable one for a cattle farm on the largest scale; the extent of pasture is almost boundless and the water is always fresh. The late Mr. ALPIN GRANT had some fine cattle here; but his executors sold them on account of the difficulty of looking after them owing to the distance from town, two tides. That difficulty is now removed, as the river steamers pass the spot twice a week, bringing it within five hours of New Amsterdam. There is good shooting in the savannah, snipe at times in the low places, pigeons in the bush, and parrots all the year round. About the creek are bush hogs and labba.

Across the river, on the west bank, at *De Velde*, was the residence of the late Mr. SANDERS, who had a fine cattle farm there. His family have lately moved higher up the river. There are the remains of a stelling projecting into the river, with a bathing house at the end of it. Mr. SANDERS held peculiar religious views and advocated total immersion in baptism.

At *Bourderoi*, nearly opposite *De Velde*, there lived a Dutch family of the name of MANDHAR, natives of Holland. They had a small farm here, but to the usual indoor occupations of a boviander, such as making hammocks and fancy basket work, plaiting palm leaves for hats, and so on, the MANDHARS added the trade of a joiner. They had a turning lathe and made furniture of a very good description. The chairs they made were in great demand, not only in the river but in New Amster-

dam; the frames were made of the white wood of the *lana*, and the bottoms of *tibiceri* from the *eta* palm. The MANDHARS owned a good deal of land in this neighbourhood which is now occupied by their descendants of the third generation.

Beyond *Bourderoi* the river turns abruptly to the south east; and near this, in the centre of the river, is a small whirlpool, caused probably by the formation of the reach, which is contracted at each end and expanded in the middle, and this causes a "turnwater," but the natives say that there is a hole in the bottom of the river.

We now come to the site of Fort Nassau and the *ci devant* town of New Amsterdam. The place is entirely overgrown and there is little to distinguish it from the surrounding bush, except some tall cabbage palms, which not being indigenous, always indicate the handiwork of man. There is a thick growth of *badouri* pimpler at the water side which has to be cut through and then the bank is reached, which rises steeply up some fifteen feet to a level terrace or esplanade the whole length of the town, on the margin of the river. This seems to have been the principal street and is still in good order; where it is crossed by a draining trench there is a neatly turned brick bridge. At present there is only one house remaining, and that is in ruin, but has evidently been a fine mansion, of more imposing appearance than most of the houses in the more modern town of New Amsterdam. It is built entirely of brick, and a flight of semi-circular brick steps leads up to the entrance, which is wide and lofty, and where, until lately, there was a scroll with the name of Buse on it. A range

of side buildings, also of brick, forms a court yard, which at present is occupied by a forest of papaw trees, which always seem to delight in growing among the ruins of old brick work. The rooms of the house, though not large were very lofty, and SCHOMBURGK, who visited this spot in 1835 speaks of "the glazed and richly ornamented windows." These are no longer to be seen, and what little remains of this fine old mansion will soon disappear, for the roots and branches of trees have forced themselves into the brick walls, and the neighbours do not hesitate to go and help themselves to the bricks whenever they want them. The site of the town seems to have been well chosen and no doubt there were good reasons for selecting this spot for the capital of the colony. It faces a fine reach of the river, where there is generally a good breeze.

Near the town, at the junction of Toorany creek with the Berbice was Fort Nassau, of which Hartsinck gives us a drawing showing its appearance in 1682. He also gives a ground plan of the intrenchments, with the position of the several buildings and fortifications. These are in his book "Description of Guiana and the Wild Coast."* All that remains to mark this spot are the graves of its inhabitants, which are in very good order, with the inscriptions on the tombs quite legible. It would be interesting to have the place cleared so that the lines of the old town and fort could be traced, a few days' labour of the cutlass would do it. Some fine lime trees have survived those who planted them, and are in full bearing, and some venerable old tamarind trees remain to tell of former days, and doubtless if the place were

* Published in 1770.

cleared many other fruit trees would be found. This should be the site of the residence of the river magistrate. It is nearly central and when once cleared could be easily kept in order and made a very suitable centre of civilisation.

Nearly adjoining the town, a little higher up was a brickery. Here also are several lime trees, which seem very hardy and once established take care of themselves and survive all other cultivation.

For some miles above the old town, on both sides of the river are estates which have not very long been out of cultivation, and are now occupied by the descendants of the former owners, who hold possession by titles more or less defective. The bread-nut seems to have been a favorite tree and thrives well, and generally marks the waterside of a boviander.

At Hitia are the Sand Hills, which supply the white sand used for making mortar. It is here the coast deposit, or fluvio-marine alluvium of geologists, ends, and the sand beds and clay deposits begin. This tract is marked 2 in BROWN'S geological map and extends inwards as far as the granite region. These sand hills are supposed to mark the line of the gradual receding sea of a former era. The open savannahs on both sides of the river all the way from Bartica upwards, though well raised above the level of the water, belong to the coast alluvium, or more correctly, to the river loam deposit; and it is only at Hitia that the second geological belt commences. This tract consists mostly of extensive dry sandy savannahs, some forty to one hundred feet above the level of the river, intersected by many large rivers, on the borders of which are generally dense forests of timber trees.

These extensive dry savannahs are a special feature in the upper Berbice district, they extend nearly to the banks of the Demerary on one side, and to the Corentyn on the other; the soil is so loose and porous that the rain never lodges but passes directly through, so that the surface is always dry. It is probably owing to the large extent of these dry plains that the air of the upper Berbice is so free from miasma, and the climate so healthy. What BROWN says of the savannahs of the far off interior of the country, is quite applicable to these Berbice savannahs or downs as they are now usually called: "the views from the savannahs have a beauty and singularity of their own, and it stirs one with a sense of boundless freedom to stand upon a knoll amidst one, and view the grassy plain fading away to the horizon in the distance and melting gradually, as it were, into the atmosphere." This feeling is shared by all travellers who visit this part of the country, and the pleasurable sensation is enhanced by the striking resemblance of the scene to the commons and downs of England; not only are the undulations of the land similar, but the stunted bushes, here and there, may readily be taken for the English gorse or broom.

The grass that covers the surface grows in tufts with spaces between them, and has a dry wiry look, but the cattle thrive upon it, and it is said to be very similar to what is found in the cattle districts of Venezuela; and a recent traveller remarked that these downs remind him of the pasture lands of Australia. When these savannahs are burnt off, which they generally are every dry season, there is a fine spring of young grass.

The flora of the savannahs is also peculiar, and with

the exception of a few clumps of palm trees, has nothing tropical in its appearance. The bushes are dwarfed and look stunted, and the leaves of some of them are so dry and harsh, that they are used as sandpaper. The flowers also have an English look about them. There is a beautiful little terrestrial orchid with a bulbous root that grows amidst the tufts of grass ; its leaves are long and narrow and so much like the blades of grass that surround them, that the plant would escape observation were it not for its pretty little pink flower. A small quail, called *beyseroo*, abounds here.

The origin of these open savannahs has been variously accounted for. One theory is that they were formerly covered with trees which have been destroyed by fire. This however is not likely, for the burning of the bush has the effect of promoting the growth of vegetation. The most probable cause is this. The whole country has, at some remote period, been submerged. This all geologists are agreed upon. On the subsidence of the water into the valleys where the rivers now flow, the higher parts of the land have been left bare and sterile ; what surface mould may have been on them has been washed down into the low parts, forming a rich soil in which trees have grown, and which by the constant addition of decaying leaves is annually enriched and is extending laterally on to the savannahs. The higher parts, having been left bare, have only produced a partial covering of coarse grass, and in some places not even grass has grown, the surface being quite bare and hard, and occasionally strewn with iron ore in rounded nodules. The tendency of the bush is to encroach upon the savannahs, to an extent that is very marked.

The Hitia savannah is a pretty spot, and has long been the site of a settlement of Arawaaks, well behaved peaceable people, appreciating the benefits of civilisation, sending their children to school, and attending the services of the Church of England mission, which has been established here for thirty years. There is a decent little church, St. Peter's, on the top of the hill, which is about to be rebuilt lower down for the convenience of the old and feeble.

The pine-apples grown here by the Indians are most delicious, quite as juicy as the common pine of the country with the fine rich flavour of hot-house pines at home. All the Indians at Hitia raise poultry, and one of them guinea birds which is not usual. A path leads from Hitia to the head of the Abary, a distance of about five miles.

About a mile beyond Hitia is the old estate *Friendship*, where the river steamer halts for the night, and where the river magistrate holds his monthly courts. It is at the house of Mr. PATOIR, who once had charge of the school at Hitia and is still useful as a warden of the church. He has been resident here for some twenty years and his farm has done well, his cattle having increased from six cows to a herd of eighty head, all fine animals doing credit to the pasturage of the savannah, where they graze during the day, coming home quietly in the afternoon to take a drink in the river, and then lying down about their master's house, giving the farm a cheerful and thriving appearance. There are five other farms in the neighbourhood of the same kind.

At Manacaboury waterside, travellers land to walk across the savannah to the mouth of the Virogne, which

can be done in about an hour and a half, while it takes four hours to go round in a boat, so much does the river wind. The path leads first through a manicole swamp, then rises abruptly up a steep escarpment to the high ground above. This is the usual formation; the high land of the savannah rarely extends to the edge of the river, there being nearly always a terrace or plateau of flat level ground between the river and the savannah, more or less wide, of good soil; and beyond this there is a perpendicular cliff, from the top of which the savannah commences. There is no gradual slope from the river to the high land, but the rise is abrupt in steps. In two or three places the lower terrace is wanting and the river washes the foot of the cliff, but generally there is a tract of level ground that intervenes between the river and the high land, and this level tract is composed of good soil suited for cultivation and is very often swampy; for the water is kept in by a kind of natural embankment, the edge next the river being generally higher than the level of the surface inside. This is probably caused by a deposit of soil by the river when in flood. The same formation occurs on the coast. The large savannahs are generally surrounded by a high mora, or bullet-tree reef next the river. This forms a natural empolder, which prevents the savannahs from running dry; and thus is preserved that water supply so valuable for navigation purposes. In the upper districts these swampy levels are mostly occupied by the useful manicole. These elegant palms grow there to the exclusion of all other trees and form a scene of beauty only excelled by a forest of bamboos. And fortunate it is for the inhabitants of these parts that nature has furnished

such a supply of manicoles, for it is the principal material of which their houses are made. The manicole, split up, is used for wattling the sides of the house, for the floors, and also for the laths on which the thatch is tied.

The word manacaboury means plenty of manicoles—caboury signifying plenty or abundance. The names of places given by the Indians are generally taken from some tree or animal, with a suffix such as caboury, abounding, cabra a creek, oeny or abo water, as Etoony, a river full of æta trees; Mahaicony, a river where the mahooka is found; Caycooti-cabra, tiger creek, and so on.

Manacaboury was once the head quarters of the Ara-waaks of the river, and the soil being very suitable for the growth of cassava, their great paiwarri feasts were held here.

Opposite Manacaboury on the east bank is a fine creek called Kimbia. It rises in the savannah and flows through a pretty lake, Abaribana, which used to be a favorite resort for pleasure parties from the old town. Souari nuts are found in Kimbia. Beyond Kimbia is Ebeni, another nice creek with sandy bottom. The river here makes so sharp a turn that steamers are apt to run into the bush unless their speed is reduced. There is an old cocoa plantation near this, called Dornboom, where the cocoa trees have grown into a forest. This estate is claimed as private property, by right of inheritance, by persons living in New Amsterdam; but their title has not yet been admitted and the place is held by the government as crown land.

At the junction of the Virogne the Berbice expands.

At this point there was formerly a fort, a church and a minister's residence. All have disappeared. The Virogne is a very fine river and extends almost to the banks of the Demerary, draining a large tract of country, mostly savannah. There were several estates on its banks, of which *Den Arend* was one. This was visited in 1796 by Dr. PINCKARD, who rode on horseback with a party from Hitia across the Manacaboury savannah. He must have crossed the Kaderabisce creek, though he does not mention it. There are still the remains of a bridge over that creek. The *Den Arend* negroes, 178 in number, were removed in 1818 by Messrs. N. WINTER & Co. to their estate the *Friends* in the lower district. The change of climate was fatal to many of them.

About an hour's pull up Virogne is the Mattara mission, a beautiful spot. It has long been under the charge of Plymouth Brethren and is the largest Indian settlement in the river. Some fine coffee trees grow here; and the cultivation might easily be extended and kept in order, for the soil is a loose sand in which weeds do not grow.

A path leads from the mission to the savannah, about half an hour's walk, through one of those curious spots called "moories," so different from the bush on one side and the savannah on the other, between which they are generally placed. Moorie is the name of a tree which grows in these spots, but the word is applied to the place itself, just as in England a heath is called from the plant of that name. The trees that grow in a moorie are all of small size and peculiar appearance; no grass or weeds are seen, only a pretty

white lichen and some moss on the ground—altogether these spots have almost a mysterious appearance, as if, as has been said, they were kept in order by fairies.

Above the junction of the Virogne, the Berbice narrows considerably, with high land on the right side (going up). At Peerboom, on the top of a hill 69 feet high, stands the house built by the late Mr. T. B. DUGGIN, who lived here many years. From this up to Coomacka is the most populous part of the river, having numerous settlers, nearly all creoles, on both banks. These are mostly the descendants of the gang of plantation *Karel and William's Hoop*, which was in cultivation up to the time of freedom. There were shipments of coffee from this estate in 1834, since which the cultivation has been given up. The labourers however did not leave the district, having a strong local attachment to the place, but settled on land of their own in the neighbourhood. The manager's house, a good building with a double flight of brick steps leading up to it, was long the residence of Mr. SANDERS, before he moved down to *De Velde*, and here also he had a stelling, jutting into the river, ending in a bathing (or baptising) house! It is only last year that this house was pulled down, and yet the place is already so completely overgrown that it is hardly recognisable.

In this district, which is called the Lana district, is a chapel and school in charge of the London Missionary Society. There are some good houses, in one of which the magistrate's courts are held, and four or five retail provision shops. The Lana district ends at Coomacka, where the river takes a bend and the land rises considerably. The view here is very fine, especially if approached early in the morning, or in the afternoon, when the sun

is low. At the waterside is the mission chapel, and residence, some Indian houses, and the fine old silk-cotton tree which gives name to the district; and the wooded heights behind complete the scene. This was once a cocoa estate, the former owners of which lie buried here, in tombs which are in good preservation.

The cocoa trees have grown to a height of thirty or forty feet, and are in full bearing and the ground is strewn with the fallen pods which no one seems to care to pick up. There is a path here leading up to the downs; but most travellers prefer going round in a boat to the Etoony, and so reaching the downs, which is one of the choicest spots in the river, and commands the admiration of visitors from the extensive view and fine undulation of the land and the English character of the landscape. A pull of an hour and a half up the Etoony brings you to the open savannah where are several Indian settlements.

Before reaching the Etoony, the Wikky falls in from the east. This is an important tributary bringing in the drainage from the country lying between the Berbice and Canje. It is a deep, navigable river, and on its banks are several Indian settlements, prettily situated, and a well conducted mission and school of the London Missionary Society. The land between the Wikky and the Berbice is a high level plateau, covered with green heart trees forming a dense forest of many miles in extent.

Proceeding up the Berbice, and passing the Parway, a fine creek on the left, and the Paripi on the right, we come to the Kibbiribiry creek, famed for the healing quality of its waters. It was a favorite resort as a sanatorium in the Dutch times, and wonderful tales are told

of the cures effected by bathing in its waters. It has a white sandy bottom, and the water is icy cold. There are many of these "cold creeks," and no doubt a residence of a couple of weeks amongst them, with frequent bathing and a life in the open air, together with the cold nights—and these are intensely cold—would be very beneficial in bracing the nerves of an invalid.

A few miles higher up is Eberoabo, also a cold creek. It was here that PETER CAMPBELL resided, conducting a large woodcutting establishment, and loaded ships with greenheart timber for export. Up to this point the Berbice is navigable for large vessels, drawing 13 to 14 feet of water, but beyond this the river is much filled up with sand brought into it from the hilly country around, and in dry seasons there is sometimes scarcely water enough to float a tent-boat, though during the rains there is a depth of eight or ten feet all the way up to the falls.*

In 1839 a steamer called the *Berbice* was built at the Canje saw-mill, and her first trip was up the river to Eberoabo with Sheriff WHINFIELD and a large party from New Amsterdam. They were back within three days.

Travellers wishing to visit the falls should leave the steamer at Eberoabo and proceed in a light tent boat, accompanied by Indians in wood-skins, which may be required if the river is low, as it very often is in dry

* The steamer *Guiana* with a Government party on board, went about five miles beyond Eberoabo creek and there was then a depth of thirty feet of water there; but that was in September 1883, and the rains having continued later than usual the river had not run so low as it often does.

seasons. From Eberoabo it takes about five days to reach the falls of Itabroo, and half that time to return.

A little above Eberoabo, on the left, is Cariaqua creek, with blueish water and remarkable for having no fish in it. The White Hill, on the right, rises straight up from the river's edge, a perpendicular cliff of white sand nearly 100 feet high, from the top of which there is an extensive panoramic view. Close by, near the foot of the hill, is the Youa-coory creek, a fine stream navigable for two days, forming a path to the Demerara.

The Berbice from here varies very much; in some places it is narrow, winding in short turns, and deep; in others it spreads out to a great width with only a few inches of water over the sandy bottom. Again, near Mappa Lake it forms numerous false passages or *culs de sac*, which have been former channels, now deserted. The country around is hilly and the first signs of rocks are now seen; just a little above Boura-hara these form a ledge across the river, causing a small rapid, leaving, however, a narrow passage near the east bank. The banks are now steep and rocky and very picturesque; at one place, looking up a long reach with high land, the distance well wooded, the scenery is not unlike the passage of the Trossachs near Loch Katrine. A similar resemblance was noticed in the Cuyooni by Mr. CAMPBELL.

Yariki creek has steep banks on both sides, looks like a Scotch burn, and appears to run with considerable force when full, as it has brought a quantity of sand into the river; its waters, however, are quite clear and not ochreous as stated by SCHOMBURGK. The river here is very shallow, being much filled up with sand, so much so

that many travellers have had to turn back at this spot ; which is the more disappointing as immediately beyond are the falls of Idure Wadde, which are very interesting. They are in a small creek which enters the Berbice from the east bank. The following is from the diary of a recent traveller written on the spot :—

“ We have succeeded in passing the flats and are at Idure Wadde ! We were soon ashore and wading (barefoot) up this beautiful glen. The excitement is increased by spying a fine haimara apparently asleep in the clear stream. The Indian was sent back to the boat for his bow and arrows, and he soon shot the fish, but it struggled so violently that the buck, for fear of breaking his arrow, let it go, when the fish sped away up the creek with the arrow sticking in him, and it was only by means of a pointed stick cut on the spot that he was got ashore and landed. He measured 2 feet 6 inches. The falls are very beautiful and this would be a charming spot for a pic-nic. The creek at the top issues from the bush, the trees on each side nearly meet overhead, and the stream, which is about twenty feet wide, roars down over a succession of rocks which divide it into several channels at first, but which unite again below, and brawls along over a rocky and sandy bed till it reaches the river. The total descent we estimated at thirty feet, perhaps over-estimated it, but it certainly appears more than twelve feet, which Schomburgk calls it ; the first leap alone is that. Probably the river was higher when Schomburgk was here. The water is very cold and the bathing delicious.”

There is, near the mouth of this creek, one of those curious Indian rock carvings, of the deeply cut kind.

At Marlissa, an hour's pull above Idure Wadde, is a range of granite rocks stretching across the river and covered with Indian hieroglyphics of the shallow kind. Copies of several of these figure on the cover of *Timehri*.†

† For an account of these rock carvings by the present writer see a pamphlet published by Judd & Co., Doctors Common, London, entitled “ Indian Pictured Rocks of Guiana.”

It is at Marlissa that the rapids commence, and the boat has to be hauled up by ropes. There are eight rapids in succession, and it takes about four hours to surmount them. After passing the last and most formidable, the river forms a small lake, almost circular, the entrance to which is through a narrow passage about ten yards wide, with rocks on both sides. At the head of this lake the river turns sharply to the left and the falls of Itabroo are seen and heard.

There is a picture of these falls in SCHOMBURGK'S "twelve views". The scenery is picturesque and interesting; and a cool breeze blows over the surface of the lake. The pretty lake with its sandy shores is surrounded by high wooded hills, which in the distance rise to a height of eight hundred or a thousand feet. A naturalist might spend a week here to great advantage. The flora is peculiar, and there is a great variety of choice ferns on the hill-sides. The glossy ibis, the sunbird, and other rare birds are to be met with; and otters abound in the river.

Itabroo is in latitude $4^{\circ} 49'$ N., longitude $57^{\circ} 19'$ W; its level is 130 feet above that of the sea.

Few amateur travellers have gone higher up the Berbice than the falls of Itabroo. The explorers Sir ROBERT SCHOMBURGK and BARRINGTON BROWN have done so, and toiled away for several weeks, but making very slow progress. They had to ascend numerous rapids and cataracts and to cut their way through overhanging woods and fallen trees, and to contend against difficulties of various kinds, until by dint of perseverance they reached a spot where an Indian path from Corentyn crosses the river and leads on to Essequibo. Both these

travellers explored this path and found the distance between the Essequibo and the Berbice only ten miles, and no sign of the Demerara River.

The Berbice is navigable for some fifty miles beyond this path, but no European has ever visited its source, which is said to be in latitude $3^{\circ} 14' N$.

The large extent of country watered by the river Berbice and its tributaries, is but thinly inhabited. The aboriginal Indians, once numerous, are now but few in number. Some families of Arawaaks still remain and some Ackawois, but no true Caribs.

The creole blacks are mostly confined to the Lana district of Berbice and the upper Canje. These are all natives of the place, to which they are much attached, having lived there all their lives. The mode of life in the upper districts suits their tastes and constitutions; and they are very healthy and not subject to fevers.

Of the class of bovianders and small farmers there are several families, living on their farms, with all the comforts of life about them. This is a class that might be increased with advantage to the colony, particularly now that steamers are running on the river and communication with town is easy and frequent. There must be many industriously inclined people in the towns, leading a very poor, and perhaps disreputable life, who, up the river, would greatly improve their condition and become respectable colonists, contributing to the general prosperity of the colony, instead of being a drag upon it. People up the river can work with their own hands in a way they can never do in town. The necessaries of life are easily attained; food and shelter

are remarkably cheap. Small farms are soon established. The grazing is excellent and extensive, perhaps too extensive, for many cattle have been lost to their owners by straying away in the savannahs, where they are now running wild; but that is the fault of their owners, for the cattle, if brought home regularly, become very tame. The milk of the cows is very rich, and the butter from it excellent. New Amsterdam was once supplied with fresh butter of the best description from the small farm of *Ma chaumière*. Poultry thrives remarkably well and increases rapidly, and a ready market for it is always to be had on board the steamers.

The land, when once cleared of the bush, is easily cultivated and gives excellent crops for two or three seasons; it has natural drainage and no kokers are required. The cultivation of arrowroot has been commenced and seems well suited to the soil, and likely to be profitable. For such trades as boat-building, the river district affords great facilities.

If facilities were afforded to persons of small means for settling in these upper districts, it would be a great boon to the colony at large, and would help to diminish the pauperism which exists to a far greater extent than it ought, in a country like this possessing such great natural advantages. The best way to assist the poor is to put them in a way to support themselves.

As to "developing the resources of the country", the more important object is to enable a certain class, that now finds it very difficult to do so, to earn a decent livelihood.

But then the present crown-land regulations must be altered and their stringency relaxed. These regulations

have been framed, not so much with a view to protecting the crown-lands, as to repelling any attempt at the colonisation of the interior of the country, and so confining all population to the coast and the neighbourhood of the sugar-estates. This may have been a necessary policy at one time, but is scarcely so now. The sugar-estate will always be the best market for the labour of the strong and able-bodied agricultural labourer; and the danger of his being drawn away from his proper sphere is a good deal exaggerated. Besides, other classes are entitled to some consideration; and there are many who are quite unsuited for the work of a sugar-estate who yet are industriously inclined and would earn a comfortable livelihood for themselves and their aged relatives in the upper districts, if facilities were afforded them. We hear a good deal about the conservancy of the forests; one would like to hear something of their being made of some use. Instead of the present elaborate and costly system of surveys and diagrams, a much more simple system might be adopted.

A certain district might be selected for the purpose, and intending settlers might apply to the river magistrate, who would allot them a piece of land for building a house, and a few acres for making a field, according to the size of the family. He would see the paals planted and take care that the limits were not exceeded. A moderate rental should be paid, and the tenant have a right of renewal of his occupancy on payment of a fee.

It is quite possible, if something of this kind were once established, that colonists from the West Indian islands might come and settle here, and so increase the population, which is so much wanted. The facility af-

fording by our rivers for conveying produce to a market gives this colony an advantage over more mountainous countries.

There is another class which might be benefited by an occasional resort to the upper district, and that is the residents in town who are closely confined to one spot by their business or official duties, but who would gladly avail themselves of a change of scene for the benefit of their health, could it be had without inconvenience. Something in the nature of a "watering place" is much wanted in this colony, and might save many an invalid from falling into serious illness, requiring an expensive change to Barbados or to England. The steamers now plying on our rivers would reach a suitable spot for such an establishment in five or six hours. The Dutch used to go periodically to the "cold creeks"; but these are very far up, and the sand-flies on the dry savannahs are almost unbearable. Somewhere in the neighbourhood of the old town would suit very well; the locality is healthy and there are objects of interest within the reach of a short excursion. A few cheap houses might be put up for the accommodation of visitors, who would go up by one steamer and return by the next, and thus get a few days' recreation with very little trouble.* Expensive town-built houses would not be required; such as the bovianders live in would answer the purpose very well and are very cheap. A house fifty feet by twenty, built in the usual style, wattled with manicoles, thatched with dallabana leaves, with sleeping rooms upstairs, could

* The steamer, having a handsome subsidy, should take passengers at a minimum rate of fare.

be built for fifty dollars, materials and labour included. The bathing in the river is good ; but for the accommodation of ladies and children, or for those who are not good swimmers, floating baths could be arranged somewhat similar to those on the Rhine, which rise and fall with the tide, so that the water is always at the same level. This could be easily effected by means of two rafts of light wood, eight or ten feet asunder, supporting a platform suspended between them under water, at the required depth, over which the river would constantly flow. As the river is deep close to the bank a short stage from the shore would reach the raft, and the bath be accessible at any hour or at any state of the tide.

Besides these minor objects, there are two industries which might be conducted with advantage in the upper district of Berbice, on a scale that would probably be profitable, and would rescue this fine country from the reproach of being desolate and unproductive. These are cattle-farming and wood-cutting ; but both should be carried on upon a scale far greater than has been hitherto attempted.

As to the raising of cattle, it would not be difficult to stock these downs with cattle, by importing several hundred cows and heifers from Venezuela. They could be brought by sea in schooners direct and landed on the spot. The voyage is not long, and if steamers were used would only be a few days. In this way the raising of horned cattle could be commenced on a footing similar to the "gigantic cattle-farms established by the "Brazilian government" as described by Mr. IM THURN in his paper on "Opening up the Country," prefixed to the catalogue of the Exhibition of 1879. In that paper

Mr. IM THURN proposed establishing cattle-farms on a large scale on the Roopoonooni and Takootoo savannahs. But surely it would be better to make use of the country nearer home, within a few hours of a market. And as to labourers, probably some of our own Indians might be trained to the work, and make as good cow-herds as the peons of the Spanish Main. Why should not Berbice have an export trade in cattle as well as Venezuela or Porto Rico?

As regards woodcutting; there is a forest of green-heart growing on a high plateau of level land, lying between the right bank of the river Berbice and the left bank of the Wikky creek, which has attracted the attention of several woodcutters from time to time, but which has always been given up on account of the distance from the water. The supply of timber was ample, but the expense of hauling too great for small gangs. It might be worth while to have this tract examined, and if it is found to be extensive and likely to furnish employment for a large gang for several years, an enterprising woodcutter, with sufficient capital, might possibly make terms with government for a grant of the tract for a long period, paying instead of a rent per acre, a royalty on the amount of timber shipped, in consideration of his laying down a temporary railway or, by means of timber carts or other mechanical aids, reducing the cost of hauling so as to leave a profit on the business. The surface of the land is perfectly level and hard and very suitable. There are Indians living in Wikky and also in Etoony who are used to wood-cutting; and additional hands could be brought up by the steamers. The creek is deep and

navigable, and opposite its mouth is a beach where Maccallum & Co., formerly loaded their ships.



Our Colonial Currency.

By J. E. Tinne.



IN the West Indies generally, peculiar notions exist in the minds of the public on this subject; and, without wishing to display a polemic spirit, it may be of interest to your readers elsewhere if I attempt to give them a brief summary of the views which one believes to be held in this colony on this question. Money in British Guiana is of four species; first, the *money of account*, which is composed of dollars and cents, and the convenience of which for its specific purpose no one here will deny; it has the further advantage of being identical in name and fractional parts with the money of account in the United States, Mexico, St. Helena, and most of the States of Southern America, while it is similar to, or readily convertible with, the French, Dutch, Italian and many other continental monies. The American, Spanish and Mexican dollar is readily procurable in the London bullion market at its intrinsic value, which fluctuates with the supply from this side of the Atlantic and the demand for China, Japan, Central Africa and other parts of the world; the cost of purchase and transmission from London to Demerara exceeds 2 per cent., and until a few years ago it was a legal tender here at 4s. 2d. English to the dollar. My own firm imported some two hundred thousand Mexican dollars at that time; the coins were readily absorbed into circulation, and in due course excessive imports would have been checked by the rise in exchange, our

financial pulse would have vibrated in consonance with those of other countries, and we should have had a currency suitable to our accounts, of an intrinsic though variable value, and therefore suitable for remittance to any part of the world at the rate of quotations ruling for silver in the London money market.

The colonial government of the day however were alarmed, while the local banks were disgusted, partly at a private firm profiting by an operation which the banks themselves should have undertaken, but chiefly because they saw their control over the island exchanges imperilled and greater facilities given to remittances in specie. Instead of the colony welcoming the useful coin and the banks meeting the emergency by raising their rate for bills on England, the legislature first imposed a duty on the dollars and soon afterwards demonetised them. The Secretary of State, when he sanctioned this latter step lost the chance of enforcing his views as to the adoption of a gold currency and the limitation of silver tender in the West Indies; and, instead of making his sanction of the ordinance dependent on our adopting his views of a proper currency, he deprived us of the next best one, which would be a silver coinage of marketable value, and left us with our present most unsatisfactory *money of legal currency*, which consists mainly of British silver, which is in England purely a token currency, the tender of which is limited there to forty shillings, but which if you sent it to your banker in England and he was willing to take it, would cost you not only the 2 per cent freight and other charges, but $\frac{1}{2}$ per cent additional commission, in consideration of which he would receive it from his *customers*; elsewhere than

England the British silver would be practically almost valueless. The whole expenses of the British mint are paid from the profits of coining these tokens of silver and copper, which bear a face value in relation to the pound sterling considerably beyond their intrinsic value. Mr. YOUNG, our Government Secretary, has suggested that we might absorb that profit ourselves by issuing our own silver tokens; but as the British Government sensibly limits its own production of these tokens, it would naturally object to our multiplying them, whilst if *we* have a debased silver token currency solely current in Demerara and coined specially for us, it would isolate us more than ever from the world and place us more entirely in the hands of the banks than before. If we are to have a Demerara dollar currency, there was little reason for demonetizing dollars of other countries of equal intrinsic value; but in that event, we shall suffer as individuals, whilst the general revenue benefits.

Thirdly, there is the *money of colloquial parlance*; the bit equal 4d., $\frac{1}{2}$ bit equal 2d., gill equal 1d., stampee, $\frac{1}{2}$ d. As the old Dutch guilders are rapidly becoming fewer, and as we have recently heard that the English fourpenny bit or "joey" (no relation to our extinct "joe" notes in this colony) is being called in, we may expect that even our country people will have to succumb to the inevitable and alter their money nomenclature. With the change we may perhaps see an agitation for some small coin more suitable to our climate than the bronze penny and halfpenny, which for offensiveness, though not in amount, rivals the five dollar note of fashionable life after a few weeks' handling.

Lastly, we have the real bones and sinews of the

country, *paper-money*. Do we all not know the man who to satisfy some creditor slaps his name to the end of a promissory note equal in amount to half his annual salary and then says "Thank God, that's paid for"? Do we not most of us see "goods" or "IOUs" for considerable amounts in the cash boxes of the merchants from their clerks or customers? Do we not know what large sums have appeared at the credit of certain funds in the colony books, before we mended our way and wrote off the balances as bad debts? And lastly do we not know the colour of a three months' bill on London drawn by our two banks on their home agents, or by some of our leading firms on a solvent absentee proprietor; and when we have that in our hand, what after all do we really care whether the small change in our pockets for daily wants is composed of guilders, shillings, or even of Mexican dollars?



A Chapter in the Life-History of a Plant.

By G. S. Fenman, F. L. S., Government Botanist of British Guiana.

MOST West Indians who have lived for any length of time a country life, and possess an observant taste for nature, are familiar by sight, though possibly not by name, with the common large-leaved shield-fern (*Aspidium macrophyllum*, Sw.), with its ample leafy fronds, and their serried dot-lines of clustering spore-cases, capped (as the groups are up to maturity) by the little membranous circular shields. Here and there in favourable situations, in districts of low altitude, it is a common wood and wayside plant on, probably, all the West Indian islands; and here in British Guiana, it is still more plentiful, but because of the different conditions of the country, not so often seen by us in its native haunts as by our island neighbours. Everywhere, whether on the islands or the mainland, it is found under much the same conditions of soil and shade,—the former fairly dry and the latter rather light, such as open forest or low bush might best afford. Those who have observed it in different countries and are familiar with its appearance, know that it is a plant that presents hardly any variation of character: it seems to be the same in all its features wherever found under the forementioned conditions of growth.

Constant and true in its characters as the type plant generally is, there is, however, a specialised form of it, which I have taken as the subject of these remarks, that

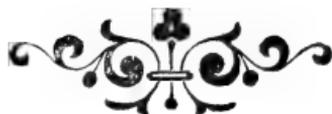
I have recently become acquainted with, which does not occupy the *terra firma* of its prototype, but lives an aquatic life and has developed a very striking and peculiar aspect, picturesque in itself and full of interest to the enquiring naturalist. On numerous creeks of the Pomeroon River, and less abundantly on the main river itself, this special form is found plentifully in the water, clustering on stumps, logs of wood, and even the branches of trees that hang down far enough to be washed by the stream. It presents a most gay and fantastic appearance; for, like sailors aloft in a ship's rigging, in the axil of every leaflet, and sometimes on the ribs and surface as well, are perched infantile plants, fully equipped with leaves and roots of their own for a separate and independent career, but temporarily attached to the parent plant by the bud from which they have developed. Through the overhanging branches, that in those still solitudes a passing breath of wind occasionally stirs into indolent motion, the sunlight gleams and plays on their pale incipient foliage, distinguishing them with magic contrast against the dark sombre green of the old plants which support them. So far in their evolution they have lived a dependent—one might say parasitic, but that they are true, though abnormal, vegetative developments from the parent—and ærial life. Their birth and brief period of dependence, till they reach as it were their majority and become in turn the progenitors through many years of generation after generation of fertile successors, may be told in few words. First, through the slightly ruptured epidermis, the embryonic bud appears, a mere gland, barely visible at first to unaided sight. When a little more advanced, this is

seen to be composed of a minute fleshy nucleus, coated by a few germinal scales. Then, by degrees, rudimentary fronds arise and active rootlets are thrown out, and the bud becomes a young plant complete in all its parts. After a time, borne down by their increasing size and weight, the parent fronds reach the water, when, if the plantlets reach a suitable surface, they root into it and begin their independent existence; or, if not, they are carried away, by the drag of the stream or by the friction of floating material, to make a home on any favourable spot they may chance to drift to. There can be no reasonable doubt that this aquatic form was originally derived from the plentiful, widely-spread terrestrial form. Both are strictly identical in all but the viviparous character I have described, and the different habitats they occupy. When the buds are removed, there remains no feature to distinguish a frond of one form from a frond of the other. Now, this being established, it will be interesting to inquire how this aquatic form originated, and why has it, living in water, acquired a bud-bearing faculty to such a conspicuous degree, to which the type on land shows no disposition: and what purpose, if any, in the economy of its life does this power serve? How the conditions (the physical causation of the result) came about which changed this plant over a large area of the country from a terrestrial into an aquatic subject can only be inferred with more or less of probability. The nature of the conditions can however be indicated with more of certainty: their influence on the plant can be shown, and the important purpose that the adaptation to these (so successfully accomplished) serves can be clearly seen.

It is a matter of common observation how much the majority of plants that possess a wide range are affected in character under the varying conditions and degrees to which they are subject of drought or moisture, exposure or shade, heat or cold, and difference of elevation (which in some particulars are the same) acting continuously upon them. The known instances of this variation of form under the influence of physical surroundings are innumerable and rapidly increasing. Guided by this experience we may look with some confidence to the present environment of our subject for an explanation of the adaptive change it has undergone. Now its distinguishing character, viviparousness, is not an unusual feature in the fern family, and it appears to be induced and much fostered by an abundant, ever-pervading, atmospheric moisture. This inference is justified by the fact that most of the plants which exhibit it inhabit wet mountain forests, the shady banks of streams, and other similar very moist localities; and that among such, it is in those which are the most thoroughly and constantly pervaded by this dripping atmosphere that it shows its fullest development. To such influence our plant, in its river-way habitat, sheltered by the surrounding and over-reaching forest from sun and air, is most completely subject. As I have intimated, we can only speculate (though with certainty as to the essential circumstances) from the results which we see have been produced as to the history of how the conditions came about which produced these results. Not only was water the great factor, but, judging from the truly aquatic habits of the plant as we see it to-day, water must have prevailed in the end, generally and abund-

antly. It is very probable that the region occupied originally by the ancestral form was, under physical change, invaded by water, becoming gradually, by very slow degrees over a long period, quite flooded. This result must have occupied a very considerable time, for had the change been sudden, it is exceedingly doubtful if the vegetation of this type could have survived it. Then, as the water slowly and insensibly increased till it covered the ground, all such plants as had so far survived by the advantage derived from favourable location, or constitutional fitness, in the same degree adapted themselves to the conditions. In course of time, under the prevailing aqueous influence, some of these—possibly few in its earliest stage—evinced a casual tendency to produce buds on their fronds. At the same time that they were gradually becoming specialised by this character, as the water increased, the difficulty of maintaining the succession by ordinary generation must have become more operative year by year; for the majority of the spores falling on the water would perish, and fewer and fewer, as time went on, would find places favourable to their successful germination. In those rare spots, too, they had to compete, no doubt, with rival vegetation struggling also under the same inimical conditions for security of life. Here we see the value of this development, and the actual necessity that it met, under the precarious conditions of life which had come to exist at the period it originated. The very survival of the plant under such circumstances was threatened, and would eventually depend on this viviparous effort becoming established and permanent, as the normal method of reproduction, influenced by the same cause, was steadily becoming ineffective.

The young plants thus produced doubtless inherited the tendency in an increasing degree, and succession after succession perfected it. Then in the course of time probably the drift of the water to its points of relief formed channels, and, as these became deeper and more effective, there was a gradual withdrawal of it from the intervening land. The aquatic vegetation followed, and was henceforth confined to the banks of streams, as we see it at present. Now, likè all racial tendencies that have existed for long periods, the characteristic is so firmly established that apparently if the physical conditions which produced it, and under which to-day it flourishes so well, were withdrawn, (though much modified under the changed circumstances) many generations would elapse before it again disappeared, leaving no trace on the surviving plants of its having existed and played such an important part in a chapter of their life-history.



On Lamaha Water and a Process for Purifying it.

By E. E. H. Francis.

ITS nature and composition:—The water of the Lamaha canal consists of the surface drainage from savannah tracts, the upper soil of which contains much peaty matter, or pegass, and decomposing vegetable *debris*: hence the water, like other bush water throughout the colony, is deeply coloured and resembles weak tea in appearance. The colour is due to the presence of humous bodies dissolved in the water—principally, a brown acid substance, soluble in alkalis and precipitated by acids, resembling humic acid, and a small quantity of apocrenic acid. The colouring matter cannot be separated from the water by the mere application of heat or by the passage of a galvanic current, but it precipitates in brown flocks spontaneously, and often completely, when the water is allowed to stand for several months in glass vessels exposed to the light. Nor can the colouring matter be easily destroyed by oxidation; thus acidified solution of permanganate, or Condyl's fluid, acts but imperfectly upon it, and it stubbornly resists the action of peroxide of hydrogen, even if aided by heat. Filtration through animal charcoal partially removes the colouring matter; and it can be completely separated by means of acetate of lead, hydrate of iron or alumina. From a gallon of the water there were obtained by precipitation with alumina 4.737 grains of colouring matter, and the water then became perfectly white. Apart from the vegetable matter present, the water is fairly pure, as it contains only about $3\frac{1}{2}$ grains

per gallon of mineral impurities, consisting of iron, alumina, magnesia and a trace of lime and potassa, together with small quantities of silica, sulphuric acid and chlorine—in fact, just the substances that the clay soil of the colony might be expected to yield to water in contact with it. The constant presence of iron in Lamaha water to the extent of about $\frac{3}{4}$ of a grain per gallon is worthy of note and may be of interest to those persons who think that the colour of Lamaha, and other bush water is due to the presence of “tannin.” Iron in solution in the presence of tannin produces a black colour—ink, in fact—but the water does not exhibit an inky tint. Owing to its freedom from lime salts and mineral matter generally, Lamaha water is almost as soft as rain water—tested with an accurately made soap solution its hardness was found to be exactly 4 degrees. The following represents a careful analysis of the solid residue left after evaporating the Lamaha water, and shows the nature and quantity of the impurities contained in one gallon :*

Vegetable and organic matter	...	...	4.653	grains
Iron peroxide	...	...	0.701	„
Alumina	...	...	0.230	„
Lime	...	...	0.050	„
Magnesia	...	...	0.133	„
Potassa	...	...	0.116	„
Soda	...	...	0.965	„
Silica	...	...	0.500	„
Sulphuric Acid	...	...	0.432	„
Chlorine	...	...	0.371	„
			8.151	„
Deduct Oxygen	...	...	0.167	„
			7.984	„

* All the analytical determinations given in this paper are the result of duplicate, frequently of triplicate, closely concordant experiments, and may be thoroughly relied on.

On the best method for decolourizing and purifying the water:—The dark unsightly appearance of Lamaha water and the large quantity of vegetable matter it contains unfit it for many domestic uses. Only stern necessity compels persons to bathe in or drink it, and it is shunned by laundresses who have any care for the colour of the linen they wash. A cheap and easy process for removing the colour without harm to the water would therefore be of great service. The methods chiefly employed in purifying coloured or peaty waters are of two kinds:—one is by simple filtration through porous and absorbent substances such as animal or vegetable charcoal, magnetic oxide of iron, spongy iron, silicated carbon, &c. ; and the other by precipitating the colouring matter chemically, usually by means of alumina added to the water in the form of alum. The use of alum for this purpose is well known here and in most other parts of the world. Early in 1880 the writer commenced to make experiments on the purification of Lamaha water and soon found that the method by filtration was of no avail for operations dealing with the water supply of the town. The decolourizing power of charcoal or spongy iron filters is very limited for Lamaha water ; and the filters are speedily rendered inactive by the large quantity of vegetable matter that accumulates in them. This will be evident when it is stated that Georgetown requires 300,000 gallons of Lamaha water a day ; and that quantity will contain about 200 pounds of vegetable matter that would have to be removed before the water became colourless. Attention was therefore directed to the best way of carrying out the method of precipitation ; and it was ascertained that

1·614 grains of alumina was the smallest quantity that would effectually remove the colouring matter from one gallon of the water. This quantity of alumina is contained in 15 grains of alum; but as alum is rather an expensive source of alumina, a cheap substitute was sought for, and at last found in "alumino-ferric cake," a neutral sulphate of alumina manufactured by Mr. SPENCE of Manchester and; amongst other things, used for "decolourizing turbid, clayey or peaty water for drinking and for manufacturing purposes." The following shows the percentage composition of alum and alumino-ferric cake respectively:—

ALUM.				ALUMINO-FERRIC CAKE.			
Sulphate of alumina	...	36·11		Sulphate of alumina	...	46·74	
(equal to 10·81 % alumina)				(equal to 14·00 % alumina)			
Sulphate of potassa	...	18·36		Sulphate of iron	...	1·82	
Water	... ..	45·53		Water	... ..	51·44	
		<u>100·00</u>				<u>100·00</u>	

In most cases where alum or alumino-ferric cake is employed to purify coloured water, the lime naturally present in the water is sufficient to decompose the aluminous compound, and set free the alumina, which thereupon unites with and carries down the colouring matter. But the quantity of lime in Lamaha water being too small for this purpose, it is necessary to use a certain proportion of lime, or other alkali, in addition to the aluminous material. Potash or wood-ashes, carbonate of soda, ammonia, or any other alkali will answer; but the most economical is lime. Formerly, the writer recommended the use of carbonate of soda, or its cheaper form called soda-ash; with the object of preventing the water becoming unduly

hard from the presence of lime salts. But subsequent experiments have proved that the slight increase of hardness (1.7 degrees) is of small account compared with the considerable saving in cost of material. Three grains of slaked lime, equal to 2.27 grains of Bristol temper lime, to the gallon of water have been found to give the best results; and it makes no difference whether the lime is added before or after the aluminous compound. After adding the materials, the water is well agitated and the sediment then allowed to settle, which it does completely in less than 12 hours, leaving $\frac{1}{20}$ of the water perfectly clear above. To remove the colouring matter from one million gallons of water, or sufficient for 3 days' supply, there would be required 1654 $\frac{1}{2}$ pounds of aluminoferric cake and 324 $\frac{1}{4}$ pounds of Bristol lime. The cost of the alumino-ferric cake, including freight to the colony, would be about \$15.00, and of the lime, about \$1.50, or together \$16.50. This would represent a daily expense of \$5.50 for the purifying materials.

On the composition and wholesomeness of the purified water:—The first trial of the above materials for the purification of Lamaha water on a large scale was made last August at the Georgetown Water Works in the presence of Mr. L. M. Hill, Town Superintendent, and Mr. C. Williams, F.C.S., Town Councillor. A reservoir holding between 24,000 and 25,000 gallons was filled with the water, and 40 pounds of alumino-ferric cake and 19 pounds of slaked lime were successively dissolved and mixed in this. Twelve hours after, the sediment had completely settled, and the bottom of the reservoir was clearly visible.¹ The water thus purified had no unpleasant taste, was clear, and quite white in

small quantities, but exhibited a slight yellowish-green colour when seen in large bulk. Its hardness was 5·7 degrees; and the solid residue from one gallon had the following composition :—

Vegetable and organic matter	...	...	0·558	grains.
Combined water	...	...	1·512	„
Iron peroxide...	...	...	0·070	„
Alumina	...	...	0·000	„
Lime	...	...	2·352*	„
Magnesia	...	...	0·278	„
Potassa	...	...	0·140	„
Soda	...	...	1·315	„
Silica...	...	...	0·154	„
Sulphuric acid...	...	...	4·385	„
Chlorine	...	...	0·479	„
			<hr/>	
			11·243	„
Deduct Oxygen	...	...	0·216	„
			<hr/>	
			11·027	„

* Equal to 3·108 grains of slaked lime.

Comparing this with the former analysis, it will be seen that nearly all the vegetable matter, nearly all the iron and all the alumina have been removed by the treatment, whilst the lime and sulphuric acid have been increased,—the former to the extent of 2·302 grains and the latter of 3·953 grains, together representing about 6 grains of sulphate of lime—a perfectly harmless and constant constituent of potable waters. This however cannot be said of the impurities that have been removed. The presence of vegetable or organic matter of any kind in water is objectionable. However harmless it is generally, it may become highly noxious under certain conditions, and moreover greatly tends to foster infusorial and parasitic animal life.* That

* According to MALLETT (*Chem. News* 46 p. 63) the injurious effects produced by drinking polluted water do not depend on the chemical

the brown bush-water of the colony exercises a specific effect on the functions of persons drinking it is well known; but its action ceases after a time and it is said that persons habituated to its use even prefer the water to any other. Mere taste however affords no criterion of the goodness of a water. Only a few years ago nearly every London church possessed its pump in connection with a well either in or near the churchyard, and several were quite famous in their neighbourhood for the agreeable taste and appearance of the water. Persons sent long distances to obtain a supply of the cool and sparkling water from particular pumps, even after it was proved that it was highly polluted and undoubtedly received the drainage from the adjacent graves. It was also shown that the more polluted the water the more it was praised and sought after. Subsequently, when a violent epidemic of typhoid fever or cholera raged in the Metropolis, and it became evident that several of the pumps had become centres of the infection, they were chained up, preparatory to removal. Nevertheless, people broke the chains to get at the water. Even in this city there is but little doubt that if the various water vats were overhauled, there would be disclosed the body, not of the mythical missing terrier of the last Exhibition, but of many a real one, together with other cadaveric abominations now tempering the rawness of the rain water.

There is too much iron naturally present in the Lamaha water, and it is well got rid of, if the water is to be used for drinking. According to the best authorities, good potable water should not contain more than $\frac{1}{10}$ to

constitution of the organic matter, but on the presence and action of living organisms. *Journ. Chem. Soc.* 1883, p. 883.

$\frac{2}{10}$ of a grain of iron per gallon ; but Lamaha water contain nearly $\frac{3}{4}$ of a grain. It has been suggested that the iron would act as a tonic, and therefore might be beneficial ; but tonics should be taken under medical advice and not as articles of diet—their constant use would be anything but beneficial.

The complete removal of alumina, not only of the portion added in the form of aluminoferric cake, but also, that naturally present in the water, is a point of interest. Any objection to the method of purification of Lamaha water herein proposed could only be founded on the use of an aluminous compound, as the presence of salts of alumina, owing to their great astringency, is always objectionable in food or drink. Now a glance at the analysis given on page 316 will show that Lamaha water naturally contains 0.230 grain of alumina, as well as 0.432 grain of sulphuric acid : just the ingredients that are contained in about $1\frac{1}{2}$ grains of aluminoferric cake. But the whole of the alumina, both added and natural, is got rid of by the purification process—thrown down in combination with the colouring matter by the agency of the lime, which at the same time unites with the sulphuric acid and remains in the water in the form of sulphate of lime or gypsum.

A few grains more or less of lime salts or other innocuous mineral compounds make very little difference in the potability of a water, and if the total mineral constituents do not much exceed 30 to 40 grains per gallon, they afford no reason for rejecting the water for domestic uses. The water supplied to London, and indeed most other places, contain a much larger quantity of lime and other salts than the purified Lamaha water. Thus,

the Kent Water Company supplies London and parts of Kent with more than 6 million gallons daily of deep well water that contains 5.37 grains of sulphate of lime, 16.30 grains of carbonate of lime, and other salts to the extent of about 30 grains per gallon. The only objection to the Kent water is its great hardness. The water of the river Thames, which is supplied to London and its suburbs by eight companies at the rate of about 65 million gallons daily contains 2.4 grains of sulphate of lime, 12.9 grains of carbonate of lime, and other salts amounting to about 20 grains per gallon. The New River Company supplies 26 million gallons of water each containing 1.6 grains of sulphate and 12.7 grains of carbonate of lime, besides other salts. Many similar examples could be given, but these are sufficient to show that the purified Lamaha water with its 6 grains of sulphate of lime and 3 grains of other salts per gallon is much freer from mineral impurity than the average potable waters used elsewhere.

On a simple plan for carrying out the purification process:—It was originally proposed to purify the water in large reservoirs in which the purifying materials could be mixed and from which the clear water could be drawn off without filtration after the subsidence of the impurities. This plan, however, did not meet with approval, chiefly in consequence of the cost of erecting the necessary reservoirs, and pumps. Experiments were therefore commenced by the writer, with the object of adapting the process to existing arrangements at the Water Works; and it was found that the object could be attained by dispensing with reservoirs for subsidence and employing the sand filter-beds, al-

ready provided but seldom used at the works, to remove the precipitated impurities. The method now proposed is almost a self-acting one, and would require but the most trifling expense to bring it into operation. It is as follows:—The water from the canal is to be conducted to the filter-beds by a channel which may have to be about 100 feet long and 6 to 8 feet wide. In the first part of this channel an open wooden box, liberally perforated with holes, is to be suspended by a contrivance which will admit of its being raised or lowered to any required height. A few slabs of alumino-ferric cake* being placed in the box, the latter is to be lowered into the channel to such an extent that the water passing through at uniform velocity will dissolve exactly the proper quantity of the cake. As the substance dissolves slowly and regularly, this can be managed quite easily after a few trials. Along the remainder of the channel a few hogsheads of Bristol lime are to be distributed so as to form a bed of slacked lime over which the water flows. If the current is not too rapid, no mechanical disturbance of the lime will take place; but, if the length is properly proportioned, the water will take up the exact quantity of lime necessary to set free the alumina and colouring matter. The water holding these impurities in suspension then proceeding to the filter-beds, will pass through white and clear, leaving the impurities as a brown sedi-

* Alumino-ferric cake is exported in the form of convenient slabs measuring 20" × 15" × 4", each weighing 56 pounds, and is manufactured under a patent from the mineral called Bauxite by Mr. PETER SPENCE of the Pendleton Alum Works, Manchester. The cost is 61/ per ton free on board at Liverpool, and it is claimed to be the cheapest source of soluble alumina extant.

ment on the surface of the sand. When this process is once set going, it should require but little attention. Fresh alumino-ferric cake must of course be placed in the box as the other dissolves; and the bed of lime will occasionally require renewal. As the impurities accumulate on the filter-beds, the sand will become clogged; but as the sediment is very light and remains almost wholly on the surface, it can easily be removed. Simple flushing with water, which is then allowed to run waste, is sufficient for this purpose. As the water-works are already provided with two filter-beds, each of adequate dimensions to filter the town supply, they can be used and cleaned alternately. A piece of ordinary test paper, held in the water passing from the purifying channel, serves as a useful guide to the proper working of the process. If the water is alkaline, too much lime is passing into solution, and if very acid, too much alumino-ferric cake. When the proper quantities are present the water *slightly reddens* violet litmus paper after flowing over it for a few minutes.

No opportunity has yet occurred for trying this plan on a large scale, but a model apparatus for carrying out the process is in frequent and successful operation at the Government Laboratory. It consists of a flat bottomed wooden gutter 2 feet 6 inches long and 3 inches wide through which Lamaha water from a service pipe passes to a sand filter consisting of a wooden box 12 inches square with a perforated false bottom, on which rests a layer of coarse sand 3 inches deep. A few fragments of alumino-ferric cake being placed in the first part of the gutter, and a layer of lime along the remainder, the water is turned on, and taking

up the purifying materials in its passage, it passes through the sand filter in a perfectly clear and colourless condition at the rate of about 12 gallons an hour.



Essequibo, Berbice and Demerara under the Dutch.

PART II.

By the Editor.

3.  *HE Organisation of the Colonies by the Dutch, (A. D. 1667-1796.)** Guiana, from Cayenne nearly to the Orinoco, remained in the hands of the Dutch, with but brief and important intervals, from the time of the peace of Breda till the conversion of that part of it which lies north of the Co-rentyn River into an English possession in the year 1796. It will be best, anticipating history, to tell at once the intervals to which allusion has just been made; their occasions were when the French twice, in 1689 and again in 1712, captured Berbice, on each occasion almost immediately taking ransom for it, and when in 1781 the English under Lord RODNEY took Essequibo and Demerara, which colonies were yielded to France in the following year, to be restored to the Dutch in 1783.†

* The "Calendar of State Papers: Colonial Series," from which in the earlier part of this historical sketch I have been able to draw much material, being as yet only published as far as the year 1668, I have been obliged, in treating of the period here described, to depend on less authentic and less minute authorities. And I must not omit here to notice my indebtedness to Dr. H. G. DALTON'S 'History of British Guiana' (London, 1855), a work which, though it cannot, as it seems to me, claim entire confidence, is yet useful in indicating the events in the history of the colony which have to be verified from other sources.

† While this is passing through the press I have received from Mr. N. DARNELL DAVIS a manuscript, apparently original, entitled 'Memoire

These transient, and therefore comparatively unimportant events, having been told, I may turn to the general consideration of the period which has now to be described, extending from 1667 to 1796. But one other point may first be noted; and this is that the land to be treated of in this chapter is smaller than that dealt with before; for Surinam, unlike the rest of the land, never again became English. It is somewhat curious that the English and the Dutch should thus, as it were, have exchanged the colonies which each founded.

The Guiana which we have now to consider extends, therefore, from the Corentyn river, which forms the boundary of Dutch Guiana or Surinam, nearly to the Orinoco.* It included, in 1667, the two colonies of Essequibo (founded 1580) and Berbice (founded 1626); and to these, in 1765, was added the third colony, of Demerara.

Throughout the period the Dutch were busily engaged in giving shape and organization to these colonies. It will be most convenient first to describe the general management of the colonies during the period by

sur les Colonies de Demerary, Essequibo, Berbiche'. The date is 1752; and the contents purport to be 'an answer to the questions of the Marquis de Castries as to the state of the colonies of Demerara, Essequibo and Berbice, with special reference to the products, population and the amount which they might yield to the royal treasury'. The writer's name does not appear. It is apparently a report drawn up for political purposes just at the time of the brief occupation of Guiana by the French in 1782-1783. I regret that it has come into my hands too late to be of much use on this occasion; but I trust to be able to print it, either in full or in abstract, on a future occasion.

* It is hardly necessary to recall the fact that the exact boundary of British Guiana toward the Orinoco has never been satisfactorily settled.

their rulers in the Netherlands ; and then, the process of internal organization having been very similar in all the colonies, it will suffice to take one as an example, and to describe the life led, and the nature of the deeds done, in that one. The example chosen for this purpose will be the colony of Berbice.

First, as regards the general external management of the colonies, the first time any authoritative body had been constituted in the Netherlands to care for the scattered settlements of Dutchmen on the "Wild Coast" had been about 1621, when the first Dutch West India Company was established, with sole control over all settlers and monopoly of all trade in Essequibo with its dependencies, that being then the only Dutch colony in Guiana. Thus had been inaugurated the system according to which the Dutch colonies in Guiana were to be governed, not directly by the government of the Netherlands, but by a great trading company somewhat similar to the famous East India Company. And when, five years later, VAN PEERE had been allowed, as has been told, to take possession of the banks of the Berbice, rights as regards that river similar to those which the West Indian Company enjoyed as regards the Essequibo, seem to have been given to him, as an individual. Thus two systems and two distinct authorities were created in Dutch Guiana. But the rights of VAN PEERE seem very soon to have lapsed in some unexplained way. On the other hand, the rights of the original company, in Essequibo, had continued till 1657, when they had been voluntarily relinquished to a commission of eight persons, the original company extinguishing itself in great disgust at the smallness of the profits it had drawn from the colony. It seems not

improbable that, at first, even the Dutch, though, unlike their rival nations, they cultivated the soil, had shared the general hope for much gold from Guiana; and that the company had dissolved as soon as it learned the deceitfulness of this hope. The substituted commissioners had soon found, when in 1665 war broke out between Holland and England, that they were unable to bear the cost of the necessary military defence of their property; and they were thus forced to yield both their rights and their corresponding duty of defence to the Government of Zealand, which of all the Netherland provinces was throughout the most active in the affairs of Guiana. Thus the proprietorship of the settlements rested with the State of Zealand at the time when, by the Treaty of Breda, opportunity for peaceful organization under the Dutch was almost for the first time allowed. The war over, Zealand in 1674 allowed the formation of a "New General West India Company" with administrative rights over both colonies alike, but with provision that the company should confine the trade to Zealand. Essequibo long remained under the rule of this great trading company Berbice, on the other hand, was delivered over in 1678 to a second VAN PEERE, the heir of the original founder; and it passed, in 1720, into the possession of a special company of proprietors. Thus the management of the two existing colonies was in the hands of special trading companies, with powers almost absolute. These companies, which were, of course, ultimately responsible to the Government of Zealand, were represented in the colonies by officers some of whom were sent out from Holland, of whom others were appointed from among the settlers.

In accordance with the plan already laid down it is now necessary to turn from these general external conditions to the internal condition of the special colony of Berbice.

Just within the mouth of the Berbice River lies Crab Island. Opposite to this, on the bank of the river stood, in the year 1645, Fort St. Andries, built of small Dutch bricks, and surrounded by a high wooden stockade, beyond which again was a moat. The size and importance of this fort may be realised from the fact that its garrison consisted of about twenty-five men and a proper complement of officers. Up the river, nearly fifty miles from this fort was New Amsterdam, the quarters of the settlers. Between, and especially around, these two points the forest on the banks of the river was cleared here and there, and plantations were gradually made. These scattered plantations were connected by no roads; and, except in the very few cases in which an Indian path, hardly discernible, connected two neighbouring settlements, there was no communication except by water.

At this time most of the planters who came to the colony were men of some education and means. They built themselves pleasant houses and made gardens; they lived luxuriously, working not at all, but enjoying every barbaric luxury with which their crowds of slaves could supply them in that rich but rough land. Their only exertion was the leisurely daily ride, accompanied by a troop of running slaves, round the plantation to mark and order the necessary work; the rest of the day was spent in eating, drinking, sleeping, and toying with the least displeasing of their black woman slaves, for there were hardly any European women in the colony. The

other white men in the colony, the civil and military officials, the professional men, and the overseers of estates were, some avowedly, all really, dependent on the planters for their livelihood and still more for their social enjoyment. Of the negro slaves, though they formed very far the most numerous element in the population, it is unnecessary now to speak; they were the absolute property of the planters, who, according to their respective natures, and each according to his humour at the moment, treated these human chattels either with the kindness which a good-natured man shows to his dog or with the cruelty, varying more or less in degree, which the ill-tempered man always, and the hasty tempered man occasionally, treats his animal. As some justification of this relation of master man to slave man, it must be remembered that the latter was a savage, really little better than an animal, but recently torn from his African home, and in real need of strong restraint; and that the former lived in an age in which the equality in dignity of humanity was not generally recognised.

After all, very little progress was made during the first hundred years in the settlement of Berbice. The work had been commenced in 1625; and, as we have seen, in 1657 the original proprietary company had thrown up its rights over the colony, in disgust at the little progress which had then been made. But from an inventory of the property of the company in the colony, drawn up in 1720, it appears that even then, after more than sixty years of the presumably more vigorous administration inaugurated by the new company, there were only eight plantations, six growing sugar and two cocoa, less than a thous-

and slaves, though this estimate probably refers only to the able-bodied agricultural slaves, about a thousand head of cattle of all kinds, and two or three small vessels for trade. There were, however, probably some independent planters, with some little property, besides those forming the company. Moreover in the year of the inventory the interest of the company was sold to a new body of proprietors, who at once made determined efforts to develop it. Eight new sugar-plantations were speedily taken into cultivation; large numbers of new slaves were imported; and coffee began to be so far successfully cultivated that the growers, in effusive gratitude, sent a riding-horse to the Governor of the neighbouring colony of Surinam, he having sent them the first seed.

As this was an important period in the history of the colony it is fortunate that there exists a letter written in 1735 by a settler newly arrived in Berbice to his friends in Holland, in which the writer gives an instructive account of the place as he saw it. *

The writer reached the mouth of the Berbice River on the 30th of April 1735. His description of the size of Crab Island, which blocks the mouth of the river, is only explicable on the supposition—justified by other evidence—that the island as it exists to-day is but a very small remnant of that which it was in those days. It was

* This letter, "edited by G. T. GALBANO-ELEPHANTIUS, Historical Writer, Rotterdam," purports to have been printed in a very odd place—on Crab Island in the mouth of the Berbice River—in 1736 for VAN DE KOCK & SON. This letter has recently been translated and reprinted in Demerara (W. B. JAMIESON, Georgetown, 1877) for my friend N. DARNELL DAVIS, to whom I am indebted for a copy.

intended shortly to build a fort on the island, which would securely defend the river and the colony within it. The guard-house was first passed, where the ship, after reporting itself, lay to until the Governor sent permission for it to enter the river. Within the river the passengers were landed, and were immediately obliged to show their letters to the Governor and other members of the Court of Policy, which Court was the newly instituted governing body of the colony. The members read to the passengers a statement of the behaviour they were to observe and administered an oath of fidelity to the Court. After these ceremonies the writer was taken into the wooden gallery of the fort and there entertained until dinner was ready with a pipe and bowl of *paiwari*—an Indian drink which it would be most astounding to find in the Governor's house at the present day. At dinner there were present the Governor and his wife, the members of the Court and some other colonists. There was no accommodation for visitors in the fort or anywhere in the neighbourhood; so that the promise of free quarters for three or four weeks which had been made by the colonial officials to the emigrant when about to leave Holland could not be kept. However, a planter entertained the writer very kindly for the first week after his arrival, until he found quarters for himself sufficiently near the land which was allotted to him to enable him to superintend his slaves in their task of clearing the forest.

He writes hopefully of his land, and of the zeal and willingness of those under him. He lived in a temporary hut built of palm-leaves. The river, which is there tidal, furnished the only water to be had; the fish seemed to him slimy and full of bones, difficult to catch, and

were generally got by barter from the Indians ; game was not abundant nor as good as that in Europe, and was like the fish, hard to catch. The principal breadstuff was cassava, which seemed at first very unpalatable, but became more tasty after a time ; fruit was to be avoided, as apt to give colic. The life of the new comer was, on the whole hard. But the writer announces his intention of procuring more slaves from the next slave-ship, and devoting his attention to being master only, instead of master and servant both, as he was at the time. In fact, he was going to take to the easy life of the older planters. He asks his correspondent to send him a surgeon, a carpenter, and a housekeeper.

He did not intend to marry in the colony for the only white women then were the soldiers' wives, and they were "as ugly as sin." Girls of fourteen years old, he most ungallantly wrote, "are like thirty, thin, yellow and without teeth, so that there is no fight for them, and I curse myself three times at sight of them."

The colony was rapidly becoming more populous, and there were already sixty planters there. (This does not seem a large number considering that the colony had been in existence more than a century). There was great need of doctors, surgeons and apothecaries—not quacks, the writer significantly adds, and parsons and schoolmasters were most urgently needed, 'for really we shall become uncivilized at last.' No one, however, could come to settle without a recommendation from the directors at home and the permission of the Governor and Court of Policy in the colony. And, again as regards the new arrivals in the colony, the writer complains that three Frenchmen arrived to one Dutchman.

There was great need of communication through the colony ; the only highway was along the river, and it was somewhat difficult to get boat-hands. It had been suggested that a towing path should be formed along the whole inhabited part of the river, and that boats dragged by horses should be provided for the convenience of the public ; but this scheme was only a suggestion and no steps had been taken to carry it into execution.

To the information gathered from this letter may be added from other sources, that the principal objects of cultivation at this time were cocoa, cotton, tobacco, coffee and sugar, and that the cultivation of this last mentioned product was greatly increased about this time owing to the discovery that the coast-lands, which had not before been much used, were especially apt for this sort of crop.

Moreover, by this time the internal political organization of the colony had taken more or less definite shape, in a form which was the germ of its present constitution. The exact nature of the body called the ' Proprietors of Berbice ' which was formed in 1720, is not quite obvious ; but it was in all probability a body of the chief proprietors, who had bought the proprietary rights of VAN PEERE or his heirs. For twelve years after the formation of this body, it held the colony as its property ; and it was responsible only to the Government of the Netherlands. But in 1732, three years that is before the letter from which we have drawn an account of the colony was written, the States-General of the Netherlands, at the instigation of the proprietary company, decreed that Berbice was to have a constitution. Its affairs were to be administered by a governor, appointed from home by the company but with

the sanction of the Netherland Government ; and the governor was to be assisted by a Council, or Court of Policy, of six members. These members were to be chosen by the governor from twelve of the principal settlers nominated by the inhabitants with a certain property qualification. A Criminal Court of six members was to be established by the Court of Policy ; and a Civil Court was to be formed, consisting of the governor, as president, and not less than six members, of whom some were to be named by the Court of Policy, some by the inhabitants generally. The lands were to be allotted on suitable terms, and necessary taxes were to be raised. A parson and a schoolmaster were to be provided, and the former, by an odd arrangement never carried into effect, was to enjoy, as part of his remuneration, a free table at the governor's house, a keg of brandy, and a half a pipe of wine.

The constitution thus ordered was got into some sort of working order in the following year. The first governor was one BERNHARD WATERHAM, doubtless the same who, two years after his appointment, entertained the writer of the letter from Berbice immediately on his arrival with a pipe and bowl of paiwari in the wooden gallery of the fort opposite Crab Island. The first parson reached the colony in 1735, the very year in which the letter was written.

This new ordering of the colony imparted new life to it. Settlers flocked to it in such numbers that, though according to their new constitutional powers the company began by allotting the land free of charge, it was very soon found necessary to charge a certain sum per acre ; and, as planters became more numerous, slaves were imported in largely increased numbers. For thirty

years the colony on the whole flourished exceedingly ; then the long smouldering element of danger which was created by the vast numerical disproportion between the numbers of the masters and of the slaves broke out in fierce flame.

The sight, common at the present day, of a huge and splendid English cart-horse led by a ten-year old boy, often small and puny for his age—and obeying the slightest whim of its leader, cannot but give a thoughtful man subject for reflection. But infinitely greater must be the wonder of the same man if he ever reflects that, in past time, vast bodies of men, men who over and above instinct as of the horse possessed that mighty power called reason have for long periods allowed themselves, body and spirit to be altogether and entirely subject to very small bodies of other men, individually no whit physically stronger than themselves, and often not so strong. This marvellous phenomenon, of the strong mastered by the weak, prevailed in the colony of Berbice at the time of which we are treating in a most dangerous degree. The numerical disproportion between masters and slaves in Berbice must have been great throughout this period ; but in 1762, a terrible epidemic having proved fatal to large numbers of the white men while it had had little effect on the black population, this disproportion had become so enormous that there were at the time, according to a very competent authority,* three thousand slaves and only one hundred white men. That much physical cruelty, and—though the sufferers probably cared, as they realized, little enough about that—moral

* Hartsinck Beschryving van Guyana. A.D. 1770.

cruelty too, had been and was long afterward practised against the slaves may here be taken for granted ; in the next chapter will be produced a most trustworthy witness both of the cruelty and of the kindness practised by these Dutchmen against their slaves. For the present the fact of the cruelty may be assumed. Moreover, most of the slaves of those days had been actually torn from their African homes, where their lives had been probably hard enough, but where at least they had not endured that worst form of hardship to the savage, constant hard manual labour ; and in their new homes these people were made to do enormously hard and often incessant work in clearing the forest and cultivating the fields. They, especially those of them who were either the most savage by nature or had been artificially brutalized by unusually hard treatment, were ready to take any means of escape from their new state. And means were in many cases easily found ; for often dense forest, through which no white men could follow them, came up to the edge of the plantations on which they worked and offered them an easily attained refuge. Many had taken advantage of this ; and thus there were large communities of bush-negroes, or, in other words, escaped slaves, in the forests round the widely scattered homes of the settlers. These bush-negroes were not only in themselves very dangerous to the white settlers but they also constantly stirred and excited the minds of other Africans newly brought to the colony against their masters. Before 1763 several more or less serious riots had from time to time broken out amongst the slaves ; but these had been, though often with some difficulty, repressed. The great weapon of defence in

the hands of the planters to be used against riotous slaves had been the soldiers, stationed in the colony chiefly for that purpose. But after a time the soldiers had objected to the constant use to which they were put as chastisers of black fellows; and more than once, they had, in consequence, rebelled. But even had they been willing agents, the numbers of the garrison had, by fever and other evils, been reduced to about a score. All things, therefore, were favourable for a revolt of the slaves; and they took advantage of the opportunity.

The revolt began in the early part of 1763 at Plantation *Magdalenburg* on the Canje Creek, which runs into the Berbice river near the mouth of the latter. Having murdered their manager, the slaves from this plantation passed from place to place, burning, ransacking, murdering; and in almost every place they were joined by their countrymen. The governor, WOLFORT SIMON VAN HOGANHEIM, behaved splendidly; but he was almost powerless, owing to the fact that the few soldiers he had at his command and those of the colonists who had managed to escape to him were too terrified and too distracted to obey any orders. Meanwhile, a large number of planters far up the river, who were surrounded before the danger was sufficiently evident to induce flight, had, as a last resource, gathered together and fortified themselves in a dwelling house. By this time the slaves had acquired some sort of organization and had chosen a leader. Announcing that they meant to expel every white man from the colony, they advanced against the enclosed planters and induced them to

capitulate, by promising to allow them to pass safely down in boats. After this capitulation, no sooner had the fugitives reached their boats than the negroes fired upon them, killing some outright and taking others prisoners. The latter were murdered in horrible ways, but such as are natural to slaves excited to revenge by oppression. Very few of the fugitives escaped; and these made their way against terrible difficulties down the river. Success almost everywhere crowned the efforts of the slaves, and confusion everywhere distracted the white man. Before long nearly the whole of the banks of the river were in the hands of the insurgents; and the white men, or such of them as had not fled in dismay from the colony, were cooped up in the fort or in the ships in the river. At the end of March a hundred soldiers, sent from Surinam, reached the colony; and from this time till the end of the year small bodies of troops arrived from various quarters. The energetic governor made full use of all that he could gather under his command. Moreover he summoned to his aid the Indians, who, hating black men, were then, as always, ready to assist in hunting them down, and were thus most useful allies; for they, even far more than the negroes, were at home in the forest to which the insurgents retreated as to a cover from which they could make raids wherever they saw an opportunity.

Two curious proclamations were issued by the governor to encourage his party. One offered a reward for every rebel captured alive and for every right hand of one slain. The other, which promised pensions to all such as should be injured on the side of the settlers, did this according to a detailed scale

which is sufficiently curious to merit insertion :—

For the loss of two eyes, was promised a pension of 1,500 guilders.*

„	one eye	„	„	350	„
„	both arms	„	„	1,500	„
„	right arm	„	„	450	„
„	left arm	„	„	350	„
„	both hands	„	„	1,200	„
„	right hand	„	„	350	„
„	left hand	„	„	300	„
„	both legs	„	„	700	„
„	one leg	„	„	350	„
„	both feet	„	„	450	„
„	one foot	„	„	200	„

In May, New Amsterdam and its fortifications having been destroyed, the governor had made his head-quarters at Plantation *Dageraad*. This post was now attacked by the insurgent negroes, who are said to have numbered at that time between two and three thousand ; but the attack was repulsed by the Dutch. For a long time fortune seemed to favour each party alternately. At one time, certain information was received that there was internal strife in the negro camp ; at another time came news that a considerable body of Dutch soldiers had joined the insurgents ; and, again a little later, that of these deserters, they having quarrelled with their new allies, many had been shot by the negroes while the rest were hardly in a position to do much harm to the colonists. Sickness spread among the Dutch ; and, simultaneously, provisions grew scarce. But on the other hand, more and more soldiers, in small detachments, reached the colony. Thus things went on with ever-varying success till the end of the year. Just before the end of December it must have been somewhat embarrassing to the much-tried governor to learn, as he did, that a slave-

* The guilder = 1/8d.

ship having on board 300 new Africans had just arrived in the river. However, almost the next news he heard, in the beginning of the year, was that an ample body of troops, sent from Holland to save the colony, had arrived. From this time, of course, success came abundantly to the Dutch party. For nearly six months however, the work of capturing the fugitives, shooting some, burning others alive, hanging, torturing, breaking on the wheel, and otherwise punishing others, was continued. Among the other fugitives, not a few Dutch deserters were captured, and of these the leaders were tortured and executed as the slaves had been. This pacificatory work being at last ended, a proclamation offering pardon to the few slaves who were still fugitives was issued in October ; and then the colonists began the task of repairing the damage done, and strengthening themselves against any repetition of the recent calamity. That these efforts were successful is sufficiently shown by the fact that the onward history of Berbice in the thirty years during which it still remained Dutch was uneventful, peaceful and exceedingly prosperous ; and perhaps, remembering its previous history, the most significant fact is that the energies of the colony during this last period of Dutch rule were chiefly displayed in the importation of largely increased numbers of slaves.

Thus the history of Berbice during this period may be summed up as consisting in the extension of cultivation and the increase in the number of settlers, these two tendencies growing at first slowly but afterwards much more rapidly ; in the formation of a constitutional government ; and in the perfecting of the labour system, by slaves. A similar course of events, varied only by differences in lo-

cal conditions, made the history of the other two colonies. Even Demerara, though founded so much later, yet by the rapidity of its development not only soon raised itself to the level of the two sister colonies, but even surpassed them. About the time that Berbice was engaged in its great servile war, Demerara received its first governor (1765), and thus raised the number of colonies in the part of Guiana with which we are concerned from two to three.

Yet this three-fold state did not last long. The daughter soon swallowed the mother, and Essequibo was merged in Demerara. Near the mouths of the two rivers, the west bank of the Demerara and the east bank of the Essequibo are in places not many miles apart. The lands on the coast were by that time greatly in demand, and those immediately abutting on each of the two rivers and on the sea between the mouths of these were soon occupied; for that an estate should have a water frontage, rendering the shipment of its produce possible in that roadless land, was obviously of very great advantage. The land between, but not immediately bordered by, the two rivers was therefore brought into cultivation, by digging first one and then a second canal from the Demerara toward the Essequibo. The line of these canals was arranged between the governments of the two rivers; and then the lands along that line were allotted in due sequence to new settlers, on condition that each should dig that part of the canal which was to pass through his land. Thus in time were formed two great parallel water-ways, along the banks of each of which were houses and plantations which, if report is to be believed, were, the one the most luxurious, the other the most flourishing, in

Guiana. In passing, it may here be mentioned that when Dutch rule gave place to English these canal lands were gradually almost abandoned; but under the Dutch they flourished. The bond of union between Essequibo and Demerara formed by the new means of intercommunication was soon followed by a political union. The occasion of the change was when these colonies, which had been taken and withheld from the Dutch for two years, were restored to them by the Treaty of Paris in 1783. Then, in restoring order to the two colonies it was arranged that in future there should be but one Court of Policy for the two colonies—though these were regarded as in some sort distinct—and that this should meet at Stabroek in Demerara. This arrangement not working well, and the importance of Essequibo sinking lower and lower, the two colonies were finally united under the title of the ‘United Colonies of Demerary and Essequibo’ in 1789; thus, as sometimes happens in commercial firms, the younger but richer partner took precedence of the senior. Once more therefore, there were only two colonies in this part of Guiana.

The tide of prosperity in the colonies was now at the highest point which it ever reached under the Dutch. The colonists of that nationality, amassing money rapidly, built themselves substantial houses and adorned them with everything pleasing to their taste; they made flower-gardens and fruit-gardens such as are not dreamed of in commercial Guiana of the present day; and in the places which they had thus created they lived easy, almost patriarchal lives, supported by the exertions of their slaves. Fear of still possible revolt on the part of the slaves was no longer so serious a thorn in their flesh; for by that time

they had learned for the most part to treat these dependents with a curious but substantial kindness which had the effect of attaching the older slaves in a most remarkable manner to the persons of their masters. In the next chapter I shall have opportunity of describing one or two Dutch Guiana houses of this period; and the only points that need be emphasized at present are, that these places were much more substantial, better equipped and, in short, more homelike, than anything now existing in Guiana, and that the reason of this is that the Dutch colonist settled in Guiana with the purpose of making that place his home for life and the home of his children, whilst the English colonists, who arrived in large numbers at this time, settled merely temporarily and always hoped to return to the old country when they had made some sort of fortune.

These new English settlers exercised a very important influence on the history of the colony. About the year 1780 they arrived in large numbers, so large indeed that they are said to have formed two-thirds of the white population of the town of Stabroek. They brought with them considerable capital and a degree of commercial energy which was very far beyond that of the older Dutch inhabitants. The consequence was that before long much of the trade of Guiana, though still nominally confined to Holland, was secretly, by a species of smuggling connived at by the authorities, directed to England. But a yet more important consequence was that a strong feeling grew up in the colony in favour of a substitution of English for Dutch allegiance. To this feeling was largely due the readiness with which the colonies yielded themselves in 1781 to English besieg-

ers ; and, though the colony at that time remained but a few months in the hand of England and was, after a brief time of French rule, eventually restored once more to Holland, the attraction to England grew yet stronger. When, therefore, war was once more declared in 1796 between Holland and England, an invitation was, it is said on good authority, sent secretly from Demerara to the English at Barbados. Whether this invitation was sent or not, an English fleet under Major General WHYTE appeared at the mouth of the Demerara river on the 20th April in the same year. The united colony of Demerara and Essequibo yielded itself at once and with the best possible grace ; and this example was soon after followed by Berbice.

With this fleet a certain Doctor GEORGE PINKARD, Inspector General of Hospitals to His Majesty's forces, reached Guiana. This man having lived in Guiana during the greater part of that English occupation, and having used his unusual advantages to understand the colony thoroughly, published a series of letters on the subject, from which I propose, in the next chapter, to draw a somewhat detailed picture of social life in Guiana at that time.



Occasional Notes.

An Accawoi Peaiman.—Mr. McCLINTOCK has sent me the following interesting note :—

“ I had an Accawoi huntsman who was a sorcerer (peaiman) and considered that he had certain birds and animals so completely under his control that no inducement would have tempted him to kill any of them ; among them were powis (*Crax alector*) maroodies (*Penelope marail*) and the arua tiger (sp ?). The latter he always told he could put his hand upon any time he went out. This Accawoi died about 15 years ago. I was well acquainted with the whole family, nine in number ; they lived on the upper Barama. The father of my huntsman, having gone out with his dogs to hunt for tortoises, fell in with an ant-eater (*Myrmecophaga jubata*). As he had no arms with him, except a knife, and being weak and aged, the ant-eater threw him down, fixed its claws in his shoulders, and would no doubt have killed him but that the man got his knife, with some difficulty as it was under him, and commenced sawing at the animal's throat. When the blood ceased to flow, the Indian removed the claws from his shoulders and returned to his settlement. I saw the wounds in the man's shoulders and directed him as to the treatment ; but he preferred his own remedy, decoction of mora bark, which possesses wonderful healing property.”

Local Medicinal Barks.—The concluding remark in the preceding note recalls a subject often brought forward in this colony but never pressed to any satisfactory conclusion, hardly ever, indeed, seriously examined with a view to reaching such a conclusion. I refer, of course, to the supposed occurrence among the barks and simples so freely used medicinally by the Indians of the colony of some at least which might be of great curative service if introduced into the pharmacopœia of the world and might, consequently, be of great com-

mercial value to the colony, as natural products, easily procured in abundance and of value, for export. At every local exhibition tables are heaped with bundles of barks, named with very few exceptions only by their Indian names, and described most unsatisfactorily as to their medicinal use by the Indians. And at the close of these exhibitions these, in this state most uninteresting, objects, are thrown aside to perish. Only once, so far as I am aware, has any attempt been made to cause scientific research to be made among these barks to find any that may be of value among them. The barks contributed by this colony to the London International Exhibition of 1862 were, at the instigation of Miss, since Baroness, BURDETT-COUTTS, practically tested to some extent by CHARLES HUNTER, then Surgeon to the Royal Pimlico Dispensary. The results, or some of the results of his researches Mr. HUNTER published in the form of a pamphlet,* which, though apparently little known, seems to be the only record of any practical testing of the local medicinal barks. It seems, therefore, desirable to extract from it and re-print here the most important of its results, in the hope that these, being known, may lead to a further and more full examination of the subject.

Mr. HUNTER explains that his object was :—

“ To ascertain whether among the medicines sent (1) any of them possess curative properties not possessed by those of the British Pharmacopœia ; (2) whether the medicines exhibited from abroad—for given complaints—are of greater value than those we already possess ; and (3), if

* “ A Report upon some of the Colonial Medicinal Contributions to the International Exhibition, A.D. 1862” by CHARLES HUNTER. (John Churchill & Sons, London, 1863.)

not of greater but equivalent value, whether they can be obtained more easily and cheaply than those now in use." "It is hardly to be expected," the writer adds, "that quinine and cod-liver oil will be superseded by other remedies equally effectual, yet cheaper but there are many other medicines extensively used here which may possibly be replaced by cheaper and equally effectual substitutes from abroad. Of the English colonies none exhibited a better collection than those shown by the Commissioners of British Guiana; among them, constituting the bulk of the collection, was a series of 140 barks collected by Mr. W. C. H. F. McClintock, said to be in use among the Accawoi, Arawack, and other Indian tribes. Mr. McClintock has appended in most cases the use for which these various barks are given. From among them I have selected those which were described as 'very' or 'most efficacious' in such and such complaints, and have tried their therapeutical properties in appropriate cases."

After explaining that of the 140 barks above-mentioned many had lost their labels and were therefore useless for experiment, that others, being prescribed for complaints peculiar to South America, therefore admitted of no experimental test in England, Mr. HUNTER continues:—

"I have chosen first to examine some of those barks, of which great numbers abound in Demerara, said to be valuable from their febrifuge properties The form of administration that I have adopted has been, in every case, that of decoction of the bark, taken internally, either warm or cold. In most cases it is the inner bark of the tree that is prescribed, and that I have employed It is by decoction also that these remedies are given among the Indians of Guiana. No account being sent of the strength of the decoctions for internal use, I have adopted the same strength as used at the dispensary for the much used barks cinchona, cascarilla *et cet.*, thus placing them upon equal grounds as to equal quantities, the same doses being taken as of the decoction of ordinary barks, viz., about one ounce and a half, three times a day. In the general way, three ounces of the solid bark are broken up and boiled in eighty ounces of water for half or three quarters of an hour."

It should also be remarked that Mr. HUNTER made

use of his official position as surgeon to the dispensary to administer his experimental doses to the patients under his charge; and he took care to do this without acting upon their *imagination*, and so unfairly increasing the power of the drug in minor cases, by telling them that the medicine was new.

The barks from British Guiana on which report is made in this pamphlet are seventeen in number and as follows:—

EK-EK. Used as a febrifuge by the Accawoi. . . . The decoction is of a clear red colour, without odour, and it has a warm, barky taste, neither particularly bitter nor astringent. . . . I cannot regard the *Ek-ek* as a medicine of great tonic property, but rather one that, taken plentifully, in a weak feverish state, acts, by its slightly bitter and astringent powers, in restoring tone to the alimentary and digestive canal. Moreover, it being taken hot in the country where it abounds, it can be made fresh each time, which would render it also diaphoretic.

BOUIARI and POWESEMA. (Mr. Hunter discovered for himself the great similarity, if not identity of these two samples of bark under different names. As a matter of fact, *powesema* is the Accawoi name, *bouiari* is the Arawak; and most colonists will rightly recognise in this bark that of the *bouiari* bush-rose (*Mikania amara*) of which excellent bitters are frequently made.) The decoction is of a dark brown colour, both the taste and odour being very aromatic In cases of sore-throat and fever the therapeutic action I cannot consider great. Out of five cases this medicine was beneficial in two, in two it did no good, and it was of doubtful effect in one The *bouiari* is not a medicine of peculiarly tonic property, but seems, in three or four out of the fourteen cases in which it was given (purely as a tonic) to have been very beneficial in removing a flatulent state of bowels and in giving tone to the stomach. This appears to be due to its aromatic qualities; and I have not a doubt that, in certain cases of dyspepsia it is a very valuable medicine, for those patients that it has suited (when given by itself) have described themselves as better on this medicine than on any other they have ever taken. It is worth observing that *bouiari* gives no black or green

precipitates with a per- or pro-salt of iron, with which it can, therefore, be prescribed.

KORABALLI.—The decoction was of a clear, cherry-red colour, warm and slightly aromatic to the taste, and but slightly bitter or astringent.

. . . This is said to be beneficial in fever cases. I have tried it in fifteen cases; . . . ten improved whilst taking it: one, a child, very feverish, got well sooner than it had ever done when feverish and ill before. I cannot explain its *modus operandi*, any further than of the effects of a decoction of cinchona; of the two, however, *koraballi* seems the lighter and more agreeable, and, being a cooler febrifuge, is admissible where cinchona may not be.

SIPIRI AND BIBERINE. (By *sipiri* Mr. HUNTER seems to mean a decoction of the bark of the greenheart tree (*Nectandra Rodiæi*), by *biberine* the well known substance extracted from the seeds of the same tree.) The decoction of *sipiri* is of a light yellow colour, with a nauseating, bitter taste, and a somewhat sickly odour . . . The effects seemed to be to remove feverishness and strengthen both the stomach and system generally. The proportion of tonic principle in a given amount of this bark is much less than in the case of cinchona. . . . *Biberine*. . . . I have given in three or four cases, two being slight fever, with enlargement of the tonsils, in children; benefit followed in each case. . . . This decoction was much more bitter than the ordinary decoction of greenheart-bark.

KIARA-PEPO. . . . seemed rather weak and ineffectual (in two or three cases of fever in which Mr. HUNTER administered it) and I have omitted further trial of it for the present.

HIAWA, (*Hiawa* is *Icica heptaphylla*.) This is one of the barks vaguely . . . described on the label as "in bowel complaints" A decoction of an ounce to half a pint of water gives a rich red-coloured liquid, with a warm odour, and bitter, aromatic taste. . . . *Hiawa*, from what I have observed, seems to be nothing more or less than an astringent, acting somewhat like catechu upon the bowels Whether it has tonic properties or not, I cannot say; but if so, they must be very feeble considering the strength of the decoction.

BLACK MORA. (Black mora is, I think, merely the older state of the well-known *Mora excelsa*. *Ed*.) This medicine is said in the catalogue to be administered as 'a purgative in belly-ache.' When decocted (it gives) a rich, pink-coloured fluid, with a disagreeable, nauseating

odour and after-taste. It does not fulfil its announced object, in the doses I ordered; it even seems to have had an opposite effect.

BARAWACASHIE is used like 'black mora' as a purgative in belly-ache; and, as far as I have examined, it does so more effectually. The decoction is of a clear-red colour, with a warm odour, and an astringent, bitter and sickening taste.

KURUBALLI is simply described as an "emetic" On boiling half an ounce in ten ounces of water till three ounces are evaporated, the solution is of a dark clear-red colour, with a warm, slightly astringent taste. Being described as an emetic, I ordered the decoction of this bark in cases of bronchitis and others, where a preternatural amount of expectoration existed, also in cough. . . . Perhaps no remedy yet tried has been accompanied by an effect so uniform in each case.

ASSARA OR ARARA . . . is described as an emetic. The strength used was four and a half ounces to eighty ounces of boiling water, which was then boiled for half an hour; the result was a liquid of a reddish yellow-colour, free from odour, with a slightly astringent, barky taste—perhaps a little sickly. The decoction is free from the warm, mucilaginous nature which characterizes the decoction of senega root. . . . I gave it in cases of cough with expectoration or of dry cough with difficult expectoration and consequent dyspnoea. The result of my observations is that, first, *assara*, in the doses above given, is not an emetic in the true sense of the word; but in five cases out of six the cough was materially lessened and the general condition of the patient improved. In every respect the medicine seemed to act like *Kuruballi*, and like the decoction of senega root which is so well known here, but not so effectual as these medicines.

EWONG-EKE. . . . A decoction of four and a half ounces of bark to twenty of boiling water, kept in a state of ebullition for thirty minutes, gives a liquid of a pale, turbid, champagne aspect, bitter, but not nauseous. The bark is said to be useful "in dry belly-ache," a disease like the painters colic. . . . From the result in half a dozen cases, I am at a loss to perceive its value 'in belly ache or colic,' as it appears to me to have neither purgative nor astringent, anodyne nor anti-spasmodic properties, in any marked degree The effect upon *the system* generally seemed to be beneficial; . . . so that I look on it as a *feeble tonic*."

YARI-YARI "used in all cases of worms." Whether the

decoction should have been made stronger, whether drinking the medicine hot does make a difference, or whether the bark had been wrongly labelled, I cannot say; but the medicine appeared to be quite destitute of anthelmintic power.

KOMARA . . . is described as one of the chief medicines used in intermittent fever . . . The decoction is warm and slightly strident to the taste, neither bitter nor disagreeable. I have given this bark in several well-marked cases of low fever with coated tongue, rapid pulse, headache, deranged bowels &c, with considerable benefit. . . . The medicine was given every four or six hours . . . I can readily understand this medicine being more useful in South America, where the decoction can be made fresh and fresh, and drunk freely whilst still hot. . . .

With a decoction of *Komara* nitric and sulphuric acids throw down a red or yellow precipitate, but the alkalies do not deepen the colour; a proto-salt of iron causes a brown precipitate, but a per-salt none.

WHITE CEDAR was contributed as a medicine likely to be of great value in the treatment of complaints peculiar to the urinary organs. . . . A decoction of about four ounces to twenty ounces of water is of a deep-red colour, with a peculiar, rather bitter, and disagreeable taste. Time has only permitted me to try its effects upon two patients,—with benefit in both cases."

KOBE-REE. This bark I have tried in several cases of slight fever . . . but with very little effect.

Concluding his remarks, Mr. HUNTER expresses his disappointment at not having found among those which he examined more medicines of very decided merit; some seemed to him not even to merit mention; others seemed to equal in value, but not to surpass, other medicines already in use and obtainable in any required quantity. Yet there are some, he adds, which should undoubtedly be added to the pharmacopœia, and of these he makes especial mention of *bouiari*.



Couvade.—The following additional instances of 'couvade' were written out for me by their observer, Mr. R. L. KINGSTON, who now lives on the Tapacooma Lake, but formerly lived at the mouth of the Yowramai Creek of the Pomeroun River.

1.

"Some years ago the young Indian wife of a couple living on the Yowrama Creek brought forth her first child. The father, a civilized Indian, to please the old woman in attendance on his young wife, took to his hammock; and being in want of a new bow-string, thinking it a good opportunity, twisted one. Just as he finished, the child began to cry and scream. The midwife made a row, and made the poor fellow sit down and undo his whole line, saying that in twisting the line he had twisted up the entrails of the child."

2.

"Some years ago a young Indian woman from the Akaiweeni Creek was employed by an Arawack living on the Tapacooma Creek to weed a field of growing cassava. The price agreed upon was four dollars. While working the woman became pregnant. As this was not known to her employer, she was allowed to eat of the game which was shot from time to time. The employer had a fine hunting dog; but one morning when he went out with this, the dog would not hunt. The man came home, caught hold of the dog and gave the poor brute a severe peppering; but it was of no use, the dog never hunted again. However, the woman's pregnancy was discovered before she finished weeding, and not a cent did she get. The four dollars were stopped, as payment for the dog she had spoiled by eating of its game while knowing herself to be pregnant."

3.

"While some (True) Caribs were poisoning the upper Pomeroun with *haiari* for fish, I saw one of them rub his shins with the beaten and washed out *haiari*. Asking why he did this, he told me his wife was with child, and that he could not therefore go into the water without first rubbing his legs with *hairai*, lest all the fish should sink to the bottom."

Etymology of the word 'Grail-stick'.—Referring to a previous note on this subject, the correspondent to whom I am indebted for the just quoted information about cou-vade writes :—

“ The old Dutch colonists used a turn-out called a curricule. When driving a pair, they used a pole with a cross-piece attached having a ring at each end, by which the cross-piece was buckled up to the collars of the horses. This cross-piece was called a ‘ greel-stoke.’ ”



“ Fascination ” by Snakes.—From time to time some little attention has been paid to a power said to be possessed by snakes of ‘ fascinating,’ and so capturing, their prey. In his recent and itself most ‘ fascinating’ book on “ Animal Intelligence ”*, Mr. ROMANES has very briefly summed up the evidence for and against the reality of this power. He quotes a typical instance, which will make the nature of ‘ fascination ’ plain to readers of *Timehri*:—

“ Mr. Pennant says this snake (rattle-snake) will frequently lie at the bottom of a tree on which a squirrel is seated. He fixes his eyes on the animal, and from that moment it cannot escape ; it begins a doleful outcry, which is so well known that a passer-by, on hearing it, immediately knows that a snake is present. The squirrel runs up the tree a little way, comes down again, then goes up, and afterwards comes lower still. The snake continues at the bottom of the tree with its eyes fixed on the squirrel, and his attention is so entirely taken up, that a person accidentally approaching may make a considerable noise without so much as the snake turning about. The squirrel comes lower, and at last leaps down to the snake, whose mouth is already distended for its reception.”

* “ Animal Intelligence ”, by GEORGE J. ROMANES, M. A., L. L. D., F. R. S. (International Scientific Series,) London, 1882, p. 263.

Here, writing in a Guiana magazine, I may add that a similar instance of 'fascination' will be found in our own classic, CHARLES WATERTON'S "Wanderings in South America."*

It is obvious that 'fascination,' in the sense of those who believe in its exercise by snakes, is something akin to mesmerism. But the conclusion indicated by Mr. ROMANES is, in words quoted from SIR JOSEPH FAYRER, a most excellent authority on snakes, that "fascination is only fright."

My reason for referring to the subject here is that, in reading Mr. ROMANES' book, it occurred to me that in all I have read on the subject under notice I remember no allusion to the fact that, as most people have surely experienced, we are ourselves not infrequently the subjects of fascination, in our dreams. Then, some terrific object, some terrific danger, appearing to us, we feel, and a most terrible sensation it is, absolutely incapable of action, even of the slightest movement out of the way of this danger. In fact, alike to us during such dreams and to the squirrel of the above-quoted story, fascination is simply, and in the most literal sense, *loss of presence of mind*.

If this is so, it seems not improbable that the subject under fascination, whether it be a man or some lower animal, in thus more or less completely losing power of volition, simply reverts for the time to a lower stage of psychological evolution than that attained by, and proper to, its kind when under normal circumstances; that is, supposing the subject under fascination to be a

* 1st Edition, London, 1825. p. 100.

man, his mental faculties for the time being are not those of the human race, but may be those proper, perhaps in slighter cases, to the lower mammalia or even to some of the yet lower articulates, or, perhaps in extreme cases, in which that most dreadful feeling of utter and entire incapacity of volition is experienced, his mental faculties for the time being may be simply those of the polyp attached to its rock.

The Barbarian view of Guiana.—The barbarian view of our colony, the expression of which is met with but too often, is really a very serious subject; for the calumnious reputation of Guiana, as nearly the most forlorn, desolate and deadly of the places lighted by the sun, is, despite its astounding falseness, a serious hindrance to progress. It has, however, also often a very comic side; and as probably the most remarkable existing instance of this, the following note, which appears in THOMAS W. FIELD'S well known and valuable "Indian Bibliography," in allusion to the Rev. W. H. BRETT'S book on the "Indian Tribes of Guiana" (1868) may be given.*

"Neither the horrors of a forest savannah stretching hundreds of miles without sufficient dry ground to build a camp upon; the danger of receiving a flight of arrows freighted with the deadly ouarri poison, from the tameless savages of the hills, or the equally subtle and less avoidable pestilence which pervades every breath of the malaria saturated atmosphere, could appal the missionaries of the Cross to the Caribs and other wild savages of Guiana. The forest is twined with

* An Essay towards an Indian Bibliography, being a Catalogue of Books relating to the American Indians, in the library of THOMAS W. FIELD. New York 1873. p. 45.

gigantic serpents above, and roamed by ferocious beasts below, the paths are barred by the webs of monstrous and poisonous spiders, and every rotten trunk houses a hundred centipedes. On the shores hides the loathsome cayman, or basks the rattle-snake; and in the water millions of ferocious little fish, whose mouths are armed with steel traps, fasten with resistless voracity on the intruding stranger. *All we know of the aborigines who inhabit these deadly climes is communicated by such fearless missionaries as Brett and Bernau.*"

To me, living in the very place where Mr. BRETT, a few years ago, did his good and really earnest work as a missionary, surrounded by no savages, troubled by no beasts more fierce than musquitoes, his chief difficulty being the exercise of the almost superhuman patience needed to overcome the shyness and reserve of the kindly gentle Indians, the above extract seems to refer, not to Mr. BRETT'S very soberly told story, but rather to some account of Guiana which EDGAR ALLEN POE, never having been here, might have written in some wilder mood than ever even he was in, and which GUSTAVE DORE, inspired beyond his wont by the madness of POE, might have illustrated.

And, in case this note should be seen by any future bibliographer of American Indians, it may be as well to add that, valuable as are Mr. BRETT'S, though hardly Mr. BERNAU'S, facts about the Indians of Guiana, another much more considerable and extremely valuable account of our Indians was published twenty years before Mr. BRETT wrote, by Dr. RICHARD SCHOMBURGK*.

New Local Literature.—Two new books on Guiana

* "Reisen in Britisch-Guiana, von RICHARD SCHOMBURGK." Leipzig 1847.

have been published since the last issue of *Timehri**. Mr. BRONKHURST'S book is avowedly a medley of articles contributed by the compiler to various newspapers, together with many scraps by other writers, from similar sources. The subjects dealt with are chiefly those concerning our very varied labouring population. East Indians, Chinese, Portuguese, Negroes are all told of; and a few notes concerning the upper classes during the earlier times of the colony are included. The most interesting portions of the book are the scattered notices of the modifications of their national customs, religious and other, which the East Indians and Chinese have made in consequence of their new surroundings in this new home of theirs. No one who is, or has been, in Guiana can turn over the pages of this book without finding passages both interesting and instructive; but so little care has been exercised in the arrangement of the material that few will probably attempt to read it through, and still fewer will probably succeed in this attempt.

Of the other book it is, for obvious reasons inexpedient to treat here; and it is sufficient to record that it gives: some hints of the experience to be expected by a traveller in this colony; an account of the Kaieteur Fall, one of the two great natural features of the colony; sketches of the plant and animal life; and then an elaborate account of the Indians of Guiana, their tribes, appearance, habits, dress, religion, folk-lore, *et. cet.*; and finally an account of the stone im-

* "The Colony of British Guiana and its Labouring Population" by the Rev. H. V. P. BRONKHURST, London, 1883.

"Among the Indians of British Guiana," by EVERARD F. IM THURN, M.A., London, 1883.

plements, shell mounds, rock pictures and other antiquities discovered in the colony.

The catalogue of contributions sent from this colony to the Calcutta Exhibition has also been published, in pamphlet form*. From its very nature, the catalogue itself, though valuable as a record, can not be very interesting reading. But prefixed to it is a brief account of British Guiana: an account of our sugar industry, this being we believe from the pen of the Hon. W. RUSSELL: and a reprinted essay by Mr. HENRY KIRKE on our immigration system. The account seems to be founded partly on the description published in the directory annually published at the office of the *Colonist*, which is itself, apparently founded on various descriptions published in the catalogues of previous exhibitions. Mr. KIRKE'S essay, good in its original place of publication, among the "Russell Prize Essays" of 1877-8, being now attached to a publication which will probably have some small circulation in India, from which country by far the larger part of our labouring population is drawn, loses none of its original value.

New Plant from Guiana.—The following extract is from "The Gardeners Chronicle" of the 4th of August:—

ACROSTICHUM (ELAPHOGLOSSUM) MAGNUM. *Baker, n. sp.*

This is a large new *Acrostichum* of the sub-genus *Elaphoglossum*, which was discovered in 1880 by Mr. G. S. Jenman, on the banks of the Mazaruni River, in British Guiana, and of which he has just sent living plants to Kew. It is allied to *A. perelegans* and *A. auricomum*.

* Catalogue of the Exhibits sent from British Guiana to the Calcutta Exhibition. Demerara, The *Argosy* Press, 1883.

Root-stock suberect. Basal paleæ small, linear subulate, nearly black. Stipes tufted, those of the barren frond 3—4 inches long, clothed with small lanceolate adpressed fimbriated membranous paleæ. Sterile lamina 2—3 feet long, $1\frac{1}{2}$ —2 inches broad at the middle, narrowed gradually to the apex and base, membranous in texture, green on both sides, the paleæ of the upper surface numerous but inconspicuous, minute, ovate, adpressed, whitish, deeply fimbriated, of the under side densest on the midrib, not adpressed, minute, membranous, lanceolate, ferruginous, densely fimbriated; veins slightly ascending, moderately close, distinct, simple or forked. Fertile frond not yet seen. *J. G. Baker.*

Dutch Guiana at the Amsterdam Exhibition.—Our neighbour-colony has done well at this exhibition. Mr. C. J. HERING of Paramaribo has received the following honours; a silver medal for a most elaborate bibliography of Dutch Guiana, a M.S. copy of which he most kindly sent me some six months ago, to be used in the long, but unavoidably, delayed compilation of a general bibliography of Guiana for the pages of *Timehri*; a second silver medal for a set of very well kept diagrams illustrating the meteorology of Surinam; and, for other contributions, one gold and two bronze medals beside a certificate of honourable mention. Mr. M. R. MATTIS, also of Paramaribo, received a gold medal for a set of fine casts of fishes, similar to the admirable set which he made and sold to the Georgetown Museum.

The Representation of the Colony at Exhibitions.—There are many interested in the colony who regret that British Guiana was not represented at the Amsterdam

Exhibition ; many, again, regret that the colony was not represented at the recent Fisheries Exhibition ; and there are many, on the other hand, who, seeing with alarm how frequently we are now-a-days called upon to contribute to exhibitions and how considerable an expense is unavoidable incurred each time response is made to these appeals, regard all such shows with great disfavour. Even at this moment appeal is being made to the colony to represent itself at a forthcoming Forestry Exhibition ; and, seeing that next to, but a long way after, sugar our forests yield the most important of our produce, this appeal seems more than usually pertinent. But, even while this matter is still under consideration, it is announced that the buildings lately erected for the Fisheries Exhibition are to be utilized for displays, in 1884 of sanitary appliances, in 1885 of recent inventions, and in 1886 of general colonial produce. The thought, thereupon, occurs, whether, in place of partial but repeated representation at several of these many successive exhibitions, it would not be far better and of much greater advantage to the colony to reserve its strength for one very complete and, more or less, final representation at the Colonial Exhibition to be held in 1886. With nearly three years for preparation, an effort might be made, in accordance with some properly organized scheme, which would result in the representation of the colony, at a comparatively small expense, in a way which would be at once unprecedented and almost final. And in further recommendation of this proposal it may be urged ; 1st, that by providing in the scheme that the collections exhibited should be, as far as desirable, the property of our local museum,

in which they should eventually find a permanent place, an unprecedented opportunity would be afforded of gathering a worthy local collection of colonial produce; 2ndly, that by providing that the collections should, as far as possible, be in duplicate—especially if other colonies would act on a similar scheme—such an opportunity as could hardly be resisted would be afforded of forming in London the long desired permanent colonial museum; and 3rdly, that by taking the opportunity of publishing, in connection with this Colonial Exhibition of 1886, a very complete catalogue not only of the produce of the colony actually exhibited but also of such other products as might be absent from the collections sent for exhibition, either because they were not at the time procurable or because they could not easily be shown, a complete and, for a time, final report on the products and capacities of the colony would be provided. That this journal may further, as far as lies in its power, this suggestion, it is proposed to include in the next number [June 1884], a detailed suggestion of the best mode of effecting this thorough representation of British Guiana at the Colonial Exhibition to be held in London in 1886.



Errata.—On page 66 of the present volume of *Timehri*, the date of ROGER NORTH'S enterprize to Guiana is misprinted 1650 for 1620. On page 104, I inserted a note to the effect that the word cabacaburi in Arawak means "silk cotton tree" (*Eriodendron anfractuosum*); I am informed on good authority that

this is a mistake, but the real meaning of the word has not been given to me. Again, on page 132, by a slip of the pen I wrote that *warracaba* is the Carib, *yacombi* the Arawak, name for the trumpet bird (*Psophia crepitans*), thus transposing the Arawak and the Carib name for this bird. Since the instalment of the 'notes' on West Indian Stone Implements included in this number of the *Timehri* has been in type, I have become aware that the very curious 'banner-stone' therein described and figured (p. 255, Pl. 5) is the property, not as I supposed of Mr. ROUSSELLET, but of Mr. E. L. ATKINSON, and came, not from St. Lucia, but from St. Vincent.

EVERARD F. IM THURN.



beautiful of all the Horatian odes seem to sound in my ear :—

Quis desiderio sit pudor aut modus
Tam cari capitis ?.....

.....
Ergo Quinctilium perpetuus sopor
Urget ! cui Pudor, et Justitiæ soror
Incorrupta Fides, nudaque Veritas.

Quando ullum inveniet parem ?
Multis ille bonis flebilis occidit ;
Nulli flebilior quam tibi, Virgili.

All in this land should, and most will, mourn the Quinctilius who has gone from us; but it seems as though it would be hard to say which among many of us may fitly mourn him most, as Virgil for Quinctilius.

Born in Edinburgh in 1814, and educated, eventually as a lawyer, in his native Scotland, where he was the fellow collegian, at Glasgow, of his life-long friend Sir JOSEPH HOOKER, the widely known and as widely honoured Director of Kew Gardens, Mr. CAMPBELL came to this colony about 1840, and has since been more rarely an absentee from this land than almost any other colonist of equal standing. He himself used to say that he allowed himself one visit home at the end of every ten years; and in the earlier part of this year, though his painful illness seemed sufficient cause, he was unwilling to break through his rule by going home, for advice, before 1885, by which time he would have completed another decade of colonial life. It is sad to think that his wish, more than once expressed to me, that he might live out his life to the end in the colony which, more completely than most of his fellows, he had adopted as his home, has not been fulfilled; but, on the other hand, it is pleasant to remember that as, on the 7th of last

month, he was laid in his grave in a London cemetery, there stood by more than one of those who had long been associated with him, as dear friends, in his distant home.

In the law courts of the colony Mr. CAMPBELL had a peculiarly successful career, very soon taking a leading position, which he retained, and indeed improved, up to the end. The many who know the extreme method and care which he used in all that he did, even outside his professional business, will understand this.

But there is one particular feature in his life's work on which it seems more especially right to dwell in these pages. He was ever the prime mover in nearly all the more purely intellectual and scientific advances made in the colony. One of the chief among the original founders of the Royal Agricultural and Commercial Society, and its honorary secretary from the beginning up to the day of his death, a very large number of his good works took the form of constantly enlarging and improving the functions of that Society; its library, especially during recent years, has been guarded and increased chiefly by him; the formation of its museum and, though at a considerably later period, the appointment of a curator for this museum, were largely due to his exertions; every of the many exhibitions, local and foreign, in which the Society, acting for the colony, has taken part have been fostered and cared for chiefly by him; even this very journal in which I am writing owes its successful foundation largely to his co-operation. And, though not directly connected with the Society, yet akin in spirit, the botanical gardens now growing with unhopd speed toward complete success

really owe their initiation almost entirely to Mr. CAMPBELL, who long and earnestly urged their formation, for many years vainly, but at last, to his great and just delight, with success.

A lesson may be learned by considering the means by which he accomplished these good works. In the first place, his character won for him the friendship of all the best men in the colony; and the influence he thus gained he always conscientiously used to the best advantage. His scientific attainments, which have often been misunderstood, were considerable; and these were of a nature which made them especially valuable to his fellow colonists under the circumstances in which he was placed. He was never a specialist, unless perhaps to some small degree as a botanist. But his mind, naturally acute, had been so thoroughly and widely trained that he was well able to take an intelligent interest in, and speedily to grasp, any special set of scientific facts which were brought to his notice; and as soon as these were grasped, he almost invariably was able to judge rightly of their value. Once convinced of their value, he was ever both eager, however much work this might entail upon him, and able, owing to his just influence, to advance them. He was, as it were, and in this lay his great value to the colony, a centre to which all those among his fellow colonists who felt any literary or scientific yearnings went with full certainty of finding sympathy, and, if this was in any way possible, help.

Of his quaint and charming humour, of his graceful courtesy, his geniality, his hospitality, his true kindness and of the strength of his friendship, as on things widely known, there is no need to write.

Our loss is great. But, in the closing words of the dirge which Horace sang :—

Quod si Threicio blandius Orpheo
Auditam moderere arboribus fidem;
Non vanæ redeat sanguis imagini,
 Quam virga semel horrida,
Non lenis precibus fata recludere,
Nigro compulerit Mercurius gregi.
Durum : sed levius fit patientia,
 Quicquid corrigere est nefas.

E. F. i T.



Report of the Meetings of the Society.

Meeting held 12th of July.—Mr. F. E. Dampier in the chair.

There were 11 members present.

Elections.—*Members:* M. Williamson, M.D.; Revd. R. H. Williams; Revd. Ernest Sloman.

Associate: C. P. Gaskin.

Treasurer's Accounts.—The Treasurer stated that he had not yet been able to make out the statement of the Society's accounts for the past quarter.

The Calcutta Exhibition.—Mr. Glaisher said that the committee, of which he was a member, appointed by the Committee of Correspondence to look after exhibits to be sent on to the Calcutta Exhibition, had advertised in all the local papers and sent circulars to planters and others throughout the colony asking for samples of all descriptions, and that he had himself written personally to many. He thought that the exhibits would be few, but fairly representative. The notice being so short, they could scarcely expect good exhibits. Owing to most of the estates not grinding at this time, good samples of sugar could not be got; those of bush products would be fair.

Destruction of Sugar Canes.—Mr. W. H. Nicholson of Pln. Farm said he had brought some samples of cane-plants to ask for information as to what destroyed them. He found them drawn out of the ground and partly eaten, and he was of opinion it might have been done by a crab dog.

Mr. Glaisher said, after examining the specimens, that it seemed to have been done by some mammal. The specimens were left in his charge for further report. The meeting then dispersed.

Meeting held 9th August.—Mr. T. H. Glennie in the chair.

There were 10 members present.

Elections.—*Members*: D. Callum, M.D.; His Honour J. T. Goldney; Rev. J. G. Pearson.

Associates: R. B. Greene; Jacob Holtzman; Murdoch McLeod, Jr.

Treasurer's Accounts.—The Treasurer laid over the accounts for the last quarter and stated that the balance in favour of the Society was \$1,170 $\frac{33}{100}$.

Timehri.—Part 1 of the second volume of this journal was formally laid on the table.

The Calcutta Exhibition.—Mr. Glaisher, Curator of the Museum, submitted a report on the exhibits to be forwarded by this colony to the forthcoming Calcutta Exhibition. The report was to the following effect:—

In making my report of the progress made in collecting the various productions of the colony for the International Exhibition to be held at Calcutta, I have much pleasure in saying that the number of general exhibits has exceeded my expectations. I think I may say that in all classes, with the exception of two, our exhibits will greatly exceed in number the exhibits sent to the last International Exhibition held at Paris.

These two classes, unfortunately, are the most important, viz., sugar and rum; but even in these classes we shall not be nearly so defective as appeared probable. I think we shall have between twenty and thirty

samples of sugar and about forty samples of rum. The reason of this defect is very obvious; the six weeks' notice of the Exhibition happened to fall at a most unfortunate time of the year, when very few estates were grinding.

As regards the other classes, in food products other than sugar we are well represented, samples of almost everything grown in the colony being already in the possession of the committee.

The class containing medicinal barks, fibres and roots is very thoroughly represented, owing to the energetic action of Messrs. Seon and Couchman, of the Demerara River, in collecting exhibits.

Of starches we have a fine set to despatch to Calcutta, permission having been granted to send the Museum specimens; and many others have also been procured.

Samples of colonial fruits will be sent in the form of preserves, this being the best way in my opinion.

By permission of the Directors, a foot was cut off each of the samples of wood exhibited in the gallery outside the Museum. The pieces cut were polished and smoothed, and form a very good collection.

We have also some beautiful pieces of carved wood made in the colony, which will illustrate the splendid nature of the wood for cabinet work.

Ethnographical specimens form, however, our best section.

Photographic views of different estates will be sent, and also an album containing views of the interior of the colony.

The exhibits will leave here for Calcutta by next mail; and I think the people of Calcutta should be able to form a good idea of the various products to be met with in this colony.

A vote of thanks was passed to Mr. Glaisher for his report.

Presentation of a Tamil M.S.—A M.S. written in Tamil on papyrus leaves was presented by the members of the Berbice Reading Society. It was decided to submit the M.S. to the Rev. R. H. Moor, for report as to its nature and whether it is advisable to translate the same for publication in the Society's Journal.

Destruction of Sugar-Canes.—Mr. Glaisher said that at the last meeting of the society Mr. Nicholson brough

down several canes which had been torn out of the ground and split apparently by some animal, which Mr. Nicholson thought might be a yawarri (*Didelphys*) or a crab dog (*Canis cancrivorus*). Mr. Nicholson had sent him down some more canes, similarly destroyed, and he had cleaned them and found teeth-marks which corresponded in several instances with the teeth in the skull of a crab dog in the Museum. The teeth-marks did not all correspond, but it might be that a smaller crab dog than the one the skull of which was in the Museum had torn the canes. He did not think it had been a yawarri. Mr. Nicholson had informed him that near where these canes were torn were other canes with more saccharine matter in them, and he had come to the conclusion that the crab dogs had split the cane plants for the purpose of getting at the grub or worm in the inside.

Donations.—Presented by Rev. Thomas Farrar:—

Pamphlet containing an Ordination Sermon Preached in St. Philip's Church, Georgetown, on the Feast of S. Barnabas by the Rev. THOMAS FARRAR, B.D. (1883.)

Pamphlet "Res Anglo-Israeliticæ." Discussed Scripturally, Ethnologically, Philologically, by the Rev. THOMAS FARRAR, B.D. and the Rev. F. P. LUIGI JOSA, (1882).

The meeting then dispersed.



Meeting held 13th September.—Mr. Justice King in the chair.

There were 10 members present.

Elections.—*Associates*: Joseph Bayne, Frank S. Sealy, J. R. Wickham, W. W. Crail,

A Wasted Water-power.—Mr. Luke M. Hill read the following note:—

Having been frequently struck by the great volume of water discharged from roofs during heavy tropical rains, it occurred to me that the power so wasted might be utilized in some way. With a view of calling attention to the matter I have collected together some data relating to the subject, and have embodied them in the paper which I have now the honour of submitting to this Society.

Taking the area of the city of Georgetown within its municipal limits at 1,000 acres, and assuming that one-fourth of this area is covered with roofs of an average height of 20 feet, we have a means of estimating the amount of work done by the fall of water discharged from this roofed area to the ground. Calculating on an annual rainfall of 100 inches over the area, I find that the units of work so done amount in the year to no less than 3,400,000 horse power, or an average of 9,300 horse-power per day. This work is of course variable, depending entirely on the duration and weight of the rainfall, as time has to enter largely into our calculations of horse-power. A rainfall of one inch in an hour—which is no unusual downpour—would, on the former assumption as to area, &c., develop work equal to 566 horse-power in a minute.

This work is necessarily distributed over a large area, but confining our calculations to Water Street alone, where the roofed area is proportionately greater than any other parts of the city, and assuming the length of the street to be 5,000 feet, with a 200 feet width of roofing, of an average height of 20 feet, I find the units of work developed by a 100 inches rainfall to be 320,000 horse-power per annum, and by one inch of rain falling in an hour equal to 54 horse-power per minute.

From the roof of the Stabroek Market alone the annual development of work is equal to 28,000 horse-power.

Having pointed out that the power so wasted over the city is no small quantity, I will now endeavour to suggest a means by which it might be utilized by converting it into electricity.

The rainfall from each roof might be conducted into one main down pipe, in which would work a small turbine wheel driving a dynamo-electric machine, the electricity so developed by every passing shower to be stored in accumulators of the type of Faure's secondary batteries. These as they become charged, in variable time depending on the rainfall, could be collected and stored at central depots, whence the power

could afterwards be distributed uniformly, either by electro-dynamic engines or utilized directly for electric lighting.

The practical application of my ideas, which I fear I have put before you in a very crude form, I must leave to others ; my object has simply been to ventilate the subject, leaving the inventive genius of the age to develop something useful out of it if the matter is thought worthy of further consideration.

The Cultivation of India-Rubber Trees in the Colony.
Mr. R. W. Imlach, Acting Secretary, stated that he had received a letter, dated on the 17th July, 1883, on this subject from Mr. J. A. Robinson, of Mount Street House, Wrexham, North Wales ; he added, with reference to the previous letter to which Mr. Robinson made reference, that, in the absence in England of Mr. W. H. Campbell, the Secretary, to whom the missing letter must have been addressed, there was no record of its receipt.*
The letter was as follows :—

Sir,—Some time ago I ventured to trouble you respecting a project for cultivating trees of the india-rubber species, the chief feature—a most valuable one—being the *propagation* of these from adult stems, thus very materially hastening the period of yielding. The method is very simple when known : it is successful, and it is *known only* to myself and another. For reasons given in my former letter, we are desirous, if possible, of carrying out the project in British Guiana. My former letter on the subject may not have come to your hands, and I now beg to ask the favour of a reply from you, as to whether it is likely either your society, or any one member of it, would take an interest in the undertaking ? We ourselves *know* the practicability of the business, and the great prospects it affords in the future, if properly started, and are ready to throw ourselves into it to the extent of our means, relying entirely upon *results*, of which we are confident.

* The missing letter from Mr. Robinson was handed by Mr. Campbell, before his departure to England, to the Editor of Timehri, with a request, subsequently fulfilled, that it should be answered. As Mr. Robinson requested strict privacy in his letter, it was dealt with without reference to the Society. ED.

We do not wish to lose another season. We wish to establish the business in a British colony as a matter of preference, and as we are unacquainted, personally, with any one in the colony, may I beg the great favour of a reply, with, possibly, if you do not care to enter into the matter on behalf of Society, a list of names of the members, as we should like to communicate with one or more of them on the subject. They will, we presume, be probably well acquainted with the trees and their produce, and it is only such gentlemen we would wish to broach our scheme to.

Apologising for the trouble we have given,—I am, Sir, Yours &c.

J. A. ROBINSON.

Mount Street House, Wrexham,
17th July, 1883.

It was ordered that the letter should be referred to Mr. Jenman for report.

The Cost of "Timehri".—The Acting Secretary laid on the table a statement of the account for publishing *Timehri* as it stood at the end of June 1883, at which time 52 subscribers were in arrears; and he added, in answer to a question, that the Journal did not at present pay the entire cost of its production.

It was ordered that circulars should be issued to those in arrears.

The Calcutta Exhibition.—The Acting Secretary read a letter from the Government Secretary, in reply to a communication from the Society, intimating that the \$2,000 already voted by the Court of Policy to defray the expenses of the representation of the colony at the Calcutta Exhibition was the total amount available for that purpose. The Acting Secretary stating that the amount mentioned would not cover all the expenditure which would probably be incurred in Calcutta, the matter was referred for the consideration of the Committee of Correspondence.

The Curator of the Museum stated that now that the Calcutta exhibits had been sent away, he wished to draw a short comparison between the exhibits forwarded to this Exhibition and those which had been sent to the Paris Exhibition. † To the Paris Exhibition there were sent away altogether 74 samples of sugar, and to Calcutta, 35 samples ; of coloured rum there were sent to Paris 34 samples, and of uncoloured rum 27, while to Calcutta there were sent only 15 samples of the former and 12 of the latter. With respect to other articles ; of coffee, cocoa, rice, &c., altogether 48 samples had been sent to Calcutta, and only 12 samples of this division went to Paris. There had also been sent to Calcutta, 26 samples of fruits preserved in bottles, peppers and pickles, whereas none of these were sent to Paris ; of chemical and pharmaceutical products, there were sent to Calcutta 26 samples, while only 17 had been sent to Paris ; portions of all the specimens of woods sent to the Paris Exhibition had now been forwarded to Calcutta, accompanied by wallaba wood made up into shingles and palings, dressed and undressed ; together with this last collection was sent to Calcutta the descriptive account by Mr. McTurk, who was no doubt the best authority on this

† It should be observed that when the subject of the representation of the colony at the last Paris Exhibition was under consideration, it was determined by the Exhibition Committee that, in place of the miscellaneous odds and ends usually sent to such Exhibitions, only articles belonging to several selected classes should be sent. For instance, of ethnological objects only hammocks, pottery and basket work were selected for exhibition, thus representing the three industries, of those proper to our aborigines, which might possibly, might at any rate most easily, be encouraged among these people and be developed into commercial industries. *ED.*

subject in the whole colony. Sixty one specimens of medicinal barks were forwarded to Calcutta, none to Paris. It was hoped that some one would take the trouble of inquiring into the properties of these barks, as some of them might be found to be valuable remedies. In the section of fibres, fifteen specimens were sent to Calcutta, and to Paris only seven. Three of the specimens now sent were perfectly new—Mr. Jenman said he had never heard of them before. In the ethnological department, 61 specimens had been sent, against 18 to Paris. Of miscellaneous articles, which could not be conveniently classed under any other section (such as painted calabashes, colony wood walking sticks, &c.), there were 6 exhibits. To the Paris Exhibition the whole of the views in the Museum were sent; and the best of these had been sent to Calcutta. A perfectly novel feature in connection with the present Exhibition consisted in the photographs, of which there were altogether 35 representing different estates, 7 of Georgetown, and an album which contained scenes from the interior, as well as pictures of estates, and machinery; amounting in the whole to 64. So that in every department, with the exception of sugar and rum, the staple products of the colony, more was sent to Calcutta than to Paris. A catalogue of the exhibits forwarded would be ready by next mail. The Curator wished to acknowledge the services of Mr. Fresson, whom he always found extremely willing to give him assistance.

The meeting then dispersed.

Meeting held 11th of October.—The Hon. William Russell in the chair.

There were 10 members present.

Elections.—*Member*: R. M. Clegg.

Associates: R. Duff, E. Cross,

Treasurer's Accounts.—The accounts to the 30th of September, being laid on the table, showed a balance of \$5,052.88 in favour of the Society. The Treasurer explained that of this sum \$3,283.21 had been realized by the sale of scrip, to raise funds for the new roof of the museum buildings.

The Calcutta Exhibition.—Mr. Glaisher, secretary to the Committee of Correspondence, reported to the effect that that Committee was of opinion that, as the Society merely acted as agent of the Government of the colony in the matter of the Calcutta Exhibition, and as it was for the interest of the colony that it should be represented at Calcutta, especially as it is to India that the colony looks for labour, the whole cost incurred for the representation of the colony at this exhibition should be defrayed by the Government from the general revenue of the colony.

It was ordered that an account of the whole expenditure under this head up to date should be sent to the Government, with a suggestion that such further arrangements as might seem proper to the Government should be made as to any further expenditure.

It was also ordered that the surplus copies of the printed catalogue of exhibits sent from this colony should be sold, at the price of 1/.

The Cultivation of India-rubber Trees in the Colony.—Mr. JENMAN reported on the letter of Mr. ROBINSON

laid before last month's meeting on this subject as follows :—

The only action the Royal Agricultural and Commercial Society could take in this project would be to afford Mr. Robinson any information that may be in its possession as to the adaptability of land in this colony for the cultivation of rubber yielding trees, and how it could be acquired from Government for such a purpose. My papers on the India-rubber trees of Guiana shew what is known regarding them, and, as well, the abundance of the land on our rivers adapted to their cultivation. In addition to these papers, the report published by the Government on the samples of rubber from the Pomeroon River, and my letter thereon to the Secretary of the Society would be of service to Mr. Robinson. The names of members acquainted with the subject might also be communicated as requested. The conditions under which land might be acquired could be obtained from the Crown Lands Department. It appears to me that this information is nearly all the Society can give Mr. Robinson, and it is all that he requires to favourably start his scheme.

It was ordered that a copy of this report should be sent to Mr. ROBINSON.

Sugar-Cane Mills.—The following notes by the Hon. WILLIAM RUSSELL were read :—

Since Mr. Mann read his paper on the very important question of sugar mills and their efficiency under various circumstances, my attention has been more forcibly drawn to the study of our mills at work, to note both their efficiency and defects.

There can be no doubt that the vertical mill, driven by either wind or animal power, was the first type of mill used for crushing the cane, the transmission of power from the vertical shaft of the wind-mill being the most simple. Mills of this type are still to be found at work in Barbados, on small estates, and it will, no doubt, astonish many to know that these pigmy mills give a higher percentage of juice than can be extracted with our largest mills ; and this is achieved without grinding the megass to the consistency of cotton waste, a state which contributes to the absorption of a very large percentage of the juice while this loose mass is passing between the back and top rolls.

It may not be out of place for me to explain the mode by which

canes are passed through these vertical mills. There is first the labourer who feeds the canes between the primary crushing rolls, which are set so as to embrace the canes readily. Canes are inserted up and down the length of the rolls in such a way that by the time the top cane is inserted the one at the bottom has passed through, giving room for a fresh cane, and in this way the feeder keeps up a steady supply of canes always, a single cane being in contact with the rolls. A large stream of juice results from this first operation.

The returner stands on the opposite side; and as the canes are rolled through, he seizes them and passes them between the next pair of rolls, which are close set, and the megass is delivered alongside of the cane feeder; the cane having in the last roll been deprived of the remainder of its juice by the simple process of rolling, the megass is simply the cane flattened without being *ground* into powder. The percentage of crushing by this simple operation runs as high as 62 to 64 per cent. and it is self-evident that 'as all the power has been used in rolling through the canes it must amount to the minimum. The great success attending this mode of extracting the juice lies in the freedom with which the juice parts from the cane without any absorption.

The necessity for getting through large quantities of work no doubt suggested the horizontal 3 roll mills, by which the canes were drawn in by the top and front rolls, and passed over a dumb returner, to be laid hold of between the top and back rolls. In the early days of 3 roll mills, the megass used to pass the last pair of rolls in much the same consistency as was the case with the vertical mills, the whole being handled by tying into bundles for carriage on the head; little was thought of the percentage of juice from the cane. A large quantity was got through, which was the main point aimed at, and the megass when sun-dried made excellent fuel,—so much so that I can well remember some old planters refusing to have their mills braced up, because of the injury to the megass as fuel.

With emancipation, and the necessity of economy in every department, and especially with that formidable opponent, beet, gaining ground in Europe, and the patent fact that from a vegetable containing 5 per cent. cellulose the manufacturer had succeeded by superior manipulation in extracting 90 per cent of the juice, much was written as to the wasteful extravagance of the sugar planters; and after a time, some of the most advanced made an attempt to discover what they really were getting from the sugar cane. I can well remember when 48 to 56 per

cent. of juice from the weight of the cane was considered good work.

With closer screwing up of mills, the megass became more broken up, and 58 to 60 per cent. of juice was the result; but then commenced the real era of breakages. Cheeks, gudgeons, pinions, trash-turners, all came in for a fair share of breakages. The engineers met all these accidents by introducing more strength where parts had given way, without turning their attention to the seat of the disease which gave rise to all these accidents.

The attention of engineers being called to strengthening parts, Mr, Drury, the chief draughtsman at Vauxhall Foundry, early in the fifties designed a very ingenious mill, by which all the strains were met by heavy malleable iron bolts in the direction of the strains. Why this design was set aside I know not, as I feel certain that, with all the improvements made in the designs of mills, there are none that come up to that of Mr Drury. Rousollet, a French engineer, of considerable colonial experience, who finding the necessity to strap broken cheeks under various circumstances, set himself to work; and the present mills on his patent are constructed so as to throw the latter strain entirely on malleable iron bolts. This is a decided step in the right direction, and no three roller mills give better results than those of Rousollet's type; but while strength is thus given to the cheeks warranting the users in screwing up the back rolls metal to metal, there is an inordinate pressure thrown on the "trash turner"; to such an extent does this exist, that I have seen several bars of malleable iron, 9 inches deep by 7 inches in width, with a set bend given equal to an inch and a half in the length of 6 feet between supports. Mr. Shields at a previous meeting mentioned a case in which it indicated a pressure equal to 300 tons to effect such a set. That this abnormal strain thrown upon the mills is exerted without adding to the efficiency of the crushing is beyond a doubt, and I unhesitatingly assert, that 90 per cent of all mill and gearing accidents are due to this strain.

Let any one stand by and see a mill working to its maximum power, and he will see a steady feed of canes being drawn into the jaws of top and front rolls, probably set an inch apart:—this half-crushed megass passes, or is drawn and partly pushed, over the trash turner until it is embraced between top and back rollers with a set of 3-16th open only; the megass is delivered on to the elevator like a rough blanket reduced to a rough powder, seemingly dry, but as we shall see later on this is only in appearance. This goes on for a time until the material being

shoved forward by the feeding rolls is more than the back pair can deliver, hence a friction brake is created, against which the top roll is made to rub, until the entire power of the machine is brought up by such pressure; meantime, the back roll has ceased to roll through any megass, the whole mass being held as firmly as a block of wood between the trash turner and top roll; even the front roll is brought up, there being no further space into which canes can be pressed.

The mill being now reversed, the gorged mass is quietly ejected on to the feed-board in a consistency as if operated upon by a large crimping machine. This is taking an exaggerated view of the final bringing up of the machine; but to a limited extent, this abrading power is going on constantly and so to say, cramming the half crushed megass so tightly up between trash turner, top roll, and the feed rolling through, that a large quantity of the juice which might flow away from the last grip of back roll has no means of escape, and is forced away with the megass.

The question for engineers to decide is, how to construct a mill so as to get relief from this unnecessary waste of power, and the fertile means of break down which the trash turner entails.

My attention was called by Mr. Chapman of Fawcetts to the advisability of using a two roll mill as the second mill connected with maceration. I did not see the force of his advice at the time, wedded as I was to the three roll mill; but I have seen cause to change my mind since, and I believe the finishing mill of the future will be either an ordinary two roll mill or a De Morney mill, in which, when the final grip is given to the megass, there is a clear space for the juice to fall away, while the megass is delivered in an almost perpendicular direction, as was shown in this room by the toy two-roll mill which I use for laboratory purposes.

I regret exceedingly the cause of the absence of my much respected and valued friend Mr. Mann at this time, because I could wish to thank him in person for stirring me up to make further experiments in this all-important subject, and I now trust that others better qualified will give the subject their attention.

A vote of thanks to the President for the above interesting paper was passed.

A Cacao-pest.—Mr. Mewburn Garnett stated that Mr. Bosh Reitz, a proprietor in Surinam, had asked him to lay before the meeting specimens of two kinds of beetles

which were destroying the cacao trees. In Surinam the greatest amount of destruction is caused by these insects, which seem to enter the outer bark of the tree, making holes the size of a pea, and there depositing eggs. The hole is then closed up with a fine dust which the insect gathers from the outer bark of the tree, and then the top is covered with glutinous matter, to prevent ants from attacking the young. Mr. Nelson, manager of a cacao estate on the Demerara River, reported that he had seen the insects on that river.

The Curator of the Museum said that the insects belonged to the numerous class of woodborers. He, himself, could not at present give any advice as to how they could exterminate these insects, except that each branch should be carefully examined and the eggs taken out. He thought that Mr. Bates might be able and willing to name them, a man who had been on the banks of the Amazon for nearly 11 years, and added that he would gladly send a specimen to Mr. Bates.

Mr. Shields thought that if a lantern were carried about the trees at night, the light would attract the insects. He had succeeded on several occasions in catching them in that way.

The Tamil MS. in the Museum.—The Rev. R. H. Moor reported upon the old Tamil manuscript sent to him by the Society to ascertain its value. He said it was an interesting series of love tales, which probably are already translated into English, but which, in its manuscript form, would interest the many East Indian visitors to the Museum.

The meeting then separated.

Meeting held 8th November.—Mr. G. L. Davson in the chair.

There were 8 members present.

Elections.—*Members:* Thomas Groggin; C. A. Matthey; J. Andrews; J. Russell.

Associate: A. Long.

Cane-mills.—With reference to the notes by the Hon. W. Russell on this subject read at the previous meeting, Mr. Shields read the following:—

If anything could be added to what Mr. Russell has laid before us, to show the importance of good cane-crushing it might be done by calling attention to the actual loss in dollars which this colony sustains by imperfect crushing.

The total produce of sugar in the colony may be taken in round numbers at 130,000 tons per annum. And I think it would be a fair estimate to assume that the juice expressed, taking the mills collectively throughout the colony, equals 62 per cent of the weight of canes; but as we would rather be over than under the mark, let us assume that 63 per cent is obtained.

The difference between this and what might be obtained may be fairly considered as the loss which the planters sustain through imperfect crushing. But, as it is still an open question how much juice may be profitably expressed by crushing, we will take a low figure, and assume that 70 per cent. only could be expressed. The difference then between 63 and 70 may fairly be taken as the loss in cane juice; and by turning this into figures I find that it represents a loss of 111 on every 1,000 tons, and that on the whole colony crop of 130,000 it represents a loss of no less than 14,430 tons of sugar. If we estimate this with its offal at \$120 per ton, it presents us with the large sum of \$1,731,600 as the amount which we are carelessly throwing away; and after allowing one-third of this sum for the extra cost of manufacture, we have still more than \$1,000,000 of actual loss due to imperfect crushing.

The most important question in connection with this important subject is, I think, the practical one, how to arrest this immense waste. I am sorry that in the paper before us no hint is given how this is to be done.

We are promised further experiments in connection with this question;

and it is to be hoped that further experiments will throw more light on the subject; but we, as practical men, should not forget that while we are waiting and experimenting, more than a million dollars are slipping through our fingers every year. The question for each of us should be, what are we to do with the mills we have got, and how are we to make the most of them.

And second, what is to be the mill of the future.

Mr. Russell treats us to a very graphic account of the working of the old vertical mill, and its change into one of the horizontal type, with its accompanying evil the trash-turner, which he believes to be the root of all evil; but he does not give us a hint how this is to be put right. Now I admit at once that the trash-turner is at best but a necessary evil; but as long as it is necessary, it is our duty as practical men to try to reduce that evil to a minimum. Certainly screwing up the back roll, metal to metal, is not the way to accomplish this result; indeed I am surprised that a practical man like Mr. Russell should use this expression, far less tolerate the practice, let the mill be ever so strong. What does it mean? Does it mean that two feet thickness of canes on the feed-board is to be annihilated before passing between the back rolls. If not that, then it must mean that the mill is to be twisted and distorted to an enormous extent to allow that thickness of canes to pass through; and one or other, or the whole, of the evils complained of must of necessity take place. But if the mill is properly set and judiciously worked, good crushing will be obtained and the evils complained of if not entirely eliminated, will be reduced to a minimum.

From my own experience and observations, extending over the last three years, I find the best results are obtained when an opening of one quarter of an inch is allowed between the front rolls for every six cane throwers. The back roll should be screwed up until the engine is just able to drive through the average feed with the average steam pressure. If this rule is adhered to, the best results will be obtained that it is possible for the engine to give; for, after all, the actual power of the mill to express juice is limited by the mechanical energy or power which the engine is capable of developing; and, as far as my experience goes, this is in almost every case very much too small.

Take up the catalogue of any maker of sugar mills you choose, for they follow one another like a drove of sheep, and you will find that the engines classed along with the mill are invariably much too small; *e.g.* a 32" x 72" mill is expected to be driven by a 20" x 48" cylinder. Now

we know from experience that this is very much too small and, as usually geared, is not capable of expressing more than 62-63 per cent of the weight of the canes, while expressing 1800 galls. of juice per hour, with a boiler pressure of 60 lbs. per \square ".

With a 26" cylinder engine, other things being equal, 66-68 per cent of the weight of the canes might be obtained, which on a crop of 1,006 hhds. would increase the output by 80 hhds. of sugar, or, in money value, of nearly 10,000 dollars. This increase in the crop could be obtained in many instances, I have no doubt, simply by increasing the power of the engine and running a very little extra risk in the matter of breakages.

I know that the makers of our sugar mills think that they have the power nicely adjusted to the work to be done, and that to increase the size of the engine would be to introduce the elements of destruction into the system. This may be theory, but here again experience comes to our aid and teaches us that as a rule it is the mills most deficient in engine power that give out most, and that breakages very seldom occur through the engine being too powerful, but because it is too weak to drive the feed of canes through the mill. Backing is then resorted to and a breakage occurs, through a spasmodic effort being made to overcome its own weakness. If the engine had been sufficiently powerful to drive through the feed of canes in the first instance backing would have been unnecessary, the risk of breakages reduced, and much better crushing obtained.

Mr. Russell recommends a two roller mill for second crushing, and I find on looking back over my correspondence that in a letter dated 4th November, 1880, I have recommended an exactly similar arrangement; and if double squeezing is necessary I am still at one with Mr. Russell as to the value of a mill of this description. Further experience however as to the possibility of obtaining really good results from single crushing has convinced me that second crushing is unnecessary, and that a good mill fitted with hydraulic adjustment and backed up by a sufficiently powerful engine will at one operation extract all the available juice from the cane.

Another important question of this subject, and Mr. Russell has left it altogether untouched, is the bearing that it has on the question of burning megass direct from the mill; for, notwithstanding the enthusiasm of furnace patentees as to the value of their inventions, and the puffs of newspaper editors and correspondents, I hold that the question

of burning wet megass *economically* has not yet been solved, and if it is to be solved the solution must be looked for from the mill rather than from the furnace. Given a mill that will express 75 per cent of the weight of the canes, in juice, and the question of burning the megass direct is solved independently of the furnace; whereas with the ordinary type of mill as it exists all over this colony, expressing only 60-63 per cent of the weight of the canes in juice, *no furnace yet invented* will burn the megass to advantage. It may be burnt certainly, but it would be just about as economical to burn it in a heap in the yard as in any furnace that has been brought to our notice.

Mr. Russell said they were all indebted to Mr. Shields for the very valuable and practical paper which he had read. Mr. Shields had very properly taken him to task on one or two points. While he used the local expression of metal to metal of course he did not mean absolutely that the surfaces were touching; there is always a considerable give in parts even when the rollers appear touching when screwed up. He quite agreed with Mr. Shields that under certain conditions the trash turner was not such an evil as many made it out to be. He held in his hand a return of the results of some mills, which he had intended to embrace in another paper; but it might be just as well to refer to them now, to show what was being done. Take, in the first instance, *Diamond*, with a single-crushing mill with respect to which everyone who saw it allowed that the work done was superior to anything in single-crushing anywhere else in the colony. There was 13.48 fibre in the canes put through. It was an important element, the fibre of the canes they had to deal with, because some canes had only 10 per cent of woody fibre. The experiments had been made by Mr. Alexander, the analyst at *Tuschen*, and the results had been taken very correctly. With

canes of 13.48 per cent fibre, at the *Diamond*, the expression was 66.98, or nearly 67 per cent. Coming down to *Providence*, where they had immensely powerful double-crushing machinery, the canes contained only 11.40 per cent of fibre, and the expression of juice was 77.07. At *Uitvlugt*, where they had a very fine, powerful second mill, the first one being more like a defibreur, opening up its canes for the steam to play upon them, and where they had canes with a fibre of 12.80 per cent, the expression fell down to 68.75 per cent. At *Providence* they were working very powerful double machines, with which they were satisfied to make 100 hhds. a week. At *Uitvlugt*, with a less powerful plant, they were trying to make a little more, and consequently they were putting more canes through, in proportion than at *Providence*, and with so much worse results. At *Tuschen de Vrienden*, with a small mill running at a terrific speed, 25 feet per minute, and 13.10 per cent woody fibre in the canes, they got 62.56 per cent expression, or, by single-crushing exactly what Mr. Shields had taken as the average of the colony. In fact he (Mr. Russell) had often taken *Tuschen de Vrienden* as a co-efficient for the whole colony, as an average, and his results in this case came very near Mr. Shields' average of 63 per cent, or 62 per cent. which he considered the ordinary average. At *Leonora* they had two single mills breaking the canes, which were passed through a third mill. The canes contained 11 per cent of fibre, and the expression was 74 per cent of cane juice. Mr. Russell went on to say that without a powerful engine and gearing to transmit the motion to the rollers they could not expect to get through a large quantity of work. As Mr. Shields had said, the

power of the machinery depended entirely upon the engine power. He held that at *Providence*, with double mills 72 x 32 making a 100 hhds. a week, they could ensure perfect crushing, and there was no question about the burning of the megass, which was fit to burn in almost any furnace. He did not enter into the question about the burning of megass in his paper, the latter being more to draw out discussion than to finish it. He wanted to have an opportunity of picking other people's brains, and to reply afterwards. Just now, however, he had the pleasure of complimenting Mr. Shields upon the very excellent paper he had read that day. He (Mr. Russell) should be prepared to read a paper at the next meeting on "The sugar cane as fuel" (Hear, hear), and he would then go into the whole question. Patentees of furnace feeders would then have an opportunity of publicly combating the question instead of taking up the time of the newspaper compositors in setting up long-winded articles which amount to nothing.

Mr. Shields hoped Mr. Russell would do this, and he would also do a great service if he embodied in his paper the statistics which he had just laid before the meeting; these statistics were most important. If Mr. Russell would allow him to offer a suggestion, he would like the statistics to include the size of the cylinders to compare with the power of the mills. In almost every case the cylinders were too small to drive the mill, and they would get better results by increasing the size of the cylinders. This would not, he thought, increase the risk of breakages, in almost any degree whatever. It was when "backing" that the breakages take place; and when the cylinder was large enough to drive through anything there was

little danger. He thought it was important that planters should consider whether it was not possible, by increasing the size of the cylinders, to increase the percentage of juice obtained by two or three per cent.

Mr. Russell said he would have great pleasure in giving, in his next paper, the pressure of steam, the size of the cylinders, the proportion of gearing, and the size of the mills—in fact information upon every part of this question, which was one in which he was deeply interested. He came before the Society with his paper to gain information, and so far as his specialists and himself could investigate the question he should give every information which lay in his power.

The Calcutta Exhibition.—The Acting Secretary stated that, according to instructions, he had written to the Government Secretary with reference to the expenses yet to be paid in connection with this Exhibition, and that he was informed that the Government had made all necessary arrangement with Mr. Kirke, the Commissioner at Calcutta for the British Guiana Exhibition.

The meeting then dispersed.



Meeting held 13th December.—The Honourable W. Russell, President, in the chair.

There were 16 members present.

The late William Hunter Campbell, L.L.D.,—The President said:—"Gentlemen,—Before proceeding with the order of the day, I wish to refer to the melancholy intelligence, which has reached us since our last

meeting, of the death of our late Secretary, Mr. W. H. Campbell, LL.D. I am sure all will agree with me that in the death of Mr. Campbell the colony has lost one of its most useful citizens; and this Society in particular has to lament the loss of one who might be justly styled the father of the Society; for I have no hesitation in asserting that but for the untiring zeal of our late Secretary, at times when he was almost left alone to battle against lukewarmness, the Society must have come to grief. All who came in contact with Mr. Campbell in ordinary business could not but be struck with the gentlemanly, quiet, and sound way in which he conducted his extensive legal practice; the wonder being how he grasped and got through so much. Those who met him in his capacity as an honorary member of almost every Committee connected with the advancement and the material welfare of the colony in general, and of scientific research in particular, could not but feel that when the day came for Mr. Campbell to cease his busy and useful life it would be a misfortune. That day has unfortunately arrived sooner than could have been expected; for until the day he left these shores he punctually attended our meetings, and I am certain none of us who saw him present at the meeting held on the 14th of June last imagined that it was for the last time. It has been usual in all times for Societies like our own to mark the appreciation of such untiring zeal as characterized the services of him whose loss we have now to mourn. The late Dr. Blair, whose bust graces our rooms, was in his time a warm supporter of the Society; and that bust hands down to posterity how much Dr. Blair was valued by those with whom he came in contact in his day. I

have in like manner now to propose that a resolution be placed on the minutes recording our unanimous feeling of regret at the loss of one who held for the long term of 39 years the honorary, onerous office of Secretary to this Society, and that a bust or portrait be procured and placed in our rooms, with a tablet; that the name of William Hunter Campbell may be prominently handed down to posterity as one to whom the Society owes it very existence.—“ Be it resolved, that this Society in recording the melancholy intelligence of the demise of our late honorary Secretary—Dr. William Hunter Campbell, L.L.D., testifies to the untiring zeal with which he conducted the onerous duties for the space of 39 years, thereby encouraging others to follow his example, and that it is due to the fostering care of the Secretary that this Society can now boast of a roll of over 400 members, with a library and a Museum that colonists can point to with pride and satisfaction; and that, with a view to more prominently testifying our value of his service, a bust or portrait with a suitable record of such service be placed in a niche of these rooms.”

The motion was seconded by Mr. Fleming and was unanimously approved. At the suggestion of the President it was also agreed that a copy of this resolution should be forwarded to the widow of the late Mr. Campbell, with an expression of the sincere sympathy of the members of the Society in her bereavement.

Mr. William Walker, the resident director of the Society in London, in a letter expressed his confidence of the deep concern of the members of the Society generally in the announcement of the death of their much valued honorary Secretary, whose protracted connection

with the Society, not less than his many estimable qualities, must have endeared him to all and must make his loss deeply and permanently felt.

A letter from Mr. Charles Crumpton, the assistant Secretary of the Society expressing his sincere sorrow for the death of Mr. Campbell was also read.

The Edinburgh Forestry Exhibition.—The President stated that the members of the Society were doubtless aware that a communication from the Secretary of State for the Colonies had reached this colony suggesting that British Guiana should be represented at the Forestry Exhibition to be held in Edinburgh in the winter of 1884. The President added that he had brought to the notice of his Excellency the Governor that a local Exhibition would be held here next year and that this would afford an excellent opportunity to gather a collection to be forwarded to the Edinburgh Exhibition. It had been decided by the government to communicate with this Society as to the arrangements to be made to secure adequate representation at Edinburgh.

Elections of Office-bearers for 1884.—The following were elected :—

Patroness:

THE QUEEN.

Vice-Patron:

HIS EXCELLENCY SIR HENRY TURNER IRVING, K.C.M.G.
GOVERNOR AND COMMANDER-IN-CHIEF, &c., &c., &c.

President:

HON. B. HOWELL JONES.

Vice-President:

HON. ARTHUR BRAUD.

Managing Directors:

G. L. DAVSON
 M. GARNETT
 E. H. G. DALTON.

Ordinary Directors:

HON. WILLIAM RUSSELL
 HIS HONOR J. HAMPDEN KING, B.A.
 R. J. KELLY
 HON. THOMAS MULLIGAN
 B. J. GODFREY
 G. H. HAWTAYNE.

Exchange Room Directors:

JOHN J. DARE
 ARTHUR WEBER
 EDWARD STEPHENS.

Treasurer:

ROBERT WIGHT IMLACH.

Secretary.

F. A. CONYERS.

Agricultural Committee:

HON. WILLIAM RUSSELL, *Chairman.*
 A. J. PITMAN, *Vice-Chairman.*
 R. T. A. DALY, *Hon. Secretary.*

W. S. ARNOLD
 C. L. BASCOM
 S. M. BELLAIRS.
 HON. ARTHUR BRAUD
 D. C. CAMERON
 WILLIAM CRAIGEN
 M. GARNETT
 A. R. GILZEAN
 T. H. GLENNIE
 R. W. IMLACH
 HON. B. HOWELL JONES

R. J. KELLY
 HY. KIRKE, M.A.
 A. C. McCALMAN
 E. A. MANGET, M.D.
 JOHN MENZIES
 JOHN MINTY
 HON. THOS. MULLIGAN
 P. H. NIND
 G. R. SANDBACH, M. A.
 HENRY T. STOKES
 W. A. WOLSELEY.

Committee of Correspondence:

HON. WILLIAM RUSSELL, *Chairman.*
 HIS HON. J. H. KING, B. A., *Vice-Chairman*
 R. W. IMLACH, *Treasurer.*
 EVERARD F. IM THURN, M.A., *Secretary.*

N. ATKINSON
 REV. W. G. G. AUSTIN, M. A.
 R. T. A. DALY
 E. H. G. DALTON
 E. E. H. FRANCIS
 WILLIAM FRESSON
 C. H. GILBERT
 T. H. GLENNIE
 B. J. GODFREY
 G. H. HAWTAYNE

JOHN S. HILL
 G. S. JENMAN
 R. J. KELLY
 HENRY KIRKE, M. A.
 GEORGE LITTLE, JR.
 A. C. McCALMAN
 P. H. NIND
 HON. W. F. H. SMITH
 HON. W. A. G. YOUNG, C. M.G.

Curator of Museum : E. H. GLASHIER, B. A.

Book Committee:

N. ATKINSON
 REV. W. G. G. AUSTIN, M.A.
 A. G. M. CAMERON, M. D.
 HIS HON. SIR D. P. CHALMERS
 F. A. CONYERS
 N. DARNELL DAVIS
 E. H. G. DALTON
 C. H. GILBERT
 E. H. GLAISHER, B. A.
 T. H. GLENNIE
 B. J. GODFREY
 G. H. HAWTAYNE

JOHN S. HILL
 R. W. IMLACH
 HIS HON. J. H. KING, B. A.
 HENRY KIRKE, M. A.
 REV. T. J. MOULDER
 P. H. NIND
 W. H. SHERLOCK
 EXLEY PERCIVAL, B. A.
 F. A. R. WINTER
 VEN. ARCHDN. WYATT
 HON. W. A. G. YOUNG, C. M. G.

Librarian : CHARLES CRUMPTON.

Resident Director in London:

WILLIAM WALKER, 48 Hilldrop Road, Tufnell Park, N.

Agents in London :

Messrs. RIDGWAY & SONS, 2 Waterloo, Place, S. W.

Attendance at Committees.—Some conversation took place on the subject of the customary lax attendance of

members at committee meetings, and a desire was expressed that attendance might be more regular in future.

The President's paper on Sugar-Cane Mills.—The reading of the promised supplementary paper on this subject by the President was deferred, on account of the pressure of the business, to the January meeting ; but it was arranged that the paper should at once be printed, in order that members might come to the next meeting prepared to discuss its suggestions.

Donations.—The following donations presented to the Society were announced :—

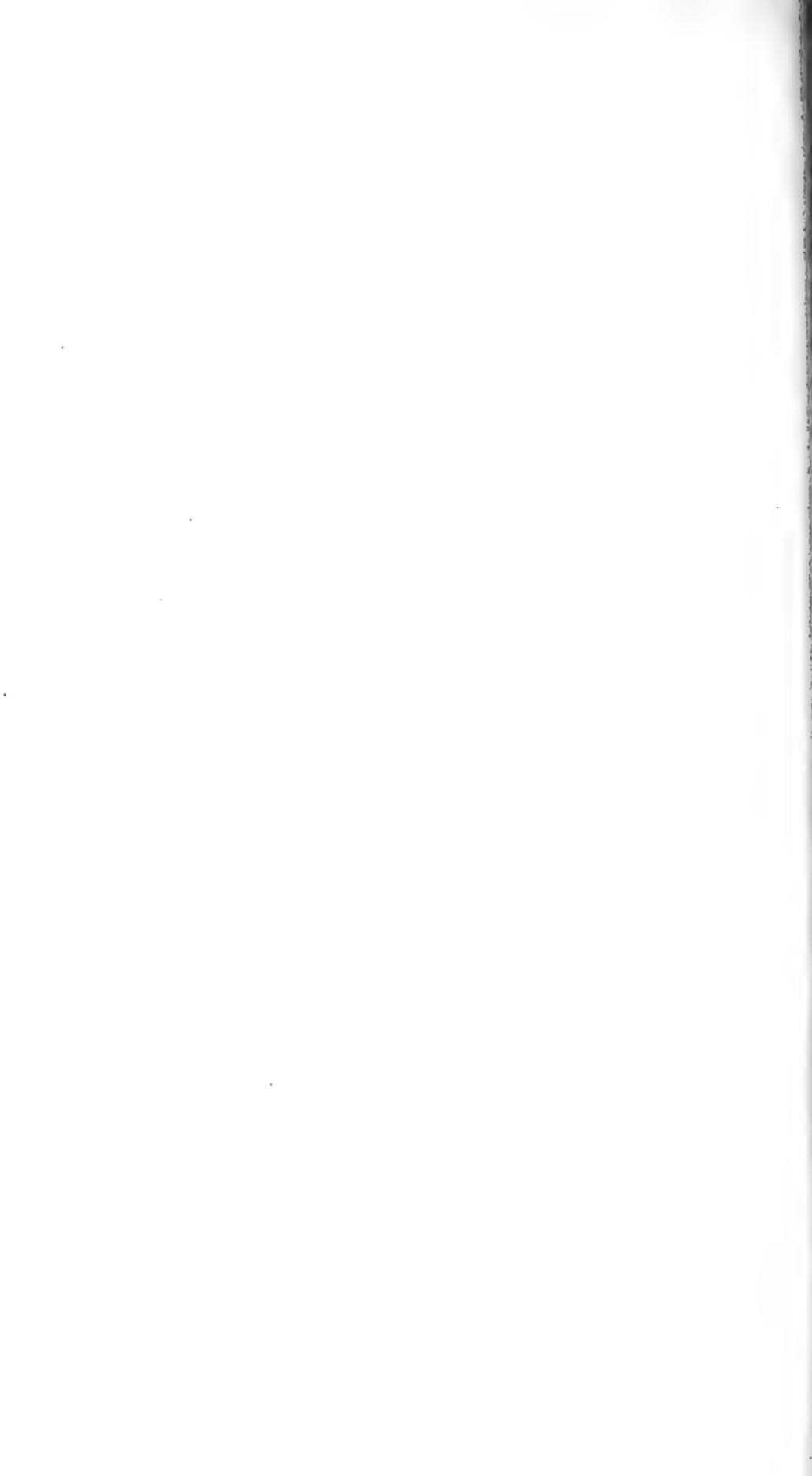
History of The Duchess of Cerifalco, by BENJAMIN MURRAY.—By W. Yellery, Esq.

Picture entitled "Fact and Fancy."—By R. W. Imlach, Esq.

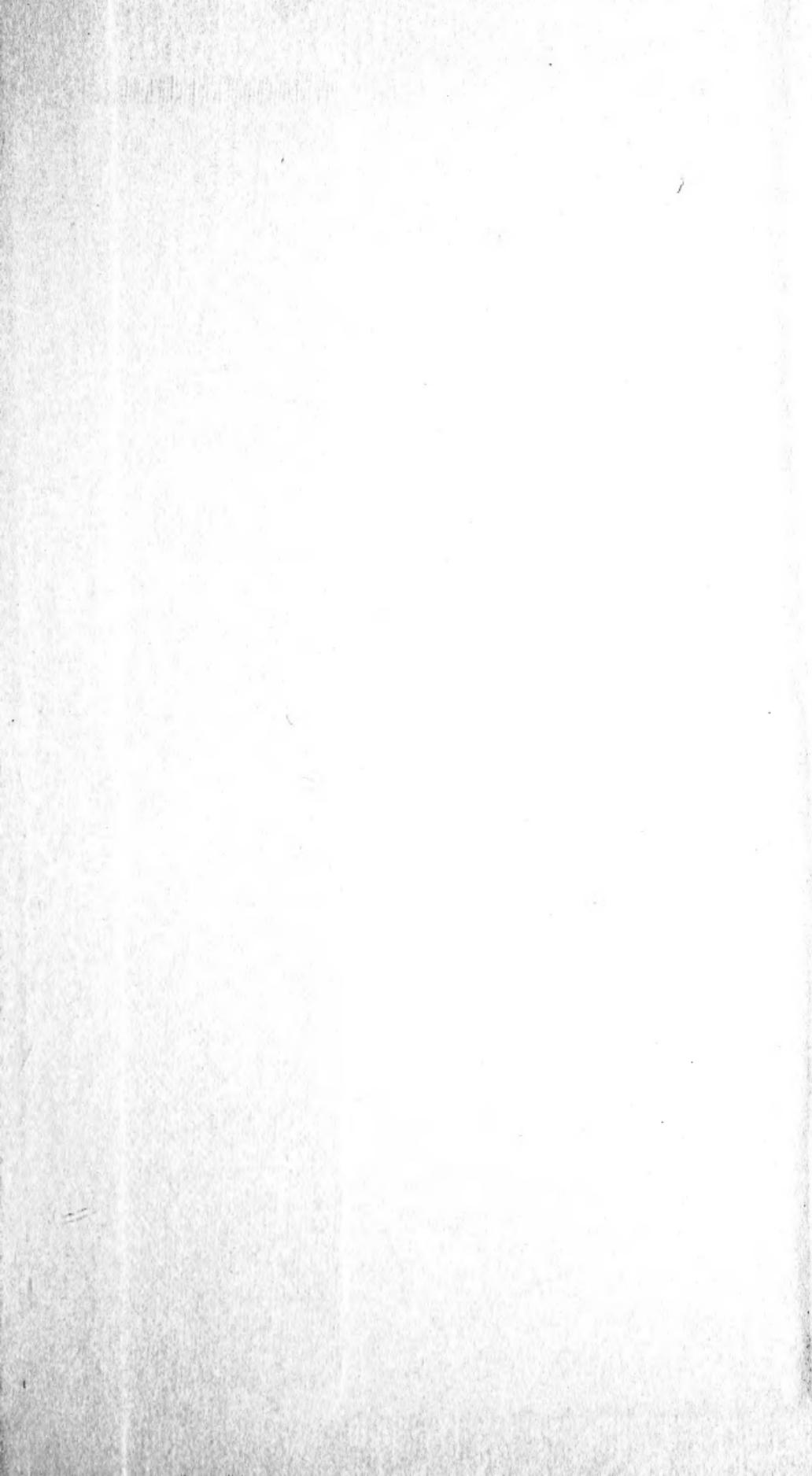
The meeting then dispersed.











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